Personal Computer World

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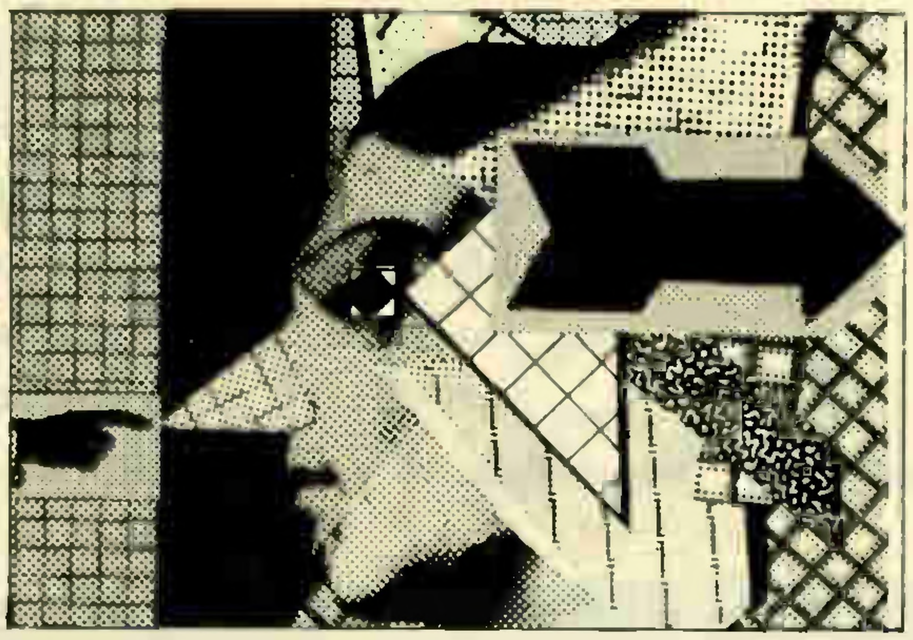

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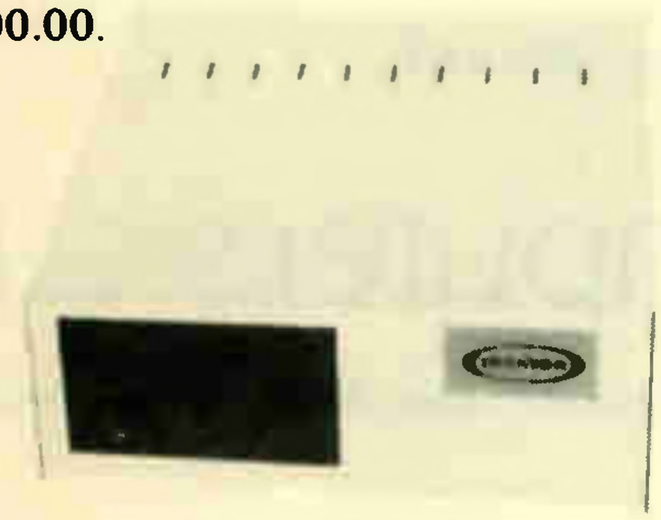

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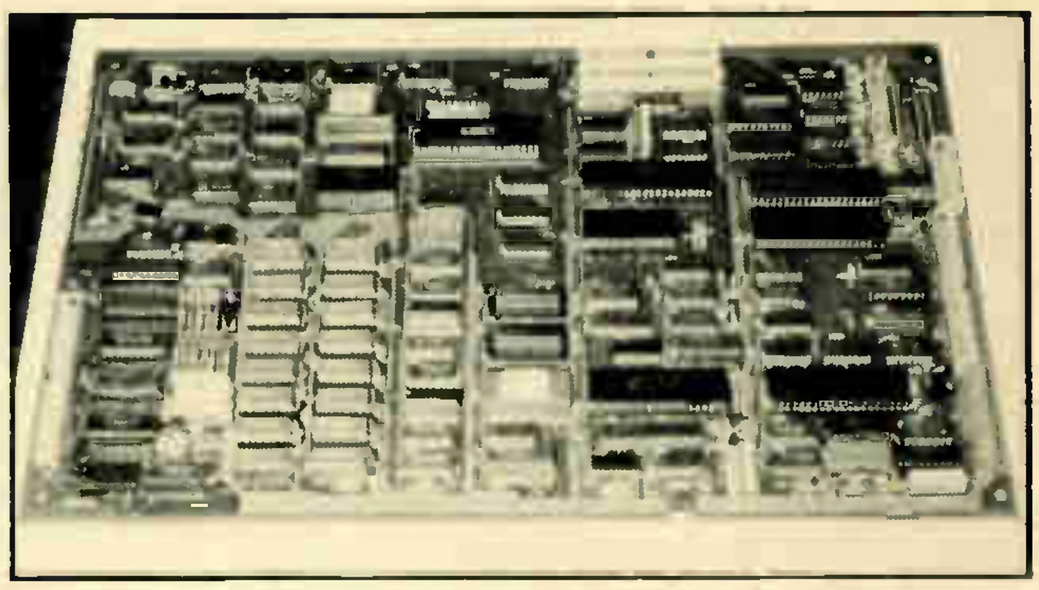

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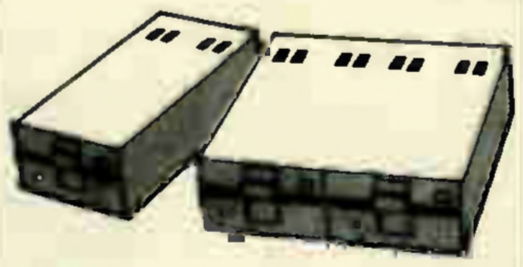

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Provides very high quality type in any six interchangeable style typefaces. It is therefore ideal for business use. Portable. Can also be used as a standard-alone typewriter. Centronics interface standard. Friction feed; 11 CPS; 12" max width; 5 different colour ribbons. Hard Cover with carrying handle. Only £399

Just phone your order through, we do the rest. Tel: (0923) 50234

EPSON PRINTERS



FX80
10" Tractor/Friction feed, 160 CPS, 11×9 matrix, 137 columsn max, Bidirectional, Logic seeking, proportional spacing, Hi-res bit image, Italic & Elite characters, underlining, subscript & superscript.
Only £388 (£7 carr)

RX80
100 CPS, 9×9 matrix, dot addressable graphics, Condensed & Double width printing, Normal, Italics & Elite characters, Tractor Feed, Bi-directional, logic seeking, Centronics Interface standard.
Only £285 (£7 carr)

MX100FT/3
136 columns, 15" carriage, plus all the facilities of MX80FT.
Only £425 (£7 carr)

ACCESSORIES

- TEX EPROM ERASER. Erases up to 32 ICs in 15-30 min. £33
- TEX EPROM ERASER with incorporated Safety Switch £38
- Electronic Timer Solid state. Connects directly to above Erasers. Protects your expensive Chips from overcooking. Our timer pays for itself in no time. £15
- Tex Eprom Eraser including the Electronic timer. £44
- Spare UV lamp bulbs £9
- POWER SUPPLY Regulated, overload protection.
  Variable: 5V to 15V @ 4A £38
- Multirail psu kit including Case. Output: +5V/5A; +12V, +25V, −5V, −12V @ 1A. Only £39 (p&p 95p)
- Attractive Beige Brown ABS CASE for Superboard/UK101 or Home Brew £26
- C12 Cassettes in Library Cases 40p
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- 9½" Fan fold paper (1000 sheets) £7
- Teleprinter Roll 250p
- UHF Modulator 6MH2 350p
- UHF Modulator 8MH2 450p
- Stack Pack the unique stackable twin drawer racking system for Computer Cassettes. 5 Drawers (10 sections) including 10 × C12 Computer Cassettes and Labels £6

CRYSTALS

32.768KH	100	16.0MHz	200
1MHz	275	18.0MHz	180
1.6MHz	392	18.432M	150
1.8MHz	395	19.968M	150
1.843M	200	20.0MHz	200
2.0MHz	225	24.0MHz	170
3.2768M	150	24.930M	325
3.57594	98	48.0M	175
3.6864M	300	100.0M	375
4.0MHz	150		
4.433619	100	100KHz	236
5.0MHz	160	1.28MHz	392
6.0MHz	140	2.4576M	200
6.144MHz	150	3.276MHz	160
6.5536M	200	4.032MHz	290
7.0MHz	150	4.194304	200
7.168MHz	160	4.80MHz	200
7.6MHz	200	5.185MHz	300
8.0MHz	150	5.24288	390
9.0MHz	200	7.7328M	250
9.375M	350	8.0833M	395
10.0MHz	175	8.86723	175
10.7MHz	150		
10.24MHz	200		
12.0MHz	175		
12.528M	300		
14.31818	170		

IDC Connectors:

Speed Block type	PCB Plug with latch Strt Pins	PCB Plug with latch Angle Pins	Female Header Socket	Female Card-Edge Connectors
Two rows				
10 way	90p	99p	85p	120p
16 way	130p	150p	110p	—
20 way	145p	166p	125p	195p
26 way	175p	200p	150p	240p
34 way	205p	236p	160p	320p
40 way	220p	250p	190p	340p
50 way	235p	270p	200p	395p

JUMPER LEADS Ribbon Cable Assembly/DIL Plug (Headers)

Single Ended Lead 24" Long

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

IDC FEMALE RECEPTACLE JUMPER LEADS

	20way	26way	34way	4way
24" 1end	160p	200p	260p	300p
2end	290	370p	480p	525p

DIL SOCKETS

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

RIBBON CABLE

Ways	Grey Price per Foot	Colour Price per Foot
10	15p	28p
16	25p	40p
20	30p	50p
26	40p	65p
34	60p	85p
40	70p	90p
64	120p	160p

DIL PLUGS (Header)

	Solder	IDC
14pin	40p	99p
16pin	49p	105p
24pin	88p	170p
40pin	250p	265p

AMPHENOL PLUGS

24way IEEEE	475p
26way Centronics Parallel	485p

ZIP DIL SOCKETS

24way	575p
28way	750p
40way	975p

VIDEO MONITORS

- ZENITH 12" Hi-Res Green Monitor. 40/80 column select switch Attractively finished £80
- KAGA RGB 12" Standard Res. Colour £199
- KAGA RGB 12" Medium Res Colour £240
- MICROVITEC 1431. 14" Colour Monitor. RGB Input Cable included £250

EURO (DIN) CONNECTORS

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

EDGE CONNECTORS

TWO ROWS	.1"	.156"
2×18way	180p	145p
2×22way	199p	200p
2×23way	185p	
2×25way	225p	220p
2×28way	210p	
2×30way	245p	
2×36way	295p	
2×40way	315p	
2×43way	395p	

D CONNECTORS: Miniature

	9 way	15 way	25 way	37 way
Male				
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 25way 'D' plug 385p Skt 450p

DISKING

FLOPPY DISKS FAST

FREE with EVERY TEN-PACK of diskettes from DISKING at these prices.

The complete DISKING DATA PROCESSING package

1 - SEE 10 LIBRARY BOX



Value £2.50

The NEW DISKING 'SEE 10' Plastic Library Box, with the facility for seeing ALL TEN DISKS, without the usual problem of bending the front disks forward. We've spent the last two years designing the BEST library box around, you will not find anything better. Unfortunately the 'SEE 10' is only available in the 5¼" size, whereas the 8" is the ordinary egly box.

★ ★ PLUS ★ ★



we supply the 'soft touch' DISKING Diskwriter. This pen is perfect for labelling diskettes, as it will not damage the delicate surface beneath the disk jacket. As an ordinary writing implement, it is superlative.
You may purchase these separately at a silly £9.90 for 50 (please specify blue or black ink).

★ ★ PLUS ★ ★

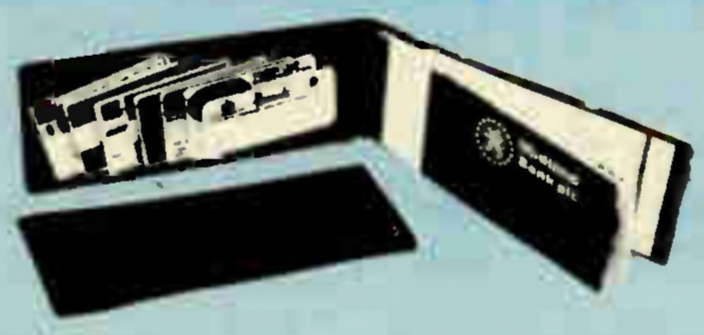
3 - DISK DIRECTORY



Value 99p

The 20 page PVC bound DISKING Disk Directory, offering two pages per diskette for keeping 'Track' of what's on each diskette. Also inside this directory, you will find a self adhesive index label for the spine of your Library Box.
You may purchase these separately at £9.90 for ten.

DISKING SUPER PROMOTION



With every TWO ten packs of any 5¼" or 8" disks by Maxell, Datalife, Memorex or Dysan purchased at these prices we will pack a FREE Cheque Book Cover.
Order FOUR Ten packs and you will receive two Cheque Book Covers and so on. This offer ends 31st December 1983.

DISKETTE PRICES EXC VAT

MEMOREX



MEMOREX - Memory Excellence

When it comes to PRICE/PERFORMANCE, MEMOREX wrote the book. Their new Japanese media is very conservatively rated, and certification levels are easily surpassed in actual performance. Protected by a special anti-static lubricant, head performance and media life is also extended.

5¼" DISKETTES

Certified for Single OR Double Density and all with hub ring reinforcement.

PRICES EXC VAT		10-40	50-90	100+
3481	S/Sided 48 tpi Soft Sect	20.90	19.90	18.90
3483	S/Sided 48 tpi 10 Hard Sect	20.90	19.90	18.90
3485	S/Sided 48 tpi 16 Hard Sect	20.90	19.90	18.90
3491	D/Sided 48 tpi Soft Sect	26.90	25.90	24.90
3493	D/Sided 48 tpi 10 Hard Sect	26.90	25.90	24.90
3495	D/Sided 48 tpi 16 Hard Sect	26.90	25.90	24.90
3504	S/Sided 96 tpi Soft Sect	27.90	26.90	25.90
3505	S/Sided 96 tpi 10 Hard Sect	27.90	26.90	25.90
3506	S/Sided 96 tpi 16 Hard Sect	27.90	26.90	25.90
3501	D/Sided 96 tpi Soft Sect	34.90	33.90	32.90
3502	D/Sided 96 tpi 10 Hard Sect	34.90	33.90	32.90
3503	D/Sided 96 tpi 16 Hard Sect	34.90	33.90	32.90

48 tpi suitable for 35 and 40 track operation
96 tpi suitable for 77 or 80 track operation

8"DISKETTES

PRICES EXC VAT		10-40	50-90	100+
3064	S/Sided S/Dens Soft Sect	23.90	22.90	21.90
3015	S/Sided S/Dens. 32 Hard Sect	23.90	22.90	21.90
3090	S/Sided D/Dens. Soft Sect	26.90	25.90	24.90
3091	S/Sided D/Dens. 32 Hard Sect	26.90	25.90	24.90
3102	D/Sided D/Dens. Soft Sect	32.90	31.90	30.90
3105	D/Sided D/Dens. 32 Hard Sect	32.90	31.90	30.90

Datalife



DATALIFE by Verbatim - With Five Year Warranty

VERBATIM have not become the World's favourite floppy disks by accident. Perfect magnetic media is their stock in trade, and to prove it they now offer an unconditional FIVE YEAR warranty on all DATALIFE products.

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Certified for Single OR Double Density, and all with hub ring reinforcement.

PRICES EXC VAT		10-40	50-90	100+
MD525-01	S/S 48 tpi Soft Sect	22.90	21.90	20.90
MD525-10	S/S 48 tpi 10 Hard Sect	22.90	21.90	20.90
MD525-16	S/S 48 tpi 16 Hard Sect	22.90	21.90	20.90
MD550-01	D/S 48 tpi Soft Sect	29.90	28.90	27.90
MD550-10	D/S 48 tpi 10 Hard Sect	29.90	28.90	27.90
MD550-16	D/S 48 tpi 16 Hard Sect	29.90	28.90	27.90
MD577-01	S/S 96 tpi Soft Sect	28.90	27.90	26.90
MD577-10	S/S 96 tpi 10 Hard Sect	28.90	27.90	26.90
MD577-16	S/S 96 tpi 16 Hard Sect	28.90	27.90	26.90
MD557-01	D/S 96 tpi Soft Sect	36.90	35.90	34.90
MD557-10	D/S 96 tpi 10 Hard Sect	36.90	35.90	34.90
MD557-16	D/S 96 tpi 16 Hard Sect	36.90	35.90	34.90

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

8" DISKETTES

PRICES EXC VAT		10-40	50-90	100+
FD34-9000*	S/S S/Dens. Soft Sect	31.90	30.90	29.90
FD32-9000*	S/S S/Dens. 32 Hard Sect	31.90	30.90	29.90
FD34-8000	S/S D/Dens. Soft Sect	31.90	30.90	29.90
FD32-8000	S/S D/Dens. 32 Hard Sect	31.90	30.90	29.90
DD34-4001	D/S D/Dens. Soft Sect	36.90	35.90	34.90
DD32-4000	D/S D/Dens. 32 Hard Sect	36.90	35.90	34.90

*For critical applications

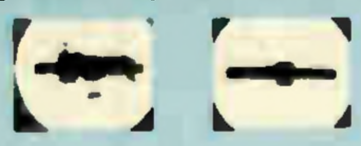
DISKETTE CARE AND MAILING



NEW LOW PRICES

DISK DRIVE HEAD CLEANING KITS

We're fed up with being asked whether our disk drive head cleaning kit actually works. So here's the proof:-



Can you really risk that breakdown?

CK5	for 5¼" disk drives	14.90
CK8	for 8" disk drives	14.90

The NEW DISKING 'SUPERMAILER'

(5¼" only)



* COPYRIGHT DESIGN - Unlike the rest, this ingenious mailer has a flute crossing action when folded, resulting in a virtually unbendable mailer.

* CAVERNOUS CAPACITY - will take, one, two, three or even four diskettes WITH envelopes.

* FULL INSTRUCTIONS - Each DISKING 'SUPERMAILER' is printed with full instructions and comes complete with addressing/sealing label.

*PACKED IN 100'S - For convenience

1 PACK	2 PACKS	3+ PACKS
24.90	22.90	19.90

All free gifts offered at any time by DISKING are subject to availability. DISKING reserves the right to substitute any similar alternative item or withdraw the offer without notice.

DISKING - RESPOND

Nervous of mail order? Fed up with "allow 28 days for delivery"? Dubious of quality? Of course you are ,so what's new? DISKING STOCK AROUND 50,000 OF THE WORLD'S FINEST DISKETTES - That's what! Ask any of our 1000's of customers, we ship inside 4 WORKING HOURS! They've also discovered this in Norway, Sweden, Belgium, Germany, Malta, Greece, France, Israel, Bahrain, South Africa, Malawi etc.
Whether you want 1 or 100 Ten-Packs - We're waiting.

Call Joan or Roger on 0428 722563. ACCESS, VISA & DINERS cards welcome.

50,000 diskettes normally in stock
most orders shipped inside 4 hours.

DISKING INTERNATIONAL

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TELEPHONE (0428) 722563
TELEX 858623 Telbur G or 858393 Telbur G

ALL PRICES PER TEN-PACK

maxell



MAXELL - The Gold Standard

Maxell consistently meet or exceed all standards, and have run disks under conditions designed to find weak points and wear. They couldn't and you won't. These diskettes are the quietest in operation we know.

5¼" DISKETTES

Certified for Single OR Double Density
48 tpi media with hub ring

PRICES EXC VAT		10-40	50-90	100+
MD1-D	S/Sided 48 tpi Soft Sect	24.90	23.90	22.90
MH1-10	S/Sided 48 tpi 10 Hard Sect	24.90	23.90	22.90
MH1-16	S/Sided 48 tpi 16 Hard Sect	24.90	23.90	22.90
MD2-D	D/Sided 48 tpi Soft Sect	32.90	31.90	30.90
MH2-10D	D/Sided 48 tpi 10 Hard Sect	32.90	31.90	30.90
MH2-16D	D/Sided 48 tpi 16 Hard Sect	32.90	31.90	30.90
MD1-DD	S/Sided 96 tpi Soft Sect	32.90	31.90	30.90
MD2-DD	D/Sided 96 tpi Soft Sect	42.90	41.90	40.90

8" DISKETTES

PRICES EXC VAT		10-40	50-90	100+
FD1-128	S/S S/Dens Soft Sect	29.90	28.90	27.90
FH1-32	S/S S/Dens. 32 Hard Sect	29.90	28.90	27.90
FD1-XD	S/S D/Dens Soft Sect	34.90	33.90	32.90
FH1-32D	S/S D/Dens. 32 Hard Sect	34.90	33.90	32.90
FD2-XD	D/S D/Dens. Soft Sect	39.90	38.90	37.90
FH2-32D	D/S D/Dens. 32 Hard Sect	39.90	38.90	37.90

Dysan CORPORATION



DYSAN - For The Decisive

When you think of disks you often think of DYSAN. DYSAN have the reputation for TOTAL dependability whatever the application. They may cost a little more but data is irreplaceable.

5¼" DISKETTES

Certified for Single OR Double Density, and all with hub ring reinforcement.

PRICES EXC VAT		10-40	50-90	100 +
104/1D	S/S 48 tpi Soft Sect	25.90	24.90	23.90
107/1D	S/S 48 tpi 10 Hard Sect	25.90	24.90	23.90
105/1D	S/S 48 tpi 16 Hard Sect	25.90	24.90	23.90
104/2D	D/S 48 tpi Soft Sect	37.90	36.90	35.90
107/2D	D/S 48 tpi 10 Hard Sect	37.90	36.90	35.90
105/2D	D/S 48 tpi 16 Hard Sect	37.90	36.90	35.90
204/1D	S/S 96 tpi Soft Sect	36.90	35.90	34.90
207/1D	S/S 96 tpi 10 Hard Sect	36.90	35.90	34.90
205/1D	S/S 96 tpi 16 Hard Sect	36.90	35.90	34.90
204/2D	D/S 96 tpi soft sect	46.90	45.90	44.90
207/2D	D/S 96 tpi 10 Hard Sect	46.90	45.90	44.90
205/2D	D/S 96 tpi 16 Hard Sect	46.90	45.90	44.90

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

8" DISKETTES

PRICES EXC VAT		10-40	50-90	100 +
3740/1	S/S S/Dens Soft Sect	30.90	29.90	28.90
101/1	S/S S/Dens. 32 Hard Sect	30.90	29.90	28.90
3740/1D	S/S D/Dens. Soft Sect	37.90	36.90	35.90
101/1D	S/S D/Dens. 32 Hard Sect	37.90	36.90	35.90
3740/2D	D/S D/Dens Soft Sect	41.90	40.90	39.90
101/2D	D/S D/Dens 32 Hard Sect	41.90	40.90	39.90

UK SHIPPING RATES EXC VAT

5¼" DISKETTES
1-2 Packs each pack @ 95p
3-5 Packs each pack @ 75p
6-9 Packs each pack @ 60p
10+ Packs ★POST FREE★

8" DISKETTES
1-2 Packs each pack @ £1.60
3-5 Packs each pack @ £1.20
6-9 Packs each pack @ 90p
10+ Packs ★POST FREE★

5¼" CLEANING KITS
Same postal rate as packs of 5¼" diskettes, 10+ POST FREE

8" CLEANING KITS
Same postal rate as packs of 8 diskettes, 10+ POST FREE

5¼" NEW SEE 10 LIBRARY BOXES
SEE 10 1-4 off @ 40p
SEE 10 5-9 off @ 30p
SEE 10 10+ @ 20p

8" LIBRARY BOXES
LB8 1-4 off @ 60p
LB8 5-9 off @ 45p
LB8 10+ off @ 30p

DISKING SUPERLUXE DISK LIBRARY (5¼" ONLY)
Same postal rate as 5¼" diskettes 10+ POST FREE

DISKING DISK DIRECTORIES
10-Pack 2.00

DISKING SUPERMAILERS (5¼" ONLY)
100 Pack Complete with sealing labels 3.00

DISKING DISKWRITERS
50 Pack £1.00

LOCKABLE DISKETTE STORAGE
All versions £2.00 each for one, £1.30 each for 2-7, 8+ postfree.

NORMAL ORDERS - We now welcome any official Government orders

We are now happy to accept any official orders with a minimum value of £30.00 from Government Departments, Ministries and Local Authorities. We do this on the understanding that invoices will be settled within thirty days or preferably less please.
Alternately, you may send your remittance with your order if you so wish.
All other non Government bodies, cheques with order please payable to DISKING. If you are a large establishment, and cannot raise cheques without an invoice please post or telephone us your order, and we will send a pro-forma invoice by return, for your accounts department to pay against.
Also bear in mind, that you do have to pay VAT, which will be added to these prices.
If you are in any doubt, please see the order form on this brochure to help you with your calculations or telephone us for assistance.

CREDIT CARD ORDERS

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 don't leave long gaps otherwise our machine thinks you've gone home) and don't forget to give the following details -

1. The Cardholder Name, Address and day time telephone number
2. Delivery Address if different
3. First Class, ordinary or special post
4. Your Credit Card Number
5. What you wish to Order
6. State whether purchasing from our General price list or Budget price list

You may leave the rest to US!

URGENT ORDERS

If you're posting your order, omit the word FREEPOST from our address, and use our normal postcode GU30 7EJ and do not forget to stamp it FIRST CLASS. If you are a Government body as defined under NORMAL ORDERS and are telephoning your official order OR are an individual or company using your credit card No., please make it clear that you wish to pay for your goods to be sent to you by FIRST CLASS POST.

FIRST CLASS RATES EXC VAT	MINIDISKS	8" DISKETTES
First TEN-PACK	2.00	2.50
Second and subsequent TEN PACK	1.50	2.00

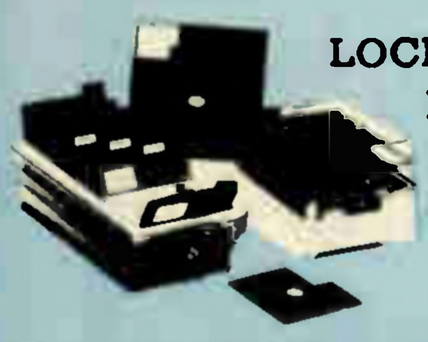
DESPERATE ORDERS U.K.

Your options are - DATAPOST Which will deliver the goods within the United Kingdom overnight (usually before 10 am the next day) provided they are ordered and paid for from DISKING by 3.00 pm or EXPRESSPOST Which will deliver the goods the SAME DAY provided they are ordered and paid for from DISKING by 10.30 am and provided you are no further north than Manchester.
These services put great stress on our sales order processing and packaging departments. Please therefore, spare a thought for our girls, and make sure that -
a) The required goods are in stock and
b) A full complement of manpower and vehicles are available at DISKING.

TRADE CORNER

Write or call for our very latest Autumn '83 TRADE PACK.
KEENER prices than ever before, but QUALITY maintained.
Don't buy other peoples cheap disks, they are probably batch tested and they will probably let your customer down. We know - we get sob stories on the 'phone daily. Every diskette that DISKING sells is individually certified! - for yours and our PEACE OF MIND.
You may mix and match any of our quality diskettes so that your customers may select their favourite brands. This way you can be sure of pleasing everybody.
A FREE sample unlabelled diskette will also be enclosed, which are available in 100 bulk packs and at extremely keen prices just in case you should be selling software.
If you get any enquiries for pre-formatted diskettes, do not sweat because we can obtain most of them.
BLANK CASSETTES are also available complete with library cases in either C-12 or C-15 format at £39.00 per 100, U.K. P&P £4.00.

DISKETTE STORAGE



LOCKABLE DISKETTE STORAGE

These anti-static, ABS plastic diskette storage boxes come in four sizes, two for mini disks and two for 8" disks.
They have a white base with a transparent smoked lockable lid, and hold 40 or 80 diskettes.
They come complete with keys and dividers.

PRICES EXC VAT

M35 40 minidisk capacity	14.90
M85 80 minidisk capacity	18.90
F40 40 8" diskette capacity	18.90
F90 80 8" diskette capacity	27.90

DISKING SUPERLUXE DISK LIBRARY (5¼" only)



The whole area of your disk, its labelling and its envelope are fully visible for INSTANT selection ANYTIME.

AVAILABLE IN TWO VERSIONS

PRICES EXC VAT	1-2	3-4	5-9	10+
SDL (For 20 minidisks)	9.95	8.95	7.95	6.95
SDLX (For 28 minidisks)	11.95	10.95	9.95	8.95
Uprating Conversion Kit	2.00			

LIBRARY BOXES



PRICES EXC VAT	1-49	50+
SEE 10 for minidisks only	2.50	2.20
	1-47	48+
8" LIBRARY BOX (NOT SEE 10 Design)	2.50	2.20

The new SEE 10 is probably the best 5¼" library box around.

(FREE with every ten disks ordered)

QTY	PART NO	DESCRIPTION	PRICE EXC VAT
			£
			£
			£

TOTAL GOODS VALUE EXC VAT £
TOTAL DELIVERY AND INSURANCE £
SUB TOTAL EXC VAT £
VAT £
VALUE OF CHEQUE PAYABLE TO DISKING £

Name: _____ Tel No: _____
Address _____
Please charge my credit card No: _____

PROBLEM ..... You know you need a computer in your business but you are faced with a bewildering range of machines and software

SOLUTION .... fill in the coupon and let us do the work for you!



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DATA DISK

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PRINTERS

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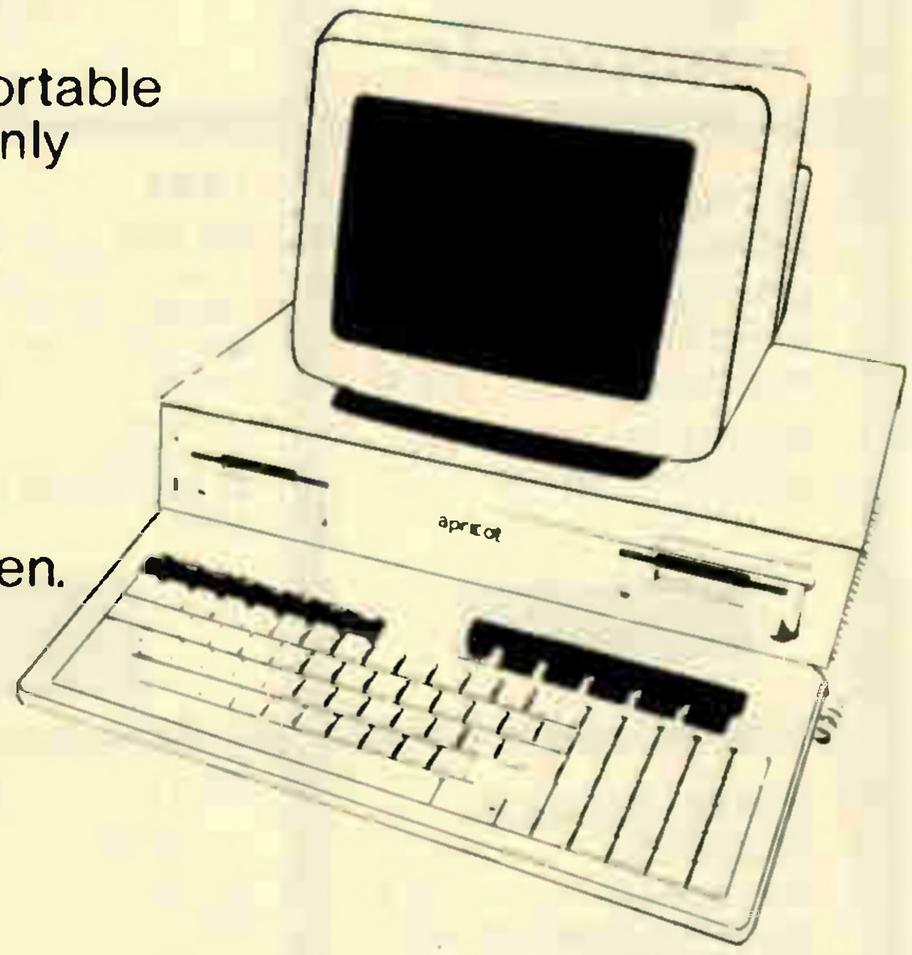

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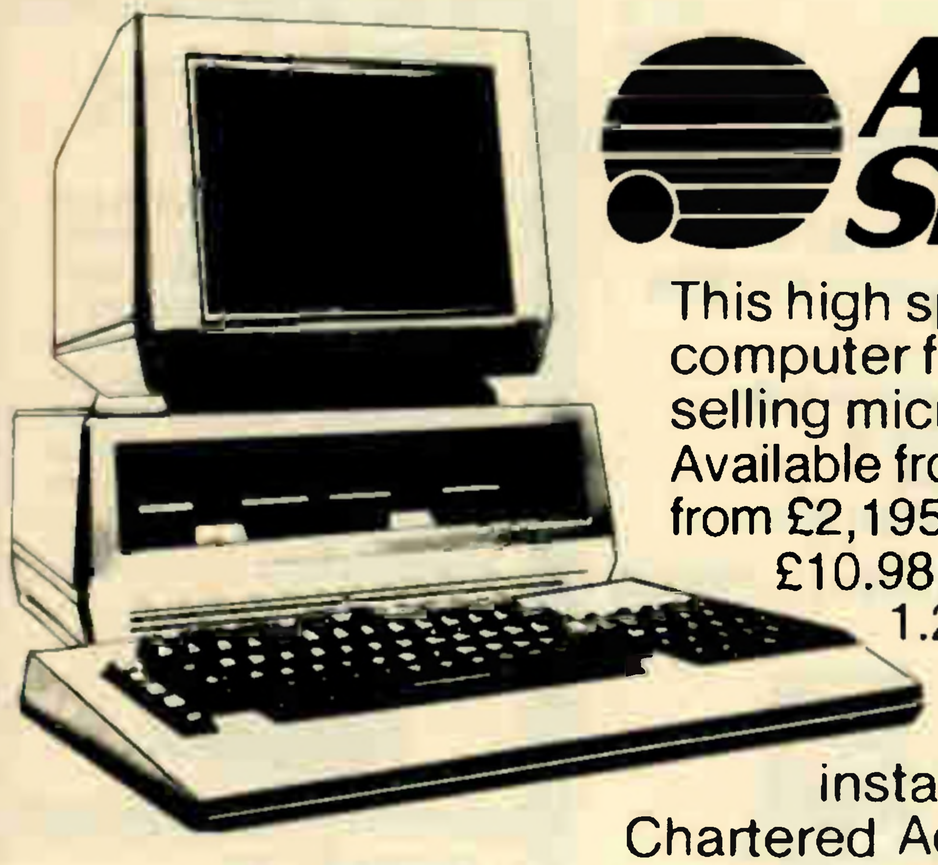

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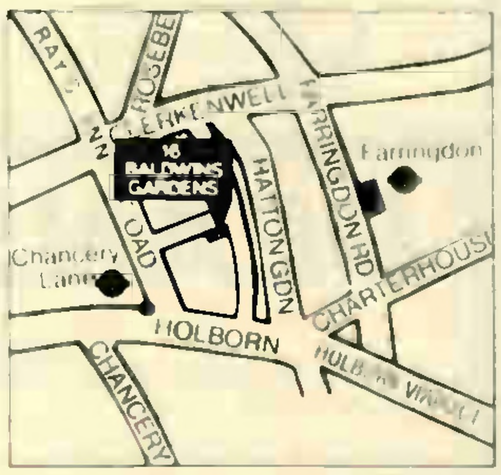

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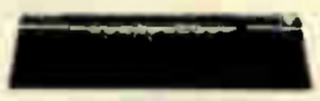

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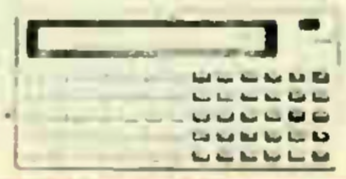

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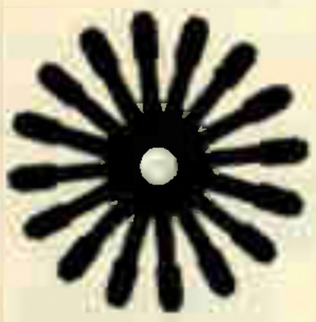

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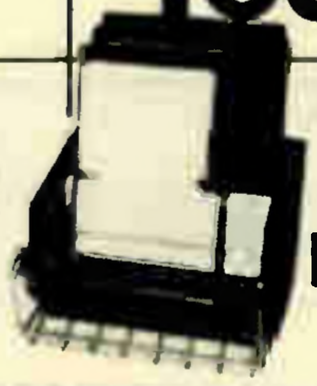

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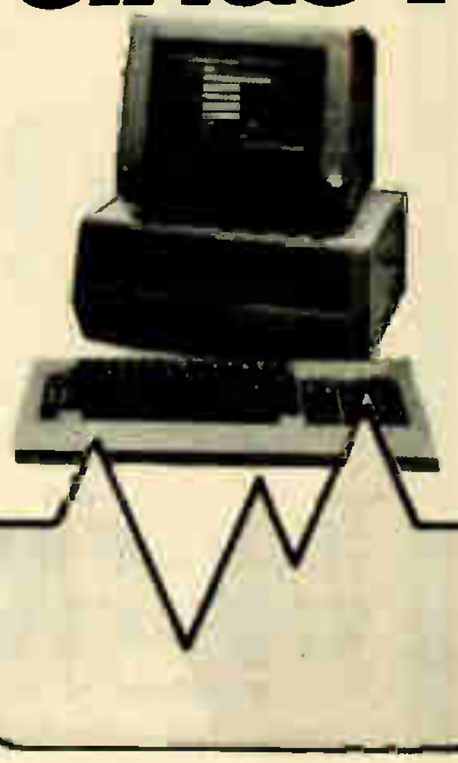

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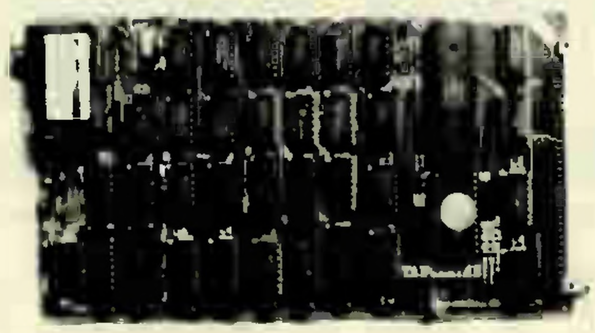

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3491-HR D-side/D Dens (48tpi 40Tr)	19.50	18.50	17.50		
3504-HR S-side/Q Dens (96tpi 80Tr)	23.00	22.10	21.30		
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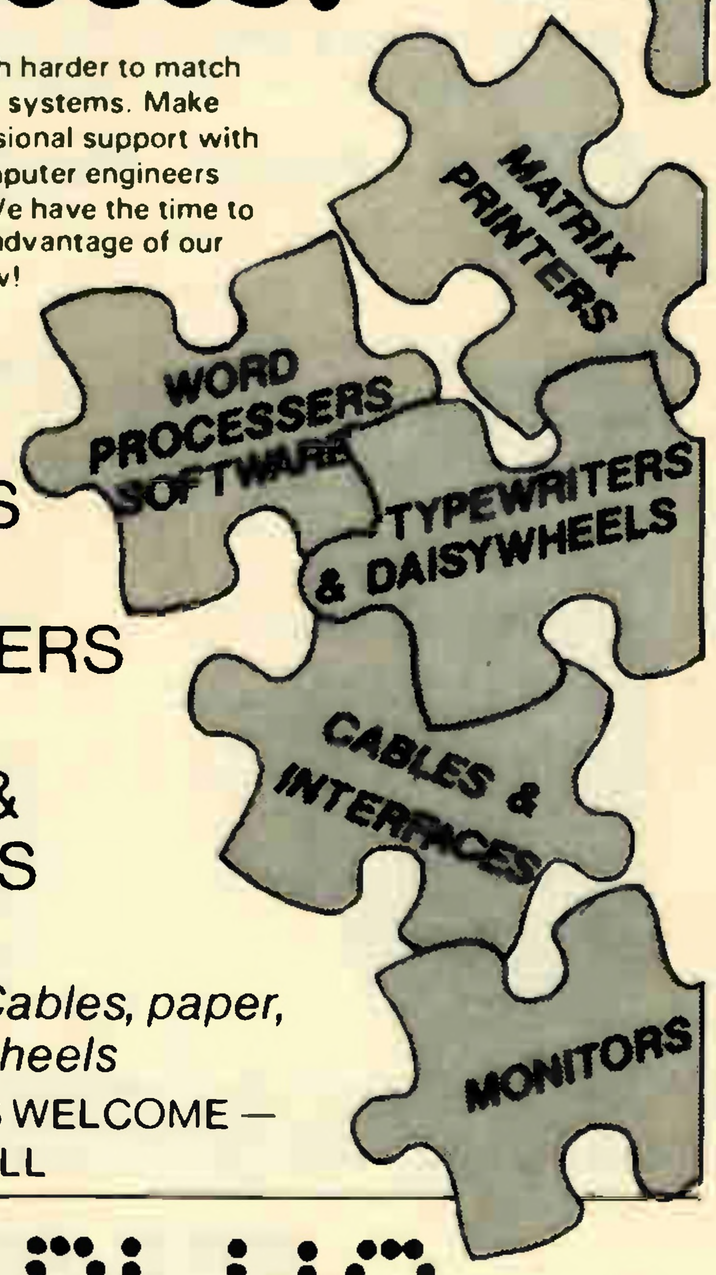

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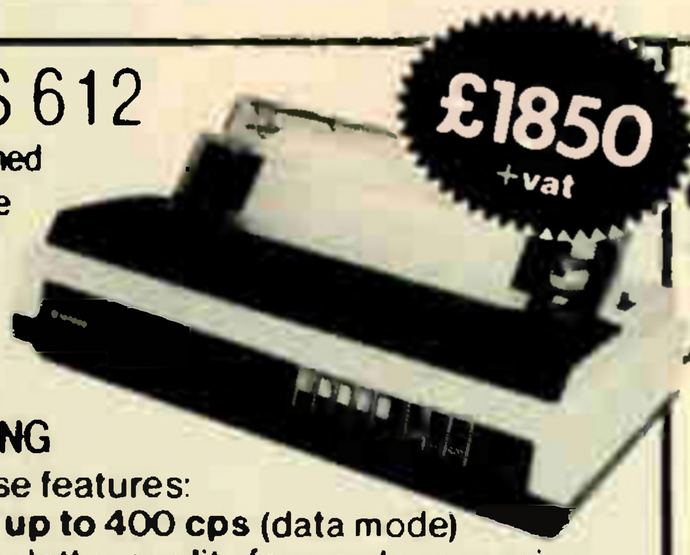

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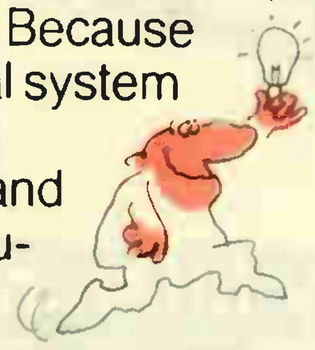

For people who mean business.

Micromail isn't for programmers, it's for businessmen. (In fact, you don't have to be much more than a one-fingered typist to use Micromail on an Apricot or Sirius computer.)

Making it work for you.



Micromail is unbelievably simple to operate. First, you press the button that dials into British Telecom's central mailbox computer, Telecom Gold. Next, you enter your secret password, the name of the person to whom the message is to be sent, followed by the text. In seconds, it is delivered to the recipient's mailbox. When he dials in, the message is waiting.

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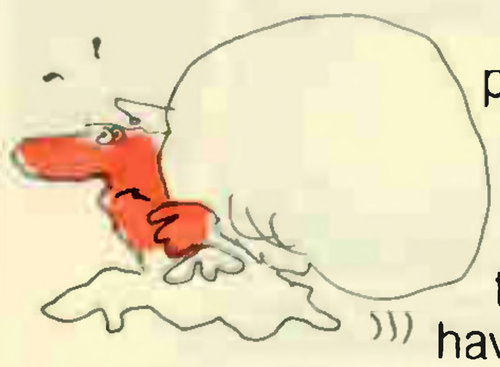

To give you an example of price, a one page A4 letter of, let's say 400 words, takes under one minute to send and costs less than 20p. And you could have a reply back within 5 minutes. Try comparing that price with Fax, Datapost or ordinary telex.

Start saving stamps.

Micromail operates non-stop and is completely portable. Which means that if you're a sales executive with a portable computer you can check your own mailbox, or transmit messages from wherever you are, whenever you want, with an ordinary telephone. You'll never have to use another stamp.



The package.

Altogether, Micromail contains three components which currently operate with Apricot and Sirius computers.

The first is a fully automatic modem which enables messages to be sent at high speed over ordinary telephone lines.



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PCW1

PCW 21

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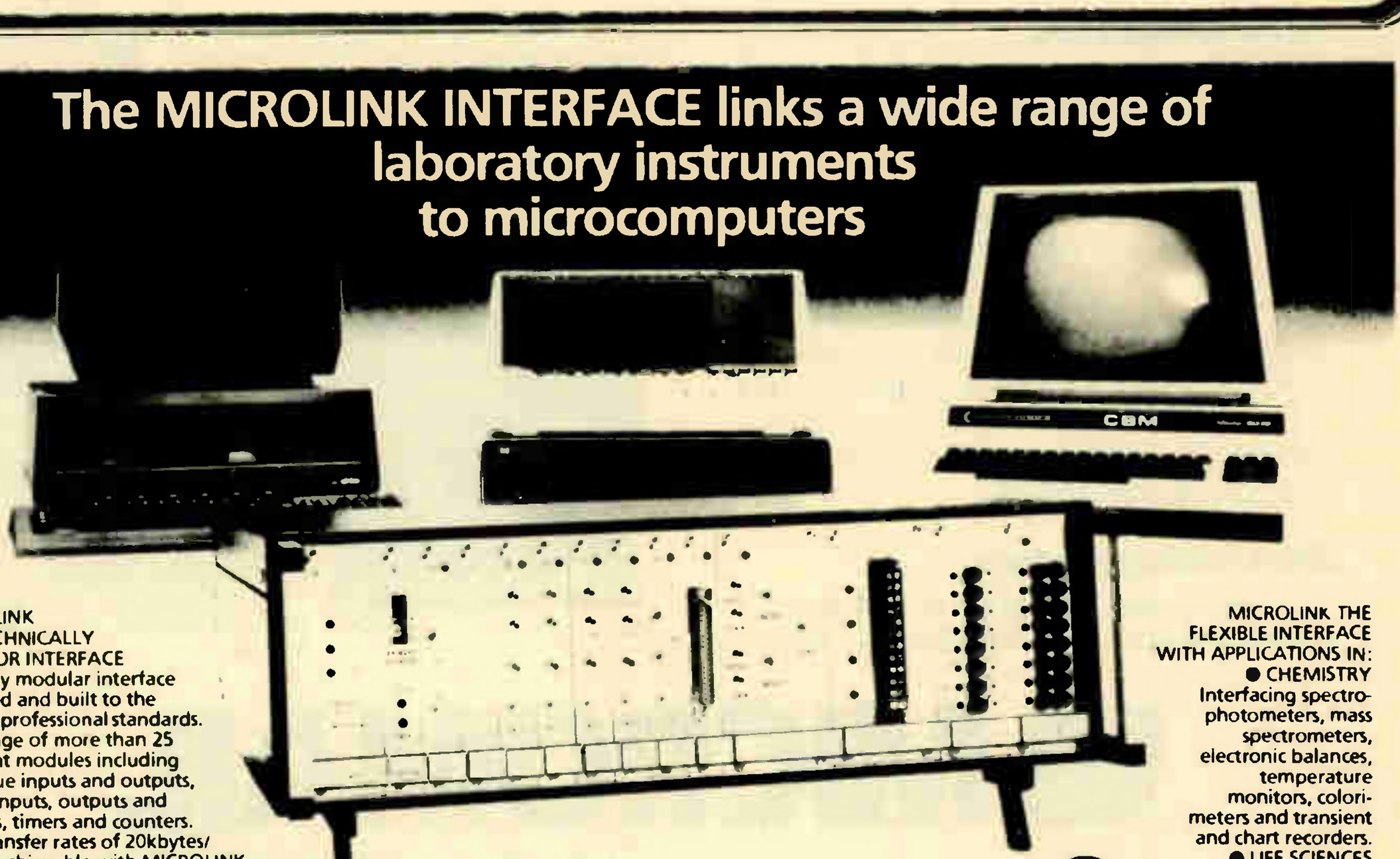

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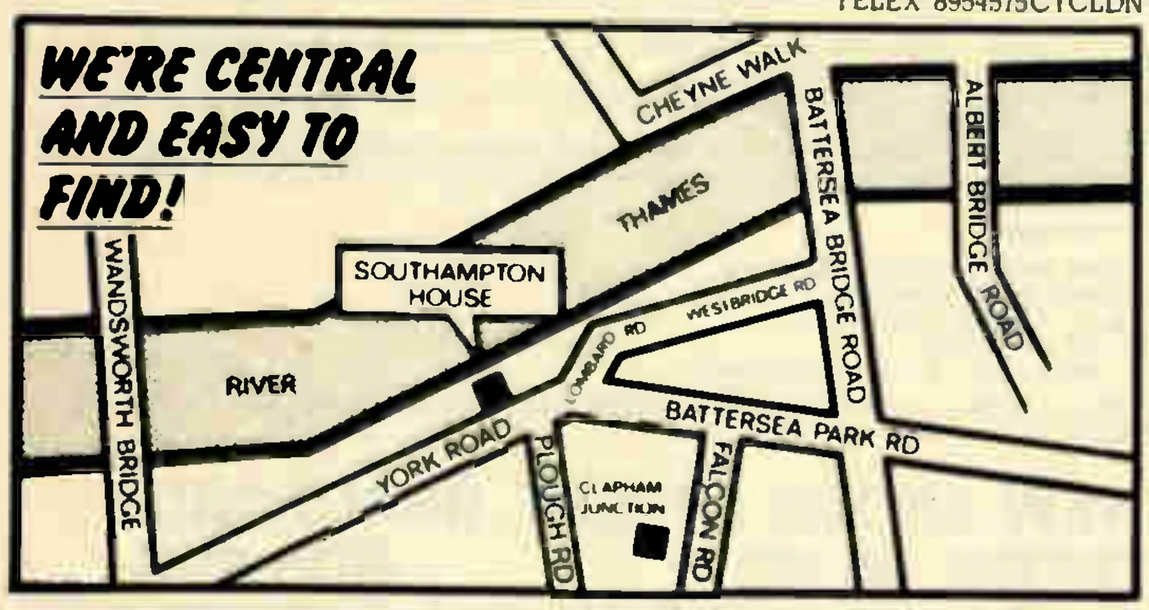

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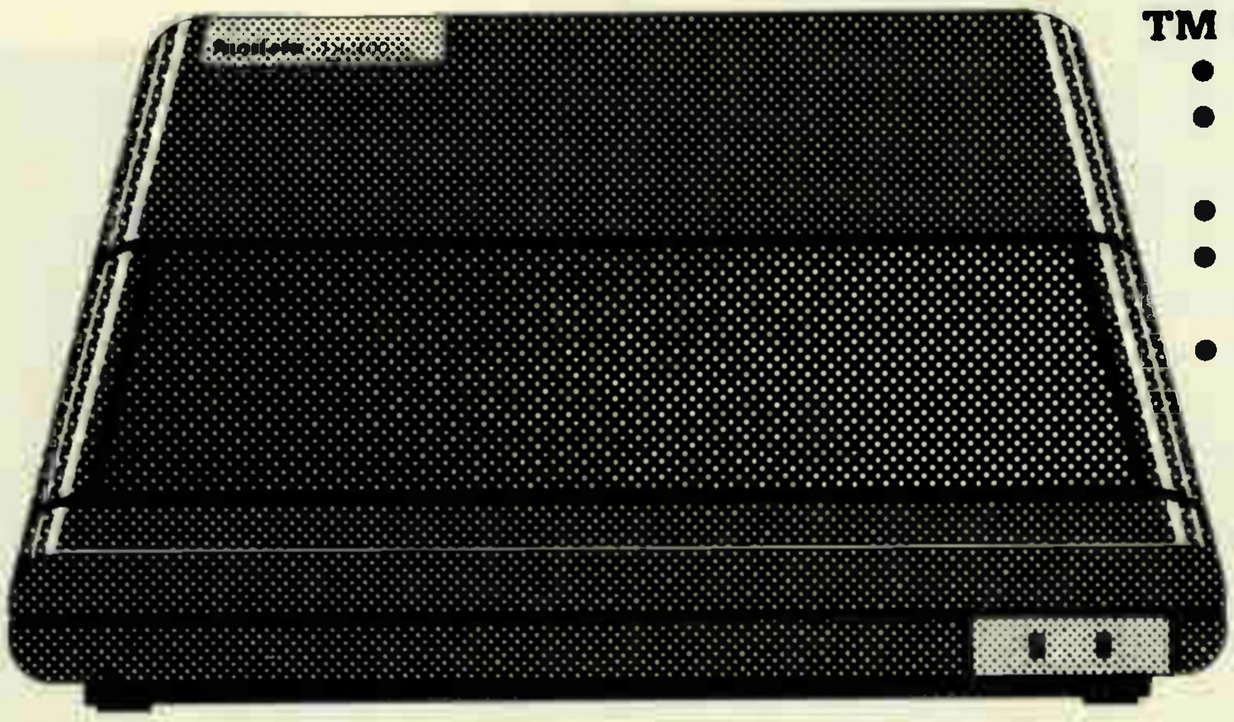

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*OPT5,n	Sets the start address of the DFS buffer (see OPT7)	*SYS	Selects either Acorn mode or Extended mode

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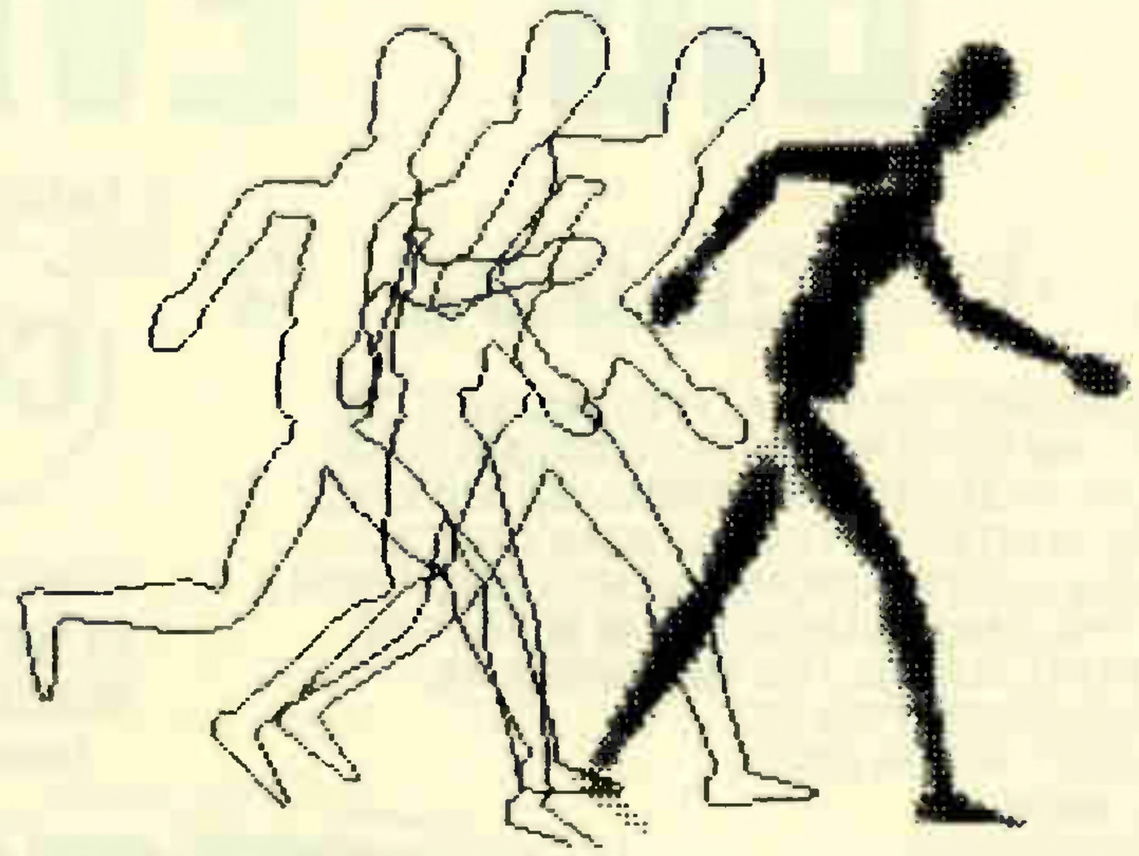

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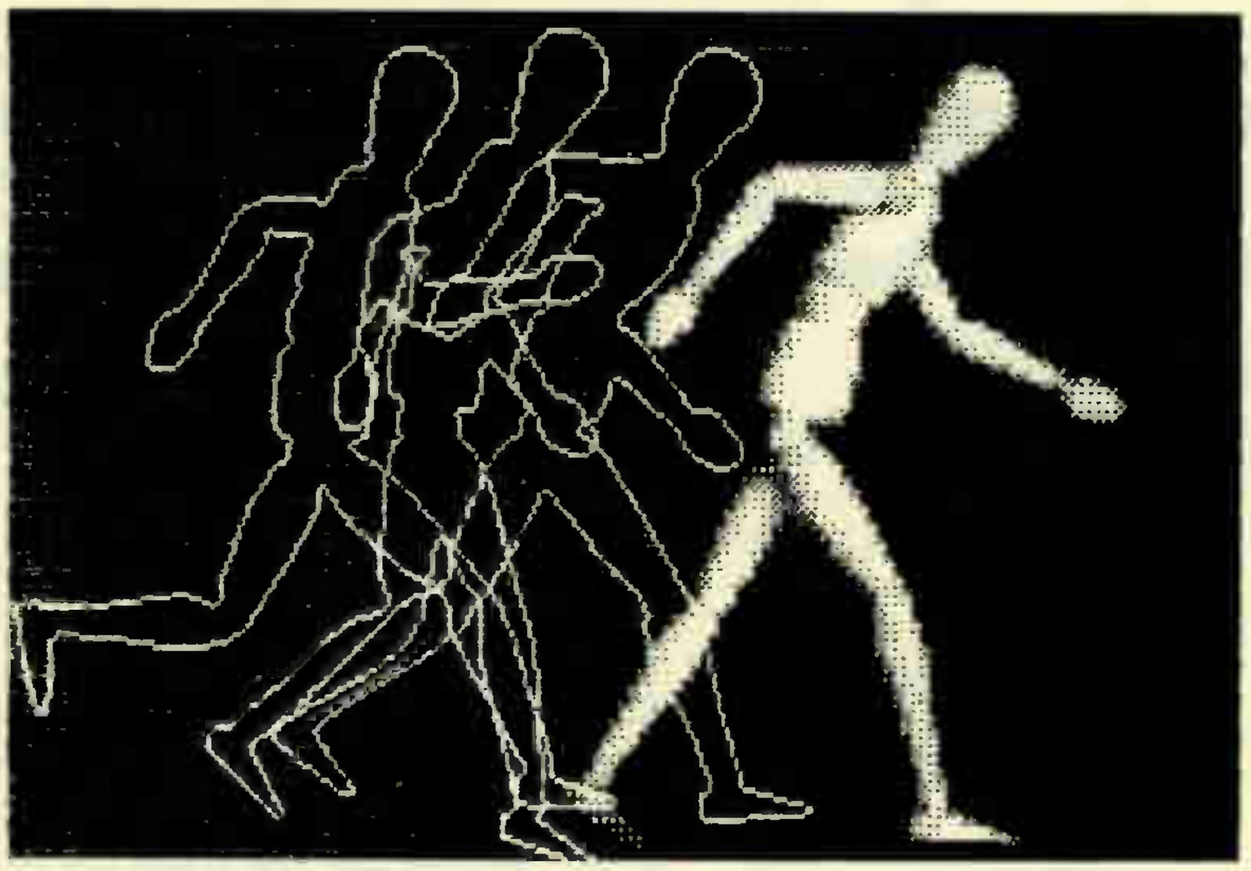

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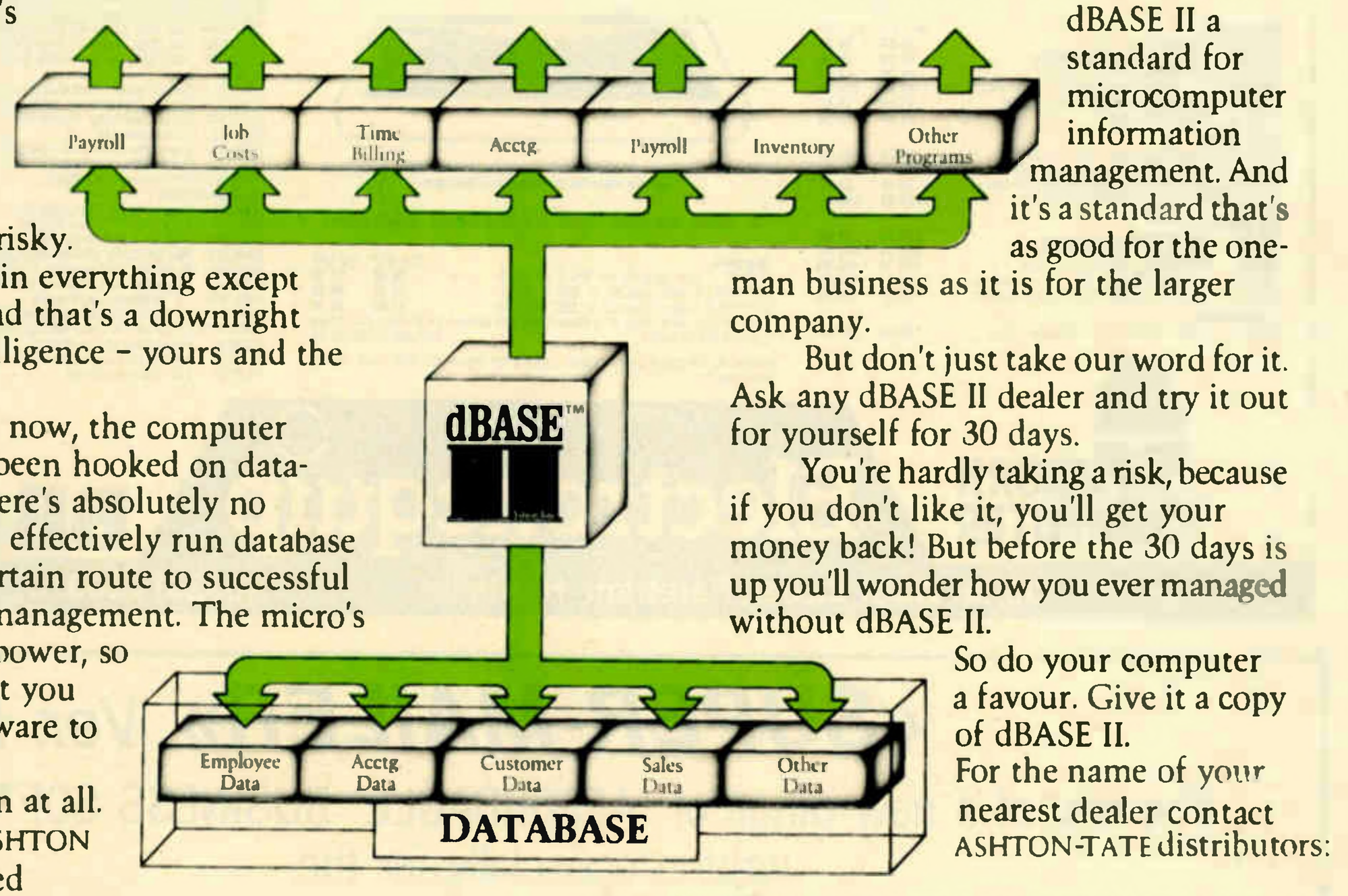

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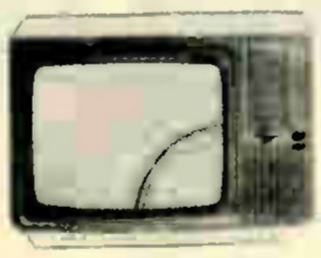

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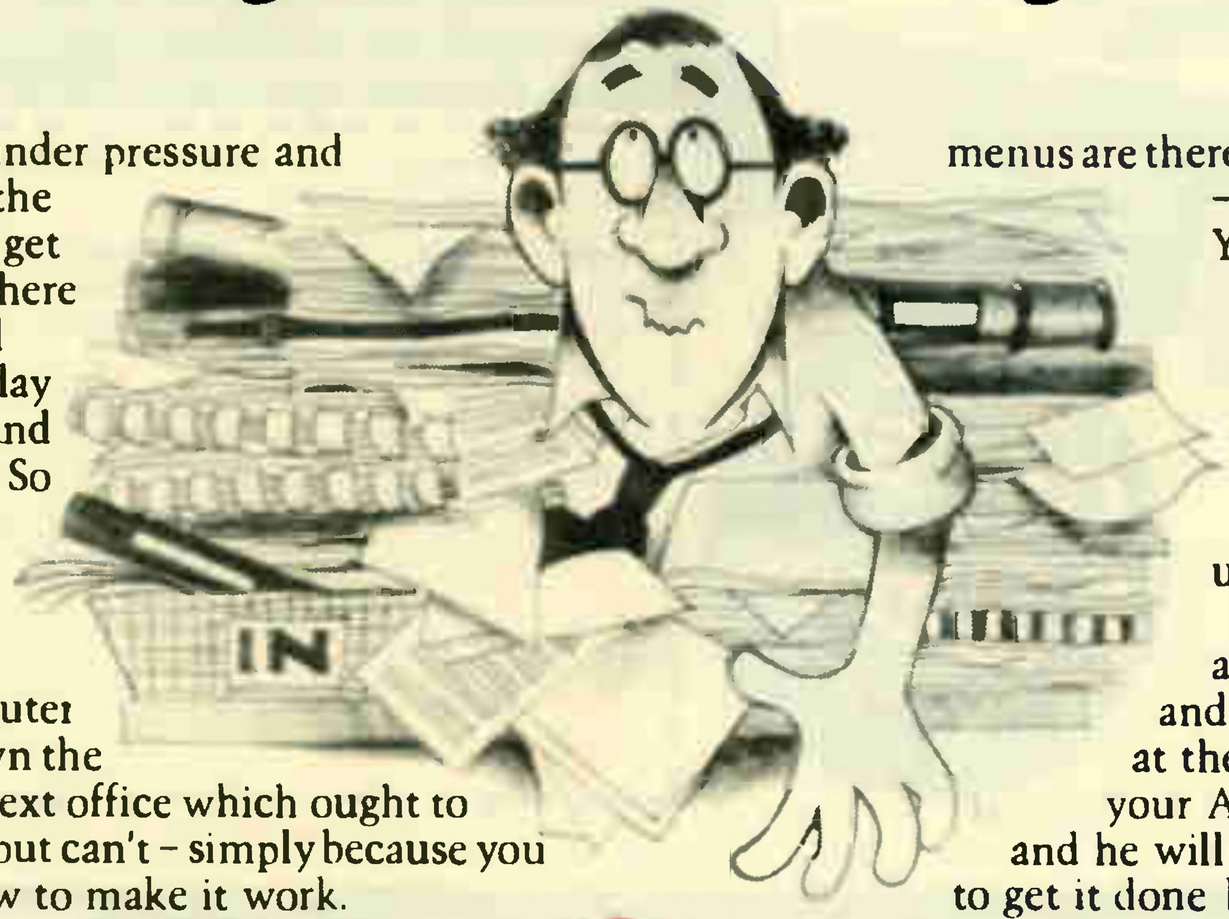

You are under pressure and you can't find the information to get the job done. Where is it? You could spend half the day looking for it. And still not find it. So you just give up and start all over again.
This is crazy.
There's a computer in the shop down the road or in the next office which ought to be able to help, but can't – simply because you don't know how to make it work.

At least, not until Friday! With Friday you can use that computer and forget all about programming. Friday will take care of everything. ■**FILES** ■**REPORTS** ■**DIARY** ■**MAILINGS** ■ **and much more.** Whatever it is you need to know – how well sales are going, what the stock levels look like, who owes you money, how much you have in the bank, whose salary is up for review – Friday can tell you in seconds. Produce reports instantly to a standard easily good enough to impress the board.

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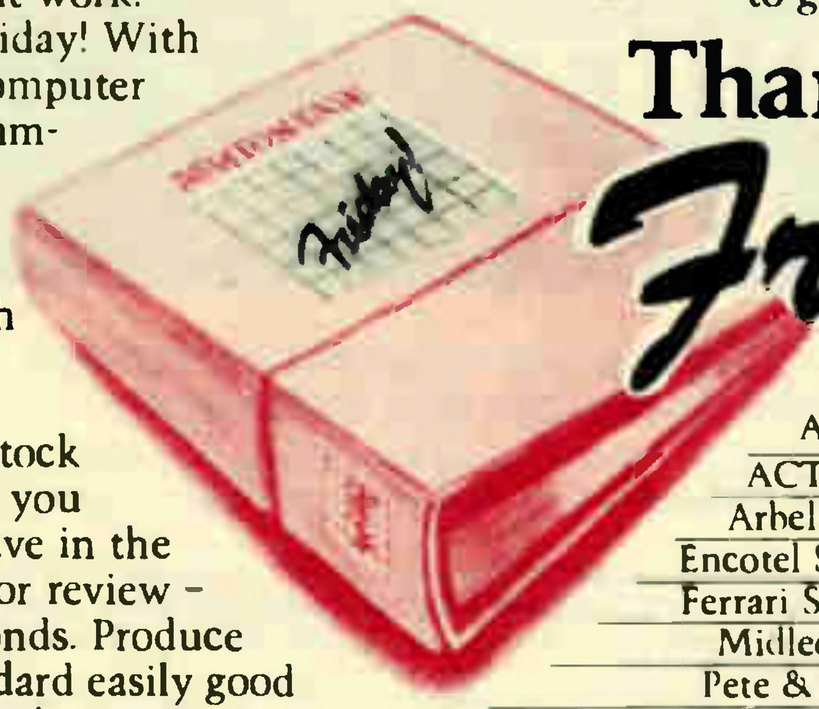
Invest half an hour with Friday and you will be amazed at the return. Just visit your Ashton-Tate dealer and he will demonstrate how to get it done by Friday.



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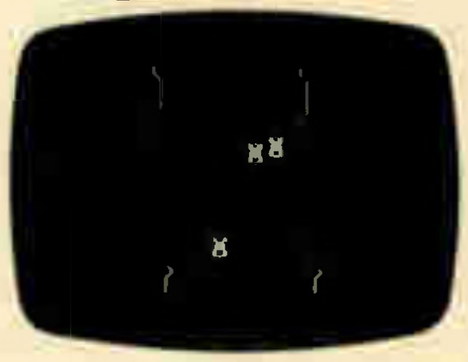

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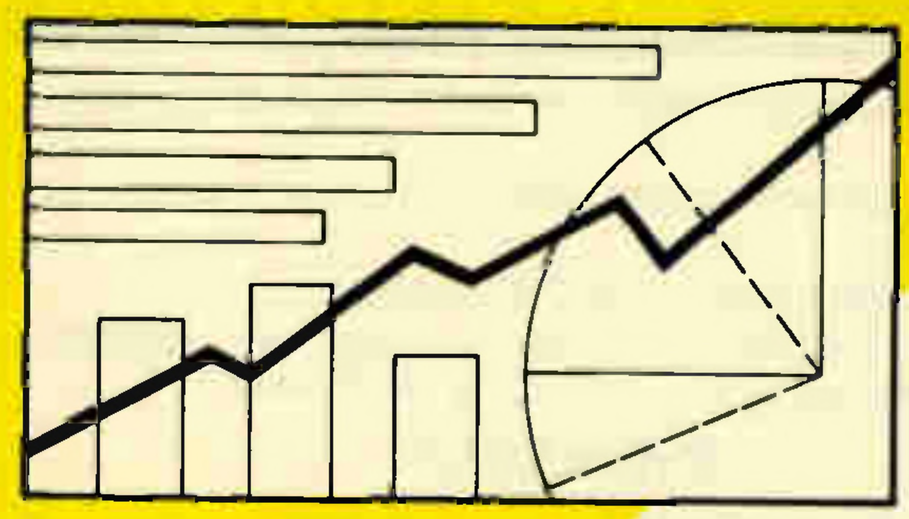

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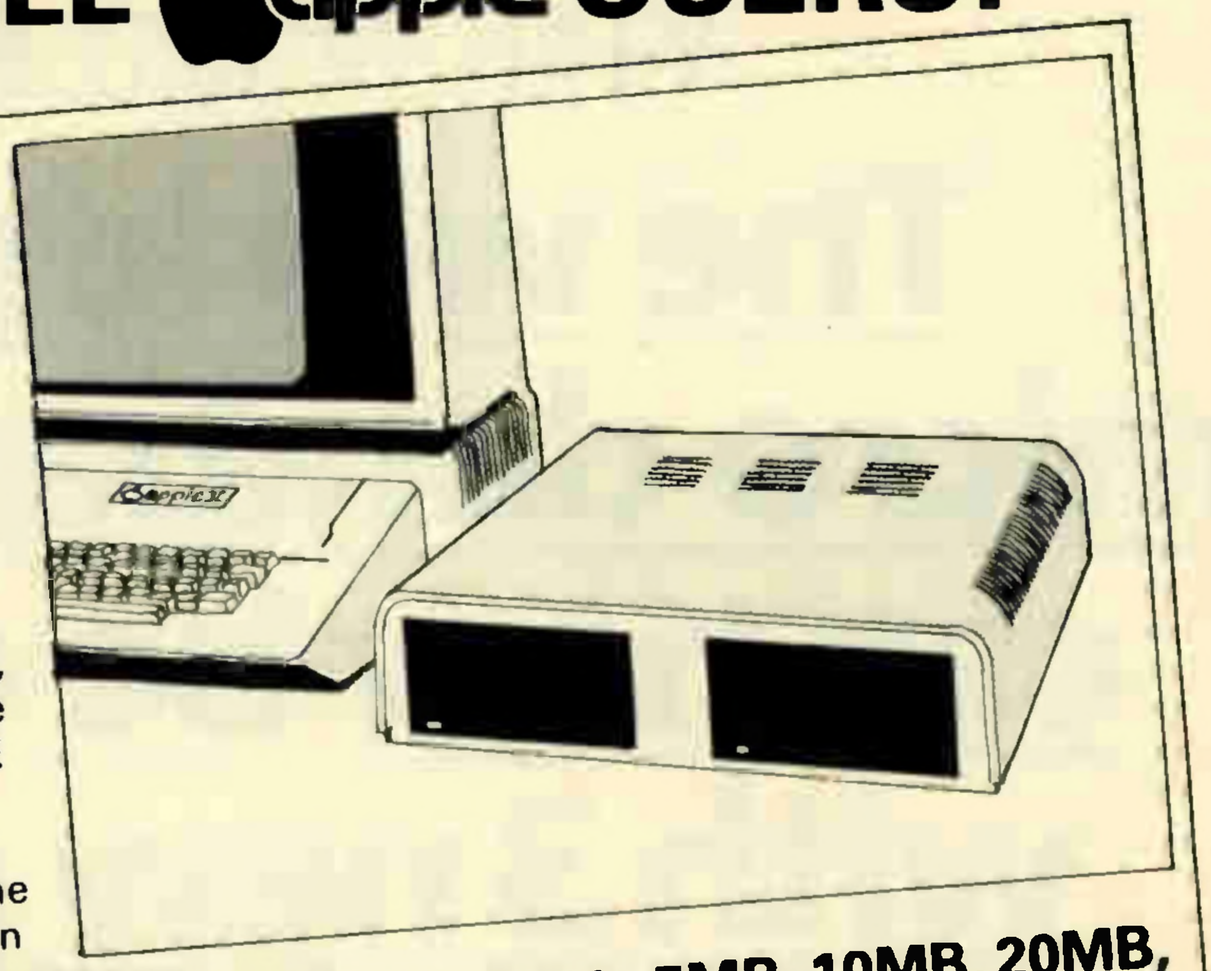

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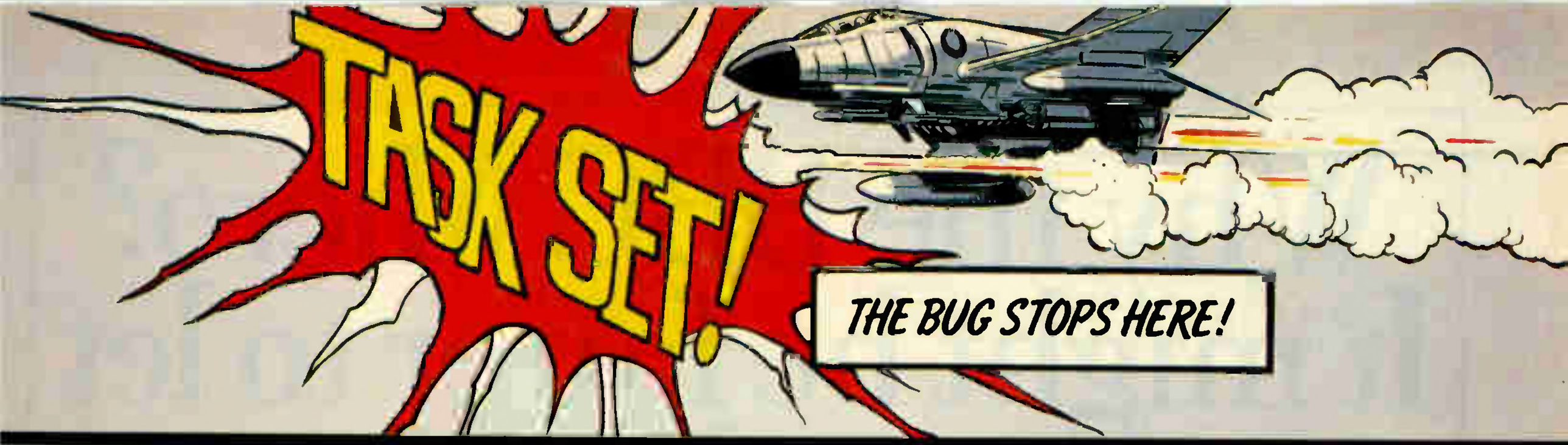

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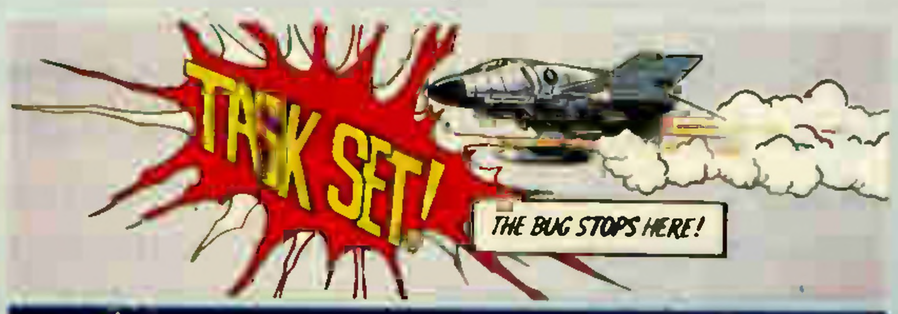



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Why the BBC Micro? It might be fairer to let someone else answer that question.

"The BBC Microcomputers are the limousines of home computers. The graphics are probably the best of any machine in this class. You are paying for a smart machine which would not disgrace the home of a professional." *Video World. Feb. '83.*

"Its design has given the BBC Micro an unrivalled potential for business, educational and serious home applications. It has been equipped to function as the heart of a system which can be expanded to suit its owner's need." *Which Micro & Software Review. Feb. '83.*

"The most attractive and exciting feature of the BBC Microcomputer is its enormous potential for expansion which will allow a highly expansive system to be built-up." *Deborah Carruthers. Which Micro. June '82.*

"They (the graphics) are tremendously exciting, and they are one of the features that make this machine stand out head and shoulders above everything else that is available in the market place at this time."
Dave Futcher. Educational Computing. May '82.

"It is expandable and has a powerful BASIC. It has superb sound and graphics, the software is readily available and the price is right."
Mr. A. D. Alles, a BBC Micro owner from Hampshire.

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

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

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

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

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

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





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

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

And now for some facts about the machine itself.

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



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

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

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

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

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

All this for only £399.

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

Both models are available from local stockists and the BBC Micro B from W.H. Smith Computer Shops.

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

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

Your order will be despatched by fully insured courier.

Finally, you can also use the coupon simply to get full reprints of the articles from which the press cuttings featured have been taken.

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To BBC Microcomputers, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.

☐ Please send me more information on the BBC Micro.

Please send me _____ BBC Model B Microcomputers at £399 each, inc. VAT and delivery.

I enclose PO/cheque payable to Acorn Computers Limited Readers A/C or charge my credit card.

Card Number _____
Amex/Diners/Visa/Access (Delete)

Name _____

Address _____

_____ Postcode _____

Signature _____ PWA

Registered No. 140 3810 VAT No. 215 400220

The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.

● *This is an entirely new computer system. It was designed with both eyes fixed firmly on the future. So that whatever shape the future takes, we'll be able to fit it into the system. Just as simply as the peripherals and software already available fit into the system. That way, the system will grow with you. And you'll never get left behind.*

● *Based around the Z80A microprocessor, and utilising Microsoft™ BASIC, Aquarius™ has 8K ROM and 4K RAM resident within its console. It is able to provide up to 16 colours and resolution of 320x192, and generates its sound directly through the television's speakers.*

● *With twin cartridge ports, the mini-expander allows simultaneous use of additional RAM and software cartridges. Twin disc game hand controls are included and the unit provides two additional sound channels. The 16K RAM cartridge plugs into either the console or the mini-expander, increasing Aquarius™'s RAM capacity to 20K.*

● *With the ability to reproduce the entire graphic and character set of Aquarius™ at 80 characters a second, the printer's 40 column output allows transcription of the complete monitor image.*



● *Using standard audio cassettes, the data recorder provides storage for programs and information, and allows the use of cassette based software. Incorporating a digital tape counter and transmission indicator, it operates sequential searching.*

● *A large number of games, designed to take advantage of Aquarius™'s sophisticated colour and sound capabilities, are available on cartridges that plug into the console either direct, or through the mini-expander. Cassette based games can be used via the data-recorder.*

● *A wide range of preprogrammed cartridges is available, including the LOGO teaching program and practical home data systems like FILEFORM™ and the spreadsheet calculator package, FINFORM.™*

AQUARIUS™
HOME COMPUTER SYSTEM

WITH AQUARIUS, YOU WON'T GET LEFT BEHIND.

MATTEL ELECTRONICS®

WHATEVER HAPPENS IN THE FUTURE, IT'LL FIT INTO THIS SPACE.

MATTEL ELECTRONICS®

AQUARIUS™

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ON STAND 438

THE SAGE II AND SAGE IV SUPERMICRO'S.

JOIN THE EVOLUTION.



To:- TDI LTD, 29 Alma Vale Road, Bristol BS8 2HL

☐ I would like a demonstration of the Sage

☐ I would like details of the Sage

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*Fast	— Motorola 68000 8MHZ no wait states
*Multi User Power	— Real 16 bit performance for all six users
*Hardware Choice	— Floppy, 18MB Winchester, one megabyte RAM, 6 ports, Parallel, IEEE 488
*Software Choice	— of 4 operating systems:- p-System, CPM68/K, BOS, Mirage APL
*Bundled	— Sophisticated Word Processing, Advanced Spreadsheet and USCD Pascal IN THE BO
*Cost Effective	— No similar machine comes close on price AND all SAGE computers come with one year free ON-SITE Service.

TDI Ltd., 29 Alma Vale Road, Bristol BS8 2HL

Tel. No: 0272 742796

There's one game you should play with a home computer before you buy it.

20 Questions.

If you're looking for your first home computer, may we make a suggestion.

Tear out this page.

And ask these questions of every computer you look at.

1) Is the basic price reasonable, say under £180?

2) Does it work with a monitor as well as with an ordinary UHF T.V.?

3) Does it include a basic training manual that doesn't require a science degree to understand?

4) Does it have colour?

5) And sound?

6) Does it take cassettes?

7) And cartridges?

8) And can you operate them with joysticks working directly off the basic unit?

9) Does it have a professional quality keyboard that's guaranteed for twenty million depressions (and no headaches)?

10) Does it have colour graphics that are capable of producing detailed pictures?

11) Is the case robust enough to stand up to the kids?

12) Does it use a standard language that's not a million miles away from English?

13) Is there an expanding range of high quality software available from the makers?

14) Does the software include educational programs for adults as well as the very young?

15) And is there software sophisticated enough to satisfy the experts?

16) Does it use the most up to date technology, for instance the 6809E microprocessor?

17) Will it drive a standard printer directly from the basic unit?

18) Is it made in the UK?

19) And for the basic price will I get an easily accessible, yet large memory of at least 32K?

20) Or will I have to add lots of extras (and lots of money) for that much?

After you've finished pestering every computer salesman in sight, compare your answers to these, courtesy of the Dragon 32 (this is, after all, an ad for the Dragon).

Questions 1-19. Yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes, yes and yes. Question 20. No.

If you're thinking that that's a lot of computer for the money, you'd be right.

However, when you come to read the handbook you'll soon realise that something's missing.

The jargon usually associated with computers.

You see every part of the Dragon has been carefully designed to be easily understood, even by total beginners. Yet it has all the features an expert could want. Just ask it.



T.V. not included in price.

DRAGON 32

The first family computer.



DO YOU HAVE WHAT IT TAKES TO OWN A SANYO BUSINESS COMPUTER?

With so many micros on the market, choosing just the right one for your business can be extremely difficult.

But for those with a wise head for value, a keen eye for quality and a good ear for a sound investment, the choice couldn't be easier

The Sanyo MBC range. A high quality system backed by a full range of software and peripheral equipment, that offers the very best possible value for money anywhere.

A well proven range, that's now been extended to include 3 new micros.

The MBC4050, a powerful 16-bit micro and two new 8 bit micros, the MBC1150 and the MBC1250. The latter having the advantage of a full graphic function and high resolution 640 x 400 dot display screen.

As with all Sanyo equipment, great emphasis has been placed on their ergonomic design, thus ensuring the maximum ease and convenience for the operator.

If you're investing in micros, make a wise decision and take a look at Sanyo to see whether you've got what it takes.

Please provide me with further information on the Sanyo 1983 Business Machines Range. I am particularly interested in (please tick):-

☐ Microcomputers ☐ Calculators ☐ Telephone Answering Machines

☐ Electronic Cash Registers ☐ Dictating and Transcribing Machines

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Company_____

Address_____

Position_____ Tel (Day)_____

Return to Marketing Dept., Sanyo Marubeni (UK) Ltd., 8 Greycaine Road, WATFORD, Herts. or Tel Watford 46363.

PCW3

SEE SANYO, THEN DECIDE

FOR FURTHER INFORMATION CONTACT OUR DISTRIBUTORS, LOGITEK, AT LOGITEK HOUSE, BRADLEY LANE, STANDISH, GREATER MANCHESTER TEL 025/426644, OR CLIP THE COUPON ON THE LEFT AND RETURN IT TO SANYO

SANYO

sinclair special 4



Inside...
Two special offers...
Six new software titles...
Microdrive!

Something for everyone, from Sinclair!

Welcome to another Sinclair Special. Even if you're not yet a Sinclair owner, I believe you'll find something of interest in this latest issue.

For instance, if you're looking for the best way to begin computing, turn to our back page. You'll see that leading Sinclair retailers are now offering the popular ZX81, complete with a 16K RAM Pack *and* a free software cassette, all for £45. That means savings of at least £29 on one of the world's all-time best-selling computers.

Those same retailers are also offering the ZX Printer at its regular price of £39.95, but accompanied by a *free* 5-roll Paper Pack, worth £11.95.

If you want to add even more speed and versatility to your ZX Spectrum system, you'll be pleased to hear that the new ZX Microdrive has now been officially announced.

Microdrives are being released on an order of priority basis. Spectrum owners who purchased direct from us will be sent order forms, in a series of mailings that begin with the earliest names on our list of Spectrum owners. If you didn't buy direct from us by mail order, send us your name and address (use the coupon in this Sinclair Special). We'll add your name to the list, and send you a colour brochure and details on how to order.

Finally, if you're looking for more ways to use your ZX system, take a look at the software opposite. There are programs for programmers, a space-chase and car race for arcade-game players, a brand new logic game for those who've exhausted 'the cube.'

The Cattell IQ Test is based on the definitive professional psychologists' test – and forms an accurate but easy way of measuring your own IQ. All the new programs are available direct from us, through the order form in this issue.

You'll see what I mean about Sinclair having something for everyone. And we'll have even more to show you at two forthcoming exhibitions: the PCW Show at the Barbican Centre, from September 28th to October 2nd, and the Great Home Entertainment Spectacular at Olympia, from September 17th to 25th.

Nigel Searle

Nigel Searle, Managing Director
Sinclair Research Ltd.

ZX Microdrive System preview!



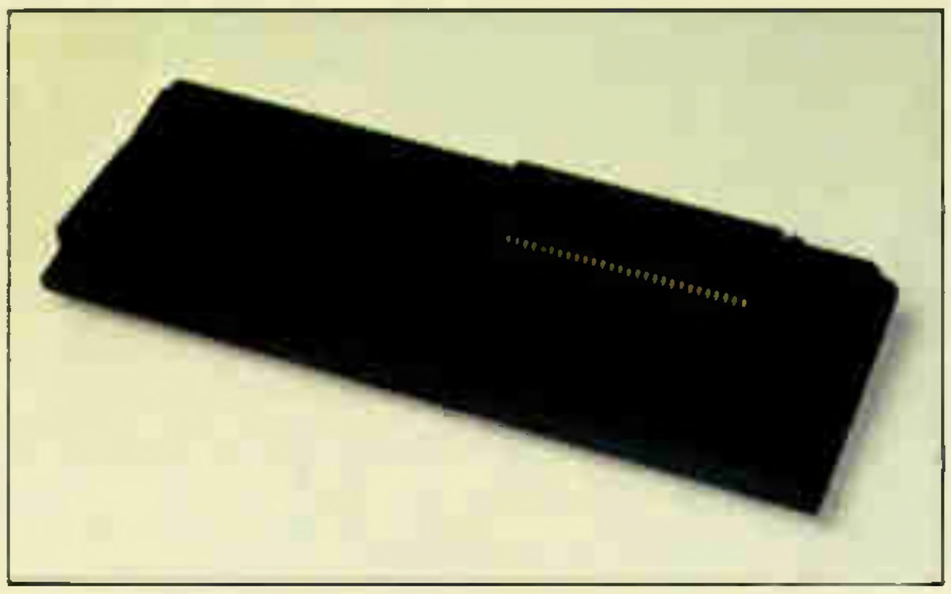
ZX MICRODRIVE

At least 85K bytes storage, loads a typical 48K program in as little as 9 seconds: £49.95.



ZX MICRODRIVE CARTRIDGE

Compact, erasable, revolutionary. Complete with its own storage sleeve. Contains up to 50 files, with a typical access time of 3.5 seconds: £4.95.



ZX INTERFACE 1

Necessary for sending and receiving information from ZX Microdrive. Includes RS232 interface and local area network facility for 2 to 64 Spectrums. Attaches to the underside of your Spectrum. Purchased with ZX Microdrive, just £29.95. As separate item, £49.95.

PSYCHOLOGY, GRAND PRIX RACING, BRAIN TEASING, PROGRAMMING, SPACE-BLASTING!

Sinclair have it all taped with six brand-new programs for ZX Computers!



Chequered Flag
For 48K RAM Spectrum. **£6.95**

Have you ever wanted to drive a Formula One car flat-out round a Grand Prix circuit? With Chequered Flag you'll need one eye on the road and one eye on the instruments, as you steer and brake to avoid hazards, and work through the gears in search of the lap or race record. This outstanding new program puts you in the driver's seat with stunning realism, and gives you a choice of three cars and ten different circuits. Don't crash!



Mothership
For ZX81 with 16K RAM. **£4.95**

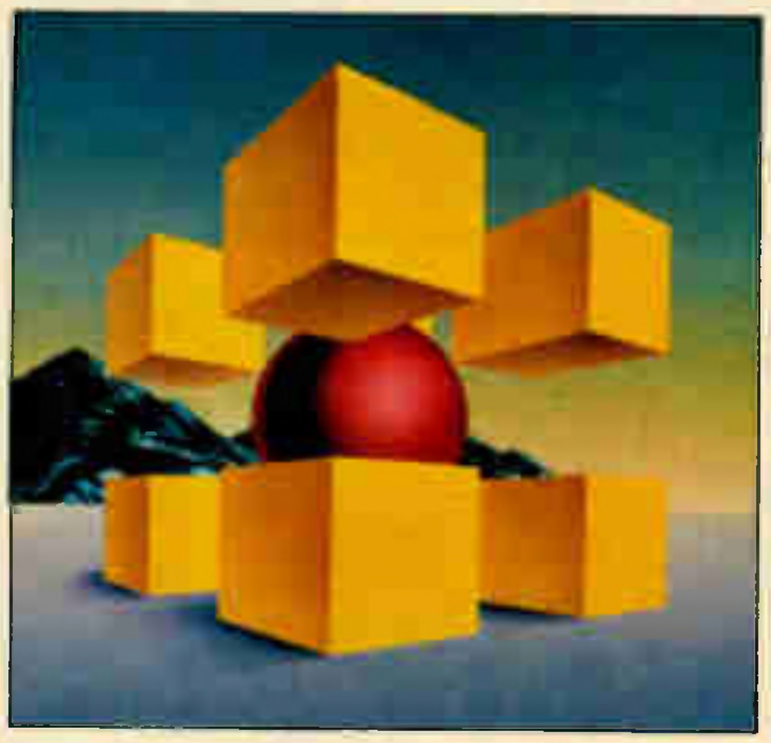
Scream down the claustrophobic confines of the Zarway. Engage suicidal drone fighters in deadly laser combat. Dodge, duck and dive in a high-speed 3-D race to attack the evil Mothership before she claims your home planet. Mothership is a truly tough challenge, and fast, furious fun!



Cattell IQ Test
For 48K RAM Spectrum. **£12.95**

Although there are a number of so-called self-administered IQ tests on the market, the only reliable way of finding your IQ has – until now – been to visit a qualified psychologist and take a battery of tests – for a fee. Now Victor Serebriakoff, International President of Mensa, has produced Professor Cattell's test in a form which enables you to use your ZX Spectrum to test your IQ.

The Cattell Scale IIIA test is timed by the computer, marked immediately, and the marks standardised against your age. This is the first time that an accredited, standardised test has been available to the general public.



Zeus Assembler
For 48K RAM Spectrum. **£12.95**

A powerful and easy-to-use programming aid, designed to simplify the entire process of producing machine code programs, enabling you to write in assembly language instructions. Comes complete with comprehensive range of support facilities.



Monitor and Disassembler
For 16K & 48K RAM Spectrums. **£12.95**

This powerful Disassembler translates machine code into comprehensible assembly language instructions, allowing you to examine the BASIC ROM, to investigate the workings of the Spectrum or to analyse your own machine code routines.

With the highly versatile Monitor, you get an extensive set of facilities to aid the entry, inspection, modification and debugging of your own machine code programs.



Flippit
For 16K or 48K RAM Spectrums. **£9.95**

Like those cube games, Flippit looks simple. But its fiendish ingenuity results in the ultimate game of logic and patience. Twist, turn and swap the nine Flippit pieces in search of the elusive magic square. But be warned, those pieces can be arranged in *millions* of combinations...

TWO SPECIAL OFFERS FROM SINCLAIR

STARTER PACK: £45



Powerful passport to home computing – now at the lowest price ever!

ZX81

Sinclair ZX81 – 900,000 sold so far.
Touch-sensitive keyboard… black and white graphics… just plugs into most TV sets.
With 212-page BASIC manual – step-by-step guide to the world of personal computing.
Normal price £39.95.

ZX 16K RAM PACK

Gives the ZX81 more power – the power to run sophisticated software like Flight Simulation and Chess. Normal price £29.95.

CASSETTE

Worth £4.95 or more. In every starter pack, there's a top-flight 16K cassette – like Chess or Fantasy Games or one of the valuable education series. Actual title varies with availability. And once you own your starter pack, there are 37 other Sinclair cassettes available (plus dozens from other manufacturers).

Look for the special packs at WH Smith, Boots, John Menzies, Currys and other leading Sinclair stockists. Not available by mail order.

Offers subject to availability while stocks last.

ZX PRINTER AND FREE 5-ROLL PAPER PACK: £39.95



ZX PRINTER

Designed exclusively for use with the Sinclair ZX81 and ZX Spectrum personal computers. Printing speed: 50 characters per second..32 characters per line, 9 lines per vertical inch. Plus graphics direct from screen. Now with a *free* pack of 5 rolls of special paper (normal price £11.95).

sinclair

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Telephone: (0276) 685311.

How to order

Simply fill in the relevant section(s) on the order-form below. Note that there is no postage or packing payable on Section B. Please allow 28 days for delivery. Orders may be sent FREEPOST (no stamp required). Credit-card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option. ZX81 Starter Pack and Printer and Paper offers are not available by mail order.

ORDER FORM

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR.

Section A: hardware purchase

Qty	Item	Code	Item Price £	Total £
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	Postage and packing:	0029	4.95	
			TOTAL £	

ZX81 Starter Pack and Printer and Paper offers are not available by mail order.

Section B: software purchase

Qty	Cassette	Code	Item Price £	Total £
	FOR SPECTRUM			
	L4/S Monitor & Disassembler	4403	12.95	
	L3/S Zeus Assembler	4402	12.95	
	G26/S Flippit	4025	9.95	
	P1/S Cattell IQ Test	4500	12.95	
	G31/S Chequered Flag	4030	6.95	
	FOR ZX81			
	G26 Mothership	2125	4.95	
			TOTAL £	

Signature

*Delete/complete as applicable.

*I enclose a cheque/postal order made payable to Sinclair Research Ltd for £

*Please charge to my Access/Barclaycard/Trustcard account no:

Mr/Mrs/Miss

Address

PCW 910

(Please print)

ZX Microdrive information request

Please add my name to the Microdrive Mailing List, *and* send me a colour brochure with full specifications of ZX Microdrive/Interface 1 [ ] *(tick here)*. You can use the above form to send us your name and address.

Announcing more exciting programs for the BBC.

Acornsoft is the software division of Acorn Computers, the company that designed and built the BBC Microcomputer. Here are four more exciting programs, all designed to get the most from your BBC Micro.

Starship Command (£9.95) is a demanding high-resolution graphics game in which you command a starship against attacking alien ships. You control the forward drive and rotational thrust of your ship, which is equipped with shields, long and short-range scanners and a sector display of the stars and alien ships.

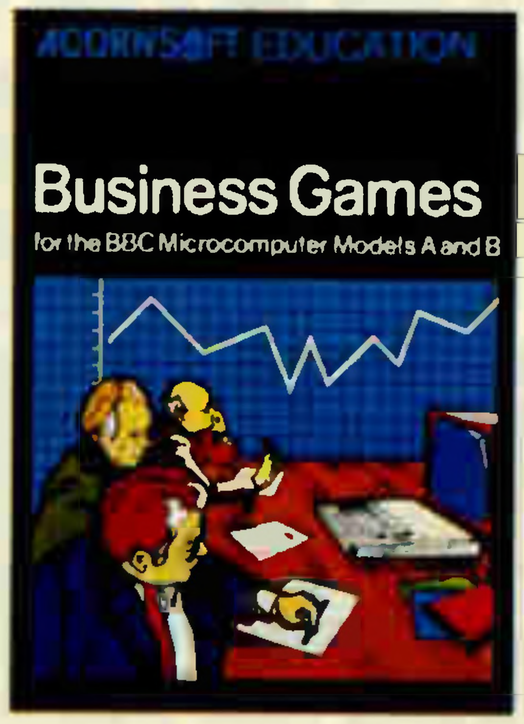
Countdown to Doom (£9.95) is a race against time as you strive to repair your damaged space ship in the corrosive atmosphere on the planet Doomawangara (Doom). Beat the clock or resign yourself to a life in the wilderness of Doom.

Business Games (£9.95) is a cassette containing two games designed for economics, business or general studies teaching.

In Stokmark, up to eight players compete in buying and selling shares aided by a screen display of relevant market information.

In Telemark, players compete to dominate in the manufacture and sale of televisions. The winner is the one who makes the largest profit or controls over half the total market.

Jars (£11.90) is an educational cassette suitable for 7-13 year olds. The objective of the program is to present, what are usually thought of as purely numerical problems, in a visual way. Jars of liquid are used to visualise volume estimation and fraction problems. Success, partial success or failure is noted by a scoring system and suitable comments.





How to get Acornsoft programs.

If you're a credit card holder and would like to buy cassettes of the programs shown in this advertisement, or if you would like to know the address of your nearest stockist, just phone 01-200 0200.

Alternatively, you can buy the cassettes directly by sending off the order form below to: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.

Also use this form if you would like to receive the current free Acornsoft catalogue.

Please allow 28 days for delivery.

☎ Credit Card Holders, Telephone 01-200 0200.

To: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.
Please send me the following:–

PROGRAM	PRICE	QUANTITY	TOTAL	(Code Acornsoft use only)
Starship Command	£9.95			SBG22
Countdown to Doom	£9.95			SBG19
Business Games	£9.95			SBE03
Jars	£11.90			SBE15
		TOTAL		

I enclose PO/cheque payable to Acornsoft Ltd.
Or charge my credit card.
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(Amex/Diners/Visa/Access (Delete)
Please send me the Acornsoft brochure ☐
Name _____
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ACORNSOFT





Intertec™ Offers The Warranty Your First Computer Should've Offered.



The rationale behind the conventional 90-day warranty is that anything likely to go wrong will go wrong in the first 3 months.

But it can take 3 months just to get comfortable with a new system. That's the honeymoon-period, when you treat your equipment with the delicacy of a safecracker.



CompuStar can network up to 255 intelligent terminals and give each of them access to common or restricted databases.

Ah, but now it's 5 months down the road, the honeymoon is over, your equipment has finally begun to justify its cost, and that's the afternoon your processor's fan succumbs to fatigue.

Or maybe the malfunction is more gradual, like a disk-head drifting increasingly out of alignment.

Or more elusive, like an intermittent failure due to borderline components.

When You Build Them Stronger, You Can Back Them Longer.

And that's why all Intertec terminals, computer networks and disk storage systems come with a full year of coverage. Not because you'll need it, but to assure you that you won't.

See—unlike other makers, we know what we're standing behind.

We don't slap Intertec nameplates on other people's parts. We build virtually all our equipment ourselves.

And we assemble it ourselves.

And we test and re-test it ourselves.

More Value For Your Money.

That's also why we can offer you superior values.

In single-user desk tops, for example, our SuperBrain offers twin Z80s, standard; 64 kbytes of dynamic ram, standard; up to 1.5 mbytes of disk storage, standard; CP/M 2.2* and MBasic† standard.

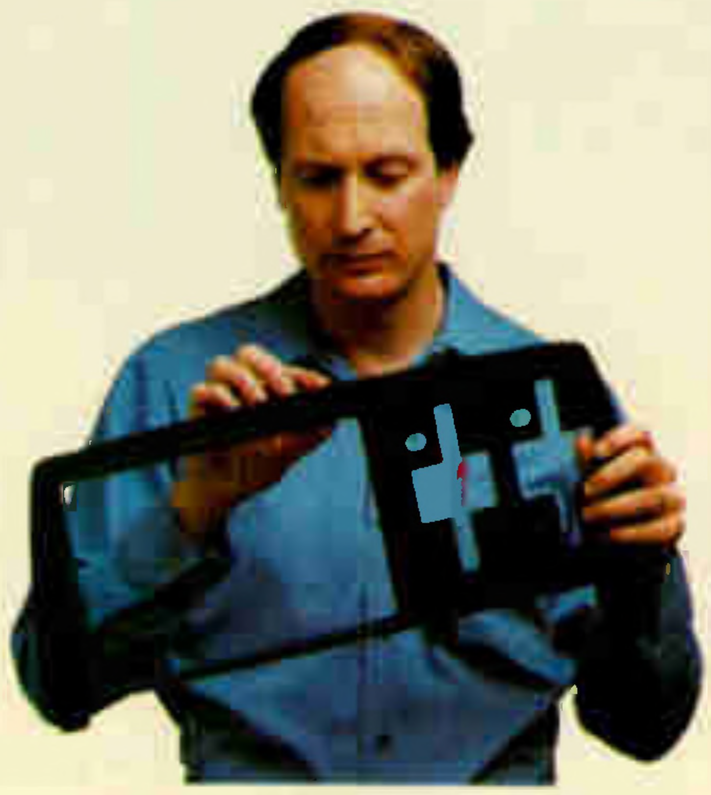
And compared to conventional multi-user systems, our CompuStar systems can give you many more hours of productive labour every day—because, instead of depending on a central processor for data manipulation, each workstation in a CompuStar network has its own processor and its own 64 kbytes of ram.

As a result, you can have anywhere from 2 to 255 workstations working simultaneously without suffering noticeable declines in execution-time.

Why Just Expand When You Can Up-Grade?

In fact, if you assess your expansion alternatives in terms of relative payback potential, you're very likely to find that up-grading with Intertec equipment from scratch would be more cost-effective than burdening your existing installation with add-on's.

Pound for pound, the Intertec system is apt to be not only faster, more powerful and more versatile, but more reliable and better supported.



Since we build our equipment from scratch, we can afford to do it right and still hold down our prices.

For the name and address of your nearest Intertec dealer, or for more information about any of our products and services, please contact our Regional Manager at P.O. Box 367, London W13-9QQ, or telex 297066.

You're welcome as well to direct your enquiries to our corporate headquarters in the USA. Telex 8106662115, or write to Intertec Data Systems Corporation, 2300 Broad River Road, Columbia, South Carolina 29210.

intertec

*CP/M is a registered trademark of Digital Research.
†Microsoft Basic is a registered trademark of Microsoft Corporation.

Peachtree Software

The gilt-edged investment for your microcomputer



You need to be sure that the application software you choose carries the hallmark of stability and reliability and will be a sound investment for the future. It should enhance the value of the microcomputer you select to solve your business problems.

The Peachtree Portfolio of Application Software meets this need. The range provides for simple book-keeping *(Peachtree Basic Accounting Systems)*, comprehensive accounting *(Peachtree Business Management Systems)* and integrated office automation *(Peachtree Office Productivity Systems)*.

Peachtree is part of the world's largest Application Software company. We have over 20 years experience helping users of large *and* small computers get the full value from the computerisation of their business.

A nationwide network of independent computer retailers offers our portfolio of products on many different types of micro-computer. These companies provide the local support you want - *backed up by Peachtree.*

Major microcomputer manufacturers and distributors have made their investment in Peachtree Software for their computers.

They include:
IBM, DIGITAL, BRITANNIA, RANK XEROX, PHILIPS, OSBORNE, POSITRON, OEM, EPSON, GRUNDY, WANG, MEMORY, SAMURAI (distributed by Micronetworks) SANYO and ALTOS (distributed by Logitek)

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THE SOFTWARE THAT WORKS FOR YOU.

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PCW6

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PIED PIPER™



THE COMPUTER WITH THE STORY!

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The PIED PIPER™ is a powerful 64K microcomputer housed in a stylish 12.5 lb. portable case. Including a remarkable 1 Megabyte floppy disk drive, CP/M® operating system, and several business applications software packages, the PIED PIPER™ computer provides unparallelled value.

And it is a versatile system that will handle all your business and personal computing needs: at work, at home and when you travel.

Remember the PIED PIPER™. What a Story!!!

*See the PIED PIPER™ at the Personal Computer World Show, September 29 to October 2 at the Barbican. Visit our Stand NO.349 to ask for a coupon valued at £50 towards your purchase of a PIED PIPER™ Computer.

For more information, contact the dealer nearest you, or: Semi-Tech Microelectronics (Europe) Ltd. 145-147 Ewell Road, Surbiton, Surry KT6 6AW. Tel: (01) 390-6179.

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with new books and software from McGraw-Hill

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C.A. Street
This book explains how file handling programs are designed, used, developed, and written. Details of the accompanying software are given below.
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☐ **Spectrum Information Handling Routines**
C.A. Street
Contains thirty programs and program segments with machine code routines for sorting. Saves hours of keying!
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☐ **PROFILE 1**
C.A. Street
A spreadsheet file handling system for the hobbyist or small business needing a cataloguing, mailing or stock control system. Handles both numeric and alphabetic information, selects, prints, processes, calculates and manipulates words and numbers.
ISBN 07 084706 1 £9.95 inc VAT



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Randle Hurley
The Spectrum can be used as a wordprocessor! The programs in this book are as comprehensive as a dedicated commercial package, and are fully described, line by line.
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☐ **Spectrum Interfacing and Projects**
G.D. Bishop
This book shows how to use the Spectrum to control the outside world and contains many examples, programs and circuits, including a DAC, ADC and latch. Hardware kits are available for projects.
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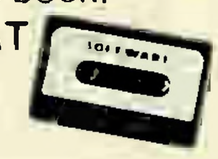
☐ **Spectrum Interfacing Programs**
G.D. Bishop
This support software provides all the necessary programs to drive the projects in the above book.
ISBN 07 084709 6 £6.95 inc VAT



☐ **ZX81/TS1000 Programming for Young Programmers**
Linda Hurley
A book intended to teach children aged 9 upwards how to program in BASIC, through games and movements, calculated to hold a child's interest.
ISBN 07 084595 6 £4.95

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Linda Hurley
Consists of three games programs not included in the above book and provides many extensions and improvements in the book.
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Geoff Phillips
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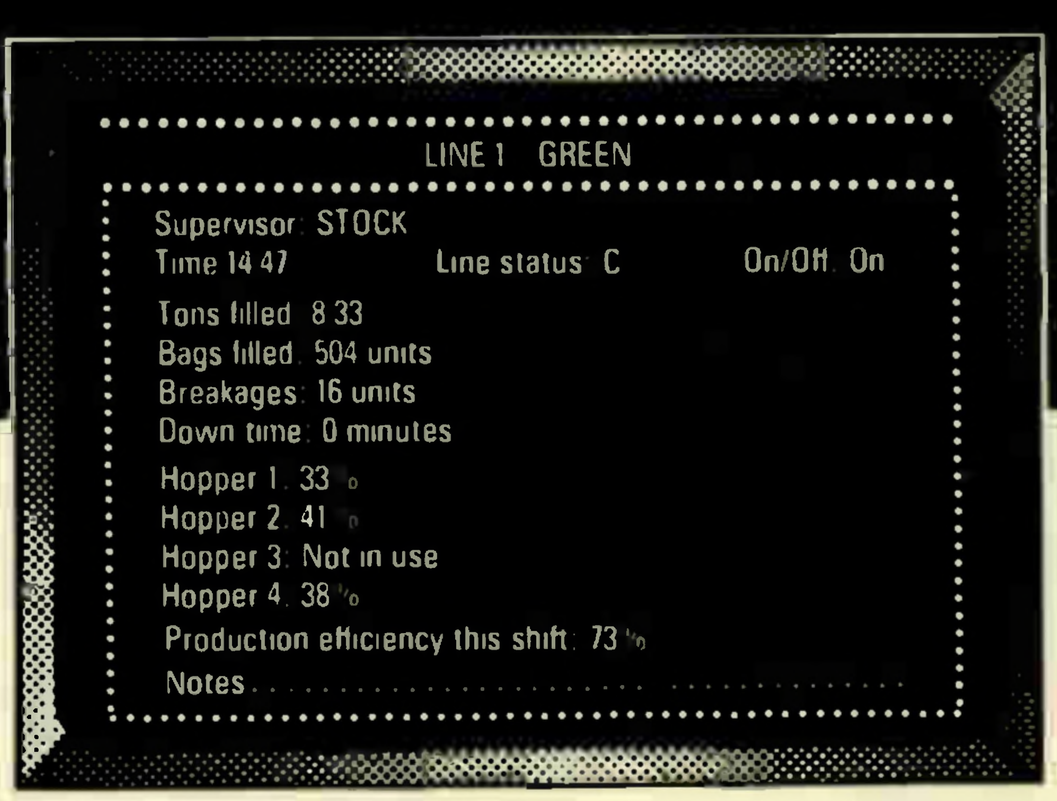

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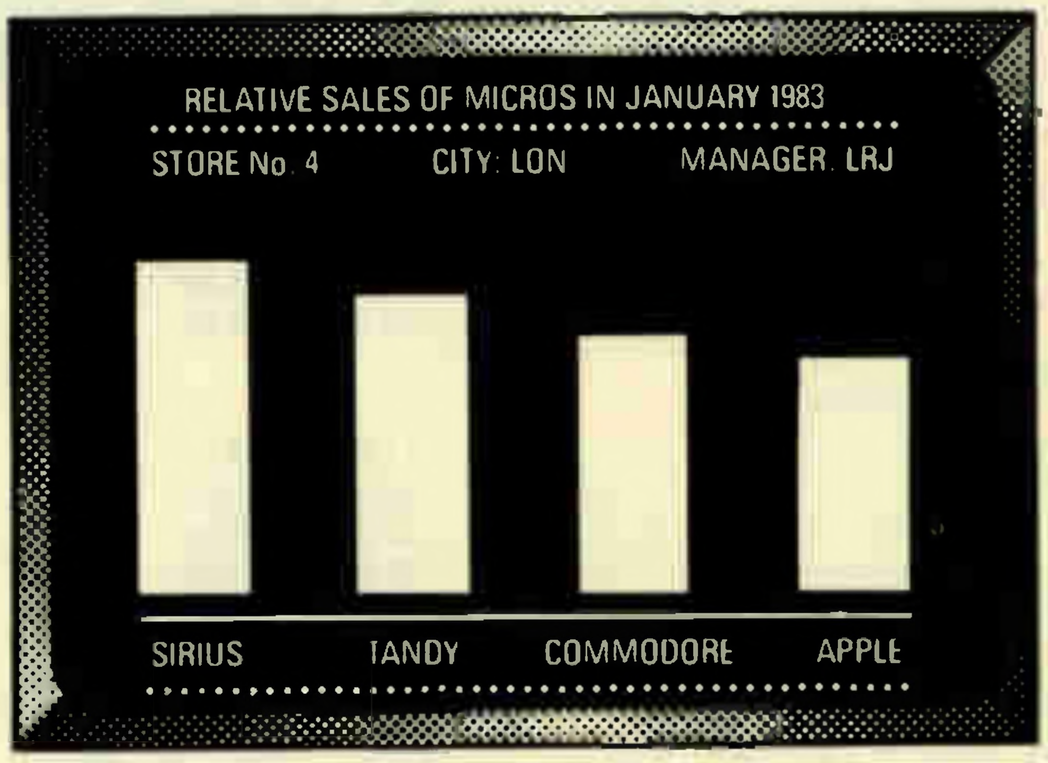

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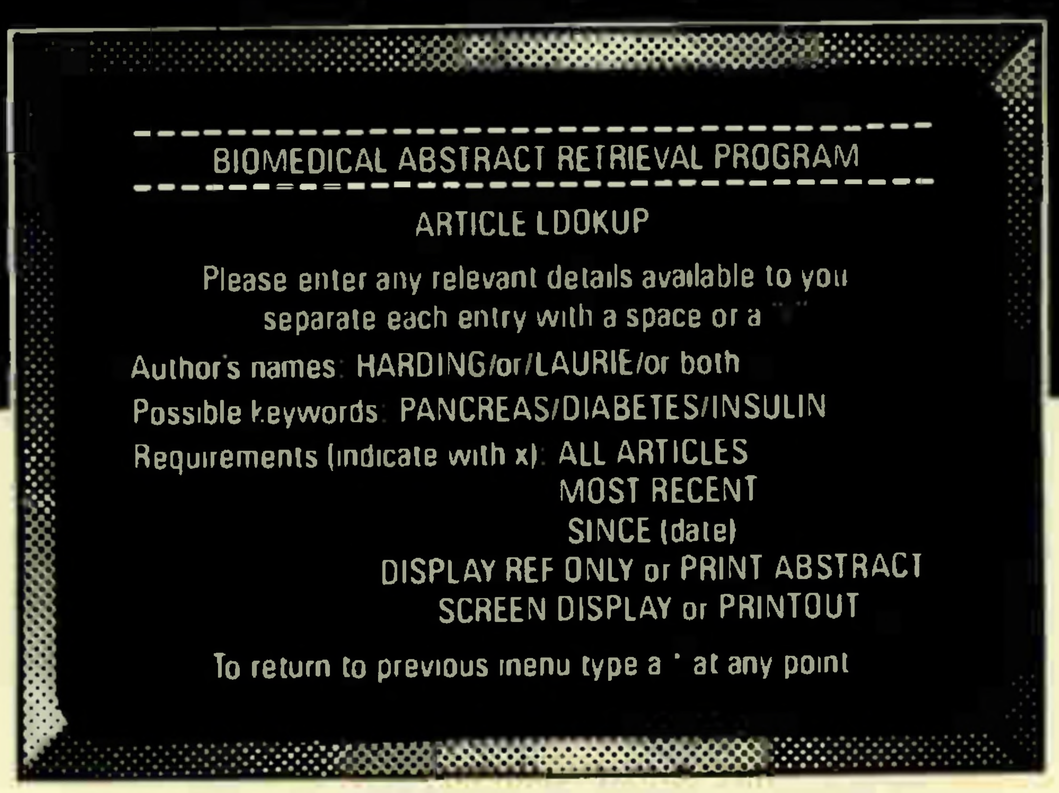

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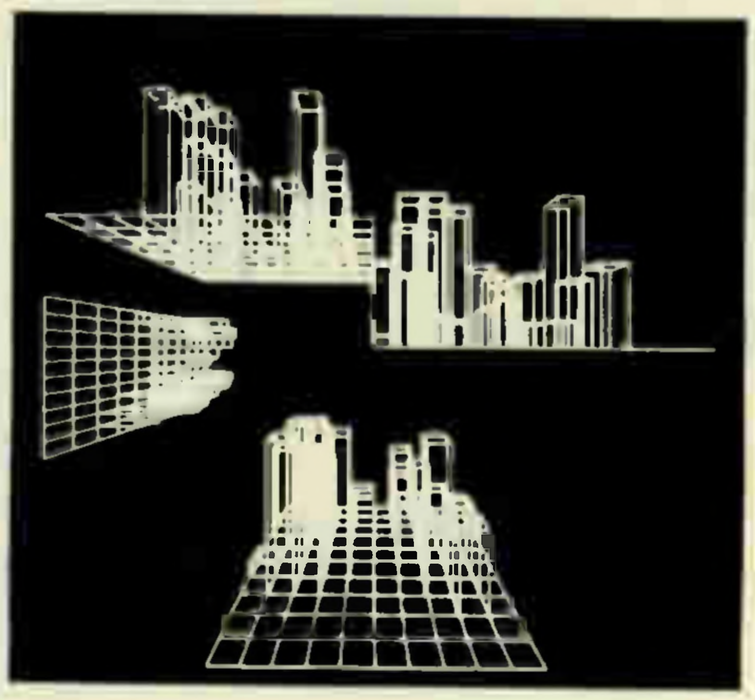

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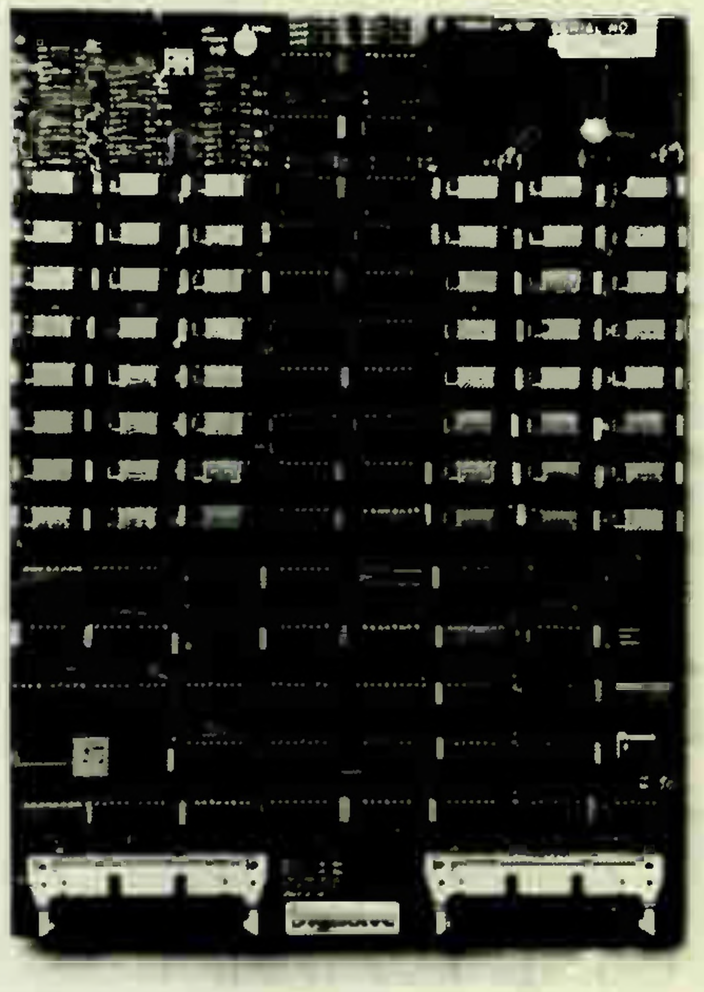

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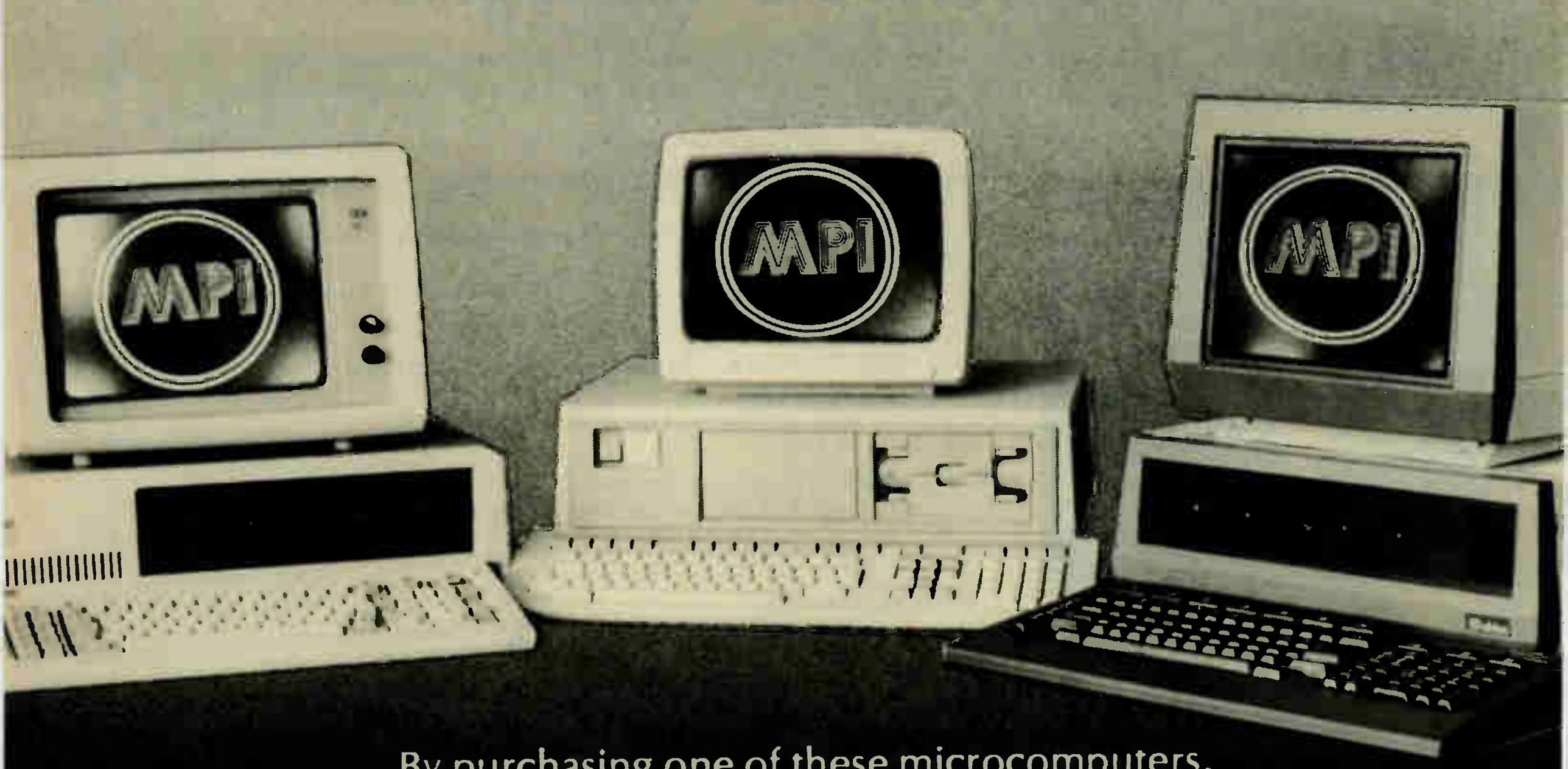

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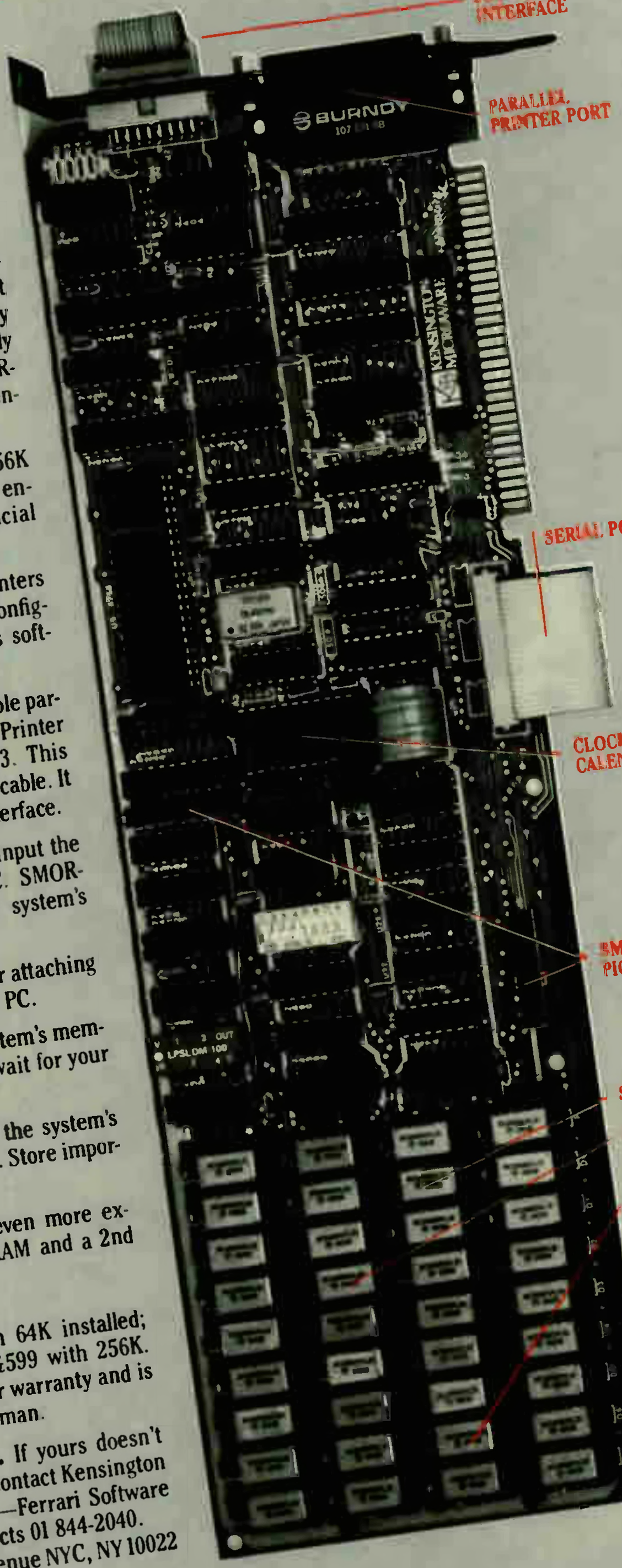

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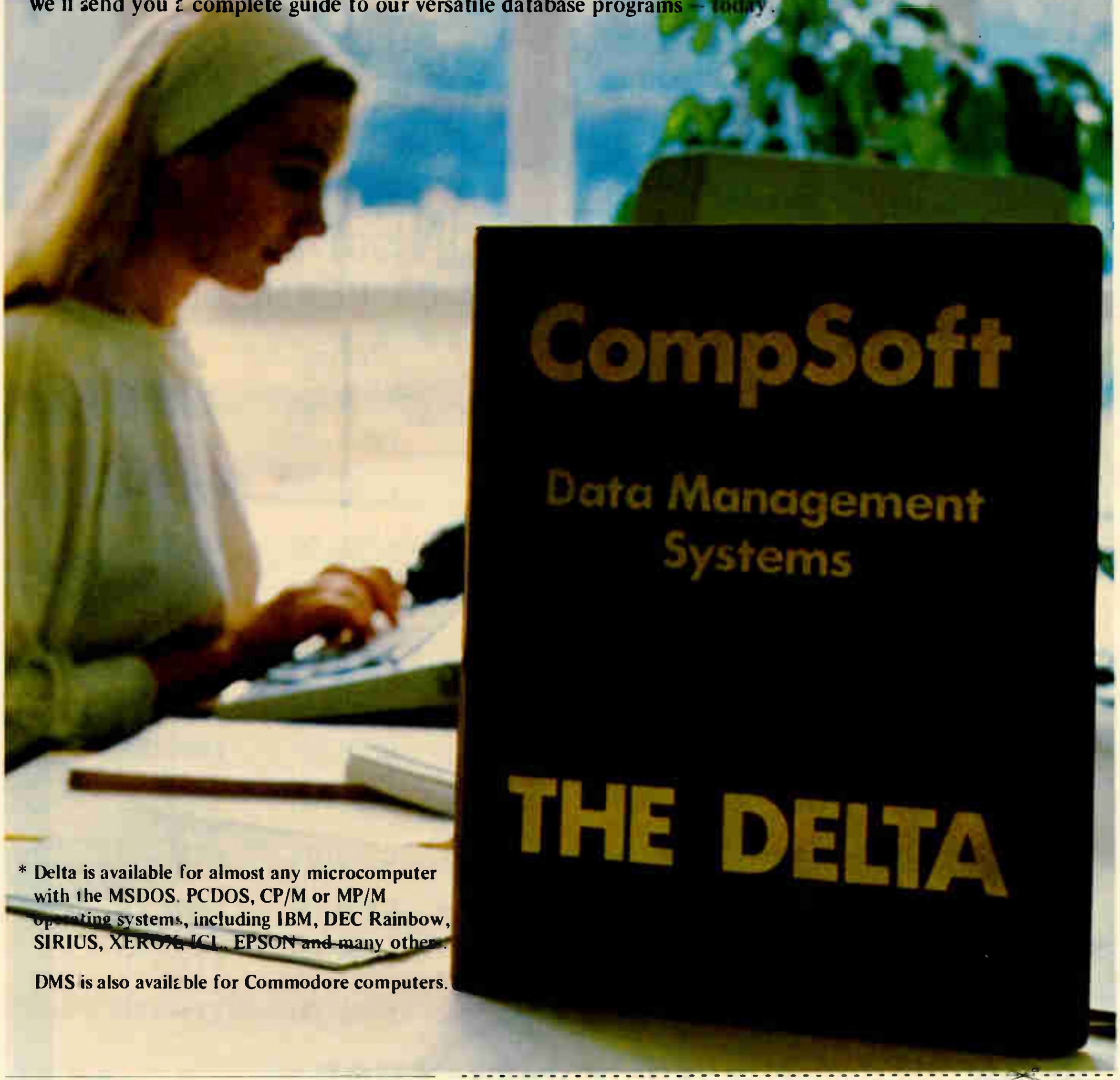

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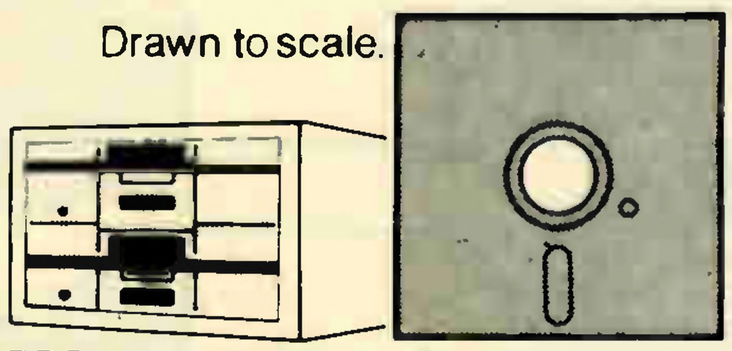

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THE SOFTWARE

		CP/M-80	CP/M-86	PC-DOS
Word Processing				
WORDSTAR	MicroPro	□	●	*
MAILMERGE	MicroPro	□	●	*
SPELLSTAR	MicroPro	□	●	*
EASYWRITER II	IUS			*
EASYSPELLER II	IUS			*
Data Bases And File Management Systems				
CARDBOX	Caxton	□		*
DATASTAR	MicroPro	□		*
dBASE II	Ashton-Tate	□	●	*
EASYFILER	IUS			*
INFOSTAR	MicroPro	□		*
PERSONAL PEARL	Pearl Software	□	●	*
REPORTSTAR	MicroPro	□		*
RESCUE	MBS	□		*
TIM III	Innovative S/w			*
Business Systems. Financial Planning. Accounting				
CALCSTAR	MicroPro	□		*
EASY PLANNER	IUS			*
MICRONET	Abtex	□		
MULTIPLAN	MicroSoft	□		
SAPPHIRE MARS	Sapphire Systems	□	●	
SUPERCALC	Sorcim	□	●	*
MILESTONE	Organic Software	□	●	
GBS (General Business System)	ByteSoft	□		
ISL (Integrated Stock & Ledger)	ByteSoft	□		
Statistics				
MICROSTAT	Ecosoft	□		*

		CP/M-80	CP/M-86	PC-DOS
Training Packages				
HANDS-ON BASIC	MicroCal	□	●	
HANDS-ON CP/M	MicroCal	□	●	
HANDS-ON COBOL	MicroCal	□	●	
WP WORKSHOP	MAC	□	●	
FLIGHT SIMULATOR	MicroSoft			*
Languages				
BASIC COMPILER	MicroSoft	□		
BASIC INTERPRETER	MicroSoft	□		
BAZIC	MicroMikes	□		
C COMPILER	Digital Research		●	
CBASIC	Digital Research	□	●	
CBASIC COMPILER	Digital Research	□	●	*
CIS COBOL	MicroFocus	□	●	
COBOL	MicroSoft	□		
FORTRAN	MicroSoft	□		
LEVEL II COBOL	MicroFocus	□	●	
MULISP/MUSTAR	MicroSoft	□		
MUMATH/MUSIMP	MicroSoft	□		
PASCAL/MT+	Digital Research	□	●	*
PASCAL/MT+ & SPP	Digital Research	□	●	
PERSONAL BASIC	Digital Research	□	●	
PL/I	Digital Research	□	●	*
XBASIC	Xitan	□	●	

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

		CP/M-80	CP/M-86	PC-DOS
Utilities				
COPYALL	MicroMikes	□		
DESPOOL	Digital Research	□		
DUTIL (for dBASE II)	Fox & Geller	□		
FILESHARE	MicroFocus	□		
FILESTAR	MicroSec	□		
MUCOPY	Wheatcroft Hards	□		
SORT	Microsoft	□		
SUPERSORT	MicroPro	□	●	
SUPERVYZ	Epic	□		
SDISK (Silicon Disk)	Xitan	□		
Communications				
BSTAM	Byrom Software	□	●	*
BSTMS	Byrom Software	□		
Graphics				
DGRAPH (for dBASE II)	Fox & Geller	□		
FASTGRAPHS	Innovative S/w			*
GSX	Digital Research	□	●	
GSS- Kernel	Digital Research	□		
GSS- Plot	Digital Research	□		

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Power 220/240V 50/60HZ.

RGB HIGH RES £299.00

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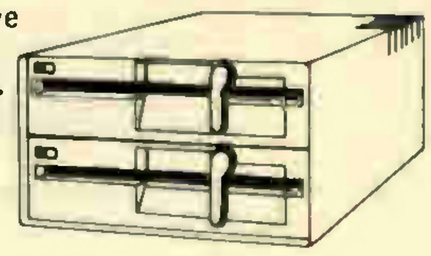

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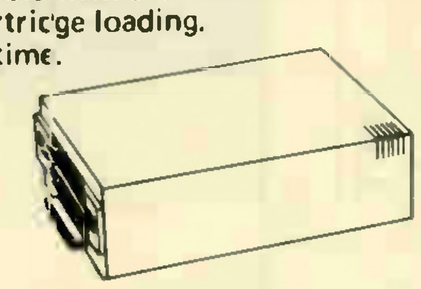

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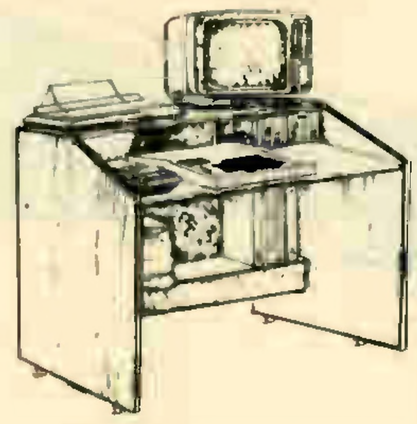

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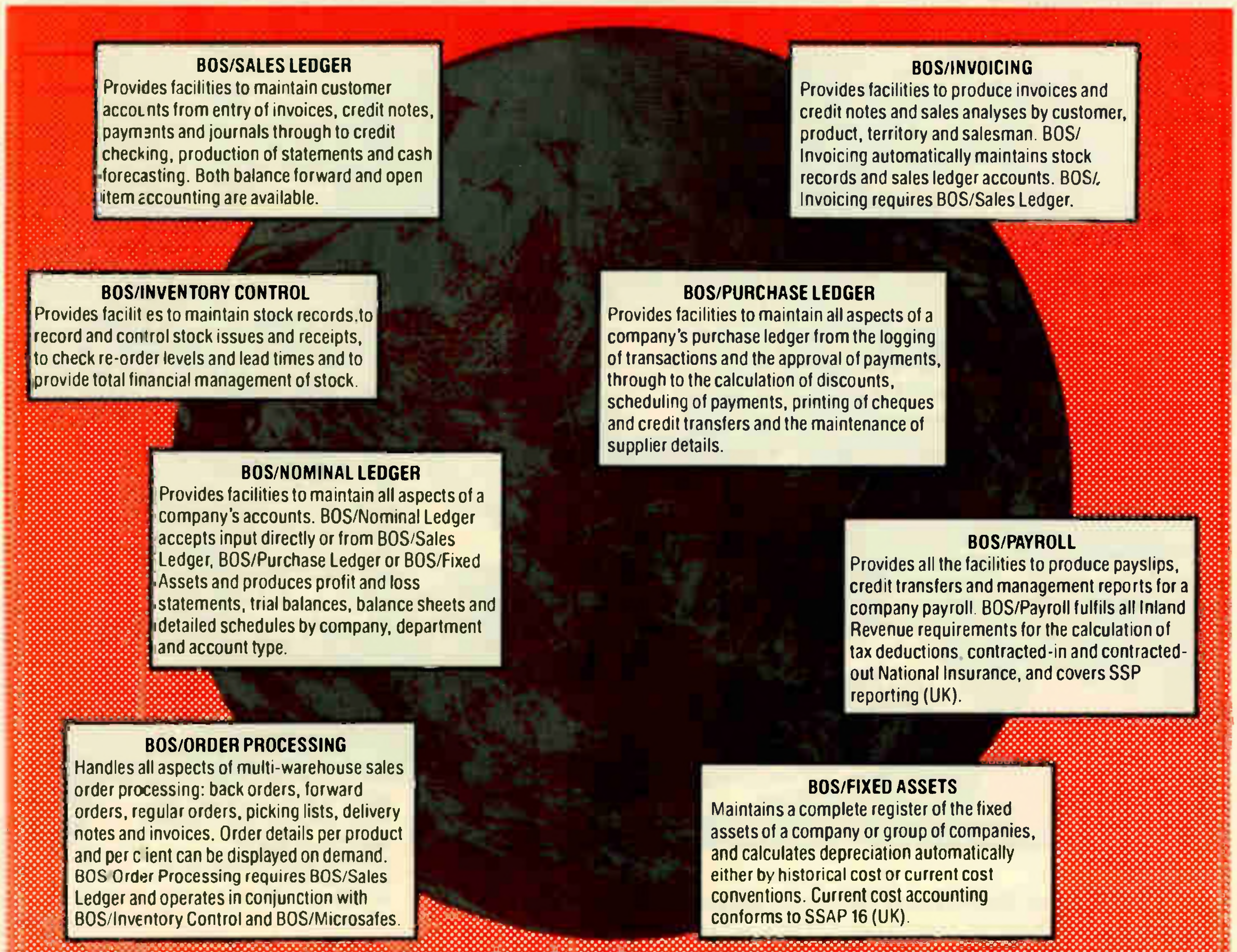

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PCW 63

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- ★ Two 8-Bit I/O Ports
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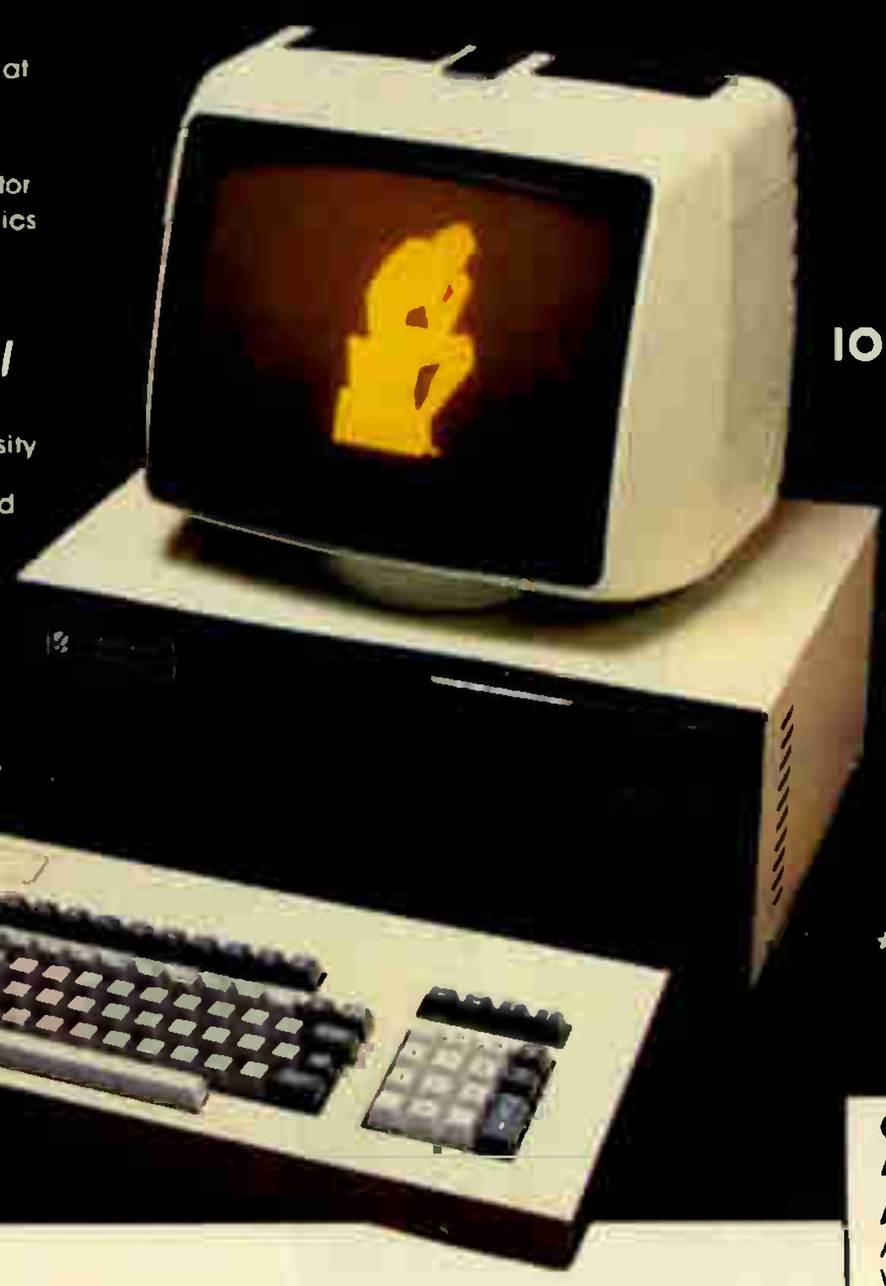

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- ★ On-board 16-Bit Microprocessor
- ★ Comprehensive On-board Software



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- ★ 4 Bytewide Memory Sockets



TWO SPARE SLOTS

The Galaxy 3 computer shown has two empty slots, in a 5 board 80 Bus format, for simple addition of Gemini Multiboards to develop your own requirements.

The Gemini MultiBoard Microsystem provides a range of 15 fully-compatible microcomputer boards, which can be used to configure solutions for micro processor problems, from as many as 10 boards, to just 1. This flexibility is due to Gemini's adoption of accepted industry standards; especially the 80-Bus, specifically designed for the Z80 microcomputer which forms the heart of the MultiBoard system.

The principle advantage of a Z80 Bus system is the abundance of software available operating under CP/M, by which software becomes machine independant; providing the user with the widest range of software available.

There is also the opportunity to develop systems based on the Galaxy 3 computer (shown above) which uses Gemini MultiBoards, but has 2 spare slots in a 5-board frame for particular configurations. Alternatively, the Galaxy 2 provides a cost-effective development tool with 3 spare slots in a 6-board frame.

With MultiBoard thousands of permutations are possible. Eight of our most popular boards are shown here, but there is a range of 15 available; together with mother boards, frames, cables, power supplies, key boards and compatible software if required. A comprehensive catalogue is available from the Dealers listed, or 'phone us to discuss your requirements.

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

LEEDS
Bits & PC's, Leeds Computer Centre,
62 The Balcony, Merrion Centre,
Tel: (0532) 45887

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

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

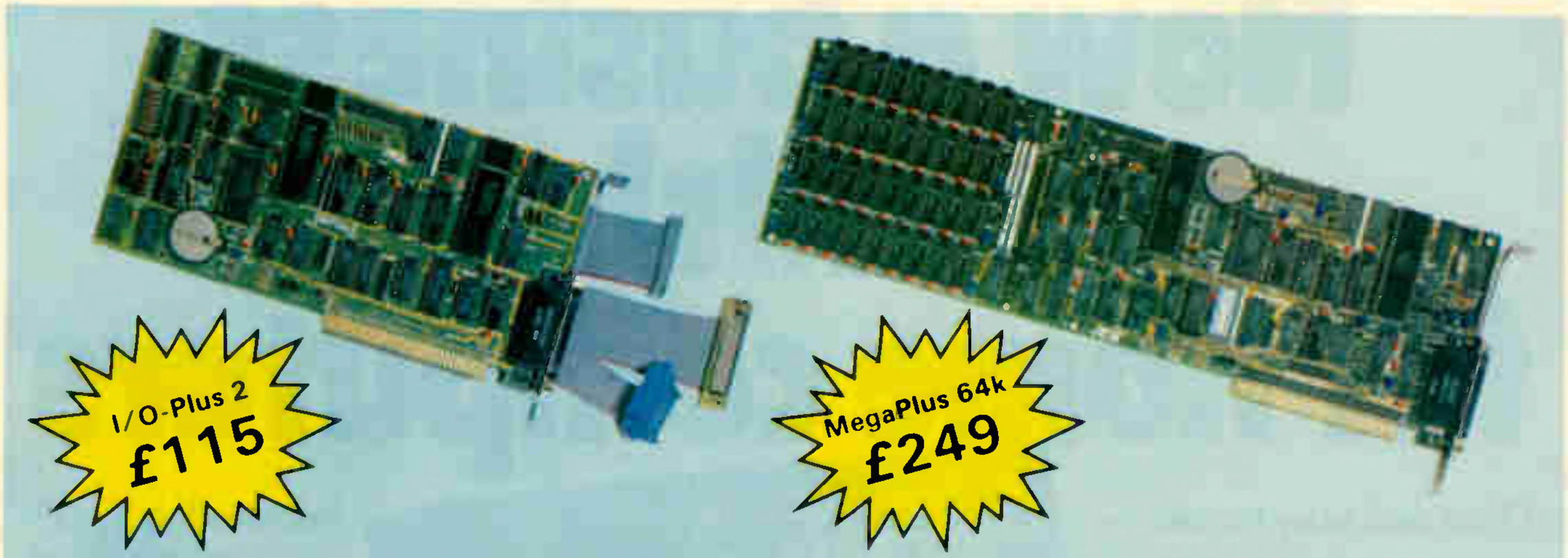
MANCHESTER M19
EV Computing, 700 Burnage Lane
Tel: 061-431 4866

NOTTINGHAM
Computerama, (Skytronics Ltd.)
357 Derby Road
Tel: (0602) 781742

MULTIBOARD COMPUTERS

Gemini Microcomputers

18 Woodside Road, Amersham, Bucks HP6 5EQ. Tel: (02403) 28321.



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MegaPlus™ and I/O-Plus-2™ are the ultimate add-on products you will need to expand your IBM PC and XT. Which board you decide on will depend on where you are heading To take full advantage of your IBM PC and XT beyond 256k, you will want to expand with the MegaPlus™. It's features include two asynchronous ports, clock/calendar, printer port, and up to 512k of memory expansion. But what if you already have all the memory you need? The I/O Plus-2™ gives you all the features of MegaPlus™ to operate your printers, plotters and modems, set your time and date automatically with the clock/calendar, without adding memory Also a special game adapter is available, but more about that later Both boards include SuperDrive™ disk emulation and SuperSpool™ print buffer software

MEGA WITH MEMORY

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

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

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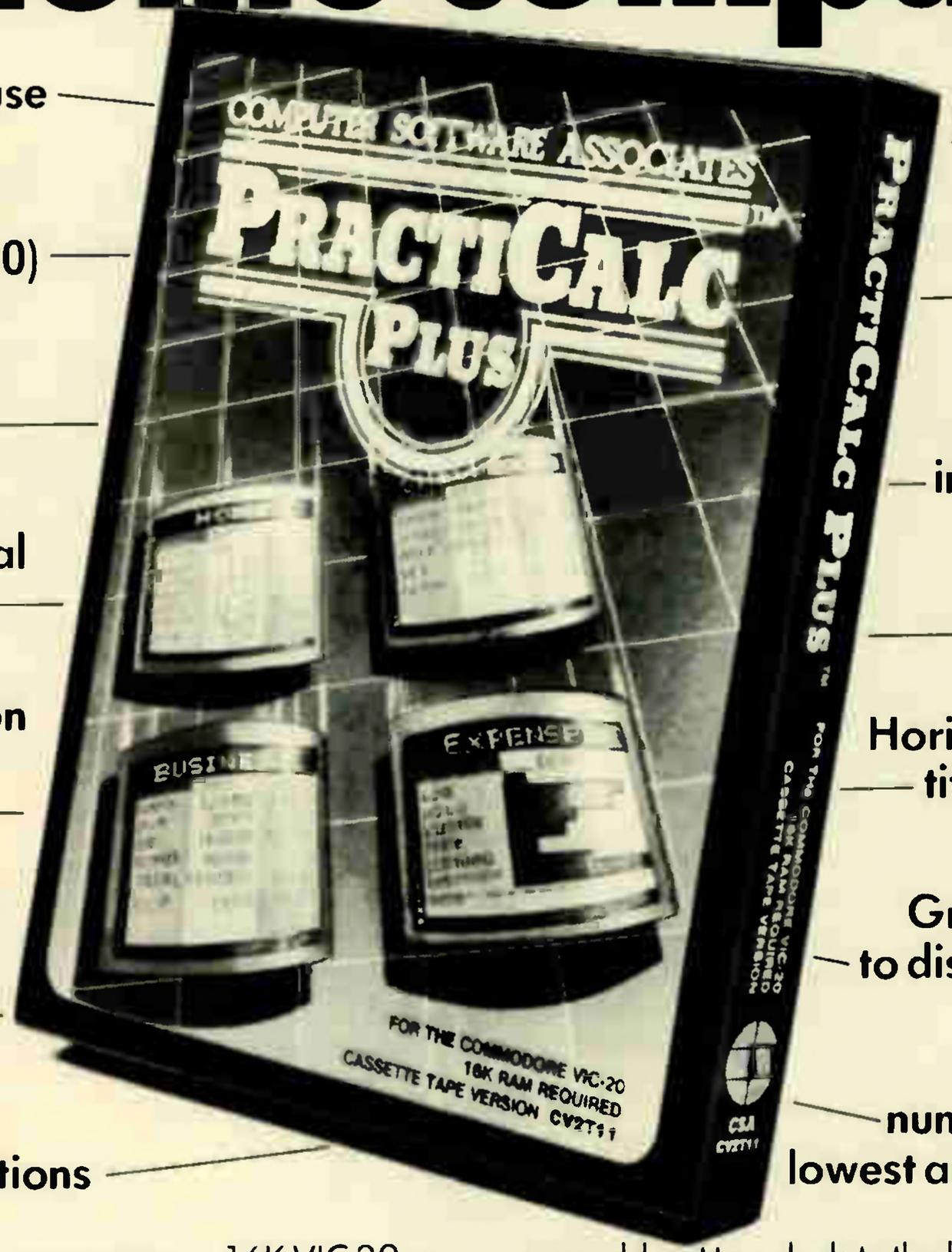

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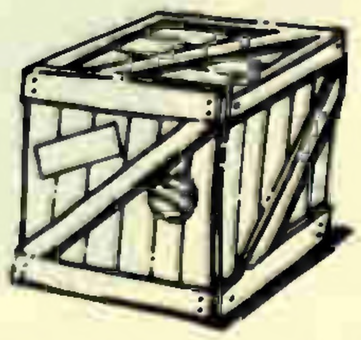

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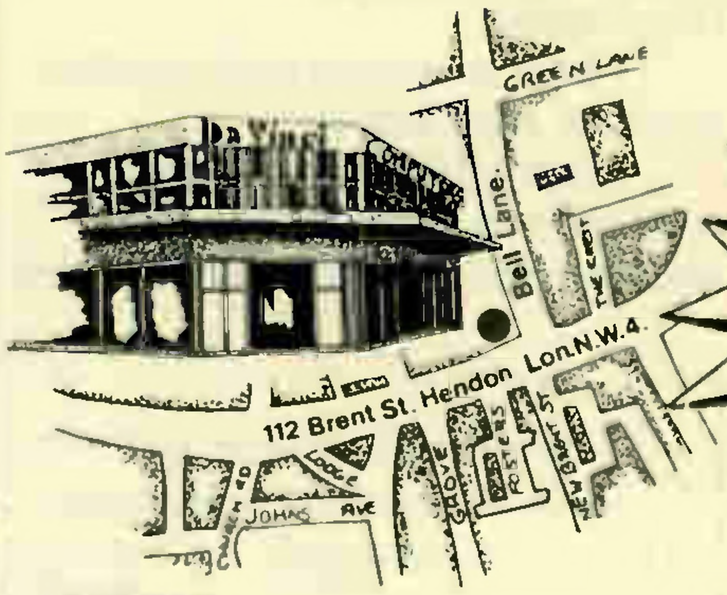

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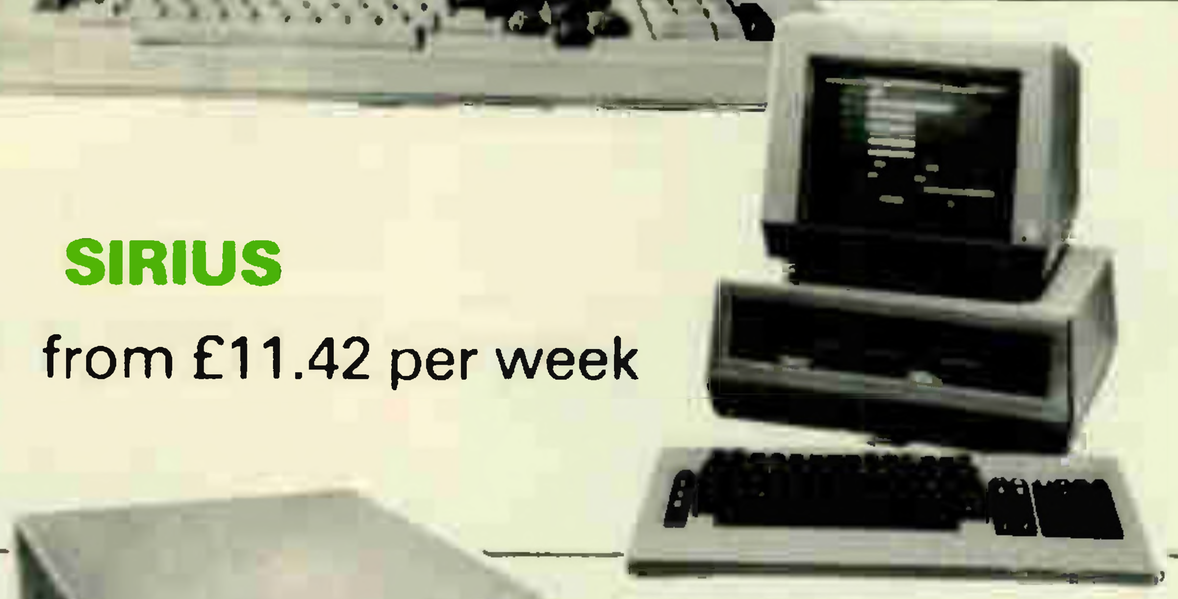

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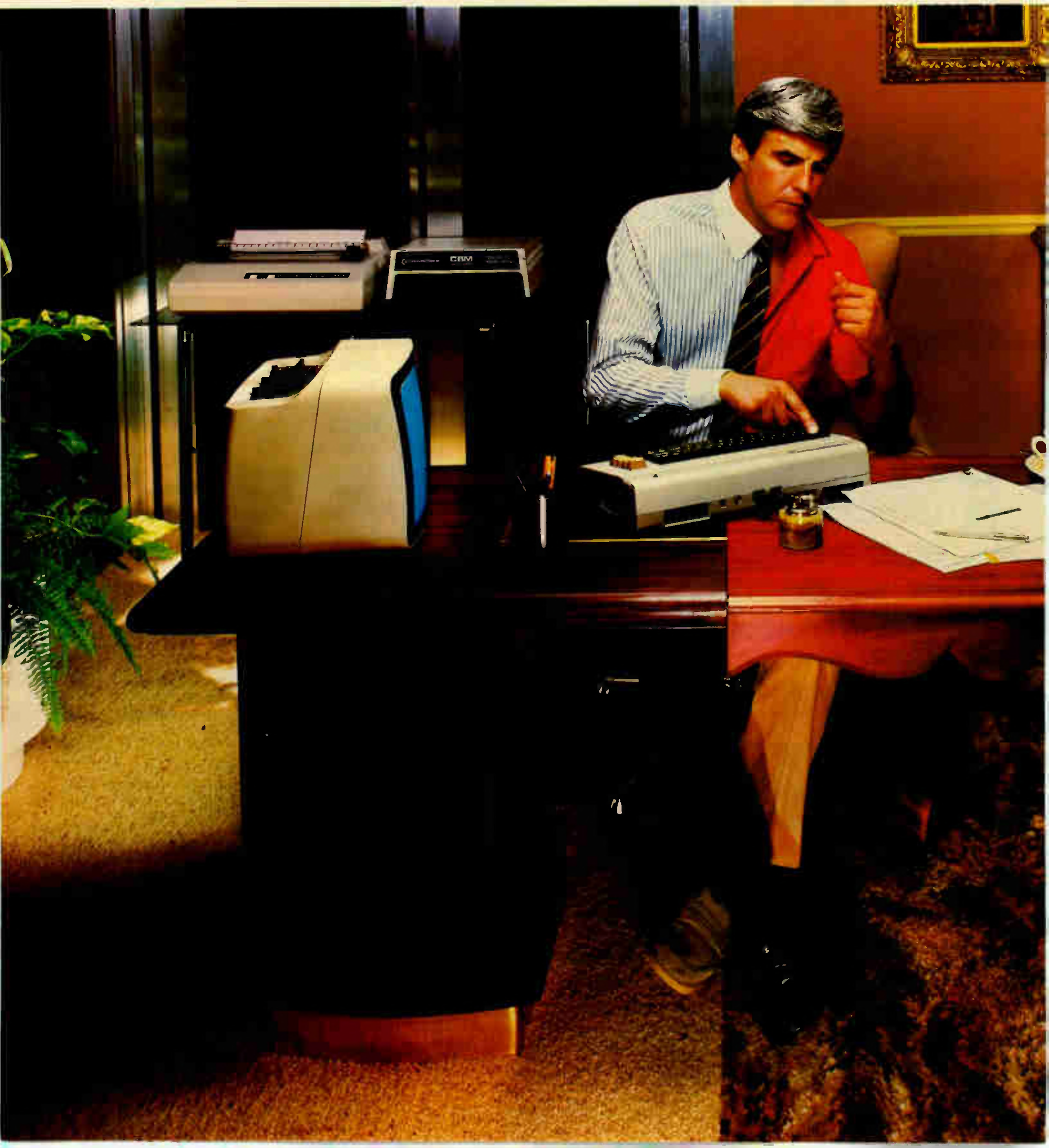

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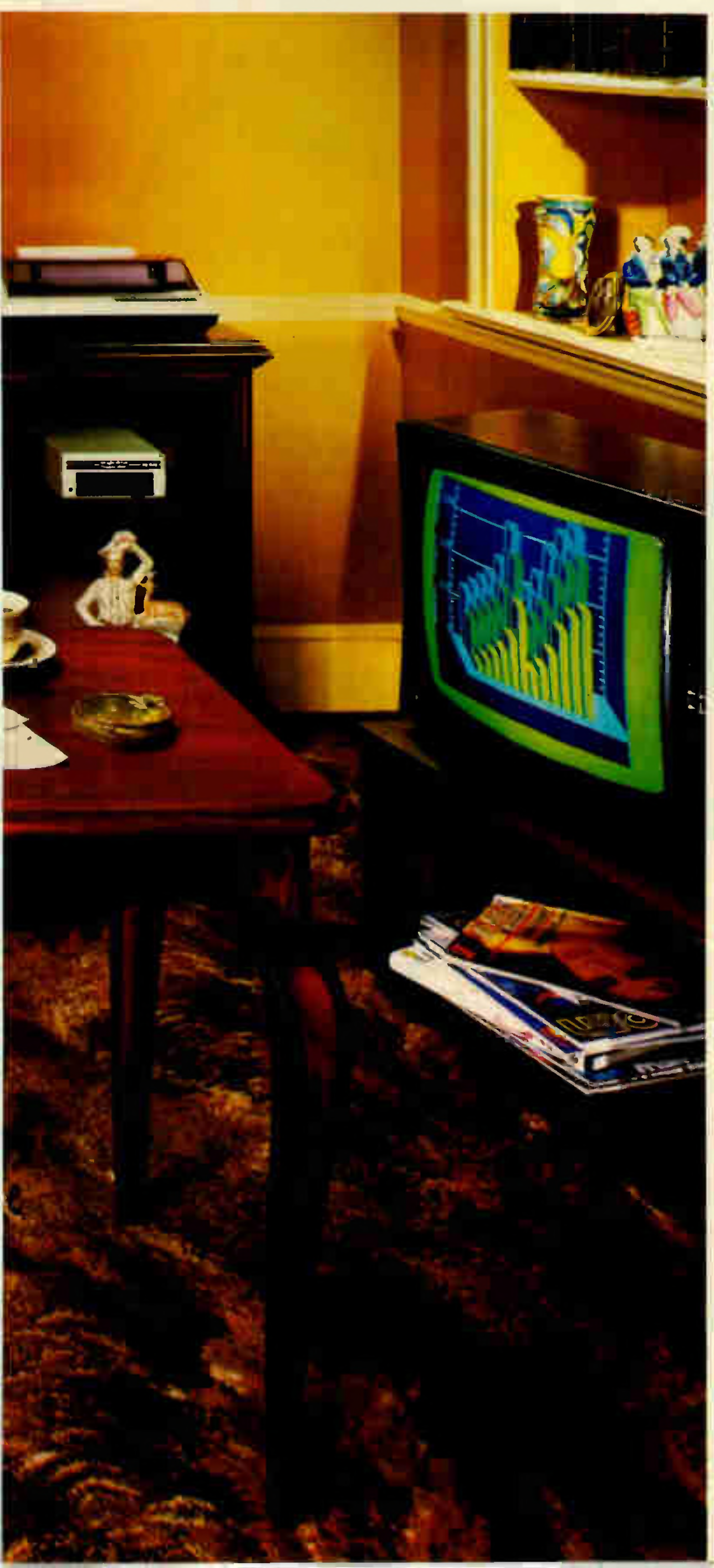

and provides the facts on which you can base sound business decisions.

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The Commodore 64 is the perfect computer for your own business, whatever its size. As well as the advantages we've already mentioned, it has a great capacity for expansion, and when combined with various peripherals** it is superbly flexible. Whether it's looking after personnel records or creating models, say, for sales forecasts, it will quickly prove to be of vital importance to any well run concern.

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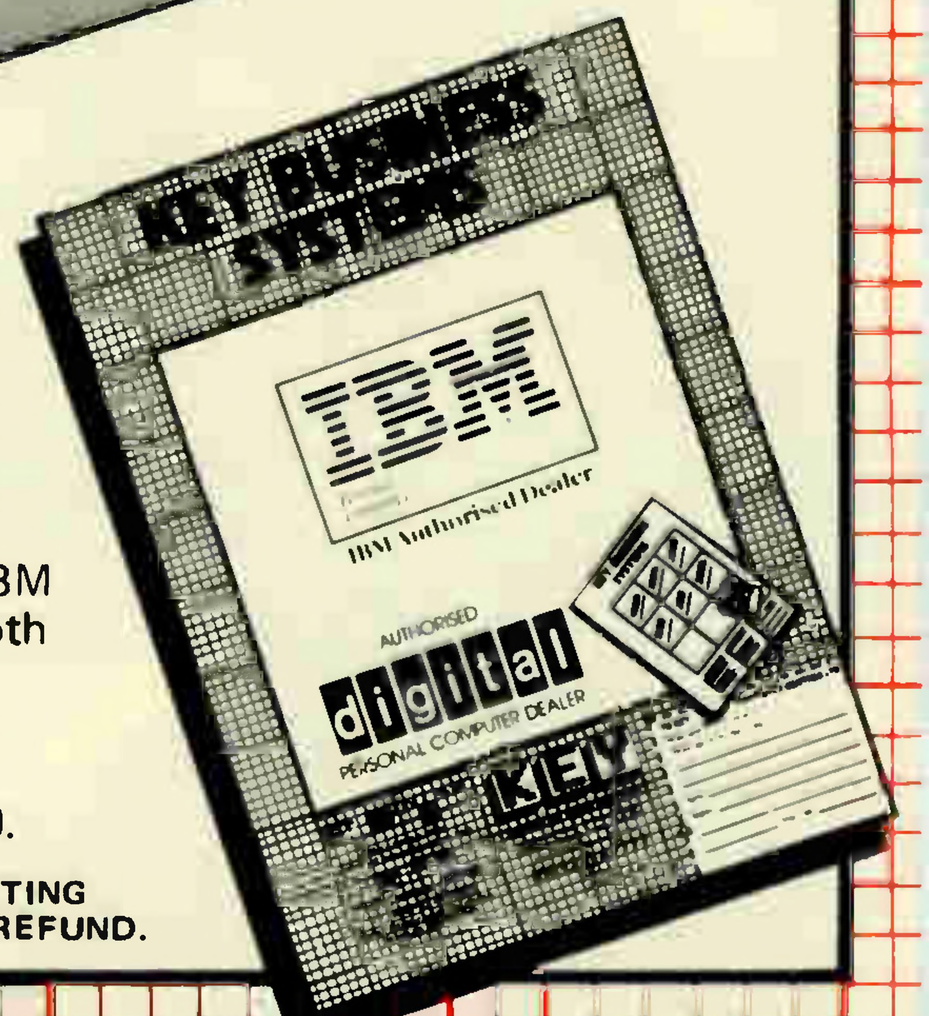

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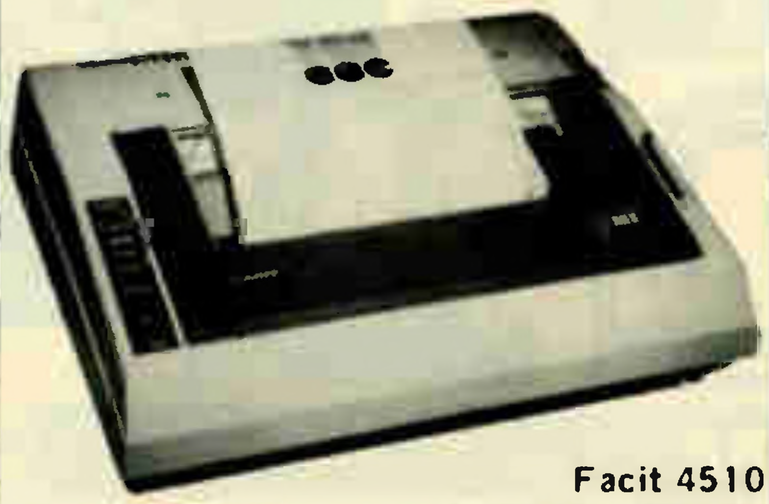

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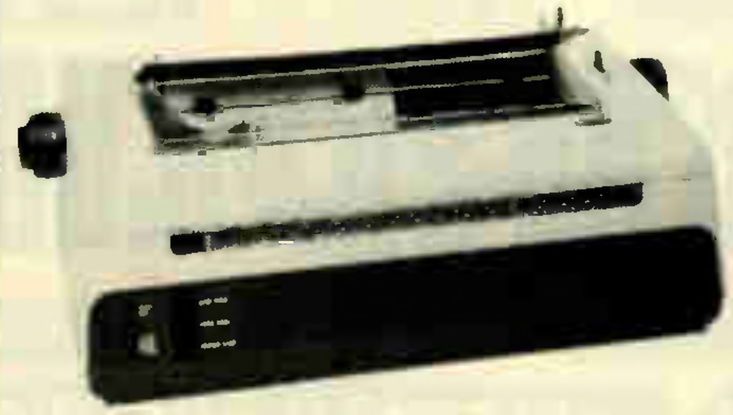

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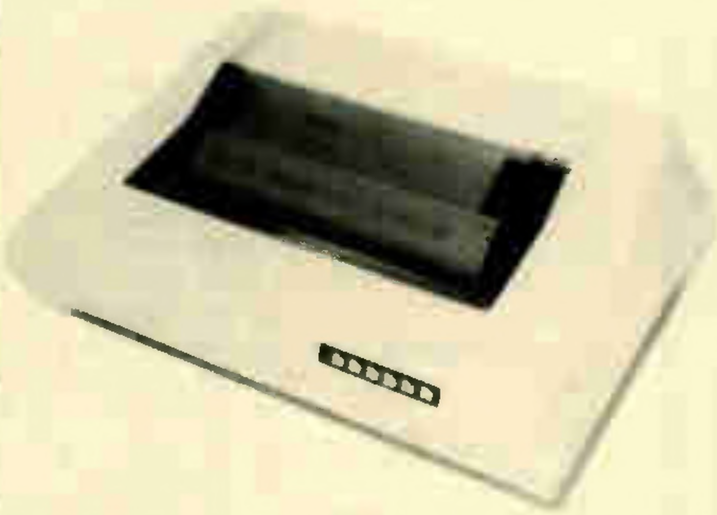

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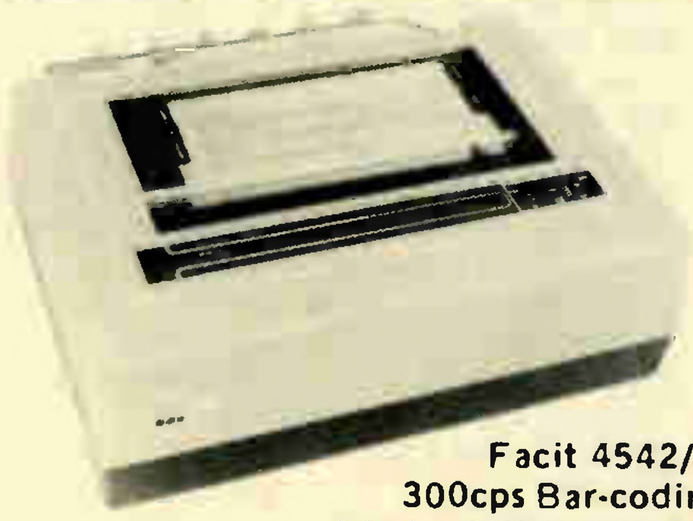

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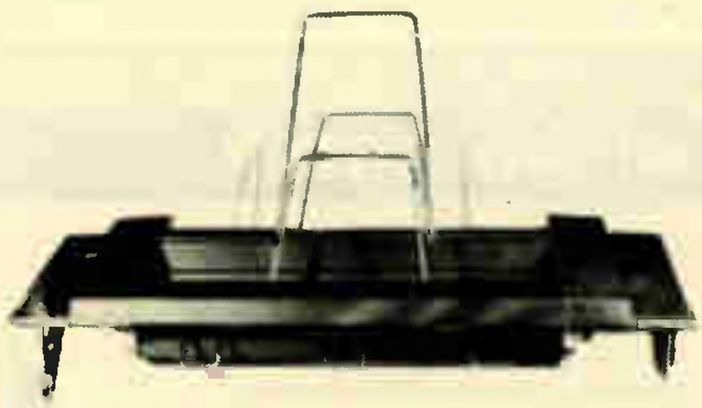

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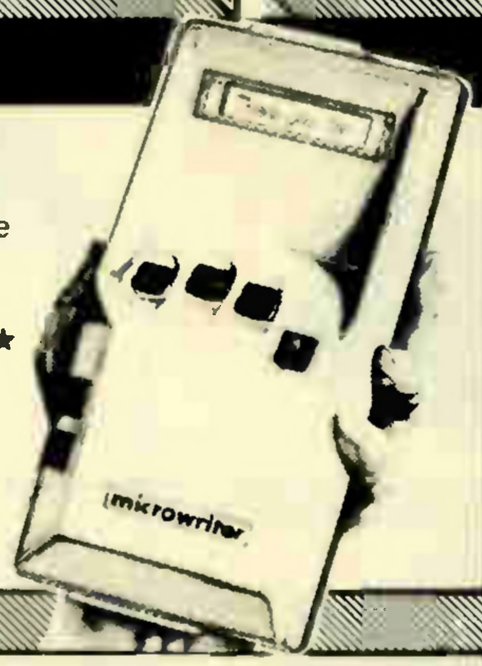

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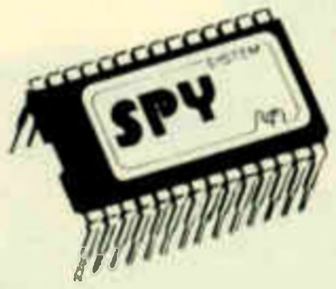

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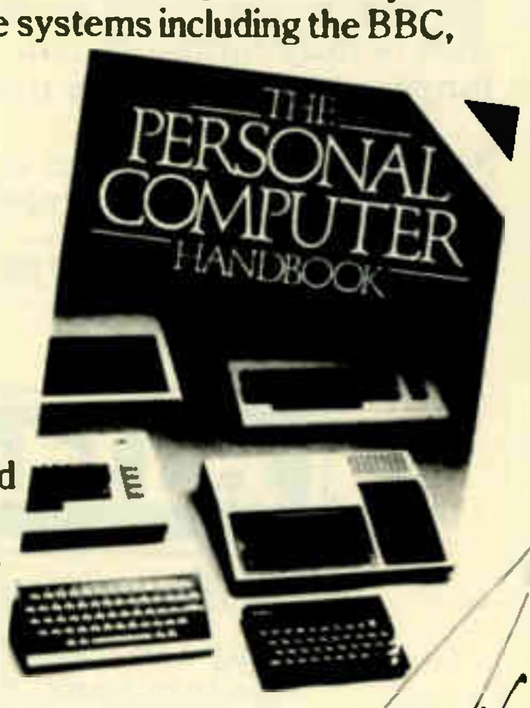

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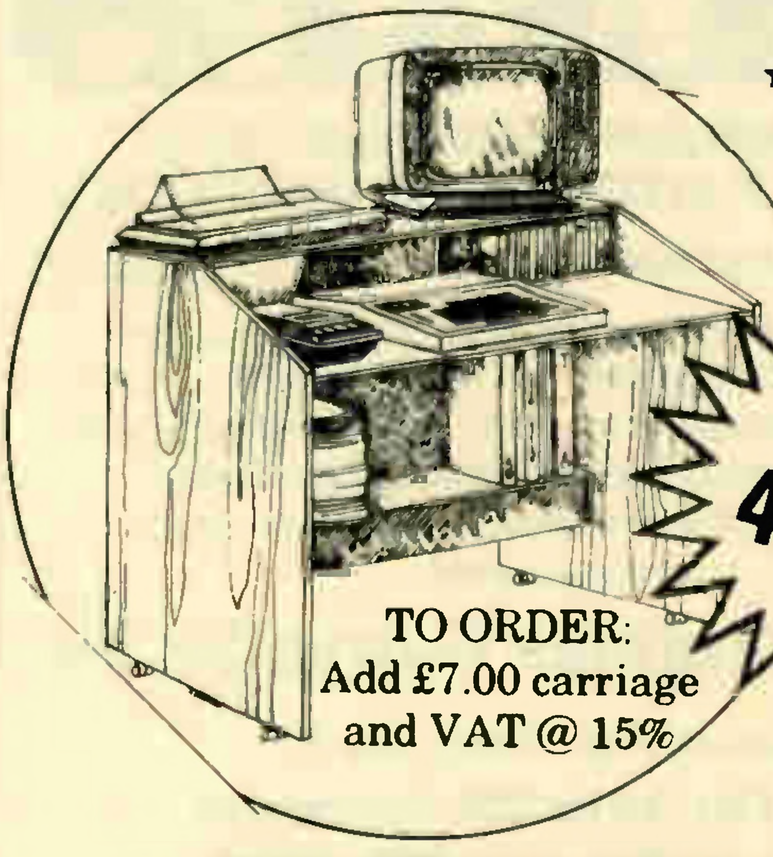

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WARNING

Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

THE PITFALLS

"DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost.
These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads, peripherals and software often carry very high cost premiums.
e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut, and shoddy workmanship during 'building' can effect the 'up-time' of your unit.
Areas to watch out for are unreliable edge connectors, corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy.

DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited.
Some computers, however, have the advantage of both games facility plus the whole world of computing to explore, as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi-Technology world, and help earn its keep with its added uses in the field of education, communication and home business use.

SOFTWARE

Make sure the system you choose has a growing library of support software, to enable you to realize the full potential of your machine.

KEY POINTS TO LOOK FOR

● High Resolution Colour

In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35,000, then the graphics can hardly be considered high resolution.
Without high resolution graphics displays such as those used in games tend to be "Chunky" in appearance.

● High Quality Sound

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a raise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects; very important for generating music. Also look for the ability to connect to external amplifiers.

● Keyboard

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications: very important if the purpose of purchasing a computer is educational.

● RAM

One of the most important features of a computer is the amount of RAM, or memory, included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care, all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU.
If it is less than 32K think again, is it enough?

● Computer Language

It is too dificult to program a computer in its own binary language so high level languages are used, the most popular being BASIC. However, there are a number of BASICs, some being very different from the rest.
A de facto standard in the computer industry is Microsoft BASIC.
Learn this one and you will be able to program in the majority of computer BASICs; such an important point if a home computer is to be used to educate your children to face the technology of the future.

● Expansion

As your interest and knowledge of computing grows, you will need a computer system that will grow with you; able to accommodate Printers, Disk-drives, Joysticks, Communications Modem, and Colour Monitor, as well as produce HI-FI sound effects.



Choosing the right system carefully will save you from throwing your money away. Check full specification, plus peripherals and software prices, before you buy. Preferably choose a Real computer system that can expand to meet your needs.

● Software

The computer you choose should have a growing selection of utility software to make the most of its capability.
Remember, computing is here to stay. You can't learn to compute on a toy, or a device which does not behave like a real computer.
In short, look out for a computer which offers all the points above, and you will be sure of getting the best value for money.

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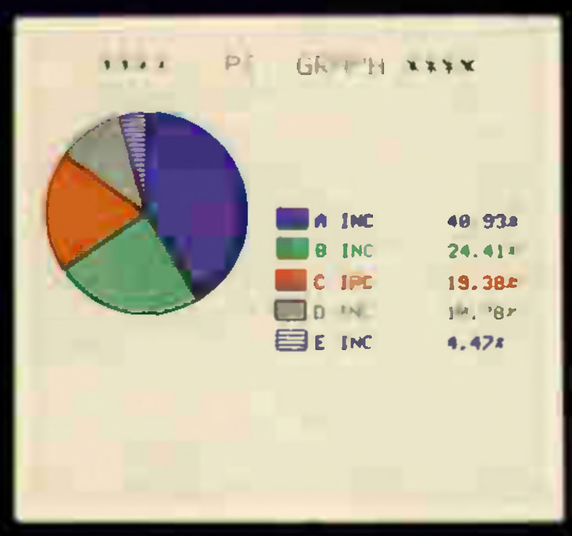

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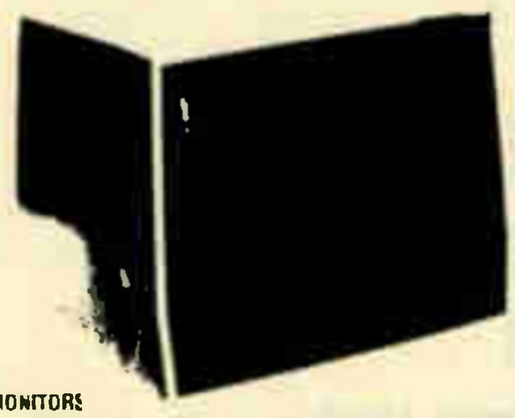

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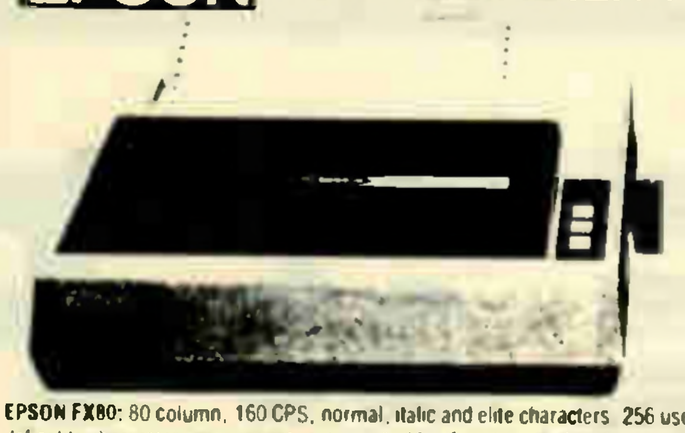

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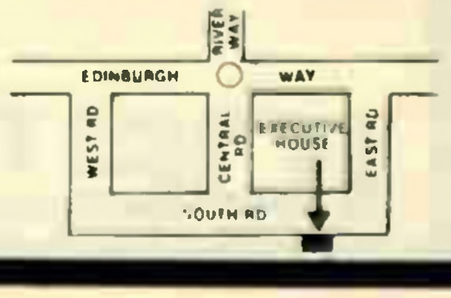

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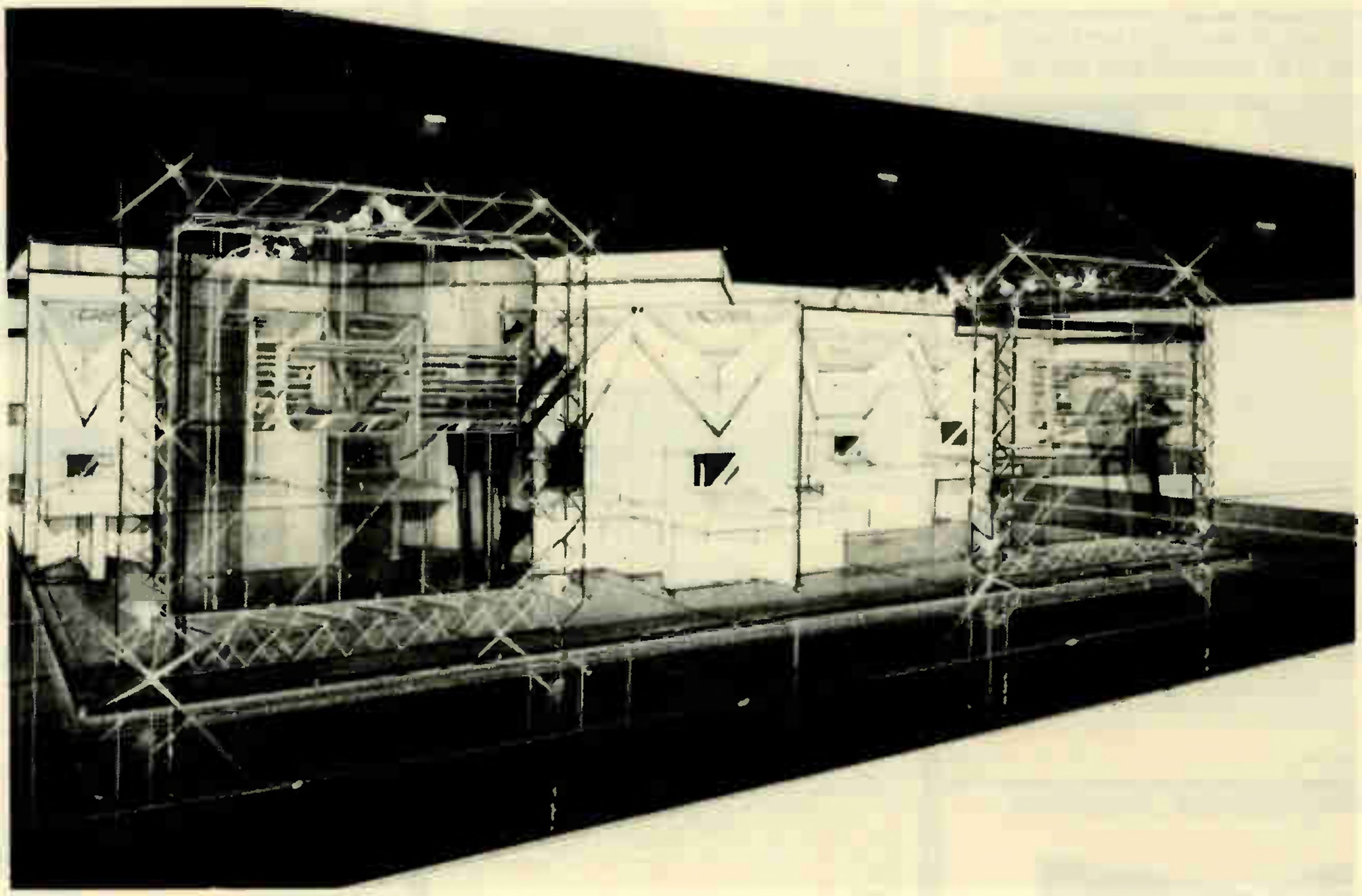

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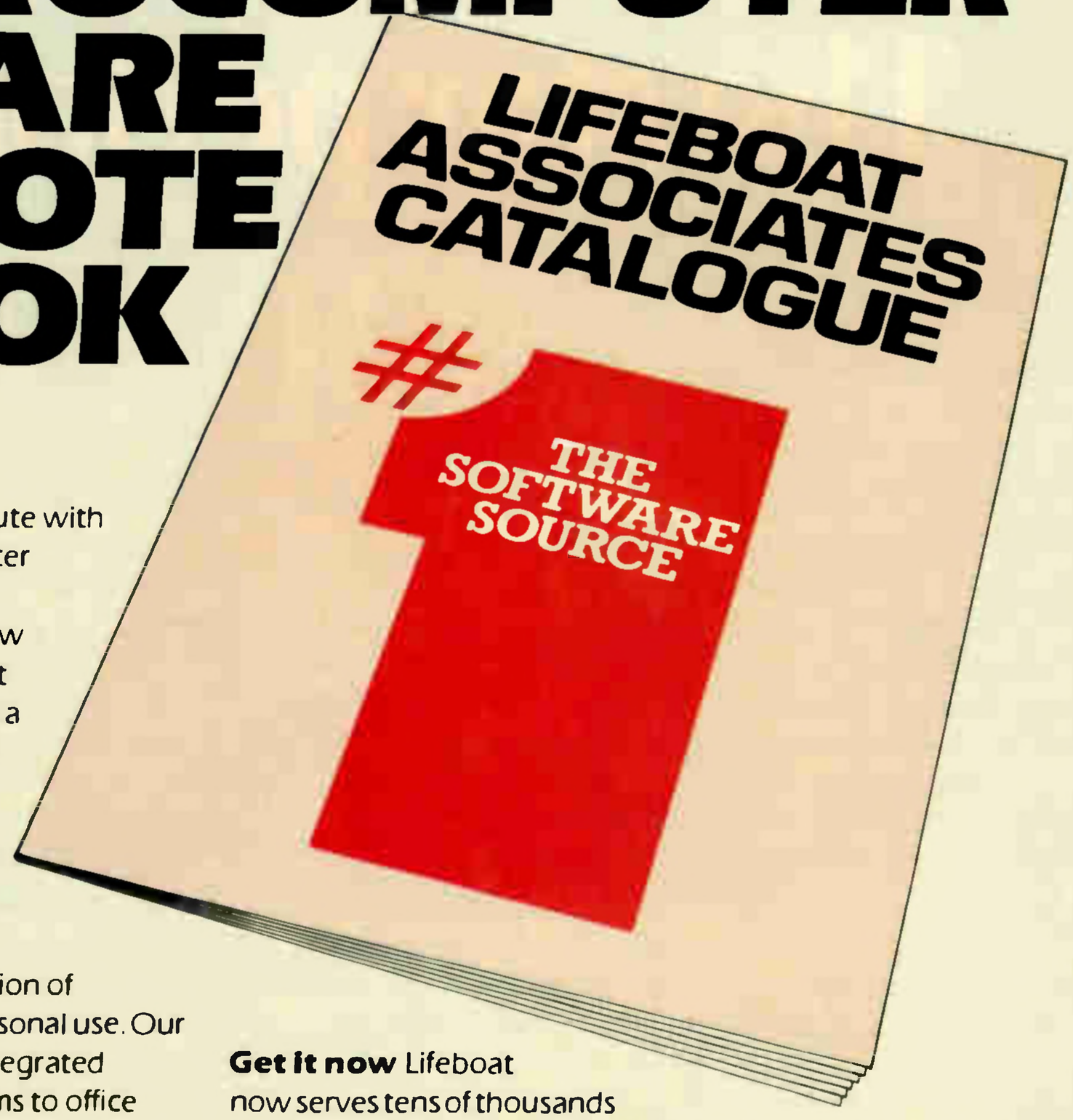

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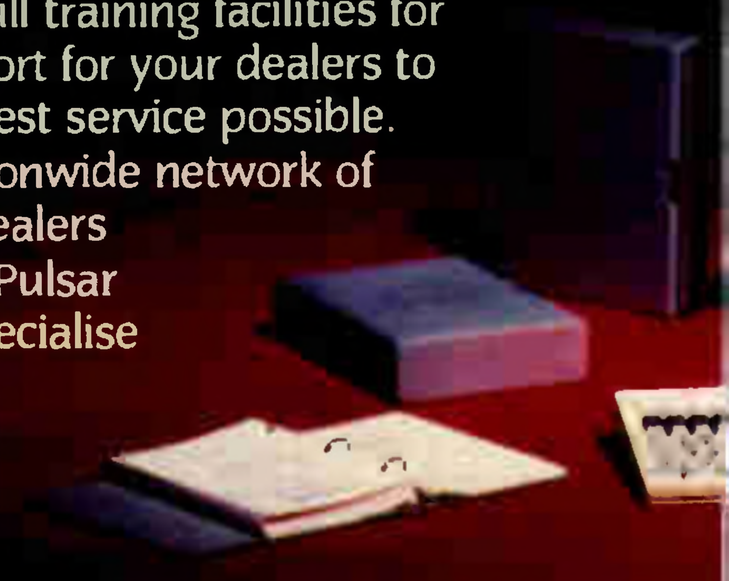

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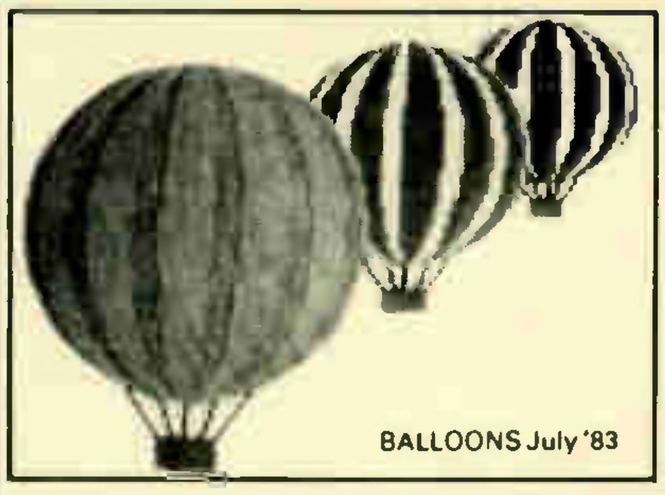





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June Issue: Program features **'Return of the Diamond'** a 16K adventure game. **'Hedgehog'** a well implemented 'Frogger' type game, and **Ellipto** Create your own off the shelf sound effects with **Sound Wizard** Plus articles on **Using Files, Rotating and Expanding Characters, Using Printers,** and **How to multi-program the User Keys** Reviews of **The Hobbit Floppy Tape system, Adventure Games,** and a **Comparative Review of Wordwise and View.** Plus **FX Call Update, Disc Program Auto-relocator, Wordwise Update,** and more **BBC Book Reviews**.

July Issue Games: Robot Attack (32k) and Anagrams, a 16k word game Watching the Beeb at work – a simple program to show your micro at work. An introduction to discs – what are they and are they worth getting Balloons – a coloured animation Make your micro speak like Kenneth Kendal Bad Program Lister – lists programs even when the computer pronounces them 'bad' Reviews of Epson and Seikosha's new printers Five books of programs reviewed, plus more software reviews Using Files part 4. A full disc sector editor program – to read and retrieve lost disc files And how to modify Acornsoft's Planetoid Plus hosts of useful hints

August/September Issues Games: Space Lords (32k) a two-player space battle, and **Mars Lander** (16k).
Build Yourself a Light Pen — simple explanation for the beginner, together with a sample program
Use our "Contact Points for the Beeb" to discover who to contact when in need.
We show how to put those 'awkward' cassette programs onto disc.
Final instalment of our popular 5 part series on "Using Files".
REVIEWS of — MICRONET, Watfords Electronic's Disc Filing System, two EPROM programmers, and the tax advisory package "Microtax".
This month's visual programs include Spider's Web, Super Large Screen Characters, Bounce and Swing.
We also show how to hold two complete screen pictures at once, and switch rapidly between them in "Dual Screens on the Beeb".
A Crossword, Brain Teaser and our 4th Software Competition provide a competitive edge to this month's magazine.
We also have our very popular scattering of Hints and Tips

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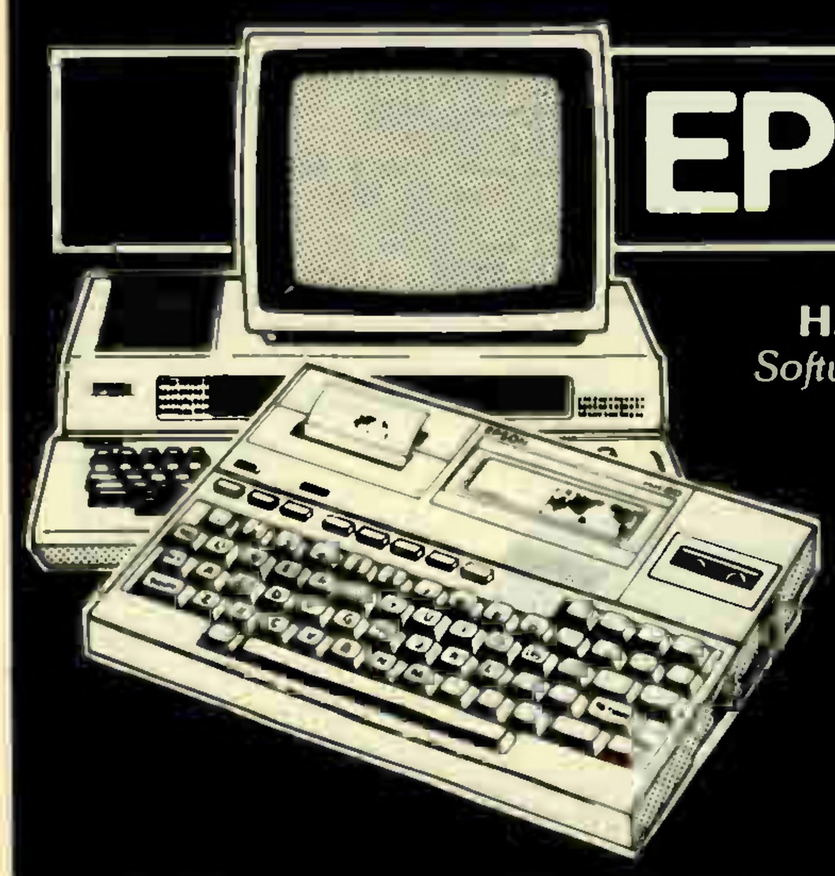

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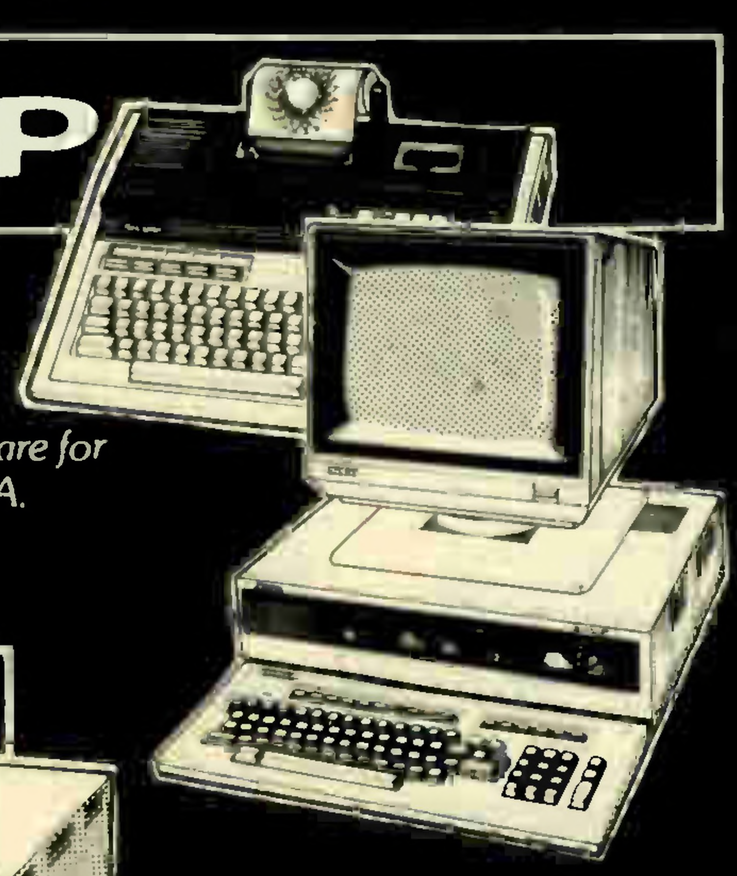

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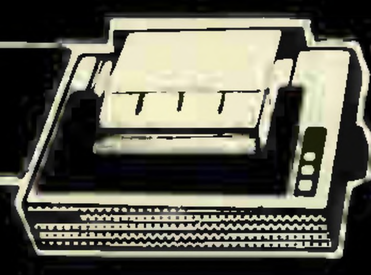

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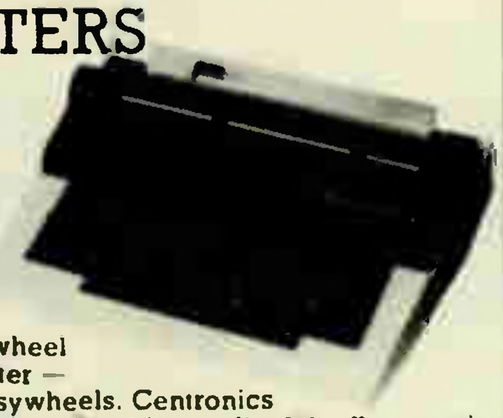

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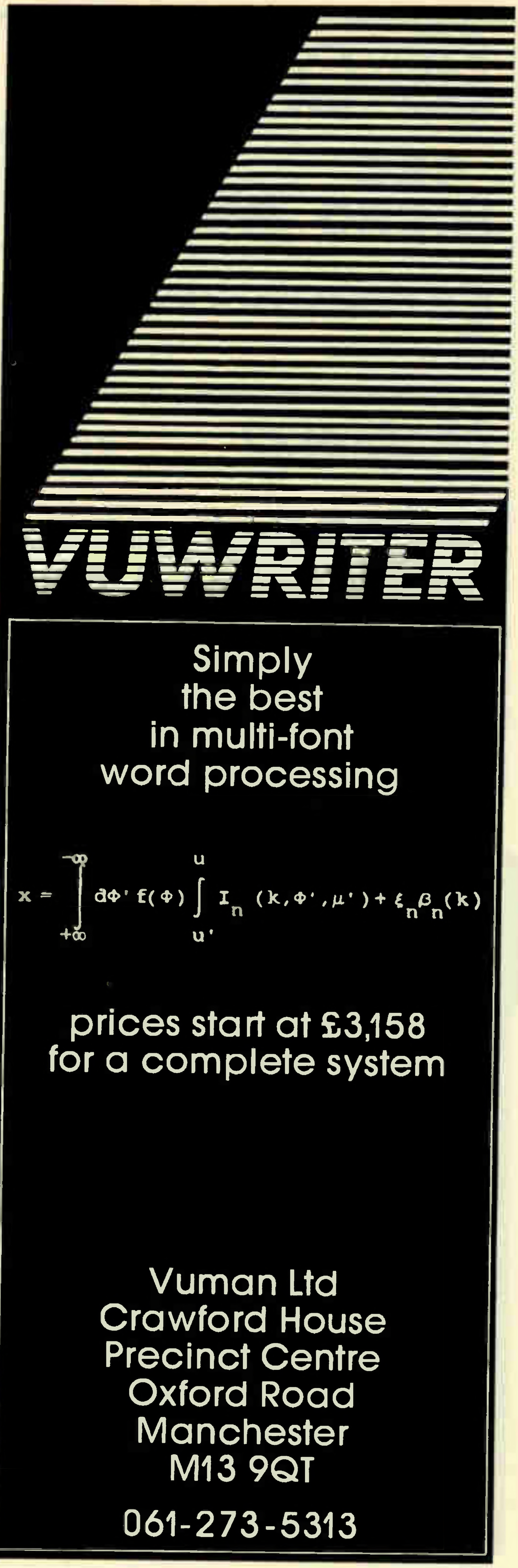

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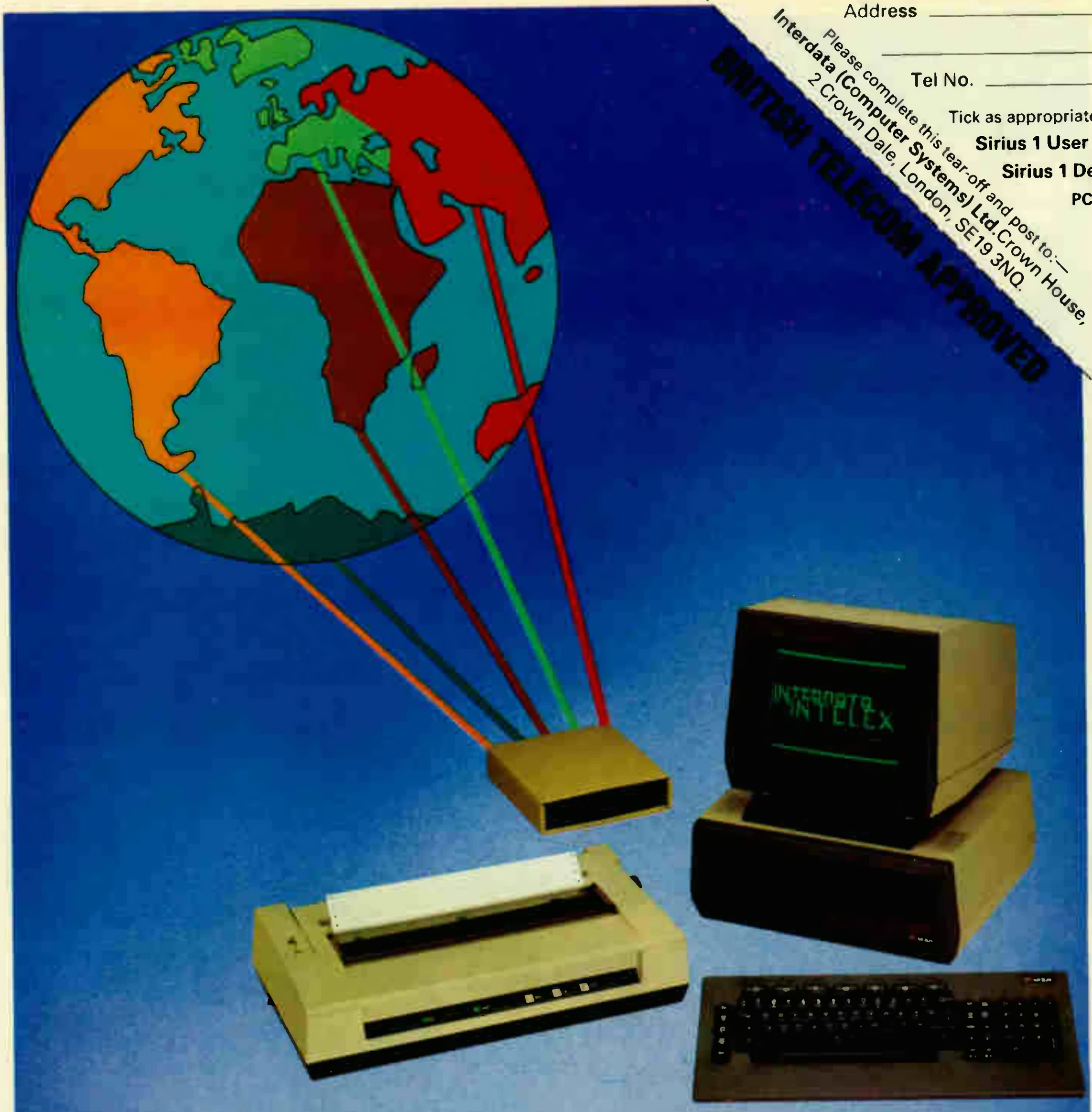

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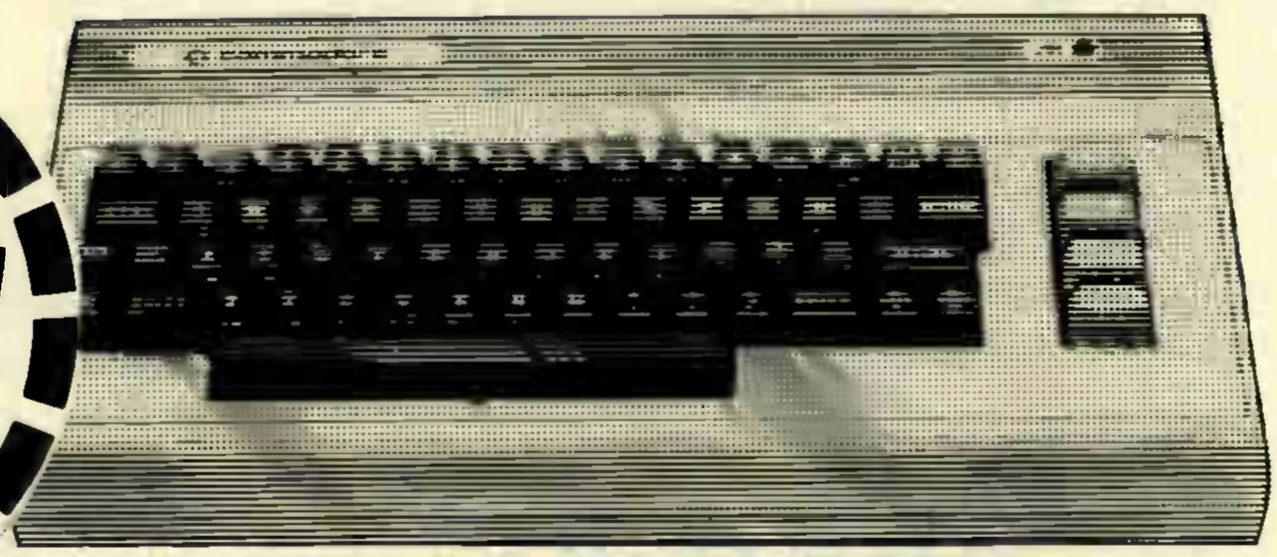

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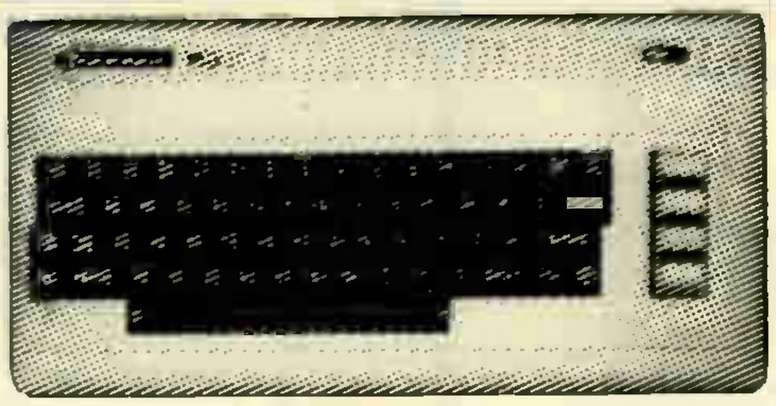

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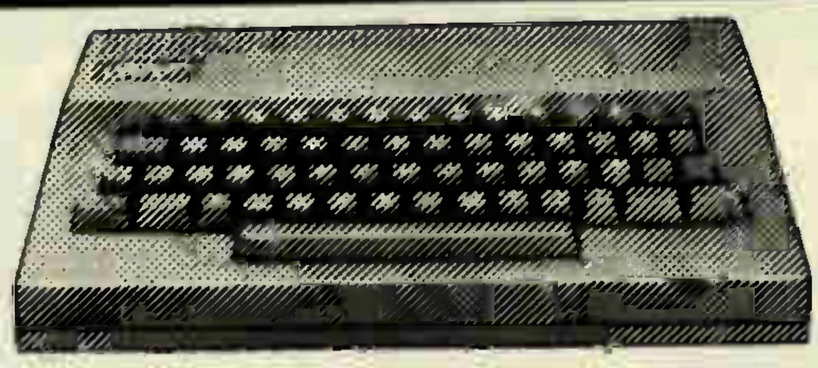

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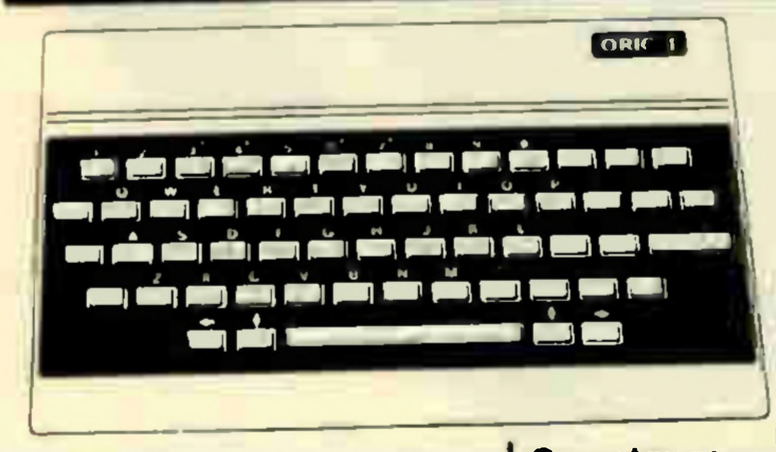

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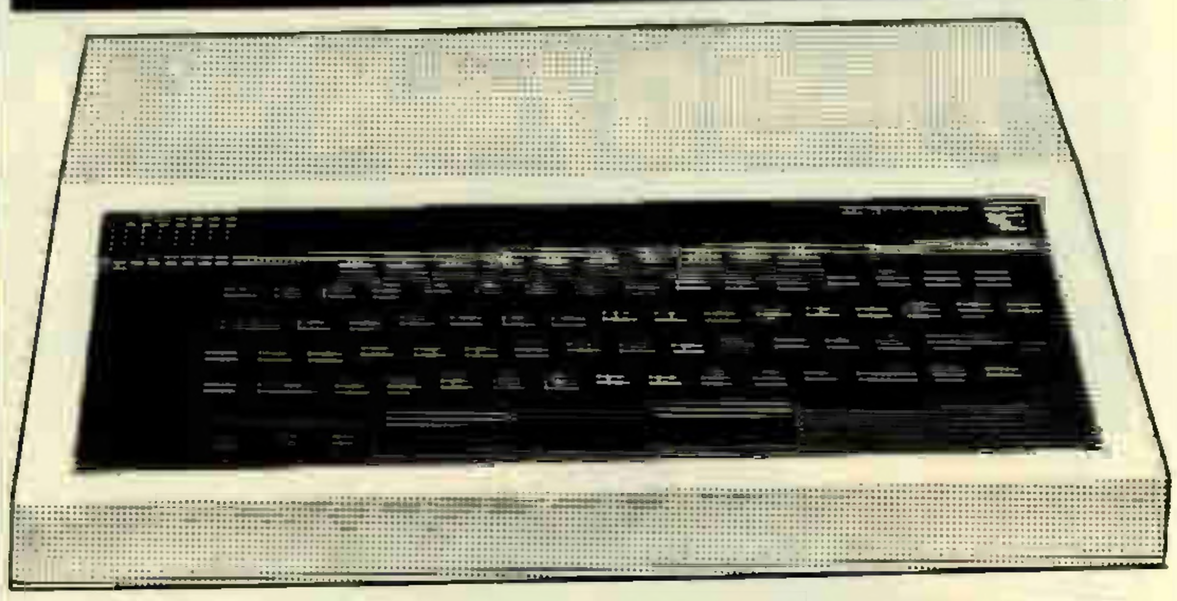

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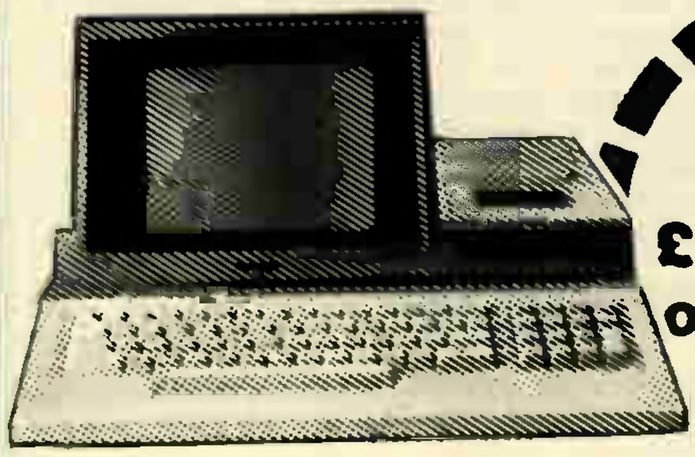

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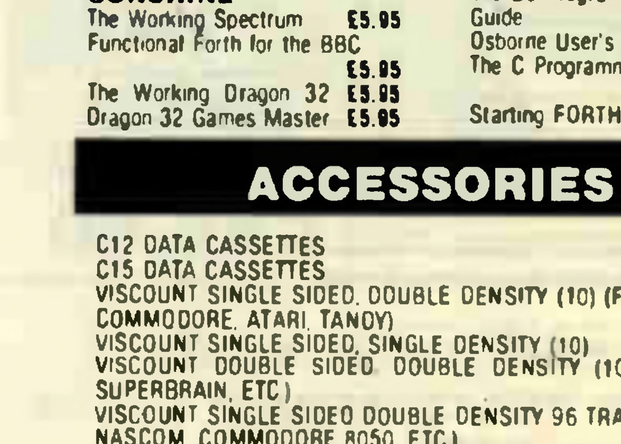

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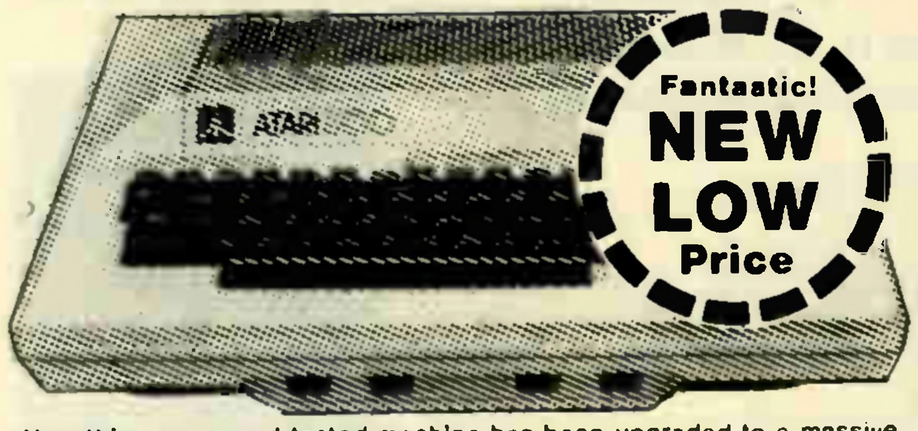

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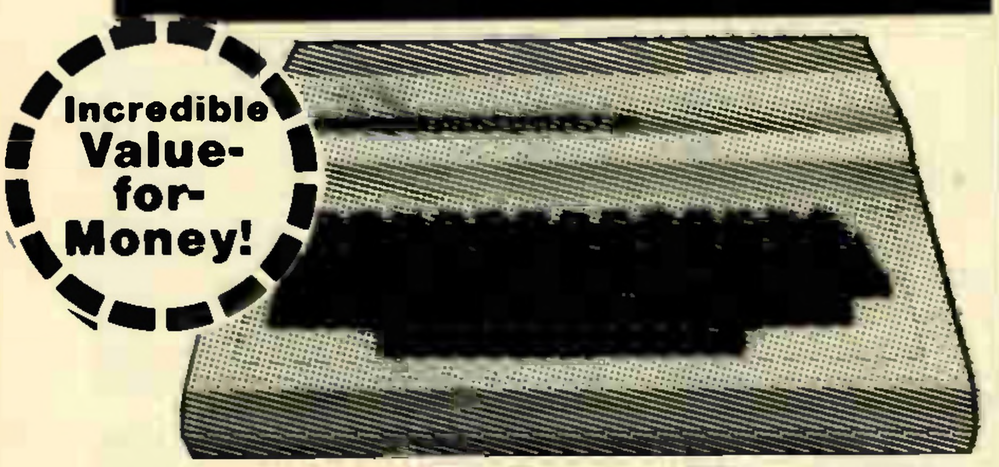

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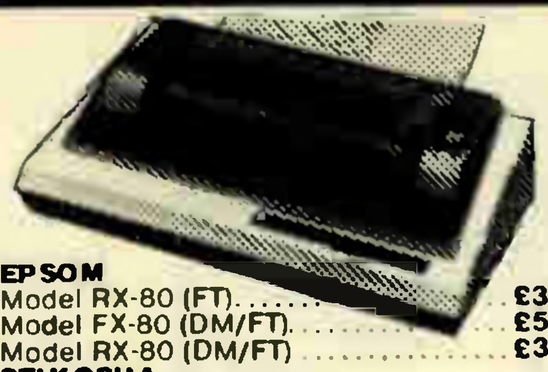

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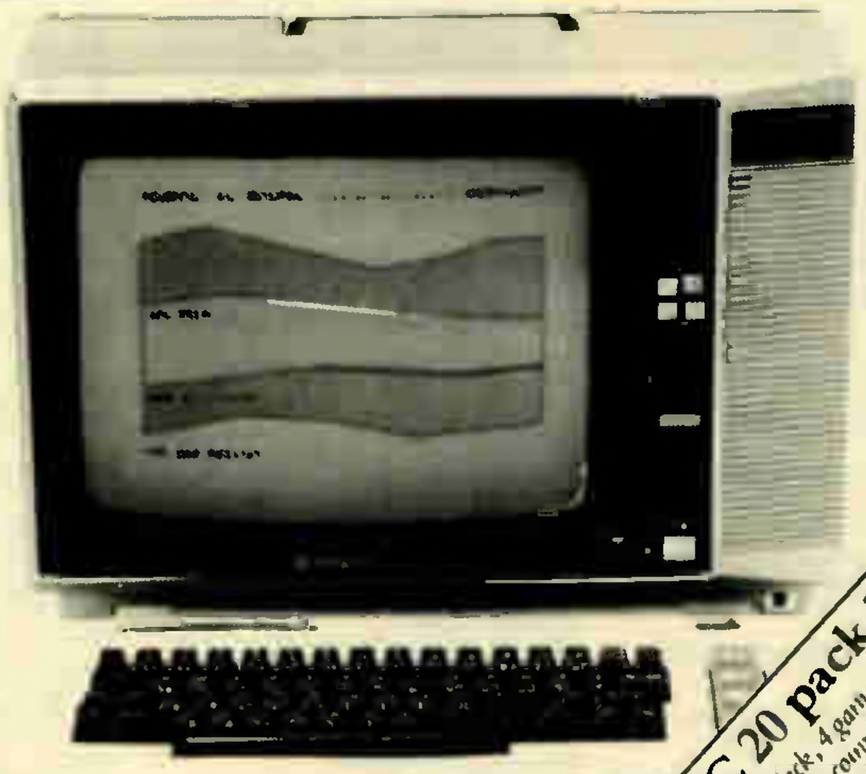

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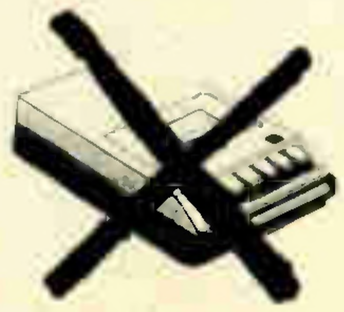

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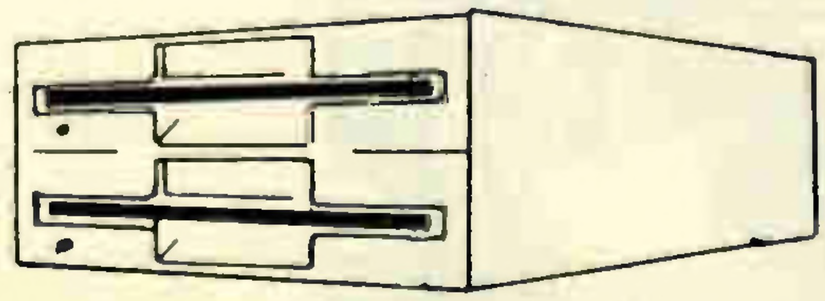

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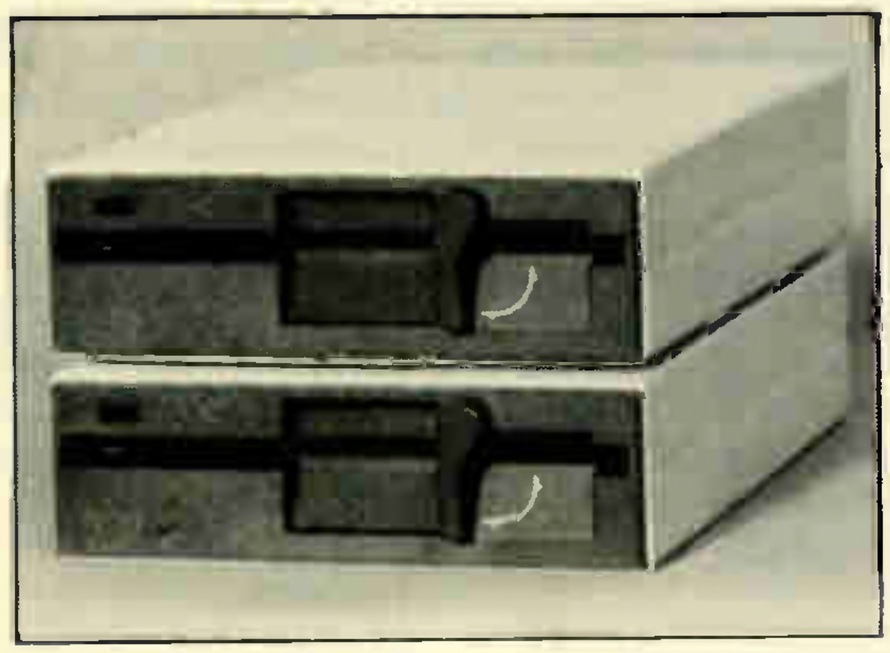

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Taste the difference

As of today, should you be daft enough to fancy using a computer on a picnic in the country, you need an enormous battery, or a very long power lead, or a 'lap-held' computer. And at the moment, there are only two lap-held computers from which to choose.

The Epson HX-20 (shown here connected to a telephone) has been joined by the Tandy 100 (tested by *PCW* two months ago). These two are now to be joined, it seems, by the NEC version of the Tandy.

The most important thing about the Tandy and the NEC 8220 is that they are as near identical as possible, and that most of their advantages and disadvantages — when compared with the Epson — are the same.

As you can tell from the pictures (taken of a model smuggled in from Japan, not the version which will be sold in this country) the NEC is different from the Tandy in shape, in the number of special function keys, and in the layout of the keyboard.

Use it, and you realise quickly that although it may appear to be the same beast in a different box, the software has been changed, too.

The software was designed for NEC and Tandy by Microsoft Japan and the hardware was presented in nearly final form by the builder, Kyocera (also Japanese).

The differences between the Epson and the two other machines are simple to list: the Epson has a much smaller display, showing only 80 characters, whereas the Kyocera beasts have 320; the Epson is a lot slower in its processing: the Kyocera machines use very much less power (so can use ordinary AA cells) and have automatic power turn-off ability to save those batteries: the Epson has an integral tape and printer, and the Epson has a better keyboard.

So much for lists: the meaning of it all is that the Kyocera machine effectively makes the Epson obsolete, were it not for the accumulation of software for the Epson over the past year. (See caption for the Epson picture.)

And the Kyocera twins have enough essential text editing, communications and programming language abilities to make up a lot of that ground.

Where they differ from each other is in the amount of memory available. Both have a 32 kbyte block of memory occupied by program chips, and theoretical maximum of 32 kbytes left for the owner. The chip involved is the equivalent of an Intel 8085.

So, while the NEC has the same 64 kbyte theoretical maximum memory as the Tandy, NEC has chosen the option of having two memory boards, each with its ration of 32 kbytes, and each of which it can alternately 'plug into the system' by software means. The result is that it can take 64 kbytes of free memory for storing text and data.

Normally, this wouldn't be much of an advantage, because the programs running in the 32 kbyte of ROM can only access one 'page' of 32 kbytes at a time. But on the current Kyocera design, there are no portable disks, so the memory is all you have.

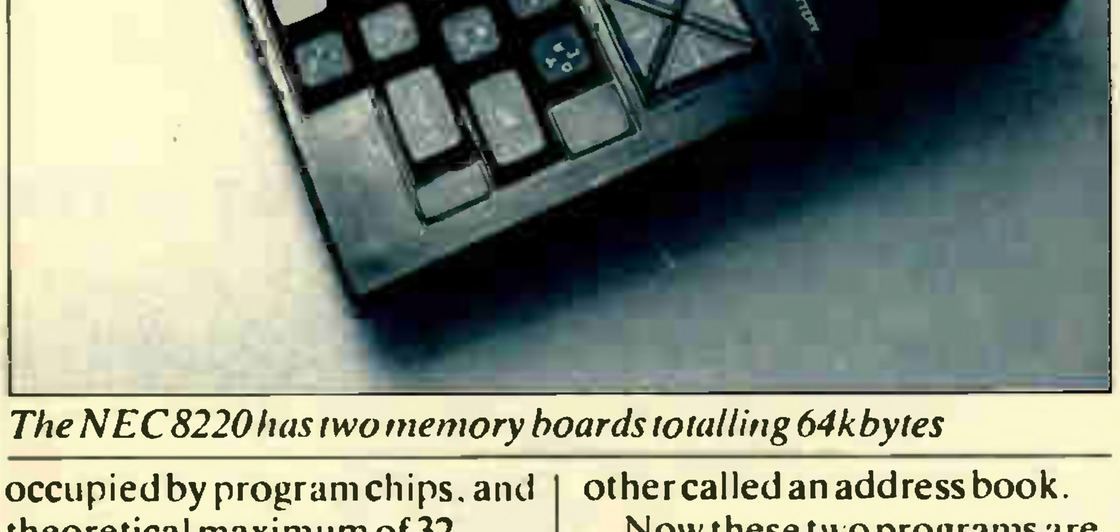
Those who remember the *PCW* review (August issue) will recall that Tandy's machine includes a text editor, a Basic Interpreter, a telecom program, and two string-finders: one called a schedule organiser, and the other called an address book.

Now these two programs are very simple. But though they may not do much, they do work up to their own limited standards, and the temptation is to use them to store often-used names, and the diary arrangements for the month ahead.

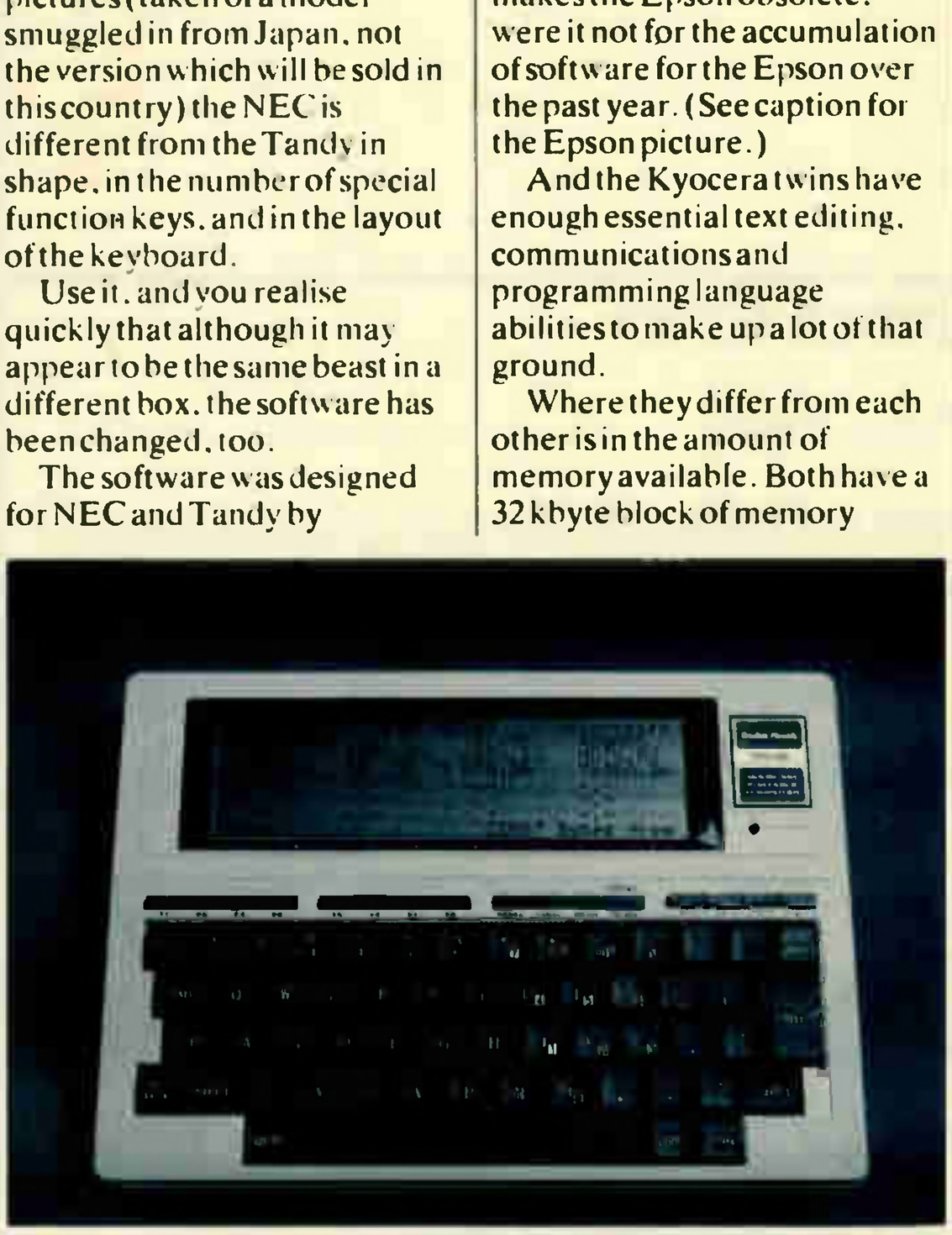
Take a standard eight kbyte machine, put a couple of dozen names in, a couple of dozen dates, and it instantly becomes clear that you can't edit more than about 500 words of text — and you certainly can't keep a Basic program of much more than about twenty lines.

The normal Tandy machine in this country will sell for £650 with 24 kbytes of memory, not the 8 kbytes supplied as standard for £500.

Now my own experience, having played with the machine for a couple of months, shows that 24 kbytes is usable, but only just. I use the thing for interviews, typing in the victim's answers to questions, and getting the advantage of having the quotes go straight into my final story, verbatim.



The NEC 8220 has two memory boards totalling 64kbytes



The Tandy's striking feature is the 40 character by 8 line display

But there isn't room for two interviews *and* two articles. And when memory gets crowded, the only place Tandy will offer you to store some of the stuff permanently, is an ordinary cassette recorder. something so unreliable as to be worth counting right out except in emergencies.

Having an extra 32 kbytes of memory will, of course, cost an extra £300 odd, because the special memory (CMOS) chips used to get this ultra-miserly power consumption are costly.

But this time next year, the cost of these chips will be very much less, and the pressure to have more memory will be very much more as useful programs come onto the market.

Always remember the first law of computer memory: 'You need more than you have.'

There are other differences between the two Kyocera machines: but ignore the extra plug on the NEC machine. It's a phone connection.

The original design for both versions includes a telephone interface — something to dial remote computers and to send data down the line.

In Britain, thanks to the energetic, go-ahead nature of our British Telecom authorities, a battery-powered computer with four AA cells has to be isolated from the 50 volt phone network in case the computer gives engineers a dangerous electrical shock. And the long and involved process of checking to see that the safety circuits work is unlikely to be complete before Christmas.

You can't argue this one with the authorities.

The NEC machine has a socket marked FD for a floppy disk. Tandy expects to have one of these 'soon' too, but my guess is that existing users won't be able to plug it in quite as soon or as easily as NEC users.

There are other differences, but without an official UK model to test, I couldn't get hold of an official manual, and so, although it is clear (for example) that the telecom program on the NEC is more complex than that on the Tandy, I couldn't try it out.

The fact that the NEC has fewer special function keys is not as significant as it looks. Each key performs some function (in Basic, for example, one key will LIST a program, and in telecom mode, one key will transmit a file, and so on) but the NEC doubles up the functions by displaying alternative functions when you press the shift key. I think the Tandy design is better, but it hardly makes or breaks the machine.

A final point on the Tandy is the fact that the software is still full of odd bugs. Not having a manual I can only assume that the NEC one is similarly raw, since it was prepared by the same software house.

But there are software differences, even in the Basic. For example, the Tandy uses the standard Microsoft Basic construction of 'LOCATE' to move the cursor to a given point on the screen. Tandy, on the other hand, has insisted on its normal 'PRINT$' statement. On the NEC, it is possible to use the nice cursor key cluster to edit any 'immediate mode' commands you give — like 'KILL"TANDY.DO"' whereas on the Tandy, a mis-type means you have to retype the whole command again.

Most of these differences point to NEC having accepted the Microsoft design, and Tandy having insisted on last-minute modifications. So it's equally possible that the NEC doesn't have equivalent faults.

I don't have the full list of Tandy bugs. I can tell you, for instance, that the text editor can't cope with left-hand brackets, that the machine cannot print line feeds, and that if you try to add text in the middle of a document, the computer gets so snarled up trying to keep the document straight that it can't keep track of what you're typing.

The line feed problem is particularly irritating. My Epson is (like many) set to move the paper up by a line *only* when the computer tells it. All Tandy printers, however, do this automatically whenever you have finished a line.

I wasted two good days trying to write a little Basic routine to put line feeds into my text files, to stop them all printing on one line of paper. A great paper-saver, yes, but not much help on legibility. Have you ever seen 3000 words on one line?

In the end, I found that there is a routine, built deep into the Tandy code, which actually *strips all line feeds out* before transmitting them.

But Tandy assures me that these problems are all being attended to, and that new program chips with alterations will be provided, free, to customers of the earlier versions of the Model 100.

It would not be right to end a list of criticisms of the design without adding that every computer user should look to get one of these.

I wrote this article on a sunny Saturday afternoon, and I did it in the sunshine, out in the garden.

If I hadn't had a CP/M machine inside to store the text



Perhaps you can't get a computer that is featured in a TV program. OK, get a TV program that features whatever computer you do have.

The Apple, therefore, now features in a VHS video tape produced by New York video specialist Lewis Video Productions. This is 'a scene from "Apple, The Movie" by Lewis' (actually it's called Introduction to the Apple IIe) and a UK TV version will be available 'shortly' for $60.

Dealers should contact Lewis on (212) 496 0223.



Yes, it's an Epson HX-20 but there's something unusual about it, apart from the fact that it's connected to a Bencom Sendata phone coupler.

The thing to look for is the thin strip of paper. It has been printed sideways.

The people behind this, Transam, produced the 'intelligent terminal emulator' which lets the Epson transmit (and receive) messages, connected to another computer. The program is also an editor, to prepare the messages, and it costs £50.

The idea of printing sideways is simple: the text appears in the same format as it would on a normal 80 column printer.

Transam has also produced an £85 parallel interface for the computer, which lets it print to an Epson printer while talking down the serial phone line.

Details of both on 01-404 4554.

on afterwards, I would quickly have run out of memory, even on a 24 kbyte system — but with the two computers backing each other up, it was a doddle.

And for once, having weekend work to do didn't mean staying indoors while everybody else sat around getting skin cancer from the ultra-violet.

If Tandy ever asks for the test model back, there could be quite a fight.

Decision maker

The only serious flaw of the Morrow computer named the Micro Decision is the fact that you need a terminal display unit to talk to the thing. Apart from that one daft lapse, it is the nicest standard CP/M system you are likely to meet.

The only other flaw about the Micro Decision was, until recently, the fact that it was hard to find in Britain. Now it is available through Midlectron at a price of £1020 (without keyboard and display) and that price does not include a lot of software.

You get WordStar, Correct-it (a program to pick up the spelling mistakes you make when using WordStar), Logi-Calc (presumably an alternative to Supercalc or VisiCalc) and two versions of Basic.

What makes the machine special is easy enough to explain. In one phrase, it doesn't set traps for you.

On an ordinary CP/M system you have two diskette drives, called A: (the colon is vital) and B: and the system knows exactly what information is on any diskettes in the drives.



The Micro Decision, model MD2E — see 'Decision maker'.

On a normal system, should you inadvertently, or deliberately want to, change diskettes, CP/M throws up its little hands in horror and says 'but you didn't type control-C first!' and refuses to have anything more to do with you.

Unfortunately, typing control-C, essential before you take one diskette out and put another in, is the standard method of terminating a CP/M program.

On the Morrow Micro Decision, should the system find a diskette with unexpected information on it in drive A: it doesn't panic.

It says to itself: 'drive A: has something on it. So this can't be drive A: after all. It must be drive B: or perhaps C: or perhaps D: or perhaps E:' and goes on down the alphabet until it finds a spare (non-existent) drive which it can describe as holding the new diskette.

It then stores the information on it quite happily.

There are some programs which can't cope with this, because they try reading and writing direct to A: and B: but generally speaking, it will save you hours of frustration.

There is also a quite straightforward 'menu' for CP/M, so that people who aren't quite sure what command to type can take their pick.

What the world wants for CP/M now is a full screen editor and a standard integral display with a monitor output, not a 9600 baud RS232 interface to a dumb terminal. Fat chance. If you like dumb terminal systems, Midlectron is on 01-481 9919.

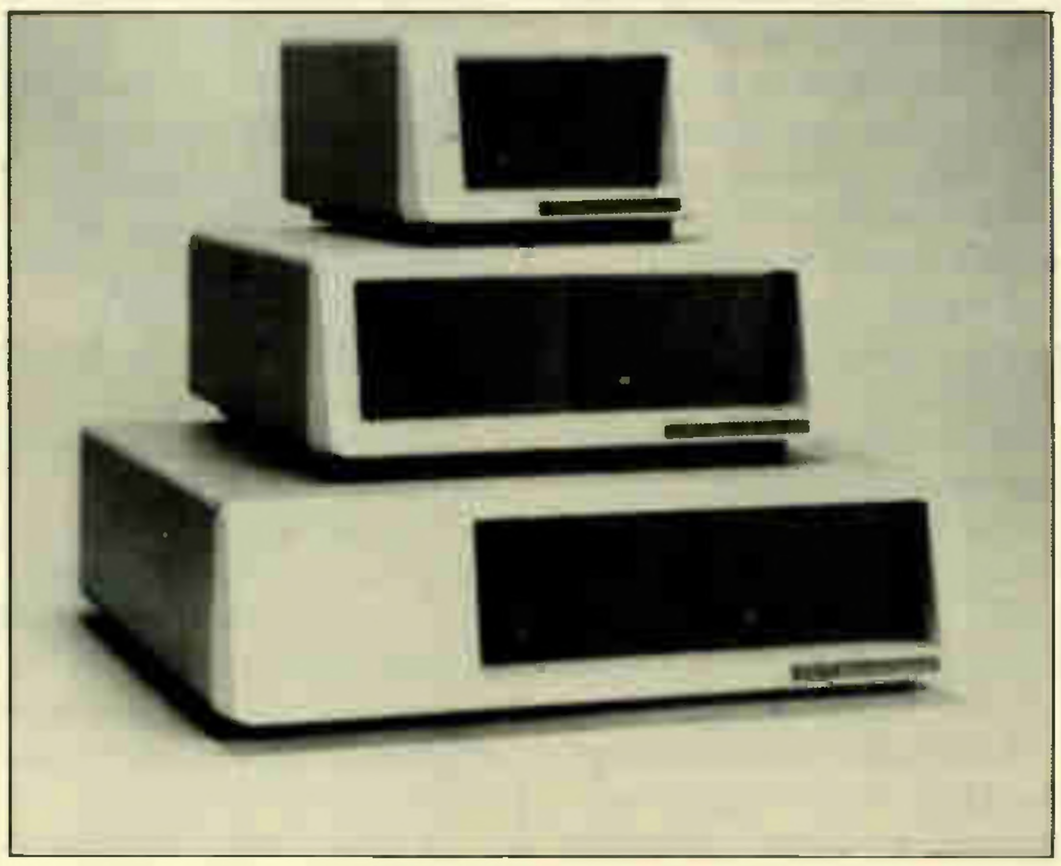
Prophet and loss

Some time back, readers will have noticed a strange beast that looked like an Acorn Atom with a TV set and a pocket cassette recorder being sold as the Prophet System 2, a spreadsheet machine.

This machine now being rather low-tech, its supplier has been searching for a way to sell it — and the answer, apparently, is to provide one, free, to students of a 'training course in computer-assisted business modelling'.

The course costs a mere £600 or so, for a day. A two-day course costs about £700. Apparently 'even beginners are able to build their own five-year profit forecast after lunch on the first day', so there is obviously more to the course than a way of dumping the Prophets. But I would call it a nice way of moving old stock, all the same.

Details from Polebrook Management Systems on (0832) 72052 in Peterborough.



The box on the bottom of the pyramid shown here may look like an IBM Personal Computer, but it isn't — it's two hard disk drives and space for five extra IBM circuit boards.

It's the idea of American firm CMC International. It's called Targa II, and prices start, for the five megabyte single drive on the top of the pyramid, at $1500.

No, I'm afraid it isn't the cheapest on the market. But the expansion chassis is quite a nice idea.

CMC headquarters are in Bellevue, Washington (near Microsoft) on (206) 885 1600.

Out of business

Nearly two years ago, a bright new firm was bringing IBM Personal Computers into Britain when IBM itself couldn't do it. Microcomputerland bought them in America, shipped them, and sold them.

Then the company went quiet, and stories of hundreds and even thousands of sales were quietly forgotten. Finally, Microcomputerland went into unobtrusive voluntary liquidation, and was forgotten.

So it was with a sad shock of nostalgia that the notice of the creditors' meeting arrived on my desk, together with the terse comment that 'estimated future realisations' included £10,000 arising from 'civil action against former directors', but that 'extensive enquiries have failed to reveal the whereabouts of a book debtor who owes £3789.'

Anyway, let's move on to the next tale. There will be enough of these stories next year; let's enjoy ourselves until then.

Flat out

If ever there was a market research project which missed the point, it must be Stanford Resources' report on flat information displays.

A flat display can be built in eight different ways, none of which is a standard TV tube (cathode ray), and each of these ways is more expensive 'in cost per character displayed' than the CRT or video display we all know.

So what?

I have been using a Tandy 100 computer for the past two months. It displays only 320 characters, whereas my main computer on my desk at home can display 2,400.

The fact that the desk-top machine has a cheaper cost per character but is more bulky, is not the reason I use the Tandy. I use the Tandy because its display uses so little power that I can run it for hours off a four pen-cell battery. So I can use it in the bus. Or in the pub.

Sure, if you produced a

Tandy with twice the size of display and a finer detail, I'd buy that instead. In fact, when Tandy does launch its 16-bit lap-held machine this time next year, with 80 column by 20 line display (oops, I suppose that was meant to be a secret) and a 16-bit processor, I'm sure I shall clamour to have one.

Flat display? I suppose it will be flat, but what's that got to do with it? What's the power consumption? That's what matters.

And for $2275, you can buy a report on Plasma, LCD, Vacuum fluorescent, thin-film electroluminescent, flat CRT, Electrophoretic Imaging, Electrochromic, and 'other' display techniques which, so far as I can find out, doesn't touch on the question of power consumption.

You can get it by contacting Daniel Sik at IPI, Nordre Ringvej 201, 2600 Glostrup, Denmark . . . Come on, it's very interesting stuff. I say, do wake up. Or phone +45 2 63 20 44. Hey, come back! Was it something I said?

Keyed-up

A typewriter 'with five keys', it says on the Microwriter announcement of a price cut to £300.

It's a portable word processor, it says. You keep it in your pocket, and write down your thoughts with one hand faster than you can scribble.

I think the time has come for all of us to say that the price is low enough, at last, to take a serious interest in the beast. And when I get back from holiday, I promise to do so, and rest assured, the first thing I will ask them is why I can count six keys.

You can see the creature working at the *PCW* Show (28 Sept-2 Oct), so ask the suppliers yourself, if you can't wait.

Details on 01-831 6801.

Supersonic retort

Minicomputer maker Data General, star of Pulitzer winning book *The Soul of a New Machine* has finally woken up and produced a sensible micro system.

By rights, I should sulk and refuse to write about the Desktop Generation from Data General (the DG from DG). The company flew several dozen European journalists over — in Concorde — to New York for the official launch in July, and I had been promised an exclusive on the beast back in February. And I was left behind!

It wasn't that I was too proud to ask. Ask, nothing: plead, beg, wheedle — I tried it all. 'Freelances like you are a luxury we can't afford,' was the only consolation(!) available.

To be honest, I think they'd have been wasting their time.

There are people who think that multi-user 'micro' systems are exactly what everybody wants. I'm not going to argue with them but I do have one small theory about multi-user minis — and that is that they should support more than one user at a time.

But for anybody planning to use either MS-DOS or CP/M-86, this system doesn't qualify as multi-user. One user can use CP/M *or* MS-DOS. The other three (max) have to use DG's own operating system.

According to advance publicity, the Desktop Generation will be a range of multi-user minicomputers, starting at around the same price as an IBM Personal Computer for a system with only one diskette drive and no applications software whatever.

That is a high price, which means that DG believes that this is a super machine. 'Data General now claims product leadership in the professional desktop computer arena,' is the way it describes the computer, which is a pretty big claim.

We'll have to wait for the Benchtests, of course. But apart from the fact that there is an extra computer chip inside DG's DG, there isn't much sign that it will be startlingly better than anything else. The only possible advantage is the use of the 8086 (rather than the sawn-off 8088 used in IBM's micro) for the standard industry MS-DOS and CP/M 86 packages.

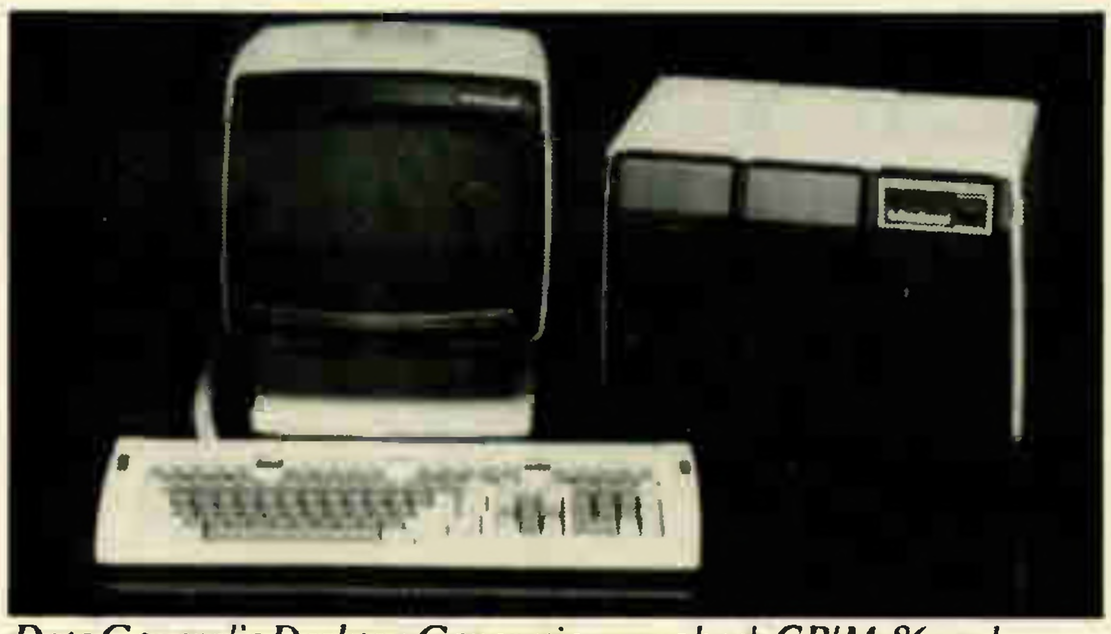
The reason that DG's claims for the DG can't be taken on trust is simple enough: they are based on DG's very high opinion of its own minicomputers, and the operating software which goes with its own minicomputers.

Take this comment by DG, for instance: '*The models 10 and 10 SP use two processors, a DataGeneral Micro Eclipse, and an Intel 8086, which operate in a concurrent mode through the use of high-speed logic. Data General has applied for a patent on the logic design which tightly couples the processors together through a shared high-speed memory. The performance of both processors is optimised, because the faster Micro Eclipse makes the 8086 appear to run faster than normal. The Micro Eclipse handles all input/output.*'

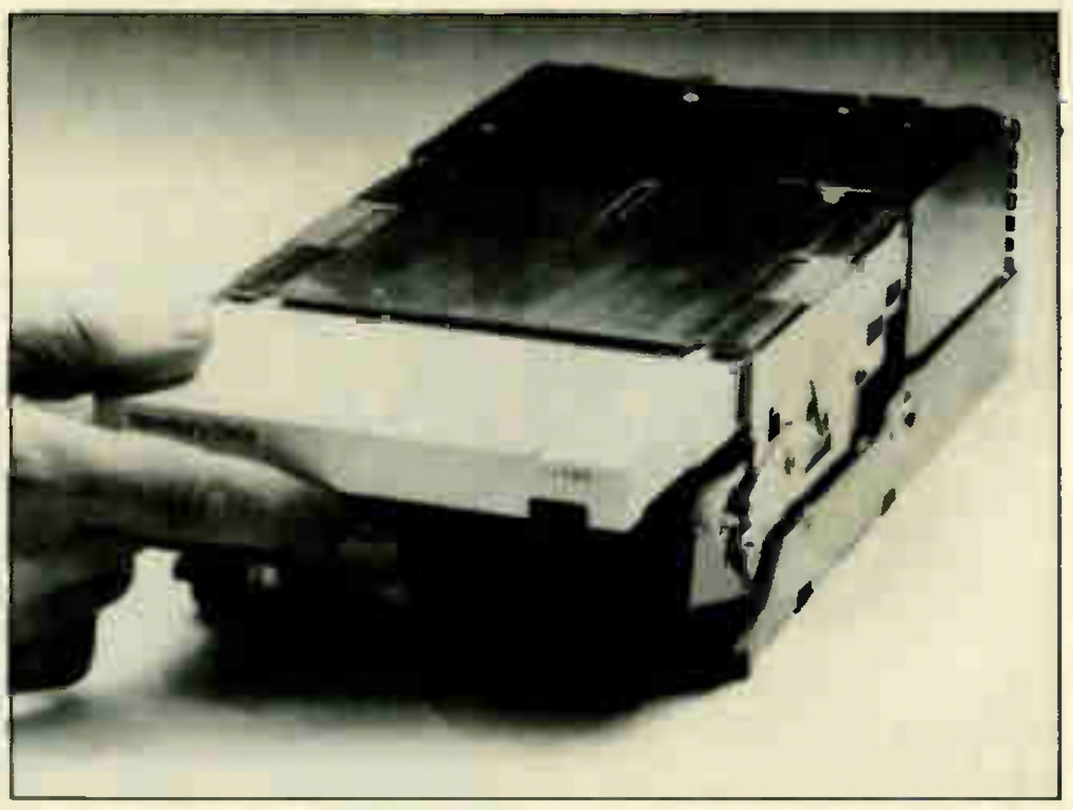
What this really means is that anybody using this system for running commercially available CP/M-86 software or MS-DOS software, will have to make sure that the programs really do use MS-DOS and CP/M-86, and really do run on the DG. Any program (such as Bstam, for instance) which uses the 8086 for I/O will simply not run, any more than it will run on DG's rival, DEC's Rainbow.

People who want a cheaper version of existing DG minis, to run programs under systems called AOS, RDOS, and MP/AOS, will be able to treat this as a multi-user system.

People wanting multi-user systems for MS-DOS and CP/M-86, however, will have to wait. This system can only run one such program at a time, because there is no such thing as multi-user MS-DOS, and you can be sure that if MP/M-86 were available, DG would



Data General's Desktop Generation runs both CP/M-86 and MS-DOS — see 'Supersonic retort'.



What you are looking at is a hard disk being pushed into a hard disk drive — not something that you will see every day. Normally, hard disks are built permanently into the drives, and when they go wrong, you can't get them out.

The drive (and the disk for that matter) are the inventions of Newbury Data which, if it can get everybody to use these things, will beat the problem of 'backing up' (making safety duplicates of important data disks).

And the news is that Symtec in Southampton has been appointed as an agent for this model 505 range, and is looking for sub-dealers and people wanting to build this system into their own original systems.

Symtec is on (0703) 38868.

mention the fact.

In theory, of course, this doesn't matter. There are hundreds, perhaps thousands, of people around the world writing software for DG minis, and selling the minis with the software, who would like to be able to package the whole thing into a cheaper box — and now they can.

Time will tell, of course. My own feeling is that people who wanted to get into the micro end of the mini market have done so already. Those DG software people who steadfastly refused to abandon the 'more powerful Data General operating systems' are not going to turn out to be the majority of the market.

And even there, the price DG is asking is not tiny. That £2500 starting price is for a single diskette, a monochrome screen and keyboard.

For a system taking advantage of even a few of the DG features, you would want the model 10/SP. There, with a single diskette, a single hard disk, a display and a colour graphics display, you are being asked £7328. Then you need to add the cost per user of extra terminals, and the cost of software.

It makes the Apple Lisa, at around £8000, look cheap with a *very* much more powerful processor, twice the memory, and an extra diskette. And the Lisa has more. It has software, and with a full package of integrated applications, the amazing Lisa windows, mouse and other features, it will eat the DG for breakfast.

But of course, all that is just sour grapes, because I didn't go on Concorde. Right?

Cover up

I absolutely dare Computer Bookshop to stock the latest computer book (on the Forth language) from Elcomp Publishing. Its cover is the reason it won't.

On the front is a distinctly Priapic male holding the word 'FORTH' (carved out of stone) above his head, much to the admiration of another individual — an equally heroic female figure concerning whom the Roman poet Catullus would have said 'O vos papulae horridulae!' without a fourth thought.

I mention this only because I'm staggering under a bombardment of publicity from Elcomp (of Pomona in California, not some kibbutz in Israel), and can't work out which bit to mention, so the choice fell on the irrelevant. Sorry.

The company has announced stuff for Sinclair, Atari, and Commodore 64 — books, expander boards, software, important subroutines and tutorials.

For full details, contact Maplin (or Mapsoft) in the UK, or contact Elcomp direct on (714) 623 8314. Apparently there are 20 software products and eleven books, so it really would be silly to try to print the whole list here.

Thumbs down

Having played with the Acorn Electron for a week or so, I find the question of 'who should buy one?' impossible to answer.

I don't feel equal to a full review — see the Benchtest in this issue — but the Electron isn't what I was expecting it to be.

The idea of a cut-down version of the BBC Micro, to me, should be simple enough. It should be a cheaper version, capable of running games, but needing money spent on it to upgrade it to match the BBC Micro.

It doesn't have joysticks, and to get joysticks, you need to spend £60 for an 'expansion interface' plus the cost of the joysticks.

It doesn't have the Prestel-like 'mode 7' display of the BBC, and to produce something like it, you have to sacrifice a lot of memory.

It won't take plug-in games cartridges, and to expand it to accept them, you need the same £60 expansion slot. Ditto for disks.

It has (baffling, this) not just a TV output, but two extra colour monitor outlets: one composite video, one RGB socket.

This is potty. People who spend less on a computer want a machine that has joysticks. People who want to spend a bit more, might also consider the luxury of providing a separate colour monitor.

Now, I know there are technical reasons why the complex conversion circuitry that does joystick control on the BBC Micro couldn't be put in the Electron. But, I ask myself, why provide the monitor option (in two forms!!) for people with less to spend, who would rather have a joystick, and a built-in joystick slot for the bigger machine?

Its main value is as a very nice machine on which to learn how to program. It certainly is good at that (or will be when the manual is available with an index) but I seriously wonder how much of the market is for that sort of machine. It does cost the same as a Commodore 64, after all.

And the Commodore 64, in America at least, is widely expected to sell for $99 by Christmas.

I predict Acorn will sell quite a few. But they are safe from the problems of having a winner on their hands. Especially if Commodore cuts the 64 to £150.

Software piracy

Anybody needing proof that software producers are not fit to be trusted with the job of 'protecting' their goods from piracy need only look at the new Sinclair Microdrive. (See also the review in this issue.)

It shows the same lack of interest in the user that you will find with Acornsoft's latest programs, and stuff from Imagine Software. And, when the others catch up, they will all do the same thing — prevent us from putting our own programs onto our own disks.

As things stand today, any fool with two tape recorders can make as many copies of a piece of tape as seems pleasant. If it's got music on it, the result is a copy of the music. If it's software, it's a copy of the software.

That's no secret — any schoolchild knows it, and judging from the schoolkids I meet, they do it. More to the point, the software suppliers know they do it, and there's nothing (technically) they can do to stop it.

The trouble is that, on tape, this software takes ages and ages to load into the computer. And people are gradually starting to buy disks for machines like the BBC Microcomputer, and soon, will start buying Microdrives for the Spectrum (when Sinclair can make enough to go round). The advantage will be that it will take only a couple of seconds to load a program and run it.

Until recently, having laid out your cash on a copy of Acornsoft's Pacman look-alike, 'Snapper', or its Galaxians look-alike, 'Arcadians', you could (with a



Possibly the most frustrating picture received this year is this shot of a small Arab child using a Sinclair ZX81 with Arabic programming words.

Obviously, it isn't easy to learn to program if you have to learn English first, so for Arabic-speaking people (and there are a lot of them) this must be one of the nicest breakthrough of the year. And the only information available at press times is that Autoram did it.

Apparently Autoram is in Jeddah, Saudi Arabia, and Ramez M Alhalaby runs it. Details on Jeddah 660 4212.

little tedious effort) transfer your game onto your disk.

Now, I find that the latest Acornsoft programs are doctored to prevent this.

Similarly, my inspection of the first Sinclair Microdrives makes it quite clear that, apart from exceptional circumstances, you won't be able to take your own taped programs and store them on Microdrives.

To do it, you have to load the program from tape, stop it, then save it to Microdrive.

This is never going to be easy. On many machine code programs, you need a special program to break into the game so that you can save it. And new programs from Imagine actually use the system clock to prevent you doing this — the clock has to have the same value at run time as it did at load time.

I really can't see any point in having a Microdrive if you can't use it for fast loading of programs.

Similarly on the BBC micro, if I spend £100 over the next year on Acornsoft tapes, and if I then buy a disk drive, I will want to run those programs from disk.

And I know I won't feel too warmly about being told 'if you want to load from disk, we will sell you a disk version' — because I know the disks are going to cost more than the original tapes.

In the end, the users will work out a way round this problem, as the history of 'nibble copy' programs in America shows all too clearly. And in the meanwhile, what will be achieved?

Certainly the number of copied copies will be reduced — at first. I stick to my theory that the number of sold copies, too, will be down. And for every time that the software company wastes its time working out a new protection method, we can count one more game that the programmer could have written in the same time, which would have actually generated money.

There ought to be a law making copying *for sale* illegal. It will never prevent people copying ('borrowing') their friends' programs, but it might, possibly, make the software industry less paranoid about copying, and as a result, less prone to mindless vandalism of the sort which prevents me from running *my* programs on *my* diskettes.

Misleading news

Ignore any reports you may see suggesting that Acorn is setting up in business making computers for other people. They derive from a statement that 'Acorn will be manufacturing the hardware of British Telecom Merlin's new Chain system.'

What it should have said is that the Acorn Electron will be inside the Chain. Acorn has no factories, and has no plans to have factories.

Other people have similar plans to use Acorn boards and boxes inside computers with their own extensions and their own labels. Acorn will not be 'manufacturing' these, either.

Night music

It's a little 'over the top' of Radio Wales to claim that its new six-week microcomputer series (starting on Fridays in October, at 6.30pm) 'is the first time that programs have been transmitted directly on a regular basis by any broadcasting organisation in Britain.'

As hardened users of micros, you will all know just how soothing is the sound of a tape recorder, accidentally connected to a loudspeaker, playing back computer software.

When Radio Wales refers to 'transmitting programs', it means computer software, yes. And it will be entertaining listeners (!) with the sound of FSK bleeping as it transmits programs for the BBC Micro and Spectrum.

As somebody who has been loading Ceefax broadcast software for several months now, I reckon Radio Wales' claim could do with tidying up. Ceefax is regular, and it is broadcast, and it is every bit as slow — but at least it is quiet.

So the claim should read: 'The first time any broadcasting organisation has, regularly and deliberately, transmitted a screeching noise guaranteed to make ordinary listeners switch off, in a big hurry.'

Radio Wales must be potty.



An expansion for the ZX Spectrum: U-Microcomputers has designed an extension of the system bus that takes several extra circuits.

The list of extra circuits at the moment is sparse, with a 'dual channel serial interface' suitable for sending data to serial printers or modems, and a 'general purpose parallel interface' including the ability to drive plotters, and (with a little extra hardware) a centronics type printer.

Prices are around £30 per board, and Unsworth says there will be further designs.

Details on (0925) 54117.

Apple expander

Either the Apple II or the Apple III can run the same operating system, providing it is Prodos.

Normally, the 'two' uses DOS 3.3, and the 'three' uses SOS (sophisticated operating system, officially, but actually meant to rhyme, in America, with 'sauce') and there is no way to pass information from one to the other.

Officially, Prodos is designed 'to provide increased compatibility between the two environments' and provides 'the higher performance required for more sophisticated Apple II applications.'

Unofficially, dealers tell me, it should be read as a straw in the wind that will blow the Apple III away.

They may be mistaken, but for my money the Apple III was never a good idea, and what people really wanted at the time was an expanded Apple II. The II, in its new form (the IIe), can be expanded all right: it just needs the software innovations of the III, and it's good for another two years.

So it's got them. All it needs on top of that is the ability to read and write Lisa diskettes, and it'll be good for three years. Bet you they do it inside twelve months.

Watch out

The Seiko range of computers (about to be launched in the UK by Intelligence UK, famous for MicroModeller software) is an extra-powerful IBM type of office micro.

C/WP OCTOBER OFFERS



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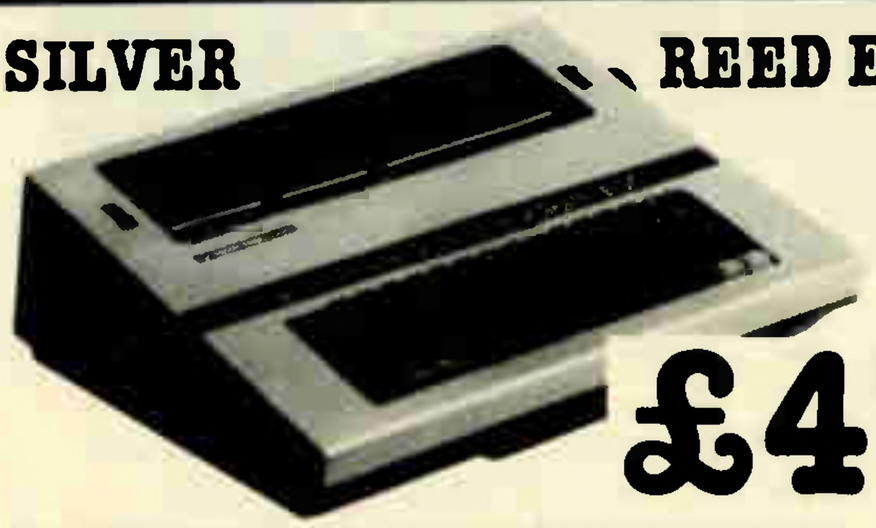

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NEWSPRINT

I've tried very hard to become enthusiastic about it, simply because it impresses me a bit more than Data General's DG did, and even so, I find myself with more questions than answers.

The processor is the Intel 8086, bigger and faster than (but very much the same as) the IBM's central processor, the 8088.

Operating systems on offer ('available') include the IBM-like MS-DOS, CP/M-86, and the multi-user MP/M-86, 'as well as an implementation of Unix system III called Unido'.

Will it run Concurrent CP/M-86? Will it run Flight Simulator? How many dealers will there be? What will it cost? If it succeeds, will manufacturer Seiko follow Japanese tradition and take Intelligence UK over as a subsidiary (or fire it and establish one)?

All this, and more, will eventually be revealed. Don't miss next month's award-winning episode . . . or, failing that sort of patience, contact Intelligence on 01-543 3711.

Mutual support

Philips, the Dutch electronics giant, has lost none of its famous ability to make its products sound at least no worse than they are.

It has found two things — a multi-user file share piece of software, and somebody to sell its multi-user P3500 computer in Britain: Currys Micro C.

You might be forgiven for thinking, from the tone of the announcement, that the world was full of people queueing up to be distributors of the machine, and from the mutually admiring press announcement equally full of other manufacturers, anxious for Micro C to sell their computers. And as to the file-sharing system, you might be equally forgiven for thinking that it was something unique to Philips.

The file sharing system is actually the latest software product from Cobol specialist Micro Focus, which has kindly announced that Philips is 'one of the first customers'. It is called Fileshare.

It is, of course, version 3.0 of Fileshare, which allows several users of Cobol programs on a multi-user micro to read and adjust records in the same file at the same time, without the data getting hopelessly corrupted.

There's a similar aura of restrained triumph about the Currys deal.

Curry's boss Derrick Clarke said: 'The P3500 was the first multi-user machine which matched our standards for customer support. We selected the Philips micro from a number of others after six months of evaluation, and we found the software exceptionally well orgainsed and designed for customer needs now.'

Philips responded with the statement that Micro C would be the first distributor to handle servicing for the P3500. Since Currys is the first national distributor, this didn't shock me as much as you might think.

'Philips felt that the Micro C service network matched its own high standards,' is the way it was phrased.

I thought the P3500 was a very ordinary system, apart from its use of Turbodos rather than MP/M as the operating system. But that's not necessarily a drawback. Let's hope they're very happy together, and get lots of happy users.

Meanwhile, Micro Focus will tell you the whole story of Fileshare on 01 722 8843, or sell you one for $400.

Educational move

Longman Software, the software division of the educational publishing house, has moved into the home computing market with the announcement of three educational programs for the Sinclair Spectrum.

The three programs, entitled 'Hot Dog Spotter', 'abc . . . liftoff' and 'Countabout', are aimed at 4-8 year olds and set out to help children to practise the basic skills of estimation of numbers, the alphabet and simple arithmetic.

Longman is obviously taking the home market just as seriously as the school one, where the company has long been active. The three programs were tested by both educationalists and children, and revisions made in the light of their comments. The programs, which retail at £7.95 each, are available from WH Smith and other High Street retail outlets. Five new titles are expected to be available by the end of the year.

Surya

More chiefs, less indians

John Coll, famous as the man who took the Acorn Proton to fame and fortune as the BBC Micro, has left Acorn.

The news is bound to cause alarm and despondency in rival computer firms, because officially he retains close links with his old company, but gets a new job as head of software for the Government's Micro Education Project at the DES (Department of Education and Science).

John has some reasonable claim to a knowledge of education from the inside, since he was a teacher at Oundle School (near Peterborough) when he became one of the first British micro enthusiasts to build his own computer with an 8-bit chip.

But to people like Sinclair and Research Machines, this will seem like a fifth column movement — Acorn's adviser in a position of considerable authority inside the Education Department!

Maurice Edmundson, who replaces him as head of education at Acorn, comes from the DES. He's actually retired, and will do a short week, four days, with Acorn.

Acorn has been going on about its 'major recruiting drive' recently. 'Over the next 12 months,' says a company announcement, 'Acorn will be recruiting about 15 new staff a month.'

This is meant to sound like healthy growth in a time of economic recession, which will somehow make us all proud to be British, especially the Commonwealth immigrants among us.

What is more interesting to computer industry fans is the recruitment, not of 'staff' but of directors. I see this as a good move, for the following reason.

A well-known figure, once in a position of some authority



There was a time when some of us hoped that Rair would become Britain's leading microcomputer company — and felt quite disappointed when Mark Potts (the bearded(ish) man in the middle of the picture) took his company into the minicomputer business instead.

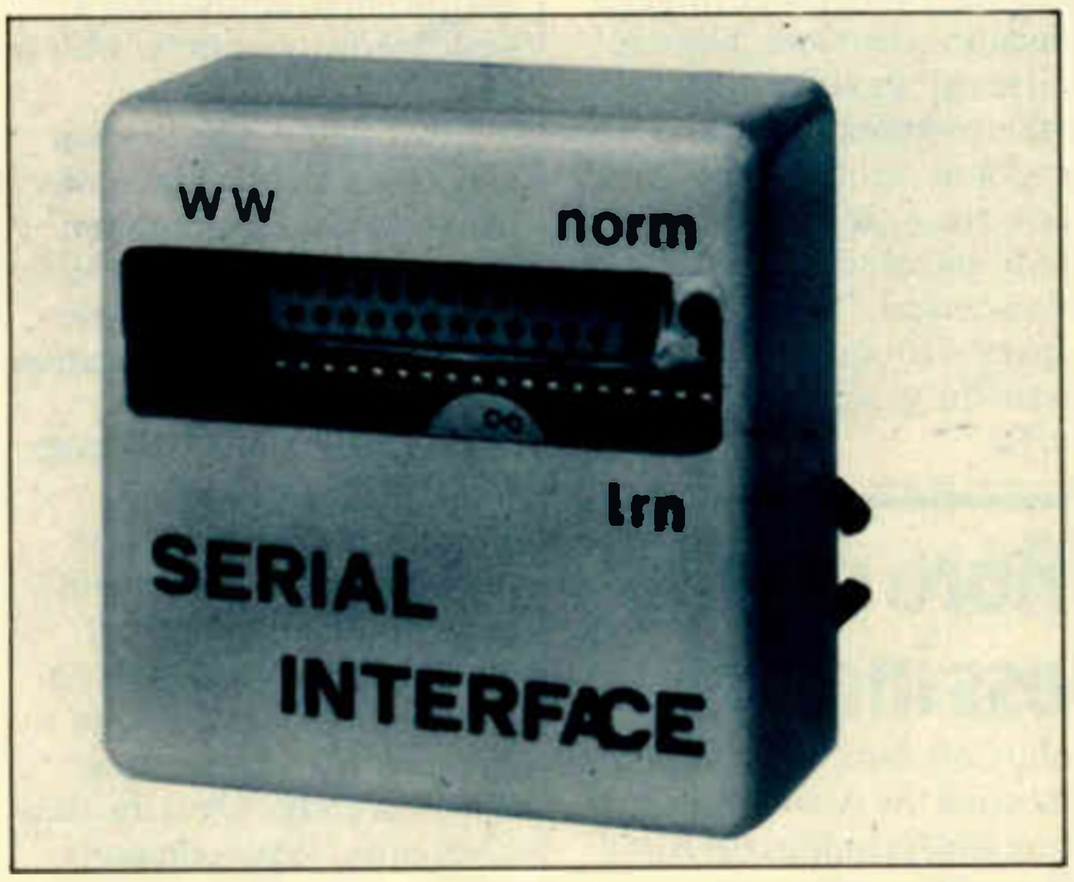
Still, as cheap minicomputer builders go, Rair must be judged a success — at least, Prudential Assurance thinks so, by putting £1 million worth of equity into Rair for development capital.

The last time we noticed Prudential buying computer shares, it was using the Coal Board's Pension Fund to buy Dragon.

This time, it's using the Merchant Navy Officers' Pension Fund.

Rair itself designed the machine which is now the ICL Personal Computer — though what's 'personal' about a multi-user mini, I'm not quite sure.

Now, it is launching a new multi-user system, for the first time using a 16-bit chip as well as an eight-bit chip to drive it. This will be called the 'Rair Business Computer' and not a personal computer, so everybody can stop grousing. Even me.



Self-teaching interfaces are not interfaces which you use to teach yourself. They are interfaces which learn. This one can learn how fast your computer sends data, what protocols your computer is using, and even on which pins you are sending data.

According to its West German designer, Reinhard Wiesemann of Microcomputertechnik, the trick is done by going into a 'learn' mode, connecting the plug to the printer, and sending text. Then you switch to 'normal' mode, and all the data picked up in the learning mode will be stored permanently in electrically erasable permanent memory chips.

It is even possible to program up to 15 code translations — so that when the computer sends the code for the letter 'A' (or whatever) the printer actually receives the code for 'B' (say). Naturally, this costs a bit more than a £15 cable. In fact it costs $125, and you have to connect the wires yourself.

Details from: Winchenbachst. 3a, D-5600 Wuppertal 2, West Germany. The phone number given is (0202) 510444.

inside Acorn (but no longer with the company) told me, some six months ago: 'If only Chris Curry, joint managing director, would get off people's backs and let them get on with the jobs he gave them, and stop fiddling with everything, things might move a lot smoother.'

This person's view was that one of the most encouraging signs which the outside world should look out for, would be an indication that Curry had stopped trying to run the company as if it had the 35 people it did in February 1981, and he really could do the job himself.

The appointments which interest me, therefore, are the recruitment of Geoff Wood, who was in charge of ICL's central education services group. He is now marketing director of Acorn International, making sure that software is correctly adapted for overseas markets. He is also in charge of educational software, and will be in charge of the ICL CES team, which Acorn has taken over lock stock and barrel, but not business premises.

To hold them Acorn has bought new premises in Maidenhead (Curry, with a touching lack of snobbery, described this as the Slough office).

Wood will be the main man behind a big Acorn drive to get UK software for the BBC Micro packaged for overseas markets under the Acorn logo.

Bob Bayham, ex Sinclair, now becomes managing director of the international (export) company — apart from sales to the USA.

Peter O'Keefe has been appointed sales director of Acorn in the UK, and John Horton has been made R&D director, while Peter Wynn is now financial director. There is a manufacturing director called Merriman.

And there are two other well-known names from different parts of the world. Journalist Christopher Ward (he was Editor of the Express until his well-publicised departure a few months ago) is now a non-executive director, and so is Jonathan Sutherland, ex GEC-Marconi.

They are part-time appointments, just to be 'strategic' level officers.

If my source's assessment of the problems inside Acorn was correct, then these appointments (if they are the right men for the jobs, which I'm not competent to judge) must be good news.

All they have to do now is produce a CMOS portable computer which will function as a keyboard for the Acorn Business Micro (due out in November), and they could be in for a long and prosperous future.

We will have to wait and see what the new plans are. The new planners are Robert Gilkes and Guy Neely as chairman and joint managing directors (only Gilkes is chairman). Gilkes comes from computers — he was managing director of UCSL Microsystems and is chairman of Strategic Planning Systems International; Neely was financial director of Glaxo Holdings until recently.

In a year or so, we will probably know what it was all about.

Torchlight fades

Starting off with a wild statement to the effect that 'we'd have to be mad to give up control of Torch,' two of that company's directors have given up, not just control, but their jobs.

The deal got uncomfortably like a saga, as first GEC offered to put money in, then pulled out, and finally a million was raised by 'existing shareholders' — excluding those directors.

'Martin Vlieland-Boddy is resigning as chairman,' it says in the end-of-term announcement, 'and from the board of directors, to devote his time to other business interests.'

He remains a 'significant shareholder' but I'm afraid I don't know just how significant.

Facts are a bit sparsely available at the moment, and in the absence of hard facts, my own opinion is that this very pleasant young man did not leave entirely of his own accord.

I have vaguely similar feelings about his colleague, Peter Harris, even though he remains on the board and is apparently quite anxious to be thought of as being in control of things.

However, since we are dealing with my opinions (not facts), I think I should add that in my opinion, the shift of control to new management was simply due to a disagreement about what the company should do next. It needed the money, but couldn't get it on the basis of the plans it had in mind.

Sirius portable

A portable version of the Sirius 1 is on its way from Victor in the States. But although the portable will be entirely software and disk compatible with the basic single-sided Sirius, it will have significant internal differences.

The most major of these is the choice of processor. Rather than using the 8088, a 'sawn-off' 16-bit processor with an 8-bit data bus, as used in the Sirius 1, IBM PC and many other machines, it will be based on the 8086. This has a full 16-bit data bus and requires its memory to be organised in 16-bit words rather than the 8-bit byte-wide organisation used by the 8088. The Sirius portable will also come with 256 kbytes of RAM as standard, rather than the 128k provided in the basic Sirius.

Said to be 'about the size of a small sewing machine', the portable will have a 9-inch screen and is expected to be launched in the UK around the end of this year or early next year. Pricing has yet to be finalised but is expected to be slightly below that of the ACT Apricot. With Sirius sales continuing to rise, but with hard disk versions of the machine taking an increasingly larger slice of the market, the introduction of the portable could well herald the phasing out of the single-sided Sirius to allow both Victor and ACT to sell a range of software-compatible machines featuring the portable at the bottom, the Apricot for the smaller user, and the double-sided and hard disk Sirius models at the top, where they will eventually be joined by the Sirius 2, widely thought to be based on the

much more powerful Intel 186 or 286 chips.
Peter Rodwell

Computer Marathon

Hot on the heels of the computer charts is yet another attempt to find the best micro with 'The London Computer Marathon'. This event was open to 16-bit machines and was a gruelling, seven day, non-stop reliability test.

The Wang Professional was judged to be the winner in what was a strange Marathon, for this was a race where if a 'runner' fell over it was promptly put back on its feet and set on its way again. An IBM PC, due to a software fault, had to be righted seventy-four times! Only Olivetti and Samurai came through the race unscathed.

Much will be made of the figures the Marathon has produced. However, the small sample size (two machines out of the thousands produced) make the results statistically meaningless. More interesting: out of the 33 companies invited only ten accepted, with four of those withdrawing two days before the race.

The program that was used only tested the reliability of the hardware and disk handling facilities. Hopefully future marathons will test other aspects considered important when choosing a micro.

The Marathon will become a regular event which triggers speculation about future events; perhaps a support engineers' sprint or a micro Olympics?
Tony Hetherington

Fast-ACTing mail

Some 3000 people in Britain have already linked up to our very own electric mail system, Telecom Gold, even though it has so far been marketed in a, well, rather discreet fashion by British Telecom. Soon, however, thousands of micro users could be joining in, following ACT's announcement of a hardware software package, Micromail, which puts Sirius and Apricot (and eventually IBM PC) users onto the system.

For £275, ACT will sell you an auto-dial modem board which slots into your Sirius or Apricot and plugs straight into one of the new-style telephone sockets, plus the software to drive it. A software-only version, for use with a conventional modem or acoustic coupler, costs £95.

But the deal doesn't stop there. Included in the package is a free subscription to Telecom Gold and you are also allocated a TG 'call sign', the three letters and three digits which are your personal electronic mail 'address'. Curiously, rather than choose 'ACT' as the three letters for all its TG call signs, ACT has gone for 'JET', the initials of non-executive director Julian Allason — he's JET007, of course. My suggestion that when they run out of JET numbers (they can only have a maximum of 999 of these obviously) they go on to using 'PCW' was met with polite laughter.

Using Micromail is simplicity itself. If you have the on-board modem, you simply plug into the telephone socket and run the software, which dials up the TG computer automatically. If you're using an acoustic coupler, you have to do the dialling yourself but, once connected, the system works in exactly the same way. You log on with your call sign and a personal password. Using simple commands, you can send a message to any other user simply by typing in his/her call sign and the message. Messages can also be written off-line with a word processor and transmitted straight from disk. Where the system really comes into its own is in sending the same message to several users (up to 500) simultaneously: you can build up a file of users' call signs, give it a name and instruct the system to send the message to all of them — let's hope the junk mail outfits don't start using this facility! Urgent messages can be sent 'express', and are automatically pushed to the top of the recipient's 'queue' of mail. You can also force a recipient to reply.

Receiving mail is equally straightforward. Having got onto the system, you can scan your mailbox for a *resumé* of what's there and read selected messages as you choose. An auto mode will dial up TG, retrieve your mail and store it



These three recruits for the Society of Men with High Foreheads (I'm a founder member) are not celebrating capillary loss, but signing a local area network deal.

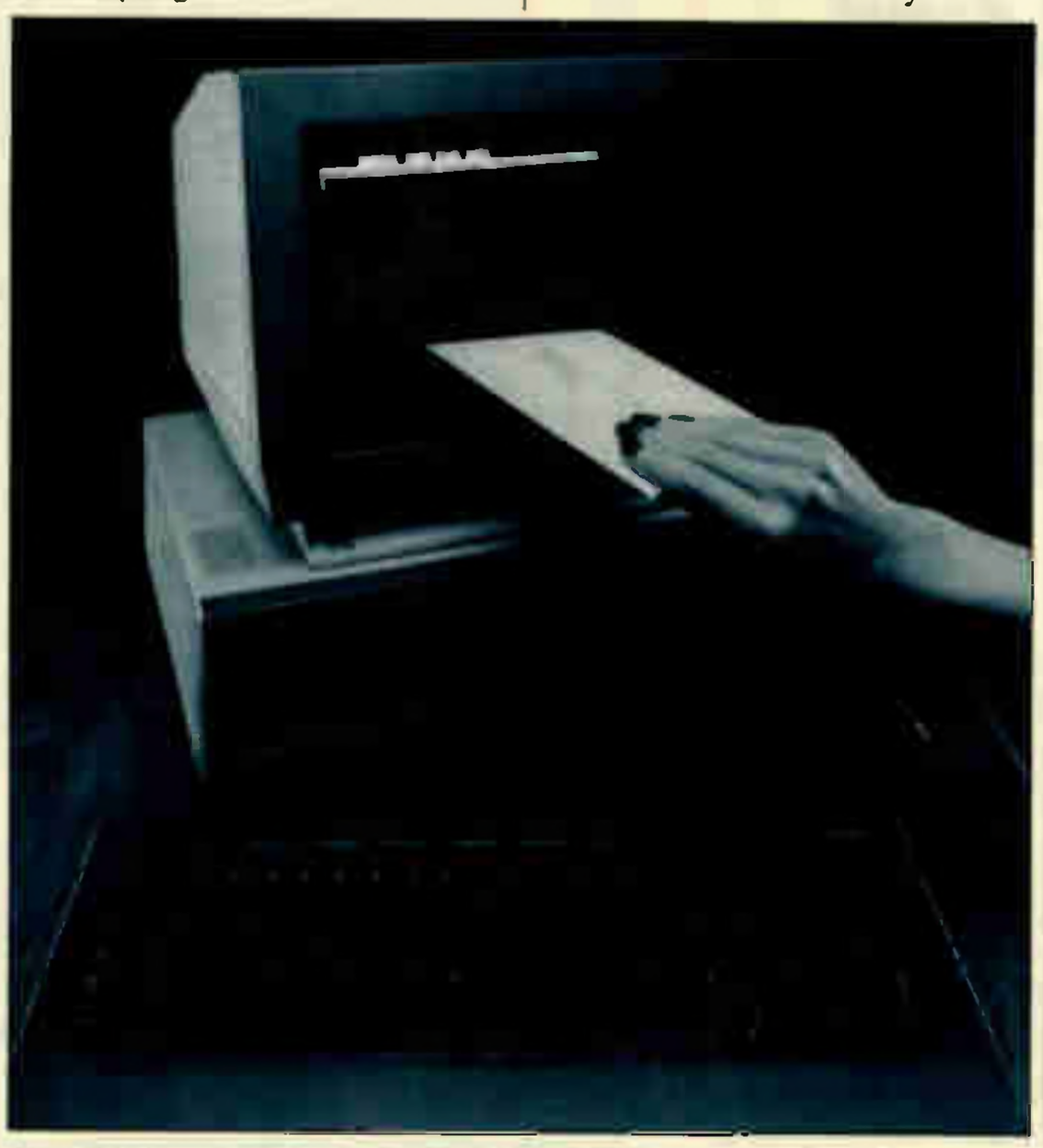
The deal is between Xionics (Mike Bevan on the left is the boss), which has done a deal with Software Sciences (managing director Mike Shone has the pen in his hand) who will market all Xionics' products.

The bit that drew my attention was the list of features of Xibus: 'These include the Xinet local area network, the recently announced microNode cluster controller, the MasterNode network processor, and the multi-function workstation that also satisfies users' needs for personal computing.

That last little bit isn't entirely accurate, fortunately. The 'multi-function workstation' is all very well, but it isn't a personal computer.

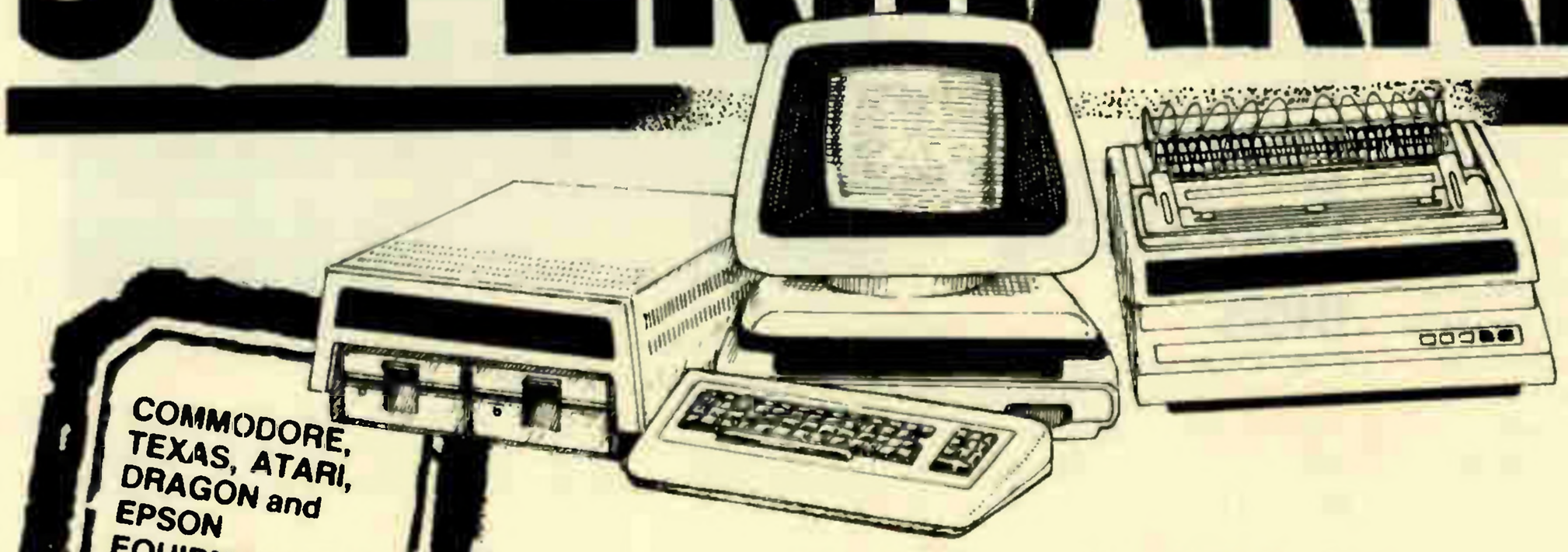
Fortunately, systems and software house Digitus is currently working hard to produce an easy way to link real personal computers straight into the Xinet network.

It's a race to get this done before rival networks like 3Com and Zynar monopolise the market, and since I believe Xinet to be a superior system, I hope it manages it.



You don't actually try to push your mail into the screen with ACT's Micromail package, although you can bet that somebody, somewhere, someday will try and push an envelope into a disk drive. See 'Fast-ACTing mail'.

THE Computer SUPERMARKET



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on disk for you to flip through off-line.

Naturally, this service isn't free but there are TG switching centres scattered around the country so that many users will be able to access the system for the cost of a local phone call. Connect time works out at 2.5 pence per minute if you're using the 300 baud service or 3.0 pence per minute at 1200 baud. A quick calculation or two will show you that the 1200 baud service is actually considerably cheaper — at 300 baud you can send 1800 characters in a minute while at 1200 baud you send 7200 in the same time. Using cheap rate phone time, you can therefore send a long letter more cheaply by TG than by conventional first-class post, with the added bonus that it arrives instantly — if the recipient looks in his mailbox immediately after you've sent the letter, he'll find it there ready and waiting.

TG also allows you to send Telex messages, Telemessages and mail to overseas countries using similar systems — this includes the USA. You can't yet receive incoming Telex messages through TG as the necessary routing and coding system hasn't been developed, but this is certainly on the cards.

If you buy Micromail, ACT will act as an agent for British Telecom by billing you for your TG charges (and presumably sending you Final Demands over TG if you don't pay up on time). ACT also throws in free training, free telephone support, documentation and a TG directory. And it plans to put its 400-odd dealers onto the system to provide an instant information dissemination service and to allow dealers to request and receive technical support.

ACT's Micromail section is on (0272) 211733.

Peter Rodwell

IBM's new baby

News is filtering through about IBM's new baby home computer known variously as the Peanut, Hercules, Sprite, Pigeon or Pancake.

IBM is carefully avoiding showing anyone the complete article — software developers see software specs and hardware suppliers see hardware ones. But it looks like an 8-bit 8080 based machine, the no-frills model coming in at about $700 for a CPU/keyboard unit including 64k RAM and one 320k disk. A complete system including monitor will cost about $1300.

IBM is apparently frustrated at the month's delay in launching the machine which was intended for September but is now expected this month. Even so the company hopes to sell 90,000 units before Christmas and 350,000 in 1984.

Memory will be expandable to 128k RAM and there is talk of a strong emphasis on communications and software compatibility with the IBM PC.

The machine will be distributed through the giant retail stores chain, Sears, and possibly through Computerland and K-Mart too.

Meanwhile IBM has increased its equity share in chip maker Intel from 12% to 14%.

Jane Bird

Bad memories

Tandy will be launching its latest colour computer at the *PCW* Show at the Barbican Centre, 28 September-2 October.

The new machine — to be called the MC10 — will be based on a 6803 processor, and, claims Tandy, will run standard Colour Basic programs 'with minor modifications'. Be sceptical about this statement since MC10 Basic seems to be much more limited than standard Colour Basic and offers no facility for any kind of extended version of the language.

The MC10 will bear more than a passing resemblance to the Sinclair Spectrum, being 20x18x5cms in size and allowing keyword entry with two keystrokes. Tandy is not known for being over-generous where standard memory sizes are concerned, and the MC10 is no exception. The standard machine contains just 4k RAM, but a 16k upgrade will be available.

The machine appears to be aimed at complete novices, offering fairly low resolution graphics, simple sound effects and a fairly limited Basic. Tandy has announced no plans to support disk drives and as yet only one piece of software has been announced — a draughts game.

Prices are not available at the time of writing, but the 4k machine is expected to sell at around the £100 mark with the 16k upgrade (giving 20k total) available for around £50. The machine will be available from Tandy microcomputer stores before the end of the year.

Surya

Reader Survey Prize

The faithful reader and lucky winner of the *PCW* Reader Survey Draw is Andrew Smith of Shipley in West Yorkshire. Heartiest congratters Andrew and thanks to everyone who filled in and returned the Survey. Let's hope we'll make your endeavours worthwhile and produce an even more magnificent *PCW* in future!!

Andrew will collect a Sharp MZ-711 with four colour printer/plotter and cassette drive. There are a further 10 runners up in the Draw and they will each receive a year's free subscription to *PCW*. Prizes will be awarded at the Show on the Sharp stand (333) at midday on Saturday 1 October.

Jane Bird

Basic Converter

With the exception of the Mode 7 (Teletext) screen, disk-handling and other hardware-specific features, the recently launched Acorn Electron (see Benchtest in this issue) supports full BBC Basic. The BBC entry on the *PCW* Basic Converter Chart thus applies equally to the Electron.

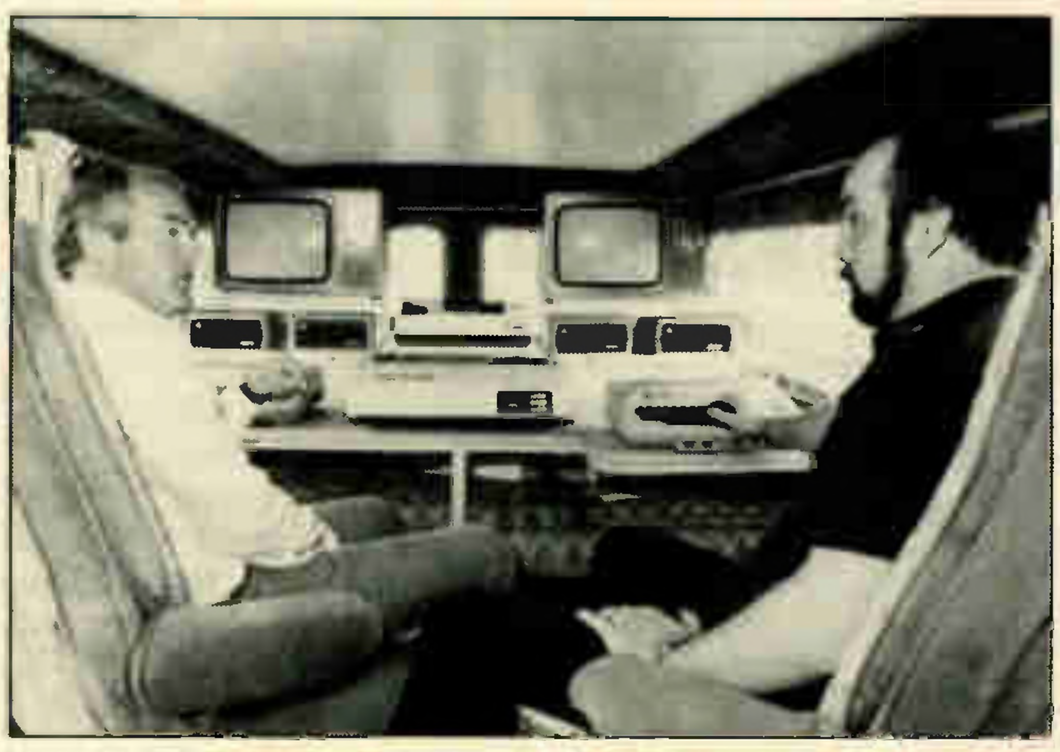
Surya

Colour version

Digihurst has announced a colour version of its Microsight 1 image analysis system running on the BBC B and Apple micros (see Checkout for a review of the system).

The colour version uses a b/w camera and a filtering system to produce a colour image. It costs £685 including VAT and is also offered to existing Microsight users as an upgrade at a cost of £100.

Surya



This is a mobile Atari computer shop, designed to demonstrate Silicon Chip's software.

Silicon Chip of Slough keep two Atari computers (the outgoing model 800) with disks, together with air conditioning for the people, in the back. You sit in the chair, and get the system demonstrated. You don't have to find your way up to the third floor of some anonymous Edwardian office block first, so it must be attractive.

The man on the right, with beard, is Silicon Chip's managing director Ian Lawrie. He can be contacted through his publicity company in Cheltenham on (0242) 45966.

I look forward to hearing of an equally mobile service van (fleet) in the near future.



COMMUNICATIONS

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

Seafarer

I am a First Officer aboard a Danish container vessel, the Lexa Maersk. For five years now I have enjoyed the use of IBM's system 7 mainframe navigational computer. However, the company is withdrawing its worldwide service in 1984. As a result my company has started replacing the system 7 with a Data Bridge 7 unit. Much of the navigating capabilities of the IBM are being sacrificed as a result.

Could you tell me if another software house has a navigating program available? I have a Spectrum 48k and am about to buy an Osborne 1 but am hesitating until I can find a program that fits my need.

M Faulkner, St Albans, Herts

Surely someone on the 'ole sceptred isle can come up with something! — Ed.

NewBrains for old

In your July issue the Programs Editor asks where the NewBrain programmers are. I suspect that either they are still struggling to write a program of the required standard, or have become so frustrated that they have given up. Presumably the owners of the five machines advertised in the same issue's Transaction File fall into the latter category.

Why should NewBrain owners, in particular, feel this way? In a word because of the almost total lack of support for the serious programmer of the machine. Users of other machines have comprehensive reference manuals from the manufacturers, detailed guides produced independently, and help from user groups. The NewBrain owner has a beginner's guide, which is very good as far as it goes, but after that the owner is left to wrestle with the machine, alone except for the handbook. For the would-be serious programmer much of the information needed is in the appendices of this publication. Unfortunately these are obviously written by computer professionals for computer professionals, which means in my experience that it *is* possible to understand what they mean, but only after working it out for yourself by much trial and error.

In addition to these two books the manufacturers also offer a Technical Software manual, which may well have the information needed. 'Offer' is perhaps the wrong word, since this is apparently in duplicated form, and priced at £50, suggesting considerable reluctance to give the information it contains wide circulation. Attempts to fill these gaps by telephoning Grundy are, in my experience, likely to be unsuccessful. The last time I phoned Teddington, to enquire about the Software Manual, I spoke to a young man whose manner made it clear that he was, in his opinion, doing me a great favour by deigning to speak to me at all; and I should not expect him to be helpful, or even polite, as well.

Nor, in my experience, is there any point in telephoning the Cambridge branch, where the software experts are. They presumably know a good deal about the machine, but this information is not apparently available to the man who answers the phone. My query (on how to achieve the equivalent of the BBC EVAL command) resulted in a display of apparent ignorance, and a suggestion which proved completely useless. (In the end I was able to find the solution in a back issue of your magazine.)

We have, therefore, a machine which the makers are quite happy to sell, but apparently unable, or unwilling to support with the documentation and advice to allow the user to program seriously. With some machines this would not matter, since most people would only use them for games, or other ready made programs. But the NewBrain is not that sort of machine, since it has neither colour nor sound, and even now, a year after the launch, there are relatively few programs available. On the other hand it has an 80-column screen as standard, and an excellent screen editor, a wide choice of character sets, a good keyboard, and exceptionally powerful input and output facilities, plus the capability to upgrade to a full CP/M machine. The people who buy the machine, therefore, are likely to be those who are seriously interested in computing and programming and, as things presently stand, are going to find it difficult to pursue that interest very far.

For the moment I shall struggle on with my spreadsheet program, and may even one day send it in to you. Increasingly, however, I am wondering whether there is any point in expanding the NewBrain to a disk system, as I originally intended. Perhaps it would be better to wait and see what other manufacturers can do — if the Advance 86 lives up to its initial claims (of course a big 'if') then I shall be tempted to abandon the NewBrain. I shall certainly need some indication from Grundy of a change in attitude before committing myself to its disk system.

R J Williams, London NW3

Rat file

I am starting a Rat File on the Oric!

I am one of those poor unfortunates who bought an Oric, misled by the company's advertising: Professional Keyboard! 16 colours! 28 days delivery! I am also one of the unfortunates who was so badly misled, if not lied to, by the Oric switchboard operator about delivery dates.

If any of your readers have bought an Oric and feel that they were deliberately misled, either in the Oric specifications or delivery dates, I would be pleased to hear from them. Similarly I would like to hear from anybody who has had experience of after sales service. I am still waiting for a reply to a letter which I wrote to Peter Harding (Sales Director) in April at the request of Oric's PR consultant.

We, the computer buying public, have been badly served by the manufacturers and I feel it is time that we put some pressure on them.

Sinclair, Acorn and Commodore have also misled us with unrealistic delivery dates, ambiguous specifications and/or very late 'coming soon' add ons but I bought an Oric, so it's Oric that I'm making a fuss about.

Keith Ollett, Hookstead, Goldsmith Ave, Crowborough, East Sussex TN6 1RG

Initative

Your magazine impresses me very much but the lack of enterprise among your advertisers does not.

I have an Epson HX-20 and although I have acquired some software from the local distributors for Epson, I have not been able to obtain locally Epson's programs such as 'ECalc' and 'Correspondent', etc. I wrote to two advertisers in your magazine asking whether they would send me the required software if I sent a cheque drawn on a London bank in Pounds Sterling. I asked what additions I should

make to the basic price to cover postage. So far there has been absolutely no response.

By contrast I have contacted advertisers in the US magazine *Creative Computing* to which I also subscribe. On one occasion I telephoned to California ordering software for a Radio Shack computer. The company concerned had a 24-hour answering service. I simply quoted my American Express card number and three weeks later the software arrived.

I am writing to you about this problem because I hope it will be more effective than simply writing to companies in England who cannot be bothered even to reply. I hope that you will publish this letter and that somebody with a little more enterprise will respond to my request for HX-20 software.

Kenneth Smith, Managing Director, Quantum Advertising, Selangor, Malaysia

(Oops — what's wrong with British industry? . . .— Ed.)

Appeal

On behalf of a national charity I am looking for someone with programming skills and some spare time, living in the Oxford area, who could help us in a voluntary capacity to develop some computer games and programs. These would be based either on the giving of information or on simulation-type games with similar objectives. We believe that among young people the computer is a very attractive, and potentially powerful medium, and are very hopeful that we could make use of programs in schools, exhibitions, etc.

If readers would like to know more about the charity's needs, perhaps they would drop me a line.

David Green, 12 Sheepway Court, Iffley, Oxford. Tel: Oxford (0865) 717554

Oric bugs

Much has been made of the TAB-bug in ORIC, but there are simple ways of circumventing it. It is due to location #30, which holds the printer position, being reset to #D instead of O. (#D = 13 is the ASCII code for carriage return). Hence one way to TAB correctly is merely to increase the values in the TAB arguments by 13.

Alternatively, before a new line is commenced, POKE #30,0. If there are a lot of LPRINT lines in the program, the ! facility can be invoked to reduce the amount of typing required. Insert early in the program the line

DOKE#400,#A9:DOKE#402,#3085:POKE#404,96:DOKE#2F5,#400

then ! will reset #30 to zero.

An associated bug is that, although the designers obviously intended a default line length of 80 characters, there is an enforced carriage return after only 67 characters have been printed: (67=80−13). The second method of curing TAB also cures this bug, but if this is not used, #31 should be set to 93 instead of 80, since this location holds the maximum line length. It can, in any case, be set to some other value as required for the printer being used.

S E Hersom, St Albans Herts

Time-honoured

With reference to your comments in Newsprint (May 1981), quality tells in the end doesn't it? The VIC and the Atari mentioned are both being discontinued but the good old Nascom is still going strong and continues to expand due to its in-built flexibility.

Now with its superb high resolution colour graphics and having perhaps the only working and cost effective network available, it is being used in ever increasing numbers in schools, technical colleges and industry.

The hobbyist can still start at the bottom with a build-it-yourself kit and expand to a 256k memory (or more if he pages the RAM boards) with colour graphics, as many I/O ports as he is likely to require, multi-tasking (run up to seven programs at the same time!) and either the user friendly NASDOS disk operating system or the industry standard CP/M.

What more can one want in a computer?

Philip Sherlock, Coventry, West Midlands

Tough standards

I am amazed to see that Martin Banks managed to write a whole article on software standardisation (August issue) without once mentioning the UCSD p-system.

How anyone could think that CP/M is still a candidate for standardisation when so many people who supposedly 'upgrade' to CP/M-86 have had to buy an extra computer to add on (a so-called 'Z80 card') in order to run their old software, is beyond me.

If you want to standardise software then the purveyors of operating systems must take the lead in setting those standards. SofTech has done so. Digital Research has not.

He also mentions the idea of a 'universal machine' that can run any type of software, regardless of format, in a way that disbelieves that it is feasible at a reasonable price. I would like to point out that it is possible to do almost this on one of the cheapest 64k dual floppy computers in the business — the Gemini Galaxy. Not only is it capable of running both CP/M and UCSD but in implementing the BIOS for UCSD I have used the flexibility of the Western Digital 179X controller chips to enable reconfiguring of the drives to read and write virtually any of the formats of which this chip is capable (SuperBrain, Osborne, IBM, Sage, etc, including 8in if you have the drives). The same facility also exists for the Nascom. A similar, but not quite so simple, facility also exists when running CP/M on these computers.

Martin Banks could be forgiven for not knowing this since my attempts to get a mention in the computer press, including your own Newsprint, have so far fallen on stony ground. Could this be because I am not a US imperialist with a three-letter name or named after a piece of fruit?

Dr York, London

Banksey replies to Dr York

I didn't mention the UCSD p-system in that particular piece for a couple of reasons. One was that the main area to which I was actually referring was standardisation of disk, and/or cassette, and/or language formats which would allow the home computer business to become the real commodity operation it ought to be. The second reason was that, despite the claims that are made on its behalf, the p-system hasn't actually become the *standard* standard. If it had, everyone would be producing machines that ran it and have it built-in in ROM. And every program writer would quite naturally scribe away using nothing else.

As Dr York points out later in his letter, in reference to his own efforts with a universal machine, having a good idea is only part of the battle. The UCSD p-system may well be the best thing since sliced bread, but that hasn't stopped much of the industry and most of the users taking only passing notice of the fact. For better or worse, the 9,000 different versions of Basic are the language 'standard', just because they are Basic.

I have a certain sympathy with Dr York on the subject of his universal machine. I know what it is like to have a provably good idea that no one wants to hear about. The end result is shown, in passing, by Dr York himself. Isn't his statement 'How can anyone think that CP/M is still a candidate for standardisation . . . is beyond me' a good example of exactly why it has become a standard. Usually, debates about what *should* become a standard are irrelevant when compared to what the market-place decides *is* the standard. And, yes, this may have something to do with US imperialists armed with megabucks and funny names. END



COMPUTER ANSWERS

Send your queries to Len Warner, 62 Beech Road, St Albans, Herts. Please note that Len cannot answer questions on an individual basis, so please don't send an SAE with your query.

TV standards

We are considering the purchase of a micro with disk drive from among the BBC-B, Atari 800 and Commodore 64 range. Our problem is that we are transferring next year to Australia, where the TV system is PAL-B. Can the micro be converted to the new standard easily and quickly?
J R Hall, Sydenham, London

I have acquired an Atari 400, but it is set up for the US NTSC TV standard. Will it adjust to the PAL system when fed with a 50Hz supply? I'm hopeful that the only modification necessary is the RF modulator.
Jeremy Evans, Brighton

To get proper reception, TV and computer must agree on four things: channel tuning, vision and sound (if used) modulation technique, colour system (if used) and picture scan timing. Nearly 60% of national TV systems use PAL colour encoding. American NTSC and French SECAM hold about 21% each. Within the PAL area most (B, G, I, N) are 625 lines 50Hz and are very similar; Brazil (M) uses 525 lines 60Hz.

I believe Australia uses VHF channel frequencies, so going there from the UK (PAL-I, UHF) you will need a new RF modulator for VHF and a tweak of the sound oscillator from 6 to 5.5MHZ. A local service centre should be able to do this quite easily. If you are buying a new TV set and your micro has a video output, consider a combined TV/Monitor for improved resolution (especially with the BBC). I understand the Beebon is popular in education down under and well supported by the distributor, and the Aussies were ahead of us with disks and Econet trials; no doubt the Atari and Commodore organisations are much in evidence too.

US to UK conversion is more tricky. Since the 525 and 625 line frequencies are close, a UK b w set may give a usable picture by adjusting the picture hold controls; a colour set may just get confused. The Atari uses a custom chip to generate TV scan and colour signals, with US and UK versions. The NTSC and PAL CPU cards differ at least by three major custom chip changes (ANTIC, GTIA and modified 6502) and an extra 4.43MHz colour oscillator. It doesn't seem worth spending around £45 on parts plus lots of labour on a £130 micro especially since there is no guarantee the patient will survive the operation!
Len Warner

File transfers

Our office has a Comart CP200 with two 5¼in drives each of 790k, which I believe to be in North Star format. I am looking for a home computer in the price range of the Osborne, and would like to have the disks interchangeable with the office machine. There seems to be a very wide range of 5¼in floppy disk formats. Can a machine accept more than one type of disk? If not, then is there another way to transfer information between two machines, for example, by direct link?
A Sampson, Brimscombe, Stroud

The CP200 with 790k disks does not use the North Star format, though both use hard sectored disks: it should be possible to program it to do so.

I am not aware of a machine in the Osborne price range that will accept North Star. Most machines, especially the lower cost ones, use soft-sectored disks. Some machines can handle several formats, but hard-sectored and soft-sectored are completely incompatible. Unless you get a North Star, Comart or similar, you will need to copy files from one machine to the other. This gives a portable machine like the Osborne an advantage, because you can easily put it alongside the office Comart to link up by cable between their RS232 interfaces. The Osborne is wired as DCE and the Comart as DTE, so a straight through cable should work. Make sure both micros have the same baud, data and stop bit, and parity settings.

The CP/M utility PIP can be used to transfer files of 7-bit data such as text files, data files in ASCII and programs in hex format. Binary data and COM programs may not copy reliably using PIP, nor will large files, so you may need a comms program such as BSTAM. This supervises in both machines during the transfer, detecting and correcting errors and pausing to allow disk saves. Using PIP, don't forget to re-allocate the serial port on the receiving machine by a STAT RDR:=PTR: command first (see 'Untimely death', August). If you are sending an ASCII text file that does not end in 'Control Z', then use a command line like
PIP LST:=filename.ext,
EOF:. This marks the end of file to close the transfer and save the file. The [E] option will also display the stream of text on the screen.
P L McIlmoyle

Radix 50

The operating system on my school computer uses the Radix 50 code for internal data storage. Could you please tell me more about this code.
R Haggar, Potters Bar, Herts

DEC computers uses this method to hold tables of program symbols because by reducing the length of each element to match it makes table searching quicker, which is important in assembling or compiling, as well as minimising table space. In Radix 50 code, up to six characters from a set of 40 can be packed into a 32-bit computer word. This saves space compared with ASCII, which needs 6 × 7 bits for 6 chars, and so would use 48 bits of storage. The characters are converted as if they were digits of a number in radix (or base) 50 octal, so the symbol $L_6L_5L_4L_3L_2L_1$ becomes the value $((((C_6*50+C_5)*50+C_4)*50+C_3)*50+C_2)*50+C_1$, where values are in octal, and the letters are converted to codes by the following table.

Code C_n	Character L
00	Null
01-12	0-9
13-44	A-Z
45	"
46	$
47	%

Len Warner

Parallel to serial interface

Will plugging an Epson MX-80 printer with a serial interface into a RML 380Z machine's parallel socket, and trying to log into the parallel interface, do the printer any harm?
Richard C Orme, Ipswich

It is the computer which is at risk, not the printer! A serial RS232 or V24 interface gives signals between −15V and −3V or between +3V and +15V, and the circuits are designed to withstand a fair amount of abuse. A parallel interface normally uses TTL signal levels, and voltage outside the range 0V to 5V may damage it. You can drive a serial interface from a parallel one provided you use simple level changing circuits, and software to serialise the data bits. Alternatively, RML can supply a serial interface. For an explanation of serial communication see 'One Bit at a Time' *PCW* Aug-Sept 82.
Len Warner

Sideways ROM

I hope shortly to be able to program EPROMs for the BBC computer. Can you confirm

which type are used as some have different pin connections. Is the 16k Basic chip on a 27128 —I see these cost £25 each!
TG Ward, Bideford, Devon

I have a BBC model B and I wish to have one of the paged ROM locations as RAM. I thought of making a board from Veroboard and using 4816s, but these are dynamic RAM and would need refresh circuitry. Could I use a ZX81 RAM pack, with some modification if necessary? Does Acorn, or any other company, make a RAM board for this application?
DB Calloghan, Norwich

The Beebon provides four 28 pin sockets for ROM software. Because each can be paged into the same 16k area of the memory map, they are drawn side-by-side on the map and called 'Sideways ROM'. The sockets are wired for the pin compatible family of single supply voltage ROMs and RAMs with the Intel/JEDEC pinout, so you can use 24 pin 4k EPROMs in pins 3 through 26, or 28 pin 8k or 16k parts. Reset links S32 and S33 to provide +5V instead of A13 on pin 26 where required for 24 pin parts. Be careful, because each link supplies two sockets. Basic is on a 16k ROM and DOS on an 8k ROM. These are factory-mask devices, which in quantity are much cheaper than the erasable type.

RAM can be provided in the sideways area if care is taken. The ROM sockets are on the unbuffered 6502 CPU bus so it may be advisable to buffer the bus from a large board. At the ROM sockets the chip select lines have very low drive capability and no Read/Write signal is provided. Dynamic RAM would need a Refresh timing signal and a refresh counter (which are provided by the Z80 CPU chip for the ZX81 expansion). As CMOS static RAM prices fall (6116 2k just over £3), it seems hardly worth the effort of making a one-off homebrew dynamic board tick —but if one of you has a design or a product, let me know.

This RAM area is separated from the main RAM by the VDU memory, so it cannot be used simply to extend Basic programs. It can be used as a data buffer, or to hold machine code routines, thus reducing the pressure on main memory. It can also be used to load language or service filmware from tape or disk, increasing the flexibility of the Beebon and invaluable if you are actually developing new firmware.

Ikon's 'Hobbit' floppy tape system with the Zero Memory Option includes both ROM and 4k RAM. It provides a filing system similar to the DFS without consuming main memory, and also has some surplus RAM. Half to 1½k may be available to the skilled user while the Hobbit FS is active.
Ikon Computer Products, Kiln Lake, Laugharne, Carmarthen, Dyfed. Tel: (099421) 515.

Watford's '13 ROM Socket Board' fits in place of ROM IC100 and provides 14 sockets. This allows the maximum 16 sideways 16k pages addressable by the OS. Extra control signals are picked up from the main PCB. Paged ROMs from 2k to 16k can be used. One special page will take ROM or RAM and its sockets will hold two 6116 2k or 6264 8k RAMs. The board costs £35 and the prospective price for 6264s is £38 each. Watford Electronics, Cardiff Road, Watford, Herts. Tel: (0923) 40588.
Len Warner

MZ-80K monitor

Where can I obtain a commented copy of the monitor listing for the Sharp MZ-80K (48k) monitor?
Richard C Orme, Ipswich

Kuma Computers Ltd, 11 York Road, Maidenhead, Berks. SL6 15Q, tel (0628) 71778, carries on the Sharp support previously given by Newbear. The MZ-80K monitor is the same for all memory sizes, and Kuma has a detailed listing for £15. The first 4Ah bytes contain a jump table to monitor subroutines.

Addr	Jump	Function
00	04A	cold start
03	7E6	get text line (DE)
06	90E	print CR LF
09	918	conditional CR LF
0C	920	print space
0F	926	tab (1-10 spaces)
12	935	print char (A)
15	981	prt string (DE)
18	999	prt reverse field
21	436	write tape header
24	475	write tape data
27	4D8	read tape header
2A	4F8	read tape data
2D	588	verify tape
30	1C7	play music (DE)
33	308	set clock (DE,A)
36-37		NOP
38	1038	restart 38h
3B	358	read clock
3E	2E5	beep
41	2FA	set tempo (AF)
44	2AB	start sound
47	2BE	stop sound

Dorothy Hickman, R Sheridon
(More on the K next month from my four new helpers—
Len Warner

Warner's corner

Mains control Halsey (July): A gremlin ate the number of independent channels (16) in the TK Electronics system: more appliances can be switched if they are grouped. Both the TK system and the Gem Systems Power Switch Box can have their power uprated by fitting bigger triacs, subject to the supply capacity.

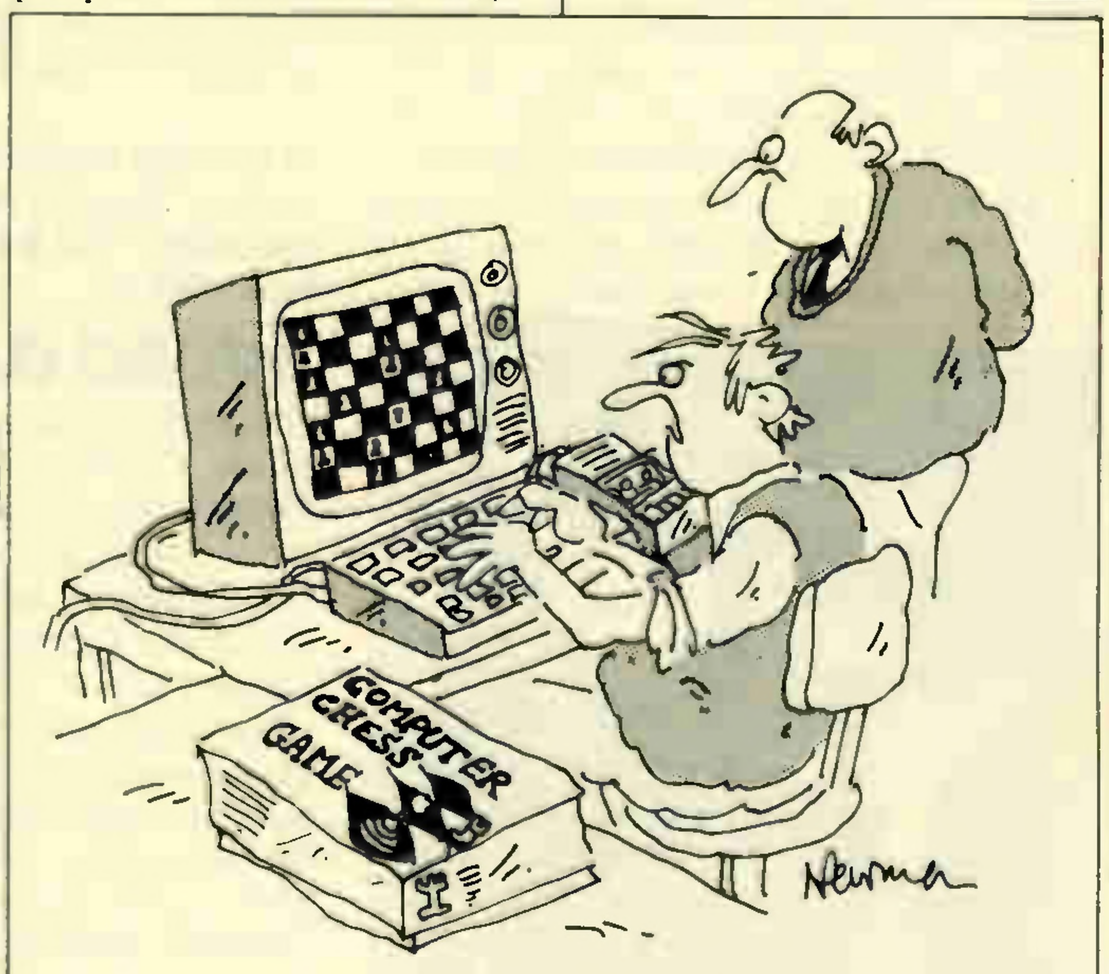
NewBrain: Sorry Mr Senna (July). Thanks to those named for the corrections.

The internal RS22 interface is handled by the Z80 processor using software timing. Thus the NewBrain cannot send and receive simultaneously, nor refresh the screen during serial I/O. The UART hardware to relieve the CPU of this task and give normal duplex I/O is provided by the expansion interface module or the peripheral interface module, but at around £150 extra cost. Without this it is not suitable as a terminal to another computer. *Michael Mann*

NewBrain Basic looks similar to Microsoft Basic, but is compiled and is better organised internally for fast execution. Line numbers are stored in a table instead of in the Basic source code. Since it is not necessary to search the program for line numbers, this speeds GOTOs and calls and makes speed less dependent on the placing of subroutines or data statements. Each table entry has two pointers. One points to the program line, the other is zero or points to the compiled line. As the line is first executed it is compiled, and the 'Y code' is stored. Subsequent executions of the line use the compiled version (unless it has been deleted because it is no longer valid or because of lack of memory). Loops and frequently used routines can profit from both features, so there is hidden power to be exploited. Details from *Dave Gunthorpe;* confirmation and a timing example from *Andrew Pearmund*. Both are now enrolled as NewBrain agony uncles.

Epson ribbons: A flagging fabric ribbon can be revived with a two second squirt of WD-40. Leave the cartridge open overnight to allow excess moisture to evaporate.
Paul Taylor

END



'Every time it's about to lose, the bloody thing accidentally crashes'

BIBLIOFILE

Once again Linnet Evans has been weaving her way through the maze of computer books available.



MICROCOMPUTER CONTROLLED TOYS & GAMES & HOW THEY WORK

By the time this piece is in print, High Streets everywhere will be Christmas stocking. This makes a timely intro for Van Waterford's *Microcomputer Controlled Toys & Games, & How They Work.*

Timely, but little else. 'How They Work' in Chapter 1 reads like a pure breeze for National Semiconductor. It would have fared better as an appendix, or in its tacky, techy form, not at all. The toys and games themselves are not of course all available in the UK, nor ever will be, given the much higher ownership of PCs here which has weighed the market away from the dedicated units of the Simon type upwards featured herein.

The main problem, however, is that the author (or his mentors) has set no problem at all. Instead he's simply rehashed the manufacturer's PR blurbs, or so one may gauge from the thoroughly uncritical approach and the very uneven coverage of different games. No attempt is made at real assessment of comparative difficulties, ease of handling, durability or even offering a symbol guide showing number of players, power supply options or whatever. You're going to need to be pretty dedicated to get much from this one.

Microcomputer Controlled Toys & Games, & How They Work
Author: Van Waterford
Publisher: TAB Books
Price: $9.95

25 GRAPHIC PROGRAMS IN MICROSOFT BASIC

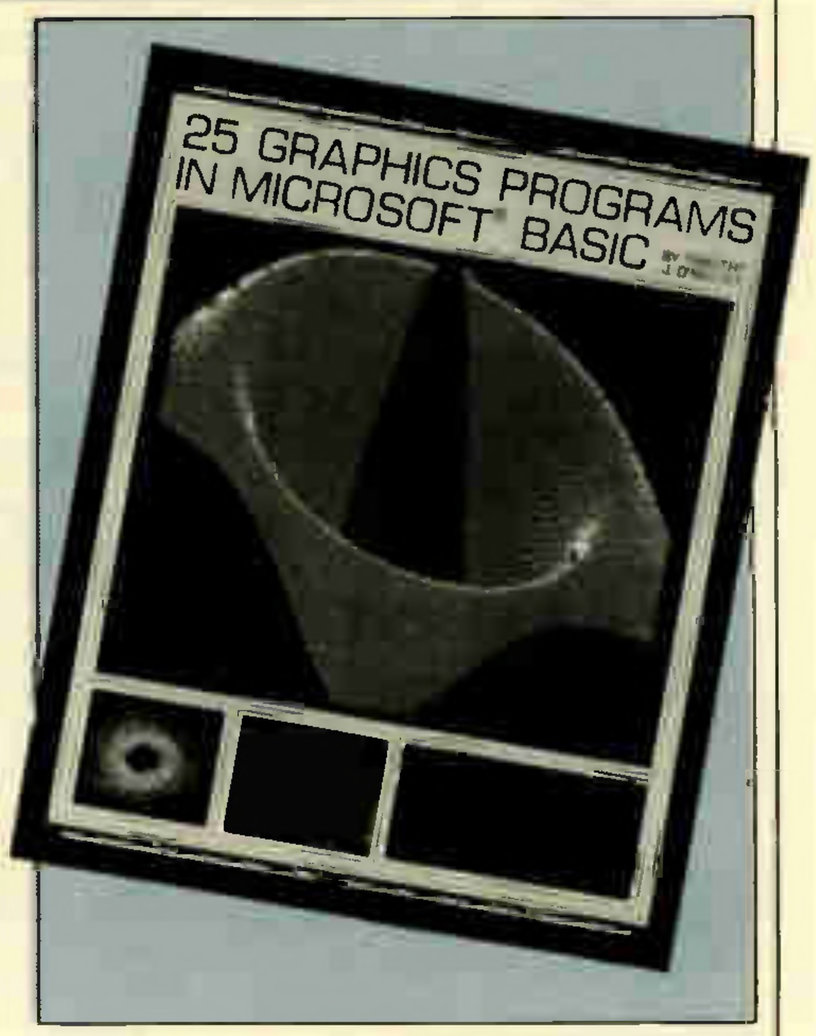
If a picture is worth 1,024 words, then *25 Graphic Programs in Microsoft Basic* by Timothy O'Malley may be high in resolutions but is low in resonance. The author avowedly doesn't set out to tell all about his subject (though on several occasions he does explain what a REM statement is), trading instead on the idea of a supplemental book for classroom or design projects. This lets him nicely off the hook of needing to explain any principles of draughtsmanship or mathematics. Then again, judging from the prolific illustrations, most of us only want to make pretty pictures of Cruise missiles heading East.

To be fair, most of the essential tools of this trade — line erasure, movement, etc — are covered by some means or other. Both high and low resolution monochrome graphics are covered, for screen and dot matrix. Reasonable account is taken of the differing ASCII codes, USR functions *et al* of different computers, and certain alternative approaches are suggested.

But the loafing style and haphazard arrangement of information do not readily impart accumulated knowledge, nor encourage the reader to go forth and harvest it personally. There's no big rainbow at the end of this set of Moire patterns.

Verdict: PRINT CHR$(12);CHR$(84); CHR$(82);CHR$(89);CHR$(32); CHR$(72);CHR$(65);CHR$(82); CHR$(68);CHR$(69);CHR$(82); CHR$(32);CHR$(84);CHR$(73); CHR$(77):CHR$(33).

25 Graphic Programs in Microsoft Basic
Author: Timothy O'Malley
Publisher: TAB Books
Price: $10.95





MICRO GAMES

One of my favourites in this month's crop is *Micro Games* by Patrick Bossert and Philippa Dickinson. Young Bossert was the lad who, at the age of 13, wrote the blockbuster on busting the cube — and if that doesn't show your age, his and mine, nothing will.

The book carries a baker's dozen or so of games, with alternate listings where possible for the BBC A/B, RML 380Z/480Z and the two current Sinclair models. Each uses keyboard input only, with no paddles or joysticks required. There's no reason why the venturesome owner of any other similar kit couldn't do a conversion job.

Subjects are appropriately non-sexist, not quite non-violent and definitely unfair to bogeymen, and as games they come across as good as any I've seen at this level. The authors take a lot of trouble to explain what the different segments of a program are doing, how and why, before showing it in total. They also suggest some mods for bigger risks plus the ultimate move of going alone. The big brother/closet auntie approach works well enough for all our Rubic boobs to be forgiven.

I won't be attempting to put canasta on the Microtan, but that's just chicken.

Micro Games
Authors: Patrick Bossert and Philippa Dickinson
Publisher: Puffin
Price: £1.50

COMPUTER GAMESMANSHIP

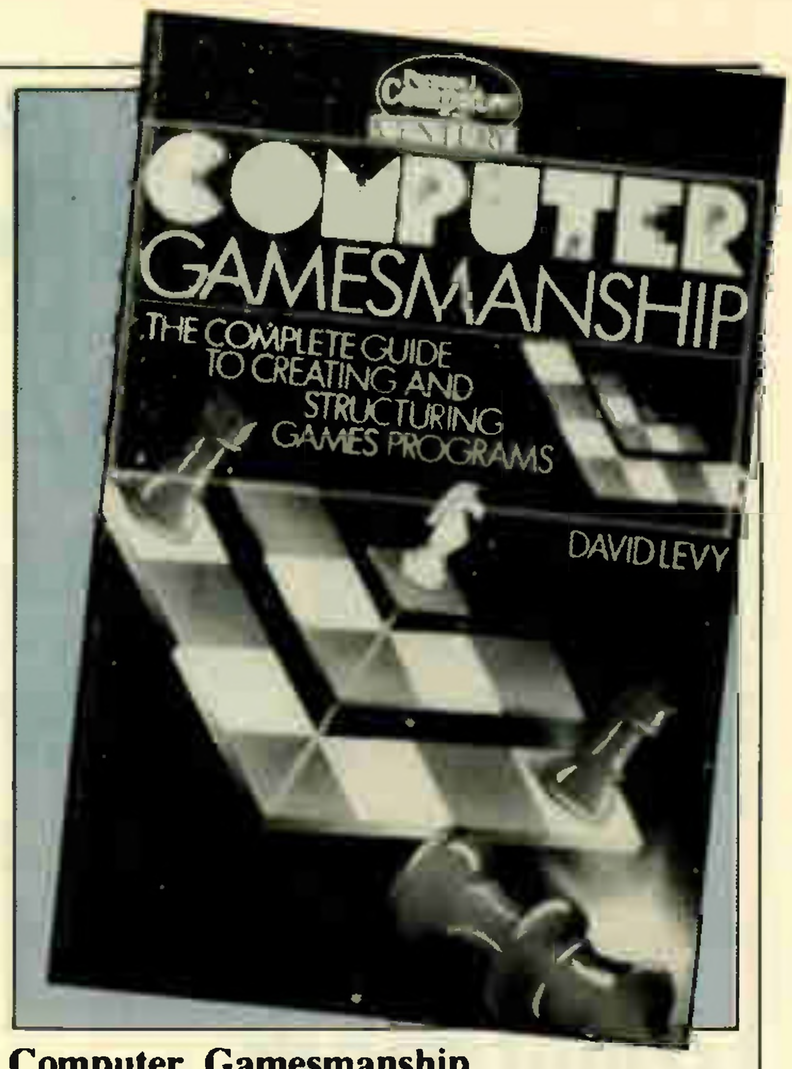
An appropriate book with which to settle down during those long winter evenings is *Computer Gamesmanship — The Complete Guide to Creating and Structuring Games Programs*. Author David Levy is of course a long-term livewire in this field, and many of you will know himself and his scripts from *PCW*.

Historically, the heavy justification for setting up the chessboard on the ENIAC was that it provided a very good trial run for problem-solving in the real world. This is David Levy's ongoing theme here. His approach and examples are all design and no code, and therefore completely independent of machine or language — even of the game itself. At the end of the day, the ball is deftly and definitely in the reader's court.

Rightly or wrongly, there's no hanging around on the niceties of pixellating the white queen's bishop, or indeed any other aspect of I/O. Rather, the opening chapter strides straight towards the 8-square ('Magic Square') puzzle and noughts-and-crosses for essential groundwork on algorithms and heuristics. (The latter, if you're unfamiliar, are a means of progress by evidence or experience rather than full-blown application of the rules. Among other things, they provide a neat and speedy way of jumping over small RAMs when the options get big — as they will do with even the most straightforward games of skill. A heuristic also of course makes a forced entry into the outer courtyard of Artificial Intelligence, which is where the Gamesmanship really begins.)

Later chapters build a portfolio of tactics and techniques with backgammon and contract bridge becoming very much chicken and egg for the afficionados — freely acknowledged — who have translated green baize and chequered boards into siliconology through the years.

I was going to conclude by saying that *Computer Gamesmanship* was a book for head first, hands later. It's a compulsive subject though, and it may just be that hearts are trumps.



Computer Gamesmanship
The Complete Guide to Creating and Structuring Games Programs
Author: David Levy
Publisher: Century/PCW
Price: £7.95

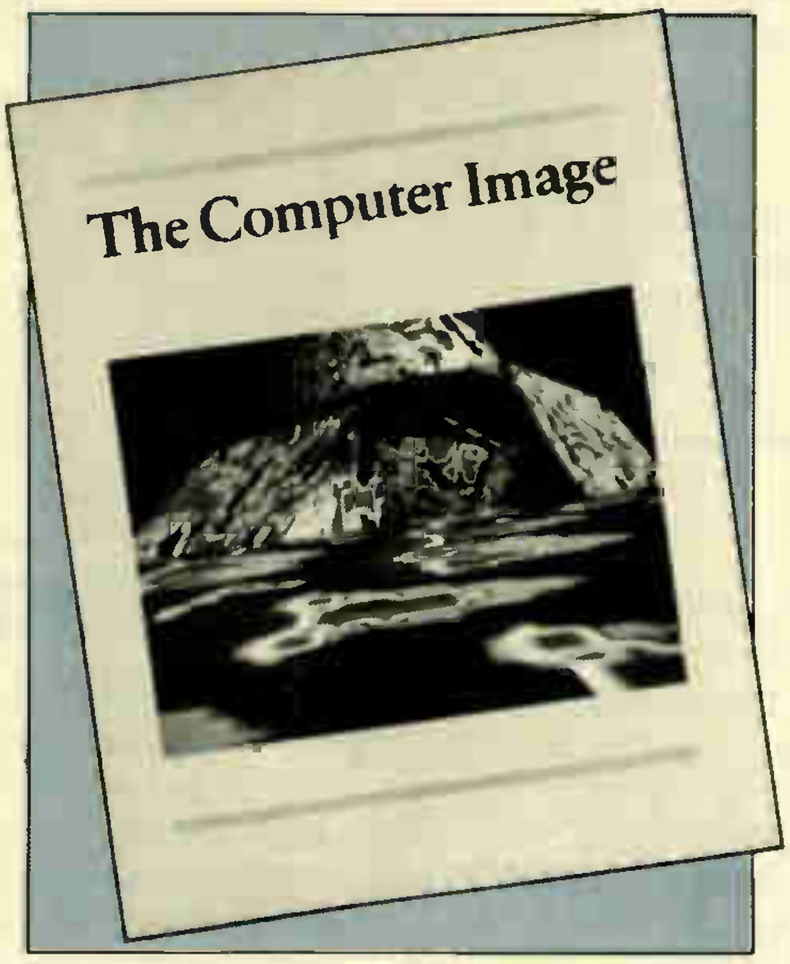
THE COMPUTER IMAGE

You might betray your age if, on first picking up *The Computer Image*, you catch yourself looking for the same instant, all-colour visual nostalgia that the 1970s displayed with its rock industry images. David Em equals Roger Dean. OK?

So far, however, raster-man vibrations haven't quite got it all their own way. Carrying over a hundred examples of the pixel-mixer's art, the largish-format *Computer Image* is inevitably something of a *resumé* of the story so far. But the visuals are anchored by text, in the form of four discrete essays leaning to the pragmatic rather than the nostalgic.

As ever, in enabling computer graphics, technology has tended to outstrip our ability to harness applications. Donald Greenberg in his 'Overview' plunges headlong into history, hardware and certain visual algorithms which may leave the more nervous reader temporarily wishing he'd been born blind.

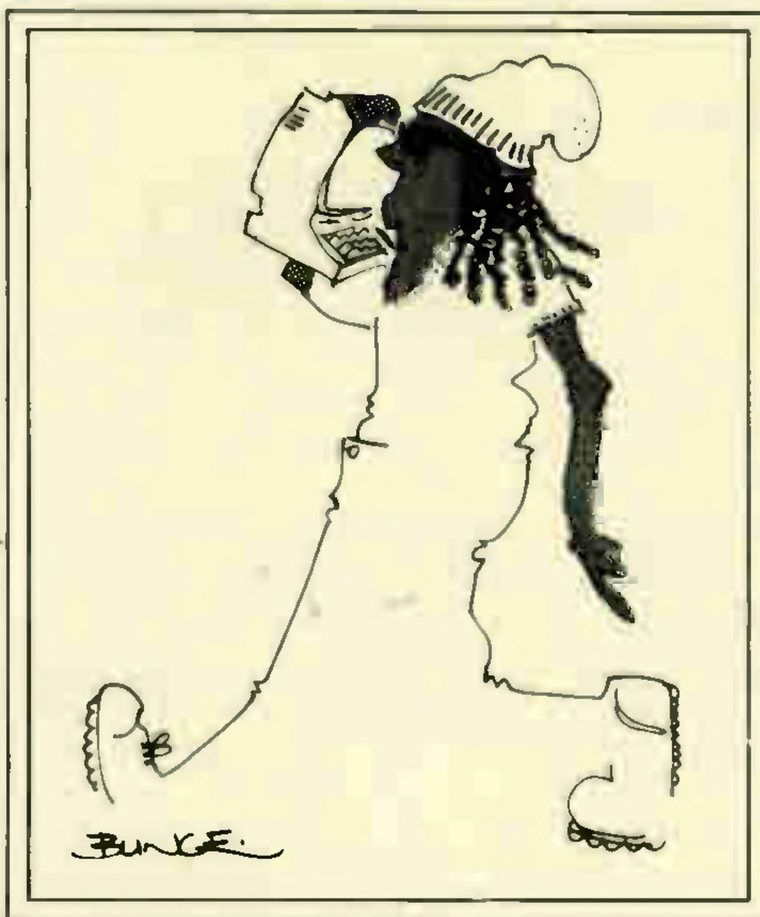
By contrast, the section on 'Color: A Tool for Computer Graphics?' breaks open very neatly the whole area of colour perception, with lots of perception psychology as well as the Munsell system. 'Computer-Aided Business Graphics' runs on the momentum with a good handful of case studies and punditry and an earnest call for in-house standards everywhere. The impact here is blunted somewhat by the inexplicably low number of pictorial illustrations.



Together these essays provide a reasonable and readable introduction to the subject as it now stands in practice, together with the necessary vocabulary and references for further reading. Note, though, that this is all screen-based with no coverage of other display methods.

The outcome is, of course that it's not a mainline picture book but a well-intentioned, if slightly disbalanced, encouragement towards self-involvement. For general interest, twenty quid is a lot of money to spend on something that may remain more of a taster than a landmark. Yet for anyone actually faced with a colour monitor (or the need to justify being faced by one), *The Computer Image* may well emerge in its true colours.

The Computer Image
Authors: Various
Publisher: Addison-Wesley
Price: £19.95



LEISURE LINES

Quickie

Who wears the biggest boots in the British Army?

Prize Puzzle

A certain number expressed in base 7 has its digits reversed if it is expressed in base 9. What is the number expressed in base 10?

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

July Prize Puzzle

A fairly low entry this month although the puzzle wasn't too difficult. Most of the 135 entries contained the correct answer: Arthur was Susan's perfect man.

The winning card, selected at random, was from Mr Gurski of Norway. Congratulations Mr Gurski, your prize will be on its way very soon. Meanwhile, keep puzzling.

by J J Clessa



PCW SUBSET

Alan Tootill and David Barrow present more useful assembler language subroutines. This is your chance to help build a library of general-purpose routines, documented to the standards we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another. PCW *will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to SUB SET,* PCW, *62 Oxford Street, London W1A 2HG.*

CORRECTIONS

The last five instructions of July's Z80 CASTXT were left out.

These are shown below.

And a rare author's slip. The machine code of the fifth instruction, JP P0,L4, in August's MSTRV should have been given as E2 YY YY and not E2 84 17, since the actual address in your machine depends on where you have located the routine.

```
LD      B,+0        ;                                   0600
ADD     HL,BC       ;move pointer to next key           09
POP     DE          ;restore test string pointer        D1
POP     BC          ;discard unrequired address         C1
JR      NXTKEY      ;and repeat.                        10E0
```

Z80 STRING MATCH

The need to match two strings arises in many different circumstances and produces interesting variations in how it is met in machine code. Our first Datasheet, COMPAR, from Peter Fox of Luton, compares a string in memory with the string inserted in the code, following the CALL to COMPAR. Both strings are terminated by a zero (null) byte. Peter uses the routine in his editor/assembler to recognise commands.

Routines like this, with data inserted in the code, tend to be easy for the programmer to use and, as Chris Hood of Walsall points out in another connection, can confound anyone trying to break the code from a hex dump, if they try to decode the inserted data. An interesting thought; though this series is not in the business of trying to confound anybody.

Note that DE, which points to the string in memory, is returned unchanged so that, if a match is not found, a different string can be easily tested for.

DATASHEET

```
;=COMPAR  - Free format string compare.
;/CLASS:  1
;/TIME CRITICAL?:  No
;/DESCRIPTION:  Compares string in memory pointed to by DE
;/              with string after the CALL to COMPAR.
;/ACTION:  Get HL pointing to string inserted in the code.
;/         Save DE and A.
;/         Compare characters of the two strings.
;/         If equal increment pointers and
;/         if characters not zero go back
;/         to compare next two characters.
;/         If characters zero, restore registers and return.
;/         If unequal, skip remaining characters of inserted
;/         string, clear zero flag, restore registers and return.
;/SUBr DEPENDENCE:  None
;/INTERFACES:  None
;/INPUT:  DE points to string in memory, terminated by null byte.
;/        The initial return address points to the string
;/        inserted in the code, terminated by a null byte.
;/OUTPUT:  If strings equal - Z flag is set.
;/                      Else - Z flag is reset.
;/         DE unchanged, Carry flag reset; returns to byte
;/         after zero byte of inserted string.
;/REGs USED:  F
```

```
;/STACK USE:  4
;/LENGTH:  25
;/PROCESSOR:  Z80

COMPAR:   EX      (SP),HL   ;HL to stack; ret adr to HL.   E3
          PUSH    DE        ;DE to stack;                  05
          PUSH    AF        ;AF to stack.                  F5
L1:       LD      A,(DE)    ;compare characters            1A
          CP      (HL)      ;of the two strings.           BE
          JR      NZ,L3     ;jump if different.            20 0A
          INC     HL        ;same so point to next         23
          INC     DE        ;pair of characters.           13
          OR      A         ;was it the last pair?         B7
          JR      NZ,L1     ;do next pair if not.          20 F7
L2:       POP     DE        ;original AF to DE.            D1
          LD      A,D       ;original A to A.              7A
          POP     DE        ;original DE to DE.            D1
          EX      (SP)HL    ;OHL to HL;new ret to stack.   E3
          RET               ;return;                       C9
L3:       LD      A,(HL)    ;not equal so skip             7E
          INC     HL        ;string inserted in code,      23
          OR      A         ;until zero byte               B7
          JR      NZ,L3     ;passed.                       20 FB
          INC     A         ;to clear the zero flag.       3C
          JR      L2        ;restore registers & return.   18 F3
```

6502 STRING MATCH

Datasheet MATCH, from Dennis May of London, is for matching a keyword string against a table of strings. The end of each string in the table is indicated by having bit 7 of its last character set and the end of the table is marked by a byte of FFH. Since a match is wanted if the keyword begins with a complete table string, no keyword length is given. For a strict match, the keyword string could be terminated by some non-ASCII-character byte such as 00H (null) or 0DH (carriage return).

The routine makes use of zero page RAM, 16 contiguous bytes of which, designated M0-MF and shown in the machine code as ZZ, are reserved by convention for Sub Set 6502 routines.

DATASHEET

```
;=MATCH - Keyword match routine.
;/CLASS:  2
;/TIME CRITICAL ? No
;/DESCRIPTION:  Looks up a keyword string in a match table.  If
;/              the keyword equals or begins with a complete
;/              table string, returns its position in the table.
;/              If keyword not in table, returns $FF in X register.
;/ACTION:  Sets position count to zero.  Subtracts characters in
          keyword from characters in table until difference found.
          If difference = $80 stores length-1 of keyword, moves
          pointer past keyword and loads position in table in X.
;/        Otherwise moves table pointer to next keyword and
;/        increments position counter.  If end of match table, sets
;/        X to $FF and returns else repeats subtracting characters.
;/SUBr DEPENDENCE:  None
;/INTERFACES:  None
;/INPUT:  M0,M1 contain address (l ,hi) of keyword to be matched.
          M4,M5 contain address (l ,hi) of match table.
;/        Match table can be located anywhere in RAM.  It can have
;/        up to 255 elements each up to 255 characters long.  The
;/        last character of each element must have bit 7 set.  The
;/        end of table is marked by a byte of $FF.
;/OUTPUT:  If match found: position in table of keyword returned in X,
;/            length-1 of keyword in M3 and M0,M1 advanced past keyword
;/         If no match: X = $FF and M3,M0,M1 unchanged.
;/REGs USED:  A,X,Y,P,M0-M5.
;/STACK USE:  0
;/LENGTH:  61
;/PROCESSOR:  6502
```

```
MATCH:  LDY   #0        ;character pointer = 0.          A0 00
        STY   M2        ;position count = 0.             84 ZZ
MTCH4:  DEY             ;because of INY for 1st char.    88
MTCH1:  INY             ;point to next character.        C8
        LDA   (M0),Y    ;fetch character from string.    B1 ZZ
        SEC             ;no borrow.                      38
        SBC   (M4),Y    ;subtract from char in table.    F1 ZZ
        BEQ   MTCH1     ;if difference = 0 do next chr.  F0 F8
        CMP   #$80      ;difference = $80 ?              C9 80
        BEQ   FOUND     ;branch if so.                   F0 1E
        DEY             ;check current table char also   88
MTCH2:  INY             ;next character.                 C8
        LDA   (M4),Y    ;get character from table.       B1 ZZ
        BPL   MTCH2     ;if bit 7 = 0 get next char.     10 F8
        SEC             ;prepare to add extra 1.         38
        TYA             ;offset to A.                    98
        ADC   M4        ;point M4,M5                     65 ZZ
        STA   M4        ;to next word                    85 ZZ
        BCC   MTCH3     ;skipping if no carry            90 02
        INC   M5        ;else increment high byte.       E6 ZZ
MTCH3:  INC   M2        ;increment position counter.     E6 ZZ
        LDY   #0        ;point to 1st character.         A0 00
        LDA   (M4),Y    ;fetch character from table.     B1 ZZ
        CMP   #$FF      ;end of table ?                  C9 FF
        BNE   MTCH4     ;if not do next word,            D0 D9
        STA   M2        ;else position count = $FF       85 ZZ
        BEQ   MTCH5     ;and end.                        F0 0B
FOUND:  STY   M3        ;store length-1 of keyword.      84 ZZ
        TYA             ;offset to A.                    98
        ADC   M0        ;move M0,M1 past keyword with    65 ZZ
        STA   M0        ;extra 1 provided by carry.      85 ZZ
        BCC   MTCH5     ;if no carry skip,               90 02
        INC   M1        ;else increment high byte.       E6 ZZ
MTCH5:  LDX   M2        ;load position into X            A6 ZZ
        RTS             ;and return.                     60
```

6809 CONVERSION

It was in May 1981 that Sub Set last had an ASCII decimal to 16-bit binary conversion. ASBNM at 117 bytes of M6800 code was a straight translation of the 61 byte, Z80 ASCNO (*PCW* November, 1980).

DECBIN from Mike Kerry of Seaford uses a similar method to ASCNO but isn't a translation. ASCNO (and ASBNM) tested the decimal string for a preceding '+' or '−' and returned a signed binary number or jumped to an overflow routine if the value was outside the range +32767 to −32767. DECBIN does neither of those things. It deals only in unsigned values in the range 0 to 65535 and simply returns with the carry flag set on overflow.

The 'advanced' 6809 processor boasts a quite bewildering set of instructions and, on the face of it, appears to be much more powerful than the humble Z80. The Z80 cannot, for example, multiply or index the stack. However, the most straightforward Z80 translation of DECBIN is only 42 bytes compared to DECBIN's 55 and will convert a valid 5 decimal digit number in 987 T states. DECBIN will do the conversion in 554 T states but, generally, Z80s run at least twice as fast as 6809s.

Readers who are not *au fait* with 6809 code may be reassured that the tenth instruction in DECBIN is only the method by which B gets its end bit into A to make D.

DATASHEET

```
;=DECBIN - ASCII decimal to 16-bit binary conversion
;/CLASS:  1
;/TIME CRITICAL?:  No
;/DESCRIPTION:  Converts a string of ASCII decimal digits terminated
;/              by a non-numeric byte to a 16-bit unsigned binary
;/              value or gives overflow indication.
;/ACTION:  Initially clear 16-bit accumulator
;/         Get next byte and increment string pointer
;/         IF non-numeric THEN exit with Cy reset
;/         Convert from ASCII to single BCD digit
;/         Multiply partial result by 10 and add new digit
;/         IF overflow THEN exit with Cy set
;/         Repeat.
;/SUBr DEPENDENCE:  None
;/INTERFACES:  Memory containing ASCII decimal string.
;/INPUT:  X points to first byte of string.
;/OUTPUT: Cy set: overflow: X = input X + 5, D = ?
;/        Cy reset: D holds binary representation of number
;/                  X points to terminator + 1
;/REGs USED:  CC D X
;/STACK USE:  4
;/LENGTH:  55
;/TIME STATES:  Valid:  559 max.  Overflow:  530 max.
:/PROCESSOR:  6809

        CLRA            ;initially clear 16-bit          4F
        CLRB            ;result accumulator              5F
DIGLP:  PSHS    D       ;save partial result on stack    34 06
        LDB     ,X+     ;get new digit and point to next E6 80
        CMPB    #$30    ;test for non-numeric terminator C1 30
        BLO     VALIDX  ;and exit with valid result in D 25 29
        CMPB    #$39    ;if terminator reached           C1 39
        BHI     VALIDX  ;                                22 25
        ANDB    #$0F    ;convert from ASCII digit        C4 0F
        SEX             ;to a 16-bit value               1D
        PSHS    D       ;and save on stack               34 06
        LDA     2,S     ;get partial result hi-byte and  A6 62
        LDB     #$0A    ;multiply by ten                 C6 0A
        MUL             ;                                3D
        TSTA            ;test for overflow               4D
        BNE     OVFLWX  ;and exit if so                  26 13
        STB     2,S     ;hi-byte back to stack           E7 62
        LDA     3,S     ;get partial result lo-byte and  A6 63
        LDB     #$0A    ;multiply by ten                 C6 0A
        MUL             ;                                3D
        ADDA    2,S     ;add in the hi-byte * 10         AB 62
        BCS     OVFLWX  ;and exit if overflow            25 08
        ADDD    ,S      ;add in new digit                E3 E4
        BCS     OVFLWX  ;and exit if overflow            25 04
        LEAS    4,S     ;restore original stack position 32 64
        BRA     DIGLP   ;and repeat.                     20 D4
OVFLWX: LEAS    4,S     ;restore original stack position 32 64
        ORCC    #$01    ;set Cy flag to show overflow    1A 01
        RTS             ;and exit.                       39
VALIDX: ANDCC   #$FE    ;reset Cy flag to show valid     1C FE
        PULS    D,PC    ;result.Recover result and exit. 35 8B
```

DEAD KEY SCROLLS

One sound reason for programming in machine code instead of Basic or some other high level languish (sic) is for speed of execution. But when it comes to displaying the results of your hard labour it is often a case of 'now you see it, now you don't' — with the emphasis on the latter state.

Geoff Ticehurst of Lutterworth has solved the problem of machine code scrolled displays disappearing off the top of his TRS-80 screen before he has even had a chance to blink by a delay routine which can be switched on or off by a press of the space bar.

SLOWUP uses the Z80 CPL instruction to invert the bits in a delay counter when the space bar has been pressed. One press will turn a long delay to a very short one, the next press will turn it back to a long delay again, and so on. SLOWUP also halts completely until the space bar is released.

The long and short delays can be adjusted by changing any of the delay counter (stored in memory), the bit mask (in the seventh instruction) and the repeat counter (loaded into B in the fourth instruction).

SLOWUP is written to make use of the TRS-80 keyboard input memory mapping. To adapt the routine so that it uses your monitor keyboard input routine (called INKEY for want of a better name), change the three instructions after DJNZ SLOWA to read:

```
CALL INKEY ; get char.
keyed in to A
CP 20H ; is it a SPACE?
JR NZ, SLOWD ; jump out if
not.
```

And the three instructions at label SLOWC to:

```
SLOWC: CALL INKEY ;
check if SPACE
CP 20H ; is still pressed
JR Z,SLOWC ; and loop till
not.
```

DATASHEET

```
; SLOWUP - Switchable delay
;/CLASS: 2 (uses direct addressing and is system specific)
;/TIME CRITICAL?: Possibly
;/DESCRIPTION: Alternates between a very short delay and a longer
;/             delay on space bar press.
;/ACTION:  Get delay counter
;/         Mask out bits for fine tuning of delay length
;/         Delay loop for delay count
;/         IF space bar pressed THEN invert counter bits and store
;/         Exit when space bar released
;/SUBr DEPENDENCE:  None
;/INTERFACES: Delay counter in RAM.  Memory mapped key input.  Keyboard.
;/INPUT: Delay counter must be in RAM.
;/OUTPUT: Delay caused.  Delay counter complemented if SPACE pressed.
;/REGs USED: None
;/STACK USE: 6
;/LENGTH: 46
;/PROCESSOR: Z80

SLOCT:  DEFW    F001H       ;delay counter in RAM
SLOWUP: PUSH    AF          ;save registers          F5
        PUSH    BC          ;                        C5
        PUSH    HL          ;                        E5
        LD      B,2         ;repeat counter for longer delay 06 02
SLOWA:  LD      HL,(SLOCT)  ;pick up delay counter from RAM 2A YY YY
        LD      A,H         ;mask out hi-byte bits 0 to 3 7C
        AND     0F0H        ;for fine tuning of delay 06 F0
        LD      H,A         ;                        67
SLOWB:  DEC     HL          ;do delay by counting down 2B
        LD      A,H         ;delay counter until zero 7C
        OR      L           ;                        B5
        JR      NZ,SLOWB    ;                        20 FB
        DJNZ    SLOWA       ;repeat till repeat count zero 10 F2
        LD      A,(3840H)   ;TRS 80 key input memory mapping 3A 40 38
        BIT     7,A         ;see if space bar is pressed CB 7F
        JR      Z,SLOWD     ;and exit if not         28 10
        LD      HL,(SLOCT)  ;else pick up delay counter and 2A YY YY
        LD      A,H         ;complement it to switch from long 7C
        CPL                 ;to short delay or vice versa for 2F
        LD      H,A         ;next time SLOWUP is called 67
        LD      (SLOCT),HL  ;and put it back         22 YY YY
SLOWC:  LD      A,(3840H)   ;loop till space bar is released 3A 40 38
        BIT     7,A         ;                        CB 7F
        JR      NZ,SLOWC    ;                        20 F9
SLOWD:  POP     HL          ;restore all registers   E1
        POP     BC          ;                        C1
        POP     AF          ;                        F1
        RET                 ;and exit.               C9
```



BANKS' STATEMENT

OF MICE AND MENUS

Martin Banks muses on whether or not the mouse will get ensnared in its own trap.

Wonderful what technology can do, isn't it? Let me, here and now, expound on why I feel the urge to make such a contentious statement.

Once upon a time, many years ago, I was a small person who shared life, bedrooms, Dinky toys and bowls of gruel with some parents, some brothers and an averagely indolent tabby cat. The last of these, as is the way of things in most well-organised households, got at least as good a deal as any of the rest of us — indeed it was often better, as the cat had perfected the trick of demand feeding.

It also was given a present at such times as Christmas and its birthday. Sometimes this would just be a piece of amazingly pungent fish, while on other occasions, it would be a trinket or toy.

One year, I remember, said moggy had a particularly successful season in the fields, and often brought us free samples of what it had captured. As a result of this it was decided to purchase, for the cat's birthday, a replica of its captives that it could practise on at home. We felt that if the cat knew there was one there already, it wouldn't bother bringing home any more.

And so it was, on an arbitrarily selected day in September (we never actually knew the cat's real date of birth), the animal was presented with a small brown paper parcel, which it neatly unwrapped. Inside was a grey, be-wheeled, clockwork mouse.

At first, the tabby was particularly taken with this new toy, and many happy minutes were spent with it chasing the mouse hither and yon. In my desire to please, however, I overwound the motor and with a loud ping, the mouse suffered a terminal coronary. The cat became bored.

In the end, of course, the breakage amounted to no great financial loss, and the investment had served to keep the cat in training at least for a few hours. I wonder if the same can be said of the latest versions of this machine.

I refer to the latest reincarnation of the clockwork cat-teaser, appearing on customers' desks about now. This is the mouse that comes with Lisa, the all-bells-and-whistles computer from Apple. Now this machine has had a great deal written about it, much of which has been complimentary. I do not intend to follow this trend. Instead it is the clockwork cat-teaser that interests me, both for what it can do, and what it represents in user terms.

What the mouse can do, of course, is replace the keyboard of a computer for a wide range of man/machine interactions. It does this in a novel and user friendly way, by relating the top of a desk to the display. Move the mouse around the desk on its little wheels and the cursor of the screen will follow suit, mimicking the track that the mouse has taken. Get the mouse/cursor to the right location and then work can be done, either by pressing buttons on the mouse itself, or via the keyboard.

This is all pretty terrific stuff, the sort of thing that users' dreams are made of. It can also be the stuff of which users' nightmares are made, especially if the user has come to depend on the cat-teaser as the means of communication with the machine. You see, one of the biggest potential problems about the mouse is that, like so many other bits of the stuff of life before it, it is a nasty little mechanical object. As most people will know, nasty little mechanical objects have a boring tendency to break, usually just when you don't want them to.

There have been rumours (unfounded, unwarranted and totally scurrilous, I am sure) that some mice have already been known to . . . well . . . not actually work, shall we say. Either someone has wound the clockwork too hard, or the cat has jumped on it from a great height, causing some form of haemorrhage deep inside its works. Whatever the reason, mice are mechanical, and mechanical very often spells vulnerable to malfunction unless the design is like a tank.

'What the mouse can do, of course, is replace the keyboard of a computer for a wide range of man/machine interactions.'

If this starts to happen any more than occasionally, it could become something of an embarrassment to the mouse makers. They will be honour-bound to find some very heavy-handed cats to road test the devices to make sure they operate reliably under a wide range of conditions, and under a wide variety of positive and negative dexterity among the users.

Manufacturers will have to watch out for the fact that users will expect their mice to be operable: indeed, users will come to rely on them like they now rely on the keyboard itself. It would be a shame to spoil £N,000s, worth of hardware and software investment for two-pennyworth of naff mechanical engineering (which is normally the way I view such wonders as my car).

But why are people going to want to use their mice so? The short answer to that is operating systems, things like Smalltalk, the Lisa system, VisiCorp's VisiOn and Digital Research's Concurrent CP/M with the User Interface. With these, at last, the user is starting to get the sort of software service needed to match the potential of the hardware, especially the 16-bit GT computers that are now readily available.

The mice are just another example of the facet of the personal computer that marks the breed out from other types of computer system. They are all remarkably interactive. The human user can sit at the keyboard, watch the display, and get a level of interaction with the machine that in practice is many times faster than that available from most mini or mainframe machines. The mouse just adds to that interactive capability and removes one more layer of the mystique of computing.

That is all wonderful, isn't it? To which the answer is yes . . . but. The 'but' in question is a fast-disappearing one fortunately, for it is the problem of operating systems. Now, I suspect you may be thinking that there are no problems with operating systems. After all, CP/M has been around for years and has a wealth of applications software around to fit it. In the 16-bit market there is Microsoft's MS-DOS which, because of the IBM PC connection, seems set to become the dominant force in bigger machine operating systems. Everything is neat and tidy, so what can be wrong with the world?

But up until now, the personal computer has been predominantly a single-tasking machine, which has meant that it has had a remarkable tendency to become input/output bound. This is a neat form of constipation whereby every and all I/O-oriented tasks effectively plug up the works until completed. Perhaps the best example of this is the PRINT run from a word processing file. While the printer sits and chunters away as best it can on your 'N' page report, you might as well make a cup of tea, launch a takeover bid for GEC or go on holiday to the Bahamas. You won't get any sense or response from your computer.

It was precisely this particular problem which prompted Digital Research founder, Gary Kildall, to consider the subject of concurrency. Having to sit and wait for his machine to finish print runs made him aware that he could still be doing other things with it — if it had the right operating system.

His solution to this problem is Concurrent CP/M-86, an operating system that allows a 16-bit computer to run several different programs at the same time. This means that a spreadsheet can be producing figures that can be going into a word processing file that is currently being

BANKS' STATEMENT

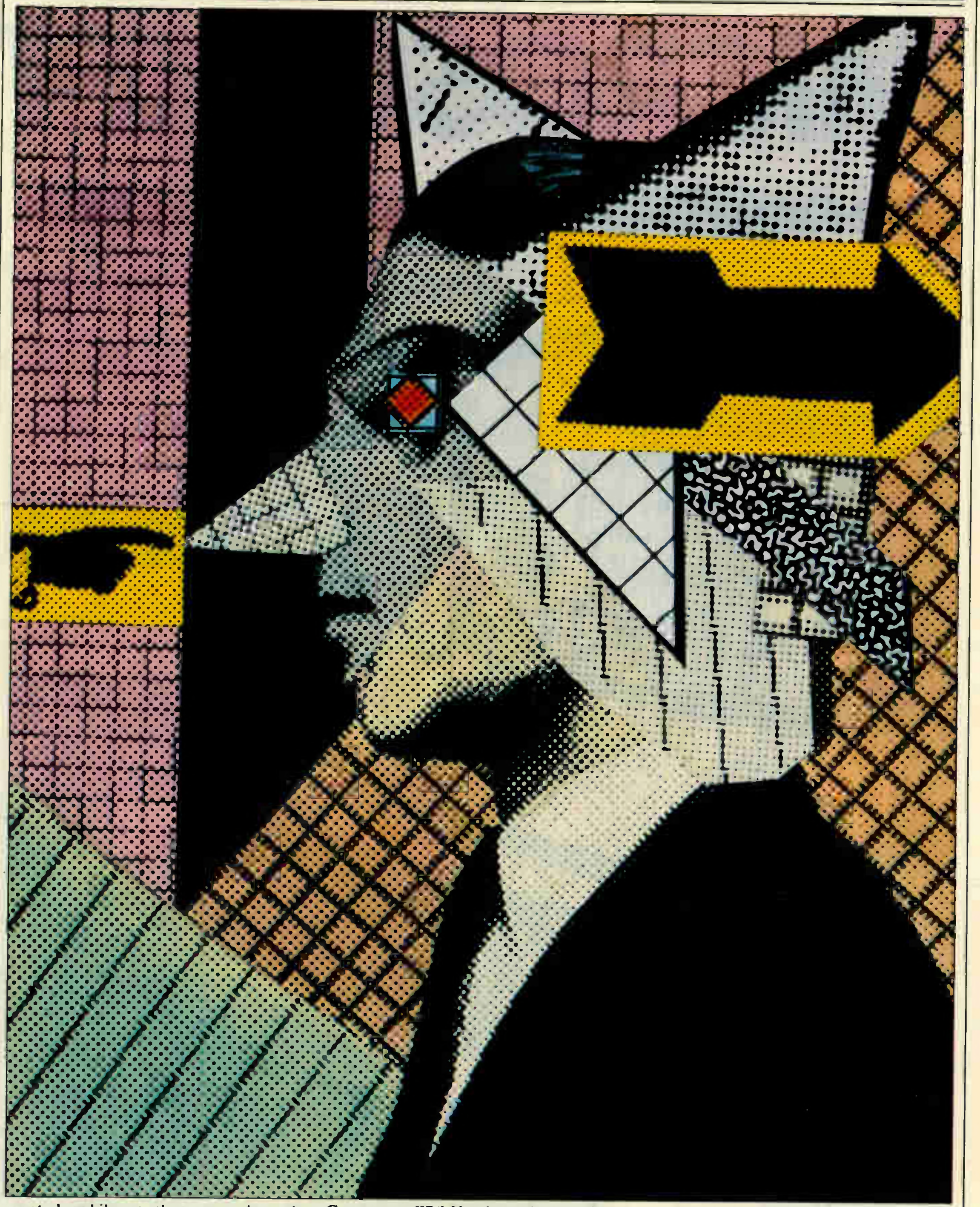


Illustration by Andrjez Klimlowski

created, while at the same time the machine is printing out previous efforts.

Couple this capability with the abilities of systems like Lisa or VisiOn, where screen windows can be created and manipulated as desired, and all these new GT computers actually start to live up to their promises on performance. Digital Research is hoping to have a window manager and mouse system available for Concurrent CP/M by the early part of next year — to be called the User Interface — so it will be in there fighting for a major slice of this important market. Single tasking could become an anachronism.

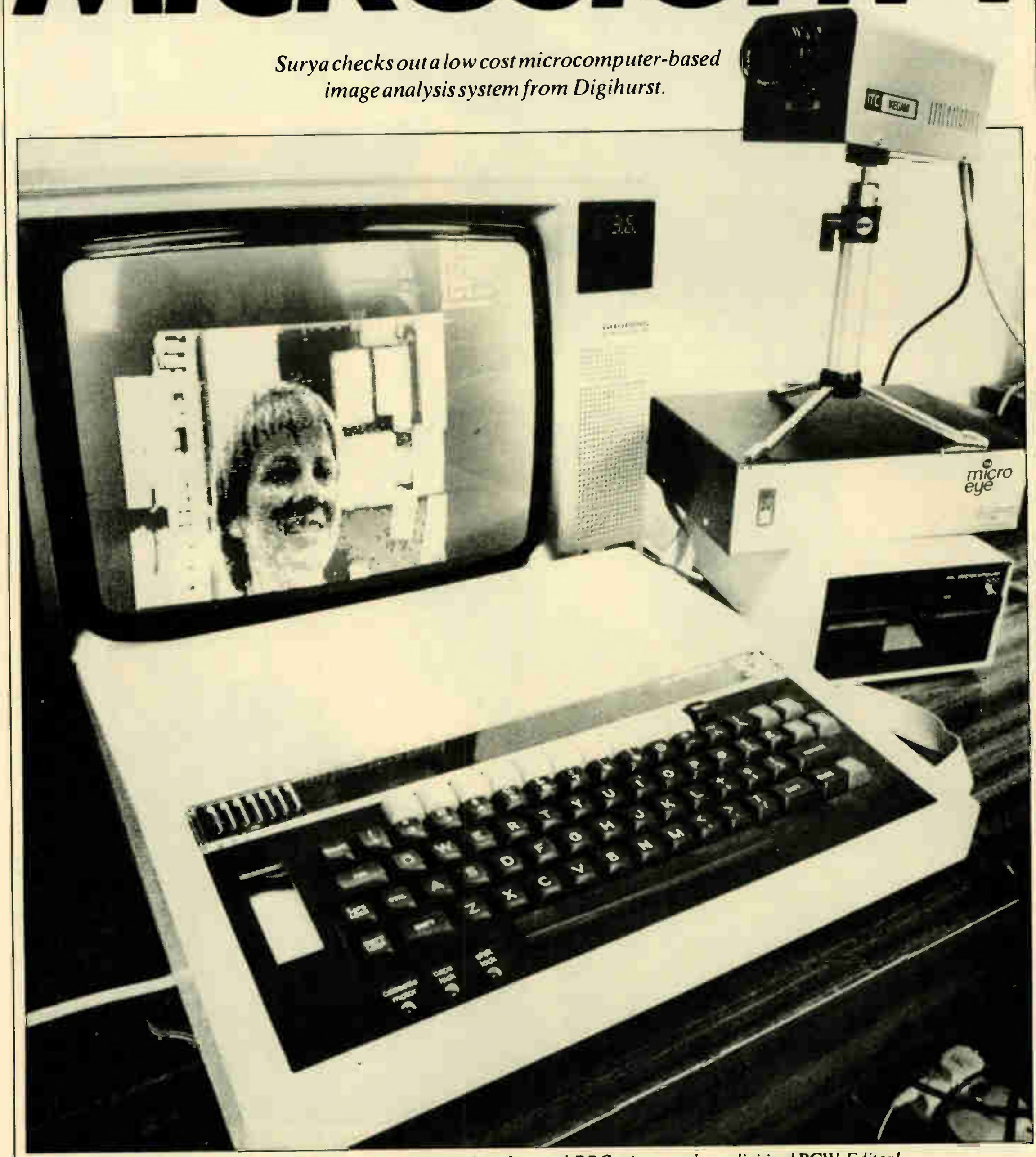
And if such systems can provide your computer with the right laxative to ease its I/O constipation, you are going to need equipment that allows you to keep up with the new, youthful, dynamic, healthy performance, which is where we came in. The mice, good idea that they are in theory, have got to prove that they are good in practice. They are going to have to work, well and reliably, despite coffee spills, being dropped, sat on or otherwise defiled.

Our cat soon got bored with its mouse, and it didn't live long enough to go for its first grease-up. END

CHECKOUT

MICROSIGHT 1

Surya checks out a low cost microcomputer-based image analysis system from Digihurst.



The complete system: closed-circuit TV camera, Microeye interface and BBC micro — plus a digitised PCW *Editor!*

Image analysis is a fancy-sounding title for the task of capturing an image and processing it in various ways. This processing may include such operations as storing the image on disk, combining it with other images, carrying out measurements, and so on. The major use of image analysis is in the field of quality control; checking components as they pass along a conveyor-belt. Other uses include applications as diverse as detecting stress patterns in metals to the 'have your portrait drawn by a computer' stands that appear at shows and exhibitions from time to time.

Since I'm going to be using the phrase rather a lot, I'll refer to image analysis as IA from now on (not to be confused with AI!).

IA systems traditionally run on minicomputers and cost from several thousand pounds up. What Digihurst has done with

Microsight 1 is to produce a low cost system using a micro rather than a mini as the host computer. The system currently interfaces to the BBC Model B, 48k Apple II, RML 380Z, Commodore PET and ACT Sirius 1. A disk drive is required. This review was carried out using a BBC B.

Overview

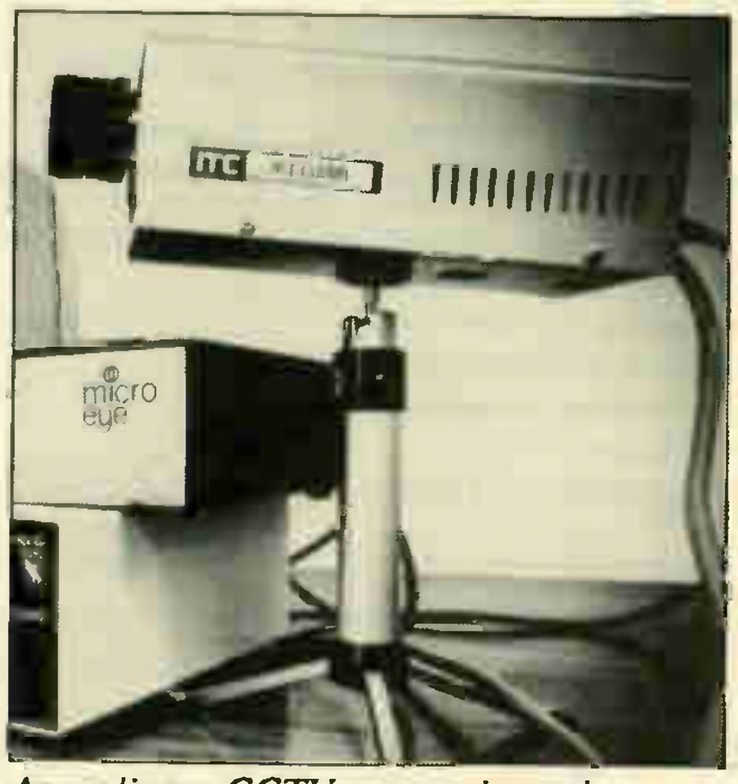
From the outset, I feel I should make two points. Firstly, although it is possible to use Microsight 1 for practical applications, the system does not readily lend itself to some of the more obvious uses of IA such as quality-control. Industrial applications, such as the conveyor-belt example already mentioned, require equipment that is both rugged — able to cope with dirt, dust and the odd knock or two — and fast. Quality control is often the bottleneck in a production process, and the whole idea of an automated system is to speed up the process. Microsight 1 is neither rugged nor fast.

Secondly, Digihurst is clearly not aiming at end users. While you don't need to be a technical whizz-kid, you do at least need to possess a good working knowledge of micros and to feel happy with the jargon which the documentation makes no attempt to avoid. You'll also need to be a competent, though not exceptional, programmer if you want to be able to do anything useful. The software supplied as standard does little more than prove that the hardware works, and at present only one piece of applications software is available (see Microscale below). It is left to the users to interface their own software to that supplied.

This said, I was generally quite impressed. At £570 for the basic system, hardware and software, Microsight 1 does make 'hands-on' experience of an IA system a practical proposition for schools, colleges and the more solvent hobbyist interested in experimenting with such a system.

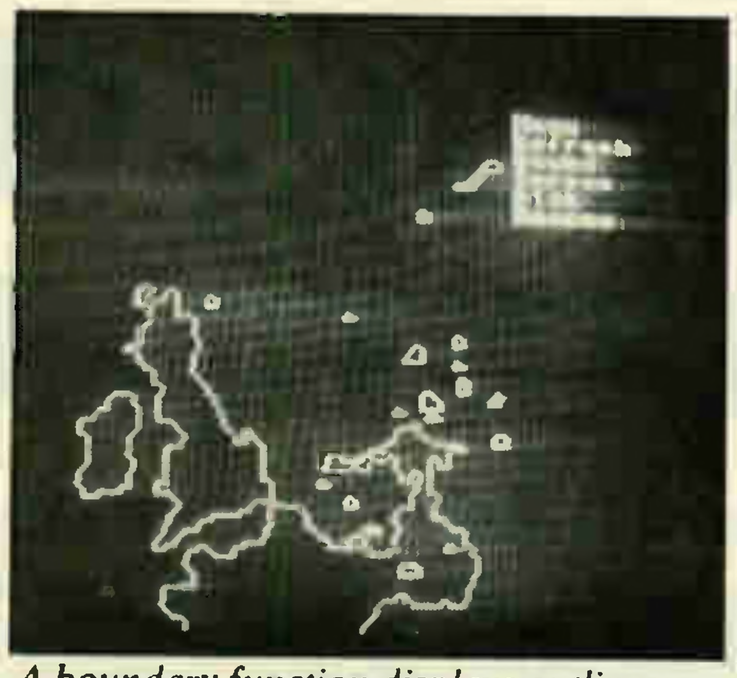
Hardware

The main hardware component is the Microeye interface. This consists of a 25×18×7cm box. The only control on the box is a large on/off switch on the front with the parallel interface and video socket on the back. The same uncluttered appearance is found on the inside, with everything neatly laid out on a single board (see photo).



An ordinary CCTV camera is used

The image is captured by means of a standard CCTV video camera of the type commonly used in High Street store security systems, and passed to the Microeye interface via a BNC to BNC cable. The Microeye interface then feeds the digitised image to the computer via an 8-bit parallel port.


A boundary function displays outlines


Map work is an ideal application

Software

The standard software supplied comprises a Basic calling routine, two Basic disk-handling routines and six machine-code programs.

The Basic calling routine is a very short and simple program to present the menu, process menu selections and transfer control to the appropriate disk-handling routine or machine-code program. The first of the disk-handling programs deals with transfers between disk and screen memory, while the second concerns itself with RAM transfers.

All the processing and display work is performed by the six independent machine-code programs. The exact facilities offered naturally depend on the capabilities of the host machine.

Documentation

The documentation comprises two spiral-bound A4 photocopied texts, each about fifty pages in length. The Microsight Manual gives an overview of the system, from both a hardware and software angle, while the implementation guide tells you about the version for whichever machine you are using.

The bulk of both texts consists of listings of the Basic and machine-code programs together with detailed technical explanations of same. This is essential if the user is to be able to produce custom-designed software for the system.

The Manual gives adequate, though not particularly expansive, explanations of both hardware and software. Once you've got hold of the basic principles of the thing and want to begin actually using it, most of the information you'll need is probably contained somewhere within the two texts. Whether you'll be able to find it, however, is another matter since neither text includes an index. I have other complaints about the documentation, the scarcity of examples being one of them, but the lack of an index is a glaring omission.

Overall, I felt that the documentation did little to aid the familiarisation process.

Using Microsight 1

Setting up the system is simplicity itself. Connect two cables, switch everything on, load the software and away you go. All being well, you will be presented with a menu of six options. Images are loaded into the micro using the R)efresh option. The camera is continuously sending signals to Microeye, but it takes five seconds for this image to be digitised and downloaded to the micro. Whatever is in front of the camera must remain (reasonably) still during this time.

I found that producing a recognisable image on the screen is very much a hit-and-miss affair, the documentation giving few hints. The camera seemed to be set for fairly low light levels, giving an over-exposed image in average office lighting even with the aperture shut right down to f16. It was usually necessary to switch off the strip-lighting to obtain a correctly exposed image.

When you feed in an image using the R)efresh key, the image is displayed using (in the BBC implementation, at least) about 25% of the screen. This allows fairly fast plotting when adjusting the exposure, focus, contrast and threshold value. Once a satisfactory image has been obtained, the C)olour option expands the image to fill most of the screen (a test window on the right-hand side is reserved for the menu).

The threshold value is set by the T)hreshold key, explained in the implementation guide as follows: 'Threshold allows the threshold value to be set during run time.' Uh-huh. A little experimentation suggests that this setting allows the exposure of a processed image to be adjusted. This can be used, within limits, to compensate for an under- or over-exposed image.

D)ump allows you to dump the image currently displayed to either D)isk or Epson P)rinter. N)omenu simply switches off the menu display (recovered using the space bar, though the documentation doesn't appear to mention the fact).

P)rocess transfers you to a second menu which enables you to carry out further processing. If you bought Microscale as

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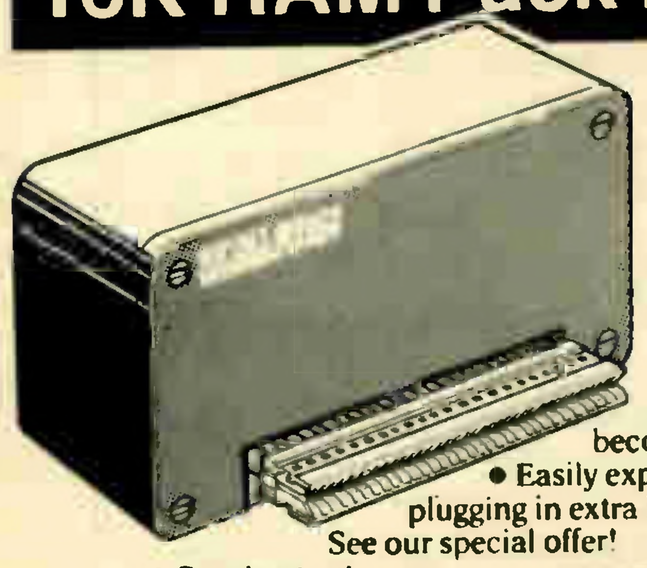

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MICROSIGHT 1

part of the package, then this will be called by the P)rocess option. P)rocess itself offers you only one further processing option, B)oundary. Boundary removes all shades of grey, displaying instead the boundary between black and white areas as a thin white outline (see photo). With Microscale present, you may then carry out measurements of the outlined objects.

Microscale

Microscale is an optional program costing £340. As the name suggests, Microscale is intended to facilitate the measurement of objects.

I don't want to appear greedy, and Microscale is a very nice piece of software, but if I were paying over three hundred pounds for a program, I'd expect a little more in the way of documentation than the three-and-a-half pages found at the back of the implementation guide. The documentation gives only a very brief explanation of what the various commands do without giving any examples of how to use the program for practical applications.

If you want to measure objects in millimetres rather than pixels, a perfectly resonable requirement one would think, you are given no help from the documentation. It is left to you to calculate the varying ratios between pixels and millimetres for different object-to-lens distances, and so on. With so little help from the guide, it was difficult to judge the quality of the program.

Microscale is used by guiding a cursor-arrow to mark points on the screen or to create rectangular 'windows'. The program will calculate the distance between any two marked points, the area within a window or the area and perimeter of a chosen boundary.

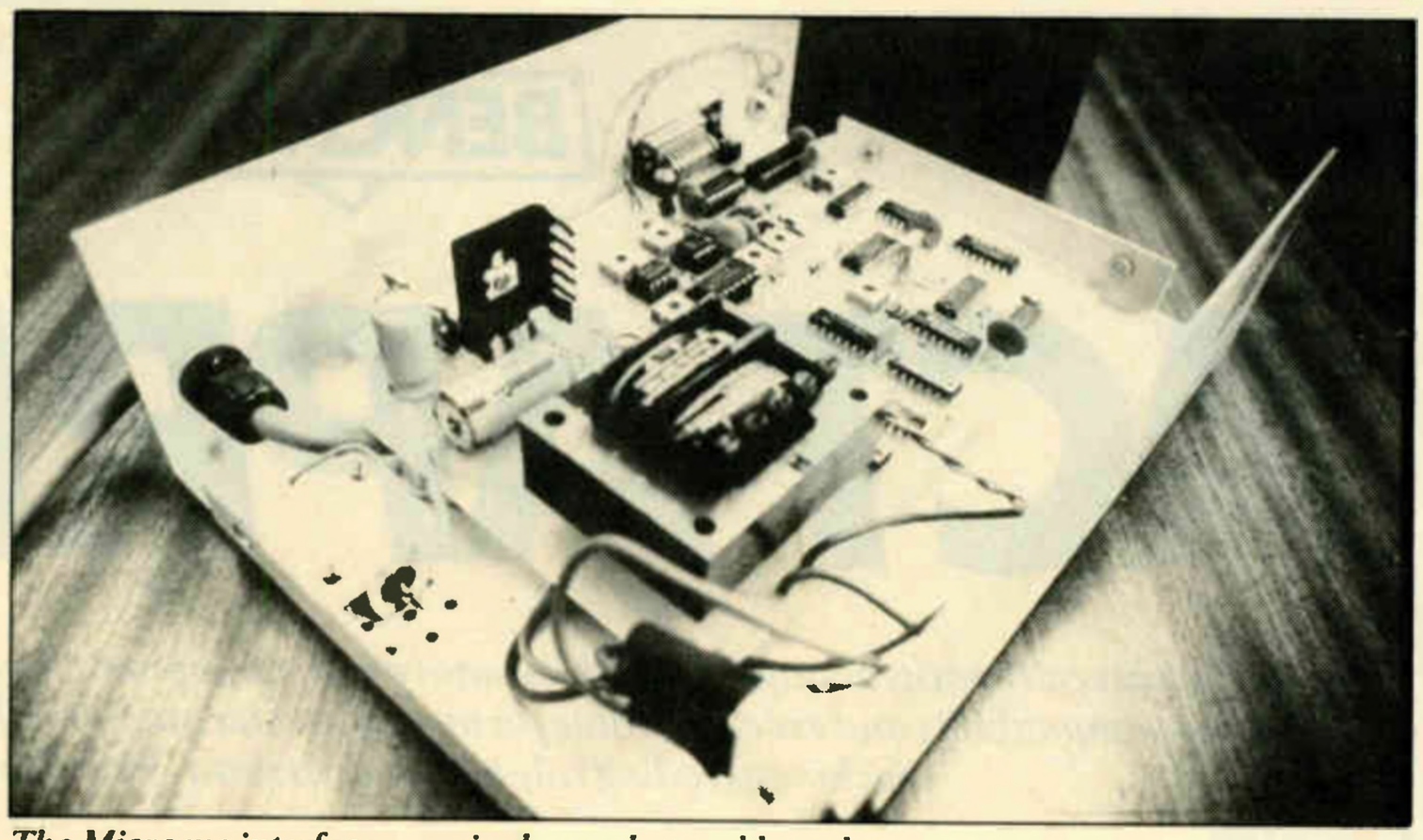
A section of the keyboard is defined as a keypad for moving the cursor in one of eight directions. To measure the distance between two points, you move the cursor to the first point, press the D)imension key and then repeat the process for the second point. The distance between the two is then displayed as x and y values.

To measure the area of an object, you use the B)oundary function to obtain an outline of the object then indicate the particular outline with the cursor-arrow. Pressing the A)rea key will display the area contained by the outline. A similar process is used to obtain a P)erimeter value.

Microscale is extremely easy to use and certainly seems to be a very powerful piece of software, but it really does require some adequate documentation to enable full use to be made of it.

Applications

Among the current users of Microsight are a pharmaceutical company using the system to detect growth in culture dishes, a dentist analysing dental charts, and someone, according to Digihurst, is using it to measure pebbles . . .!



The Microeye interface — a single, uncluttered board

As with most things in the computer world, the hardware may be ingenious but it's the software that counts. Microscale could be used for a number of applications in itself (measuring distances on maps, for instance), but most applications would require specially-written software to interface to the software supplied.

After my earlier, not particularly complimentary comments on the quality of the documentation as an introduction to the system, it has to be said that in the area of interfacing — both hardware and software — the manual and implementation guide really come into their own.

On the hardware side, the manual gives circuit diagrams of each part of the circuitry, a full description and diagram of the parallel interface connections plus a schematic diagram giving an overview of the complete system together with information on the main settings and possible adjustments.

On the software side, full listings are given of all the programs and routines together with a breakdown of what each section does. I didn't have time to do much in the way of experimentation, but it seemed simple enough — for example, to take one image every minute, storing the latest one on disk each time. With the extensive notes supplied explaining each of the programs and routines, a reasonably proficient programmer should be able to set up a simple applications system.

Conclusions

Microsight is obviously considerably less sophisticated than more expensive mini-based systems, but it is a working IA system suitable for research and educational use.

For practical purposes, Microsight 1 is likely to be somewhat limited in its uses. The lack of applications software restricts its use to the enthusiast, though software houses would doubtless produce custom-designed software to suit a given application — at a price.

The very fact of a micro-based IA system, however, is a significant achievement, particularly when a complete working system sells for less than £600. It brings practical experimentation and research into IA into the reach of schools and colleges as well as the odd dedicated hobbyist. The power of Microscale suggests that Microsight could form the basis of quite a sophisticated system given some well-written software.

To what extent it will be used for general applications will depend on the software produced for it. It is by no means impossible that the education and R&D fields will produce software which will prove useful in other, less specialised fields. Whatever happens, an interesting idea and a good bet for schools.

Prices

Microsight 1 (Includes camera, cables, interface, software & documentation)	£569.25
Microscale	£339.25
Microeye interface (if ordered separately)	£339.25

All prices include VAT. Microsight 1 is available for the BBC B, 48k Apple II, RML 380Z, Commodore PET and ACT Sirius 1. For other machines, contact Digihurst's technical sales dept. A more sophisticated, solid-state system is available for £3444.25.

For further details, contact Digihurst on (0223) 208926.

PS: Following my comment on the price of Microscale and the lack of documentation, Digihurst has informed me that it will be issuing an updated Microscale manual. With regard to the price, managing director Peter Kruger stated that the system 'is not a mass-produced item but requires an immense amount of tailoring to any particular application. We have not, so far, applied it to the same problem twice, therefore we have to include a large proportion of support costs with the software. We find it more honest to do this than to sell the product cheaply and then tell the user he has to pay the same amount again, or more, for a visit from us to apply it.'

END

BENCHTEST

ACT APRICOT

ACT has really got its act together with its innovation, the Apricot. User-friendliness, transportability, Sirius-compatibility and excellent value for money are star qualities which ought to guarantee this 16-bit machine a leading role in the micro show. Peter Rodwell reports.

ACT is a large and well-established force in the British micro business. It has a surprising number of facets, ranging from its well-known role as importer and distributor of the Sirius 1 to a time-sharing bureau service, supplier of pre-printed continuous stationery and software house. It seems only logical, then, for it to go into microcomputer manufacturing, and to do so in a big way.

ACT now has its own factory in Scotland, capable of churning out one computer a minute. And those computers will be its very own machine, the Apricot.

'Apricot' as a name actually started as an in-house project code name rather than an attempt to exploit the popularity enjoyed by other machines with fruity names. It is in fact a very rough acronym for ACT's full name, APplied COmputer Techniques — geddit?

As a result of ACT's Sirius activities, and its close links with Victor, the Sirius manufacturer, the Apricot has been subjected to two important developments.

Firstly, it is software compatible with the Sirius, an important attribute as there is now a large amount of software available for the latter. This is a bold step at a time when almost everybody seems interested in making only IBM PC claim-alikes, and certainly must have caused a few surprises over in the US, where the industry seems to think of very little other than IBM compatibility. But thankfully, the IBM PC does not have the same strangle-hold on the European market, which is to our advantage as we have more variety, choice and innovation.

The links with Victor provided a second bonus for the Apricot — Victor will sell it in the States and world-wide (apart from the UK, obviously) through its now well-established network. The agreement in fact allows Victor to build the Apricot in California and ACT to build the Sirius in Scotland, although it seems unlikely that this cross-manufacturing will take place at any significant level to begin with — I gather that ACT may make 500 or so Sirius machines in Scotland this year, but that seems to be as far as it's going at the moment.

The Apricot's basic concept was originated within ACT and an outside company — QED — was contracted to do much of the detailed design. This was then refined within ACT and the software all developed in-house too. Headquarters for Operation Apricot is ACT's Advanced Technology division, a group of white-hot technocrats housed in a splendidly luxurious mansion in Dudley, known throughout the rest of ACT as 'the zoo' because of its proximity to Dudley Zoo rather than because of the behaviour of its occupants.

ACT has set up a slick manufacturing operation along very similar lines to that of Victor: the PCBs are made, stuffed and thoroughly tested in Japan and the keyboards and disk drive assemblies are also bought in. (I'm told they'll be taking delivery of two juggernauts full of disk drives *per day* at the factory!) ACT's operation is thus a matter of assembling ready-made modules, putting them into a casing and giving the completed machine another thorough testing before it's packed and despatched.

Hardware

The Apricot comes in a stylish, beige, injection-moulded, three-box design and is, considering the power it packs, remarkably small. The main box, housing the CPU, RAM and disk drives, is 42cms wide, 10cms high and 32cms deep, approximately, and the keyboard is very slightly narrower, about 18cms deep and tapers from 5cms high at the back to 1cm at the front.

Sensibly, ACT refrains from describing the Apricot as a portable computer, preferring the term 'transportable', which sums it up quite neatly, for while the main box and keyboard together weigh only 8kg, the monitor is of course separate. Here it is unlike the supposedly portable — but much heavier — Osborne-type of machine which has the screen built in.

The transportability is aided by a neat arrangement for clipping the keyboard to the underside of the main box, with small pegs to hold its coiled cable. A flap pulls down to cover the disk drives and a toughened polycarbonate carrying handle pulls out from the box just under the front edge for easy carrying. This leaves you with one hand free to carry the monitor (which also has a carrying handle moulded into its casing). However, ACT envisages that really keen Apricot transporters may want to buy two monitors — one for the home and one for the office, perhaps — and has therefore priced the monitor separately.

I think the Apricot design is a good compromise; truly portable computers won't appear until a reasonably-priced flat screen appears and the current 'portables' are really far too heavy to live up to their description. Interestingly, ACT investigated the possibility of using a flat plasma display on the Apricot, but went off the idea when the supplier quoted a price of something like £4000 per display — in quantity!

At the back of the main box is a row of sockets: power (with a fuse holder and illuminated on/off switch nearby), monitor, serial port, parallel port and keyboard. Undoing three screws on the back panel opens up the entire case.

Inside, there's a main PCB — which can slide right out for easy servicing — under the power supply and disk drives. Everything is remarkably neat and tidy, to the point that ACT anticipates no trouble in passing any electrical safety standards with the Apricot.

The Sony microfloppy drives are beautiful pieces of engineering and, says ACT, very, very reliable indeed. They are virtually silent, apart from a soft click as the computer turns them on and accesses them. The disks themselves come in hard plastic cases with a spring-loaded metal shutter which protects the disk's surface from dust, fingers, etc, when it's not in use. There's no door on the disk drive — you just push a disk in until it's fully home and the drive automatically opens the shutter. Retrieving a disk involves pushing a small button on the front panel, at which the disk pops out, with the shutter automatically closed. The disks are, of course, far more robust than 5¼in floppies and, because of the hard case, you can write on the label with no danger of damaging the disk inside.

Currently the Apricot is supplied with one single-sided drive in its basic configuration. Disk capacity is 315 kbytes, but a double-sided option will be available later in the year to give double this capacity. ACT is considering offering a hard disk Apricot: a 3½in, 10Mbyte winchester disk drive, which will sit in



place of one of the floppies.

The machine is based on the 8086 CPU. Unlike the 8088 used in the Sirius, this has a true 16-bit data bus and requires its memory to be arranged in 16-bit words rather than 8-bit bytes. This proved rather an expensive arrangement when IBM was designing its PC over two years ago, hence its decision to go for the 8088, but today the price differential is very small. There is an empty socket next to the 8086 for an 8087 maths co-processor, available as a dealer-fitted option.

The Apricot comes with 256 kbytes of RAM as standard and two internal expansion sockets allow this to be expanded to 768k. The expansion bus is ACT's own design but full details are contained in the machine's documentation to allow outside companies to develop compatible cards — one company is already preparing a full IEEE-48 interface card. Two pop-out panels at the back allow sockets to be fitted for any add-on interface cards. Currently,

ACT APRICOT

ACT plans to make only two cards — a memory expansion board and an auto-dial modem.

The machine comes with only two I/O ports — a Centronics parallel printer port and a software-programmable serial port. See the 'Systems software' section for details of how this port — and other system parameters — are set up.

The monitor offers exactly the same display as the Sirius: 25 lines × 80 characters and 800 × 400 dots graphics resolution. Despite its small size, I found it perfectly clear and readable and it even uses the Sirius character set, which I think is one of the best around. Unlike the Sirius, though, it has a hardware brightness control (the Sirius display — brightness and contrast — is operated entirely from the keyboard). The monitor swivels and tilts and can also slide from side to side in a groove in the lid of the main box. You'd have to be a pretty peculiar shape to be unable to get the monitor in exactly the right position!

Regular *PCW* readers will know that I am very particular about keyboards, mainly because a lot of my time is spent processing words and a keyboard can make the difference between writing several thousand words in a day or spending hours correcting mistakes and swearing. Straight away, I'll say that the Apricot has a *superb* keyboard with exactly the right kind of feel



The 'transportable' Apricot is precisely and expertly designed with the keyboard clipping neatly to the underside of the main box.



The keyboard is clearly in a class of its own with its outstanding feature being the two-line character LCD Microscreen.



Monitor swivels, slides and tilts.

to it — for me, that is, as it's always a personal matter.

It has 96 keys and, like the Sirius, almost every key can be programmed to produce whichever character you like or even whole character strings. Attributes such as whether a key repeats when held down and whether its code is sent to the program being run or is intercepted by the operating system as a display control code are similarly programmable. The Apricot comes with all the keys set to auto-repeat if held down for a short while. An electronic keyclick is emitted from a surprisingly large elliptical speaker within the main box. Interestingly, ACT found that the cheapest way of providing both keyclick and 'bell' was with a Texas Instruments SN 76489 programmable sound generator chip, as used in many home computers and games machines; as full details of the chip are included in the Apricot technical manual, you could add suitable sound-effects to an applications program — zapping noises as a word processor deletes characters, maybe?

After the width of the Sirius keyboard, it feels a little cramped at first but this is mainly because there is no spacing between the main qwerty block, the editing keys and the numeric pad. The keyboard takes its power from the main unit and transmits *and receives* information via a serial link. The system reset key is recessed into the right hand edge of the keyboard and needs to be held in for a second before it takes effect. There's a power-on LED, neatly sited so it forms the dot in the 'i' in the Apricot logo.

If you think the idea of a keyboard receiving information is a little odd, then you have to realise that the Apricot keyboard is no ordinary keyboard. Firstly, it contains a clock/calendar chip (with a 9v battery to power it in a small compartment underneath); and it has its own processor and 'intelligence'. But its outstanding feature is the Microscreen. This is a two-line, 40-character LCD display mounted in the top right hand corner, with a row of six touch sensitive function keys along its lower edge, each of which has its own LED.

When the Apricot is first turned on, the Microscreen displays the date and time. To the left of the Microscreen is a row of pre-set function keys (although of course they can be programmed to produce whichever codes you like): 'help', 'undo', 'repeat', 'calc', 'intr' (interrupt), 'menu' and 'finish'. Pressing the 'calc' key turns the Microscreen into a calculator, with each of the touch-sensitive keys labelled on the Microscreen. One, 'send' will transmit the result of your calculations to the computer so that it appears on the screen wherever the cursor happens to be, just as with the Sirius on-screen calculator. But unlike the Sirius, the calculator software is held in ROM; you can switch the Apricot on and calculate away without first putting in a disk and booting up the operating system.

The Microscreen would be pretty impressive if this was the total of its abilities. But the stroke of genius in its design is to make not only the keys programmable but to allow an application program to download *text* to the LCD. So you can set up labels of up to two lines of six characters for each of the six function keys and change them to reflect the changing role of each key as your program moves from level to level. The arrangement is much tidier than taking up the bottom row of the main display for function key labels and although it makes a program Apricot-specific, the chances are that a good programmer will already have made this aspect of his software easily modifiable to fit various machines anyway — with most business micros (and some home machines) now appearing with programmable function keys, there's really no excuse for an applications package not using them. I will talk more about programming the Microscreen in the 'Systems software' section.

One problem with LCD displays is that you need to be at the right viewing angle to see them properly. Like Epson with the HX-20, ACT thought of this and there's a viewing-angle control — actually a small thumbwheel — on the right hand edge of the keyboard next to the reset button. (And because the reset button is recessed, there's no danger of hitting it accidentally as you grope for the thumbwheel.)

Apart from the 'calc' key, the only other pre-set function key which is set up to do anything is the 'print' key: this simply dumps whatever's on the screen to the printer, although this is done in text mode, not graphics. Incidentally, all the function keys produce different key codes to the Sirius, although of course they can be re-programmed; as anyone writing a program which uses fancy display attributes (underlining, reverse video, etc) will know, this is the sort of thing which varies wildly between terminals and computers anyway and the appropriate handling routines have to be made easily alterable.

Naturally, there are full cursor control keys, five editing keys, a caps lock with a LED indicator, and a 'stop' key (which generates CTROL-S to stop text scrolling up the screen and which also has a LED). The only omissions I could think of are the screen attributes keys *à la Sirius*; these are actually a nuisance if you hit them

accidentally so I re-programmed mine to produce bold and underline on/off toggle codes for WordStar, which is very handy and which I immediately missed when using WordStar on the Apricot.

The keyboard also has a small socket along its back edge for a mouse, although at the moment no suitable rodent had been captured. I get the impression that the ACT people are as unenthusiastic about mice as I am but just in case the beast isn't merely another manifestation of Californian trendiness, the interface is there.

That just about wraps up the hardware side of things; the machine is well designed ergonomically as well as from the production and maintenance points of view and incorporates features — particularly the Microscreen — which can truly be described as innovative.

Systems software

The Apricot is supplied with three operating systems as standard, all included in the price: MS-DOS version II, CP/M-86 and Concurrent CP/M-86. I have already written at length in *PCW* about the first two of these — they are both single-user, single-tasking operating systems which offer broadly similar user interfaces but have significant differences. I have never been able to decide which I prefer; I have both CP/M-86 and MS-DOS I on the Sirius and find myself using the former most of the time as all but two of the packages I regularly use run under CP/M-86. CP/M-86 wins out on simplicity and straightforwardness; MS-DOS has the friendlier and more forgiving user interface, although with version II it starts to become over-complicated by offering a hierarchical directory structure which is of little use unless you have a hard disk.

Of Concurrent CP/M-86 I can say very little at the moment as time has not allowed me to get to know it much. It allows you to run several programs simultaneously and you switch from one to the other using 'virtual screens'. A more detailed explanation of this follows in next month's *PCW* with a fully-blown review of Concurrent CP/M-86.

But it would be inaccurate to dismiss all three operating systems on the Apricot with the above couple of paragraphs, for ACT has put a lot of time and effort into tailoring them to work with the Apricot and to make all of its features easily accessible to user and programmer. All three operating systems share a basic principle in the way in which they can be implemented on a computer. A large part of the operating system code is written so that it will work with any 8088/8086 computer — the part with handles the disk drives, for instance, falls into this category. However, there is always some information which is specific to the hardware and which changes from machine to machine. This could be as simple a matter as the I/O port addresses or it can be extremely complicated because the computer has unusual or unique hardware facilities — like the Apricot's Microscreen. All of this machine-specific information is confined to one area of the operating system called the BIOS (Basic Input/Output Section) and it is left to the computer manufacturer to write his own, custom-tailored BIOS according to the requirements of his machine.

By micro standards, the Apricot BIOS is enormous: look at the MS-DOS memory map and you'll see what I mean. In fact the operating system takes up a bumper 128k or half the basic machine's RAM but it contains some interesting features in the area between 0800H and E000H on the map.

To allow the display's character set to be changed under software control, it is held in RAM. Obviously, there must always be at least one character font in RAM but immediately above this is an area of memory into which an extra two fonts can be loaded, with the machine switching under program control between the two. The keyboard tables are also held in RAM. To explain, the keyboard (like that of the Sirius) doesn't generate ASCII codes but 'logical key codes': these are trapped by the operating system which looks up a table in RAM containing the autorepeat, etc. attributes and ASCII codes assigned to each key. This is what makes it so easy to reprogram the keyboards on both machines.

A 40 kbyte block of RAM is provided within the BIOS area for use in several ways. Firstly, it can be used as a disk cache, an extra-large buffer which can hold large chunks of files or even entire files, thus speeding up disk operations tremendously. It isn't quite the same thing as a RAM disk (which can also be implemented on the Apricot) as it becomes in effect an extension to a disk drive rather than appearing as a separate, conventional disk drive. This area of RAM can also be used to hold the second and third character sets, or it can be used as a bit-mapped graphics area to provide 800 × 400 graphics resolution display. Just how these choices are made will be explained in a moment.

The primary purpose of an operating system is to provide a standard interface between an applications program and the hardware. Thus, the applications programmer needs to know nothing about how the computer works, what port addresses to use for I/O and all the gory details of the disk system — he simply uses a standard set of subroutines within the operating system to perform these functions, with the result that the program will work on any computer equipped with the same operating system.

When handling I/O to the disk, the operating system uses files — the things you see listed when you ask for a display of the disk directory — and this same method is used for other I/O channels such as the printer and console, usually with the names "PRN" and "CON" respectively. ACT has built another I/O file into its BIOS, called "MSCREEN" for sending text to the Microscreen, as mentioned earlier. For example, from Microsoft Basic you would do something like:

```
10 OPEN "O",1,"MSCREEN"
20 PRINT #1,"A MESSAGE TO THE
        WORLD"
30 CLOSE 1
```

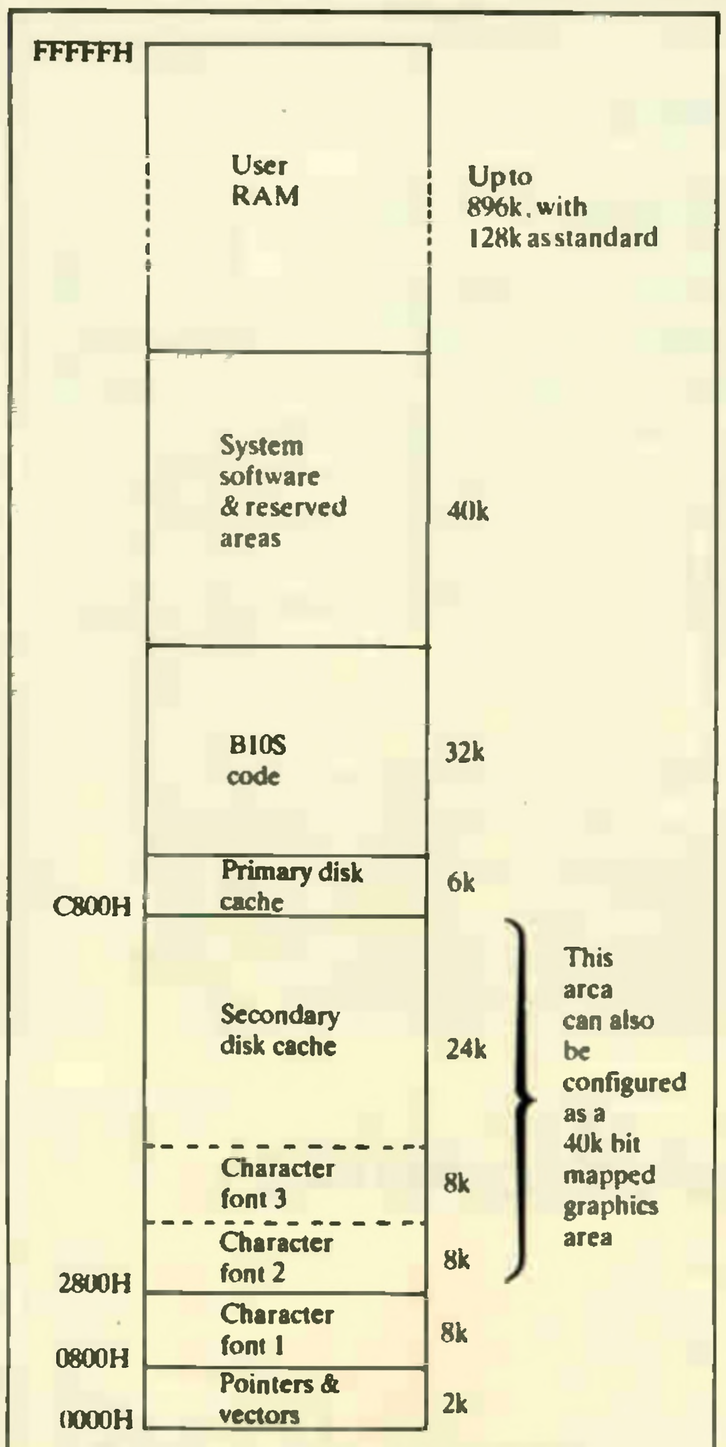
to get the text A MESSAGE TO THE WORLD onto the Microscreen: the message appears when the file is CLOSEd, not when you actually print it, so you can send a screenful of key labels, etc. and have them appear instantaneously as soon as the file is closed. Using the Microscreen as a calculator erases the display temporarily but it is restored when you turn the calculator off. A whole range of escape codes is available to scroll text, move the cursor around, etc. on the LCD. A simple escape code will restore the time/date display for neatness at the end of the program.

The clock/calendar in the keyboard is, incidentally, fully interfaced to MS-DOS so that when the system is first booted up it gets the correct time and date from the calendar and you don't need to type these in after every reset, unless of course they're wrong for some reason, in which case, resetting them from MS-DOS also resets the clock/calendar chip and — if it's displaying the date and time — alters the Microscreen display too.

The main display driver uses the same escape codes as does the Sirius, and the two



Pop out panels at the back allow sockets for add-on interface cards.



Apricot Memory Map: MS-DOS Operating System

machines are virtually 100 per cent software compatible — I transferred a couple of packages from the Sirius and they ran perfectly with no trouble at all. In fact the only area of incompatibility I discovered was with the codes generated by the function keys.

ACT has, however, added a few rather neat tricks to the Apricot which aren't — sadly — available on the Sirius. By sending ESC "," to the screen, you can define a screen window by following up with the top line, bottom line, left column and right column numbers. This is almost — but not quite — full windowing, as what it actually does is to confine all further activities on the screen to the area you have defined and you can only set up one such area at a time. Escape "." restores the 'window' to the full screen size. There is also a group of escape codes which allow you to scroll the display up, down, left or right by a specified number of characters. Like the Sirius, it can display underlined, bright and reverse video characters, although not many applications packages can be configured to use these — I'm still looking for a word processor which I can set up to display underlined or bold characters on the Sirius screen using the display's underline and bold capabilities.

Utility software

Utilities are programs which allow you to perform various 'housekeeping' chores like configuring the serial port, formatting disks, etc. Some are provided with each operating system and, generally, a computer manufacturer will throw in a few more specific to his machine.

ACT has done a great deal more than 'throw in' a few utilities to take advantage of the Apricot's facilities. Recognising that most of the users in today's business micro market have neither the time nor the inclination to learn about computers — they just want to *use* them — ACT has provided what must be the friendliest and easiest-to-use set of utilities on the market.

Firstly, there's a program called the 'system manager' which really is rather more than a utility. The idea is that the user should never have to see the 'A>' prompt of the operating system, unless he deliberately chooses to. Instead, almost everything can be handled from the manager, a friendly, menu-style 'front end' specifically designed for ease of use by a 'computer-naive' user.

The system configuration package is the best I have ever seen and makes beautifully easy the whole — usually messy — business of programming the serial port baud rates and framing, choosing the normal character set and keyboard table and setting things like the keyclick and bell volumes, the length of the delay for which a key must be depressed before it starts to auto-repeat and the speed at which it repeats. The click and bleep volumes, for instance, are depicted graphically rather than as numbers (see photo).

The configurator also allows you to choose how that big block of memory in the BIOS is used. No technical questions are involved, simply a choice of using the Apricot for software development (no disk cache) or for applications (big disk cache) or for graphics.

All this information is kept on disk and the configurator displays the current settings as you work through each item. Once you've finished, the new configuration is written to disk and can be transferred to other disks, too, along with the operating system, or you can set up different configurations to suit different applications. Although you can set up these configurations on the Sirius, you have to rebuild the entire operating system to use them, which is not really satisfactory.

Like the rest of ACT's utilities, it uses a graphical device, called the ladder, to act as a menu, and choices are made by flicking this up or down with simple keystrokes (or with a mouse, even). It also incorporates a help facility which provides on-screen descriptions of each operation and each choice. A most impressive piece of software, which could act as a lesson to many other manufacturers.

Other ACT-generated utilities include editors for character sets and keyboard tables which allow you to generate your own very easily and simply; these can be saved on disk too, again a better arrangement than on the Sirius. There are utilities which allow you to change the character font for another on disk, and restore the original afterwards, and there's one which does the same for the keyboard tables. At the moment, an applications program could only take advantage of these if the appropriate commands were inserted in a batch or submit file, but a later release of the BIOS will allow this to be done within an applications program. ACT has also written its own print spooler (currently for MS-DOS only) which will print out text while you carry on with something else and there's an asynchronous communications package which comes with the machine.

Languages and applications

As supplied, the Apricot comes with Microsoft's Basic interpreter and run-time support packages for compiled Microsoft Basic and Cobol programs, and Digital Research's Personal Basic interpreter. Of Microsoft Basic we have already written *ad nauseam* in *PCW* in the past. I was somewhat surprised, when I ran the Benchmark timings to discover that, while the Apricot is well up on the speed list, it was still slower than the Sirius (on which I re-ran the Benchmarks, as the timings published with the Sirius Benchtest were taken using a pre-release and *very* inefficient version of Microsoft's Basic 86). And it was in fact slower than the ACT 800, a now-obsolete 8-bit monster which ACT is still trying to live down.

Unfortunately, DR's Personal Basic was not available by the time this Benchtest went to press so I can't comment on it; in any case it deserves an article of its own . . . The same applies to the Digital Research graphics module GSX, which will run under all three operating systems. This frees the graphics programmer from hardware considerations in the same way as operating systems do for more mundane tasks and DR plans to incorporate it into its operating systems eventually. The idea is simple: as details like screen resolution and available colours vary widely between machines, it's a real pain trying to write a graphics program to run on more than one specific computer. GSX provides a standard interface to an applications program so that as far as the programmer is concerned, he is writing for just one machine. When a manufacturer installs GSX on his computer, he gives it details of his machine's actual capabilities just as he configures an operating system BIOS and GSX then translates the program's graphics instructions into the nearest actual operation possible on the machine.

ACT is also producing its own relational database program, 3D, for the Apricot and this will also have to await a future Database Benchtest as it was not ready for the Benchtest time (early August). This, too, will come free with the machine.

An impressively hefty range of extra-cost software will be lined up for the Apricot by launch time. On the languages side, there will be Microsoft's Basic, Fortran, Pascal and Cobol compilers as well as its Macro86 assembler. From Digital Research comes the CBasic86 interpreter and compiler, C, PL/1, Pascal MT+ and CIS Cobol LII compilers and the ASM86 assembler, plus DR's DR-Graph, DR-PLOT and DR-4010 graphics packages. Naturally, ACT's Pulsar range of business software is being transferred and

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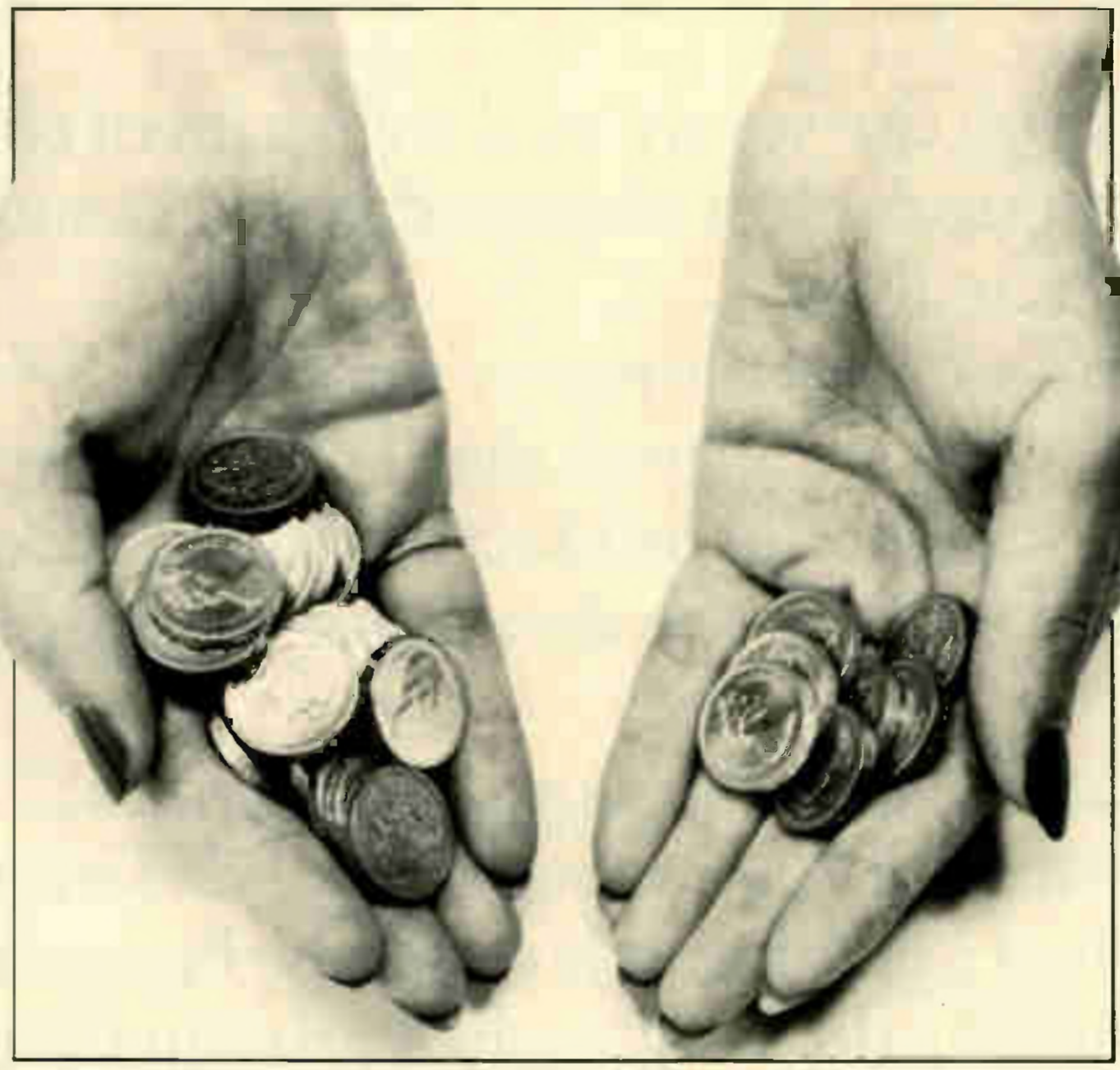

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Your chance to win one of three prize APC computers for your business or home by simply demonstrating your skill as a businessman.

NEC Business Systems (Europe) Ltd, a leading supplier of computer and communications systems worldwide, offers readers of Personal Computer World the chance to win an Advanced Personal Computer ('APC') complete with any three modules of your choice from the NEC Business Controller software range from Systematics International.

NEC Business Systems (Europe) Ltd's APC, launched onto the UK market earlier this year, is a 16-bit personal computer with the ability to support up to 640k of main memory. Offering a choice of operating systems, including the CP/M-86 system, the APC is based on an NEC-manufactured 16-bit 8086 compatible microprocessor.

The APC also features high resolution graphics, eight-colour display, disk storage capacity of 2 Mbytes, a standard main memory of 128k and a comprehensive range of applications software. Included in the prize is your choice of any three modules from the NEC Business Controller range, supplied by the award-winning company, Systematics International, the UK's most successful micro software house. This general business software range covers sales, purchase and general ledger; invoicing; stock control; payroll: job costing; and business planning.

The NEC Advanced Personal Computer offers a choice of operating systems. It can support CP/M-86, MS-DOS and the UCSD p-System. Coupled with eight-inch disk drives, this facilitates transporting software and data to the APC.

The APC comes in two basic models: monochrome and colour. All three machines to be won in the competition are colour models, incorporating dual 1Mbyte floppy disk drives, with a high resolution monitor showing a display of eight colours. The APC has a high graphics resolution of 1024 × 1024 pixels — with a moveable window of 640 × 475 pixels which can be displayed at any one time.

The keyboard includes 22 dual-mode, user-definable function keys, providing 44 optional ways in which to simplify system and application program use. Also standard on the APC is a numeric key-pad and full set of cursor control keys.

The prize APCs to be won come in colour, complete with graphics board, CP/M, and a financial modelling system, as well as the Systematics software package.

Rules

There is no entry fee, but each attempt must be on a proper entry coupon cut from Personal Computer World, and must bear the entrant's own name and address.

All accepted entries will be examined, and the prizes awarded to the three entrants who, in the judges' opinion, have shown the greatest skill and judgement in placing the 12 listed features in the order they would most successfully contribute to the efficiency of a business.

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The prizes must be accepted as offered. There can be no alternative awards, cash or otherwise. If any winner is under 18, then parental consent must be provided before the prize can be awarded.

Entries received after *the closing date* of *October 15, 1983,* will be disqualified, as will any entries received altered, mutilated, illegible, or not complying with rules and instructions exactly. No responsibility can be accepted for entries lost or delayed in the post. Proof of posting cannot be accepted as proof of receipt.

The judges' decision will be final and legally binding. No correspondence can be entered into.

The competition is open to all readers in Great Britain, Northern Ireland, Eire, the Channel Islands and the Isle of Man — except employees (and their families) of Personal Computer World, Systematics International, or NEC Business Systems (Europe) Ltd.

The judges are Alan West, Marketing Manager, NEC Business Systems Europe, Ronald Young, Managing Director, Systematics International and Jane Bird, Editor, PCW.

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PCW 159

BENCHTEST

ELECTRON

With the extensive range of software currently available for the BBC Micro, the Electron, at under £200, sounds like a wise investment. Steve Mann puts Acorn's new machine through its paces.

It's an exaggeration — but not too much of one — to say that the BBC Model A is the Ford Edsel of home computing. For those of you that don't know your history, let me say the the Ford motor company was convinced that the Edsel (named, incidentally, after Henry Ford II's father) was a sure-fire smash — not ultra-cheap but bringing the qualities of much more expensive cars into the mid-range market. The car was a lemon — it sold hardly at all and for years provided a generation of stand-up comedians with comic fodder. This was a bit unfair — it was certainly no Rolls-Royce but by all accounts the Edsel wasn't *that* bad.

When the BBC decided that its viewers should become computer-literate, it shopped around for a computer to go with the television series *The Computer Programme* and plumped for Acorn as the manufacturer. The machine that Acorn came up with — which became known as the BBC Model B — was designed with expansion in mind: extra processors could be hooked on and there was a whole host of spare sockets for additional ROMs, together with expansion ports and various other channels for communicating with the outside world. Of course, all of this cost money and the BBC was not a little worried at the thought that it could be pricing itself out of the lower end of the market. To rectify this situation, the Model A was designed. This was basically a chopped-down Model B, with all the B's features but minus the expansion facilities. It was £100 cheaper and, not surprisingly, was expected to be the bigger seller of the two computers. That was the theory, anyway. In fact, almost everybody wanted the Model B. Acorn was not geared up to produce the large numbers of Model Bs that were required and the horribly familiar production delays ensued. The Model A was soon all but forgotten.

Now Acorn has come up with what at first sight appears to be a revamped Model A. Externally, the Electron resembles Acorn's earlier Atom rather more than it does the BBC, but the new machine is very, very similar to the Model A or B. Aimed squarely at the Sinclair/Oric/Dragon market, the Electron offers all the advantages of BBC Basic at a very competitive price and the fact that large numbers of potential users will be familiar with the BBC machines through their use in schools, together with the vast amount of software developed for the BBC Micro and able to run with little or no modification on the new machine, means that the Electron has a head start in this most cut-throat of markets.

Hardware

Manufactured in creamy beige textured plastic and measuring 34cms by 16cms by 5cms, the Electron gives the impression of being all keyboard. It has a satisfyingly solid feel to it and generally gives the impression of being a very classy product indeed. Acorn has no need to resort to the misleading phraseology other manufacturers adopt in an attempt to disguise keyboard deficiencies — 'typewriter pitch', 'full-size moving keys', 'ergonomic design', etc, etc, *ad nauseam* — the Electron has a normal keyboard with spacebar that is perfectly suitable for touch-typing. The standard qwerty layout is augmented by the usual control keys; the Electron closely emulates the BBC in these but, in the interest of space-saving, several of these have to double up — the BBC Micro's ten function keys are all here but they each have to share a key with a numeral and are accessed by the CAPS LOCK/FUNCTION key. SHIFT LOCK is missing but CAPS LOCK is present, with a small LED to indicate when the lock is engaged. All keys are plainly marked in black, and in brown on the front of most of them is the keyword that can be obtained when pressing the key together with FUNCTION. The user thus has the option of typing keywords out in full or entering them using just two keys.

Unlike certain other manufacturers, which let out a squawk and invalidate the guarantee if you even so much as *think* of reaching for a screwdriver, Acorn positively encourages users to delve about inside. The top of the case lifts off after removal of four screws and the ribbon cable that connects the keyboard simply unplugs. The Electron's interior is divided in two — a small compartment to the right houses the electronic odds and ends that regulate the power supply; everything, in fact, bar the mains transformer itself, which is housed in the mains plug. The Electron power supply is decidedly non-standard: the transformer in the plug puts out 19 volts, which is further stepped down on board, giving 18 volts AC to the expansion port and +5, −5, and 0 volt lines to the PCB.

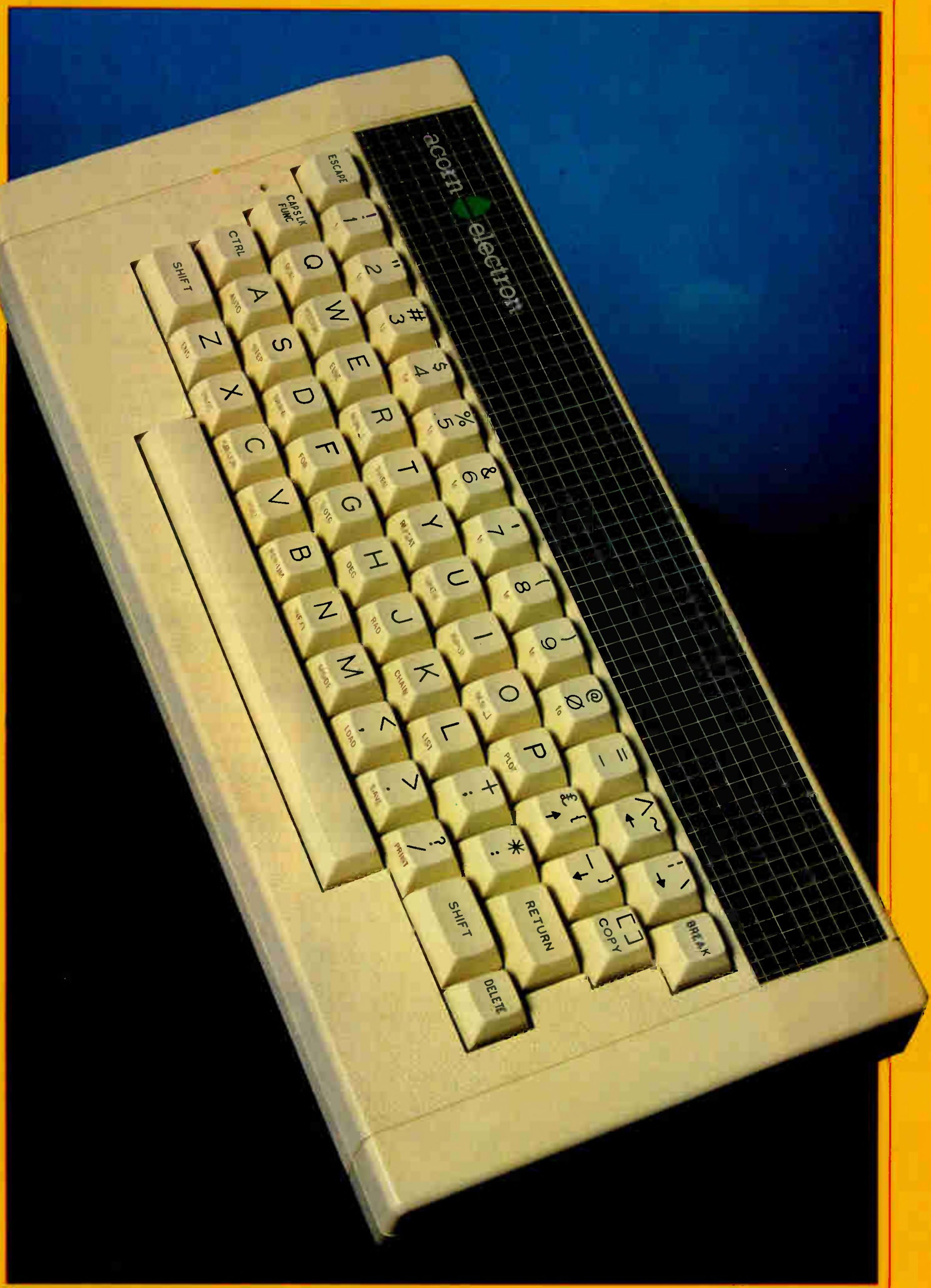
The board itself is beautifully laid out, with every component clearly labelled and plug-in connectors for the power lines and speaker leads. The processor is a 6502A running at 2MHz. It would appear that Acorn has been playing around with the Electron design right up until the moment it was launched — other review machines have apparently contained a single ROM chip in place of the BBC Micro's two, and have shown evidence of the odd patch on the board; *PCW*'s version contained the full complement of ROMs and every component appeared to be in its final position with not a patch in sight.

At the rear of the Electron is a single expansion port — a gold-plated, Sinclair-style edge connector. To the right of the machine is the power lead socket; and on the left are sockets for TV, monochrome monitor (composite video input), colour monitor (RGB) and cassette. Sound comes from a small built-in speaker; volume, while hardly astonishing, is certainly more than adequate and can easily be amplified if desired.

Software

On power-up the screen displays the words 'Acorn Electron BASIC' in white letters on a black background. The Electron runs BBC Basic, a very powerful 'structured' dialect supporting procedures and local variables.

When the Electron is switched on the computer is in Mode 6 with the CAPS LOCK on. Mode 6 gives 25 lines of 40 characters and uses 8k of RAM, making it the most economical of the Electron's seven modes. This is the major difference beween the Electron and the BBC Micro — the latter defaults to the teletext Mode 7: a mode which supports all the BBC's colours, uses standard teletext block graphics and which requires only 1k of user RAM. The teletext mode is something of an anomaly on the BBC Micro — it uses standard teletext control codes instead of BBC Basic's COLOUR, DRAW and MOVE commands and allows easy control of things like double-height text — but it is



The Electron: all the advantages of BBC Basic for under £200

excellent for programs that do not need fancy graphics but require large amounts of data. It is a pity that Mode 7 was not implemented on the Electron. As it is, in addition to the small amount of RAM needed for system 'housekeeping', the most economical mode on the Electron will take up a quarter of the machine's 32k of user memory.

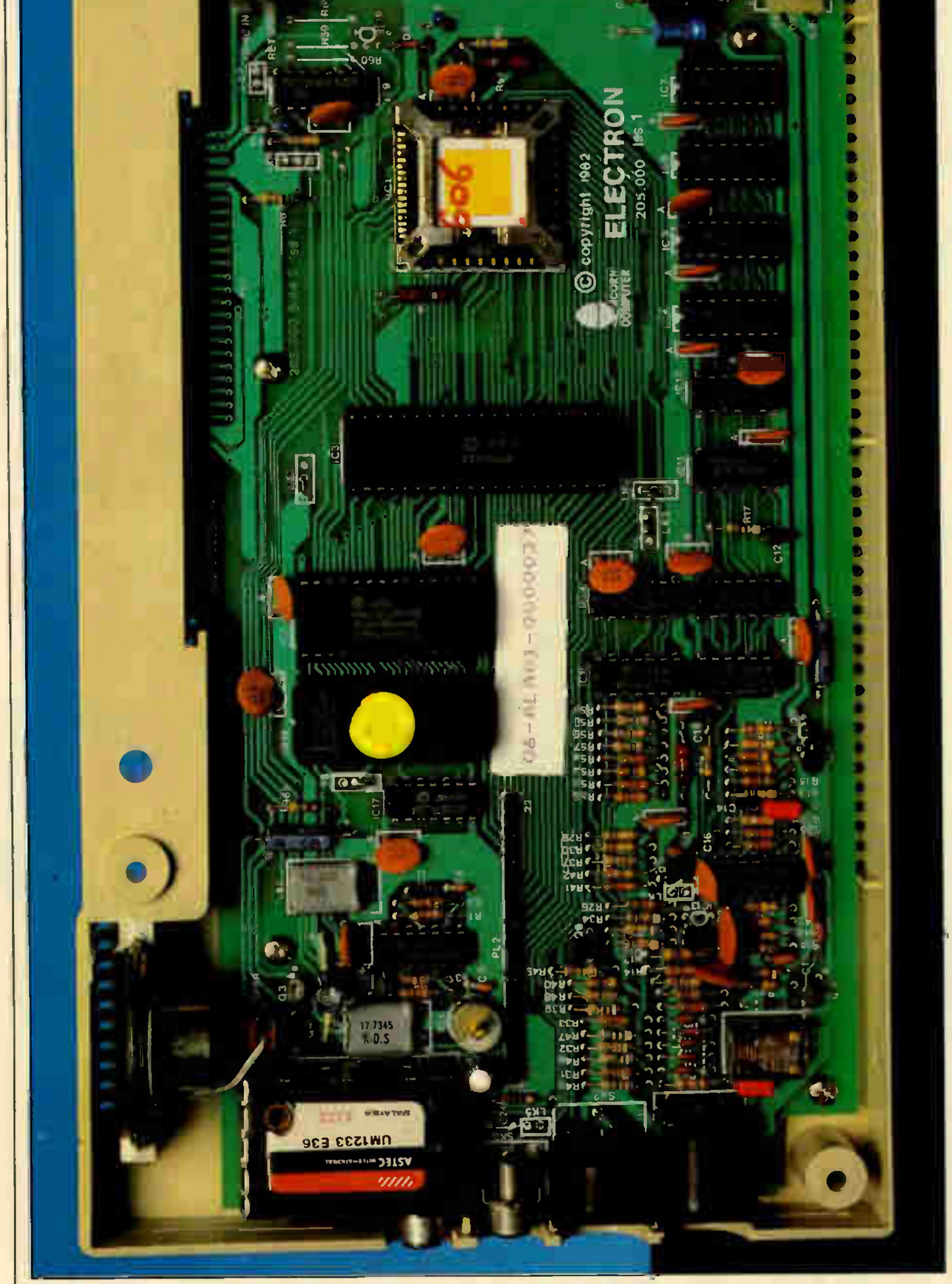
The Electron is very obliging in its acceptance of variable names. There are three types of variable — real, integer and string — and all the Electron insists on is that they begin with a letter, contain no spaces and do not start with a Basic keyword. The Electron differentiates between upper and lower case, so 'benchtest' and 'BENCHTEST' would be treated as two different variables. This gets over the restriction on names beginning with a keyword — 'total' would be accepted, but 'TOTAL' would not. Real variables are accurate to nine figures and have a maximum size of 1.7×10^{38}, while integer variables have absolute accuracy with a maximum size of 2, 147, 483, 647. Integer variables take up less space (they are stored in four bytes instead of the five bytes needed by reals) and are processed much more quickly — Benchmark 1, for example, took a mere 0.5 seconds with integer variables; Benchmark 2 had a similar 50 per cent increase in speed, taking 2.5 seconds. String variables may be up to 255 characters in length, and may be concatenated with '+'. Strings are manipulated with the usual LEFT$, RIGHT$, MID$, LEN, STR$ and VAL commands, and there is also EVAL, which, as its name implies, will evaluate a string as if it were a numeric function. A somewhat unusual Basic keyword is STRING$, which is used to make a long string from repeated smaller units; for example, to print a border made up of asterisks, you would set A$ equal to "*" and have a program line of, say,

```
20 B$ = STRING$ (20,A$)
```

Printing B$ will result in a string of 20 asterisks.

A nice feature of Electron Basic is the resident integer variables. The 26 integer variables A% to Z% are called resident because they are not cleared when the program is run or when NEW or BREAK is pressed. This allows the user to pass variables between programs. There is also one special resident integer variable, called TIME. TIME, as its name suggests, is an elapsed-time clock; its value is incremented by one every hundreth of a second and it may be assigned a starting value or zeroed like any other variable.

Electron Basic derives its power from its use of procedures. These allow the longest of programs to be split up into easily managed sub-units which are labelled and may be called by name. This makes following the structure of a program — and debugging it — much easier than in a program which relies on unconditional



The board is beautifully laid out with every component clearly labelled



Sockets for TV, monitors and cassette

GOTOs and GOSUBs. Procedures are generally placed at the very end of a program, after the END statement, and are each given a name starting with PROC. It is good programming practice to use lower case when defining a procedure to distinguish the procedure's name from the word PROC, but the only restriction on procedure names is that they must not contain spaces — the underline character is used to represent a space. All procedure definitions must end with ENDPROC. Variables may be defined as being local to a procedure or a function, and the user may have two variables with the same name coexisting quite happily in the same program, with one of them being restricted to its function within a procedure. Procedures may be recursive — ie, a procedure may call itself from within its own definition. Functions are similar to procedures, but give a single result. The Electron, like all computers, has many inbuilt functions — SIN, COS, RND, etc. The user may define any number of additional functions by using DEF FN.

The Electron has a good set of conditional statements. IF . . . THEN . . . ELSE, REPEAT . . . UNTIL and FOR . . . NEXT . . . STEP are all supported and the results of all conditional statements are evaluated with FALSE = 0 and TRUE = −1. NOT, AND, OR, and Exclusive-OR are all recognised, and the latter three will all also operate at the 'bitwise' level, which enables some interesting effects to be achieved with graphics.

Instead of using PEEK and POKE, Electron Basic relies on three 'indirection operators' for directly manipulating memory. '?' will either return the contents of a particular memory location or will POKE a value to that address; '!' will do the same, but operates on four consecutive locations, while '$' is used to place a string directly in memory. CHR$ is used to obtain a character from its ASCII code; ASC does the reverse.

Formatting and editing

The Electron allows considerable flexibility in the formatting of the screen display. The default mode gives fields ten characters wide in all modes. Numerical items are printed 'ranged right' in a field, while characters are lined up from the left. This means that if a character is entered on one line and a numeral on the next the two will not line up. This is done so that numbers will line up in the units column (or the least significant decimal). The variation in number of characters across the screen in the various modes means that the number of fields will vary also. There are three different character sizes and these give either eight, four or two fields, depending on the mode selected.

The field width and the number of characters displayed are altered by using the @% integer variable. The default value is @% = &0090A. This gives nine significant figures and a field width of ten. This may be changed to suit the user — for example, @% = &00A0C will give ten significant figures (the maximum the computer will print) with a field width of 12. The first figure after the '&' can take three values — 0 is the normal configuration, 1 gives numbers in exponent form (ie, an integer followed by a power of 10), and 2 gives numbers to a fixed number of decimal places. This formatting flexibility makes the effective display of information very easy. Numbers may be displayed in either hexadecimal or decimal format: PRINT ~ 10 will give the result to hexadecimal base (A). Text is formatted onscreen by using TAB, semi-colon, comma and apostrophe. TAB can take either one or two parameters — PRINT TAB(n);"PCW" will print 'PCW' n spaces across the screen; adding a second parameter allows specification of both column and row. The semi-colon, comma and apostrophe are used to format text in PRINT or INPUT statements — a semi-colon prints two items with no intervening space, a comma moves the following item to the next field, and an apostrophe moves the print position down one line.

Editing is one area in which I am not totally enamoured of the Electron. To amend a program line, the underline cursor is moved to the relevant line, leaving a block cursor at the bottom of the screen. The COPY key is then pressed, and the correct parts of the program line are reproduced at the block cursor. It is then a matter of skipping the underline cursor over any incorrect parts and typing in the corrections. This seems an unusually long-winded way of going about things and it is all too easy to make a mistake while using COPY. Electron Basic does not reject incorrect program lines as they are entered — as the Spectrum does, for example — but errors are trapped at runtime. Electron Basic does support ON ERROR GOTO GOSUB so the user may develop his own routines for error-handling. Error messages are mainly self-explanatory, and include the delightful 'Silly', which is the message that appears if you use the AUTO line-numbering command with a step size of less than 1 or more than 255.

AUTO is a labour-saving command that, together with RENUMBER and DELETE, allows manipulation of program lines on entry. Another useful command is LISTO, which allows a number of different formats when a program is listed. Depending on the parameter, LISTO inserts spaces to make FOR . . . NEXT and REPEAT . . . UNTIL loops stand out.

Graphics and sound

The Electron has seven modes, allowing the user to trade off memory for screen display. The modes are numbered 0-7 and are selected by using the command MODE. On power-up the Electron is in Mode 6, a text-only mode which gives 25 lines of 40 characters. Mode 5 has a chunky character set that allows only 20 characters across the screen, but is 32 lines in depth. Graphic resolution in this mode is 160 by 256 pixels and up to four colours may be onscreen at the same time. Mode 4 gives 32 lines of 40 characters and 320 by 256 pixels with two colours. Mode 3 is, like Mode 6, text-only and supports 25 lines of 80 characters. Mode 2 gives 32 lines of 20 characters but is distinguished from Mode 5 by enabling all 16 'colours' to be onscreen at the same time. Acorn is a bit naughty in saying the Electron has 16 colours — as with the BBC Micro, eight of these 'colours' are in fact flashing combinations of the eight true tints. Mode 1 has 32 lines of 40 characters and 320 by 256 pixels but differs from Mode 4 in that it allows four colours to be used. Finally, Mode 0 allows 32 lines of 80 characters or a very presentable 640 by 256 pixel resolution in two colours. In all modes the user memory takes a beating — Mode 6 takes up 8k, Modes 4 and 5 use 10k apiece, Mode 3 will use up half the available memory (16k) and Modes 0-3 require a massive 20k each.

To make things easier when switching between modes, the Electron's screen has a standard set of coordinates, regardless of mode. The screen is considered as having 1280 points across by 1024 points upwards — the bottom left hand corner is labelled 0,0 and the top right hand corner is 1279,1023. Thus DRAW 600,500 will draw a line from the bottom left to approximately the middle of the screen, no matter what mode the computer is in. The graphics screen has a separate set of commands — GCOL is used to set foreground and background colours, while MOVE, DRAW and PLOT are used to put designs on the screen. The Electron is very flexible in its use of graphics: text may be entered at any point, and graphics and text windows may be set up independently of each other. The PLOT command is especially versatile — using this enables lines and pixels to be plotted in foreground, background or complementary colours and, depending on parameters, solid triangles may be placed on the screen or areas filled in with solid colour.

The VDU command is used to set up windows, to join text and graphics cursors, to change colours and to define characters. It is also used to generate ASCII control codes for moving the cursor around and for such tasks as selecting paged mode when listing a program. A full list of VDU codes is shown in Fig 1. VDU is, in fact, shorthand for 'PRINT CHR$'. As an example of its use, consider the Electron's method of dealing with user-defined characters:

Character codes 127-255 are initially undefined. 256 bytes of RAM are set aside for the definition of characters with codes from 224 to 255 (more may be defined if memory is reserved for this with an FX call). To define the character with code 224, say, VDU 23 is used, with the bytes that make up the new character entered after the code number. As a simple example, to redefine character 224 as a space it would merely be necessary to enter VDU 23,224,0,0,0,0,0,0,0,0 Now, every

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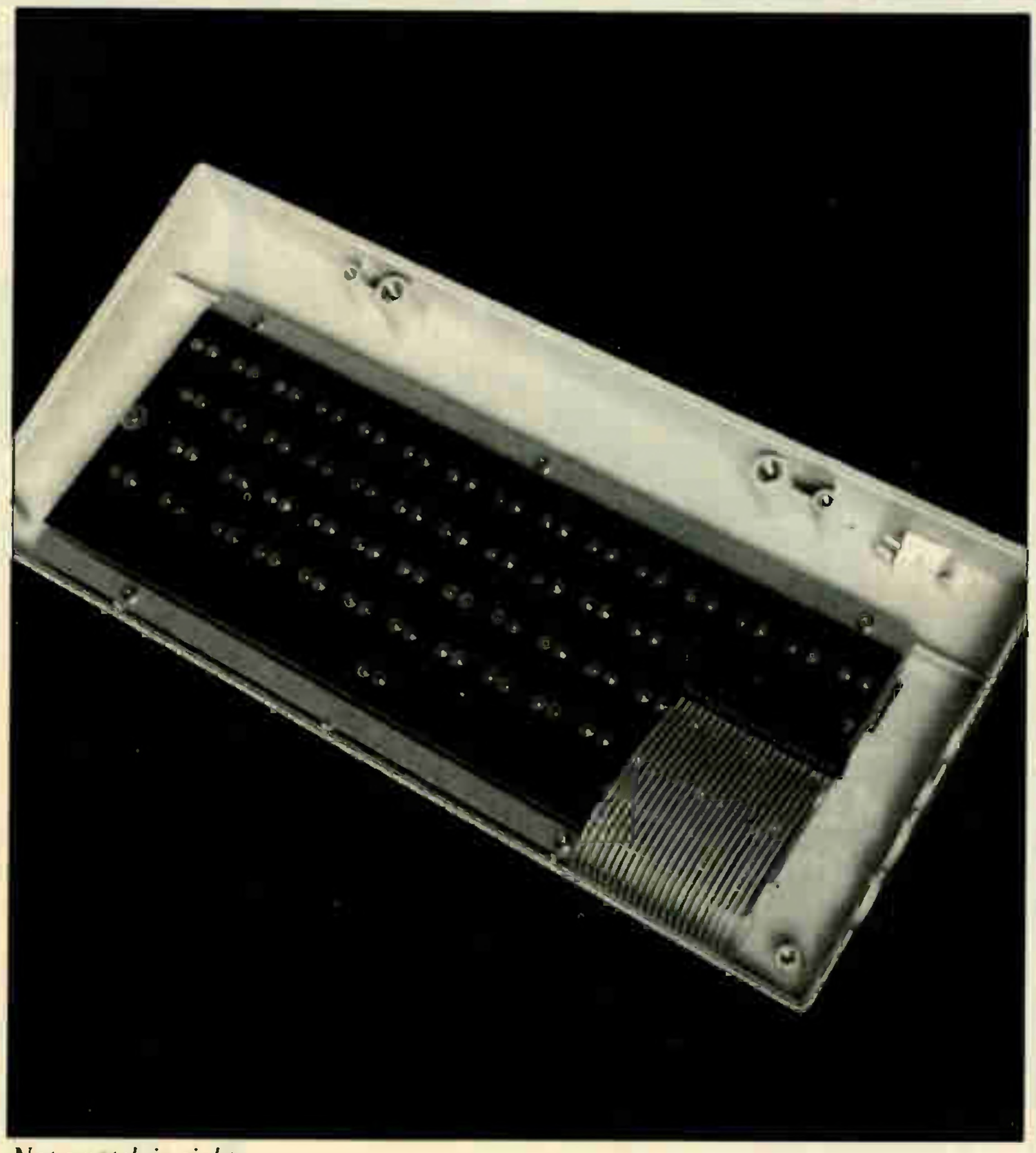
time CHR$ 224 is entered a space will be printed.

The Electron follows BBC Micro syntax in handling sound. The SOUND command is used to produce a noise at the inbuilt speaker. To maintain compatibility with the BBC Micro, there are three tone channels and one noise channel although, unlike the BBC, the Electron can handle only one channel at a time, so chords are not possible. The 'shape' of the note produced is set up by using the ENVELOPE command. All sound commands rely on inputting a stream of numbers — ENVELOPE, for example, has 14 parameters — and the syntax seems needlessly complicated, especially when compared to something like the Sord M5 which makes entering of music very simple. The restriction of using one channel at a time only means that the Electron will not be used for any truly musical effects — as with the Spectrum, the best that can be achieved is simple sound effects for games, etc.

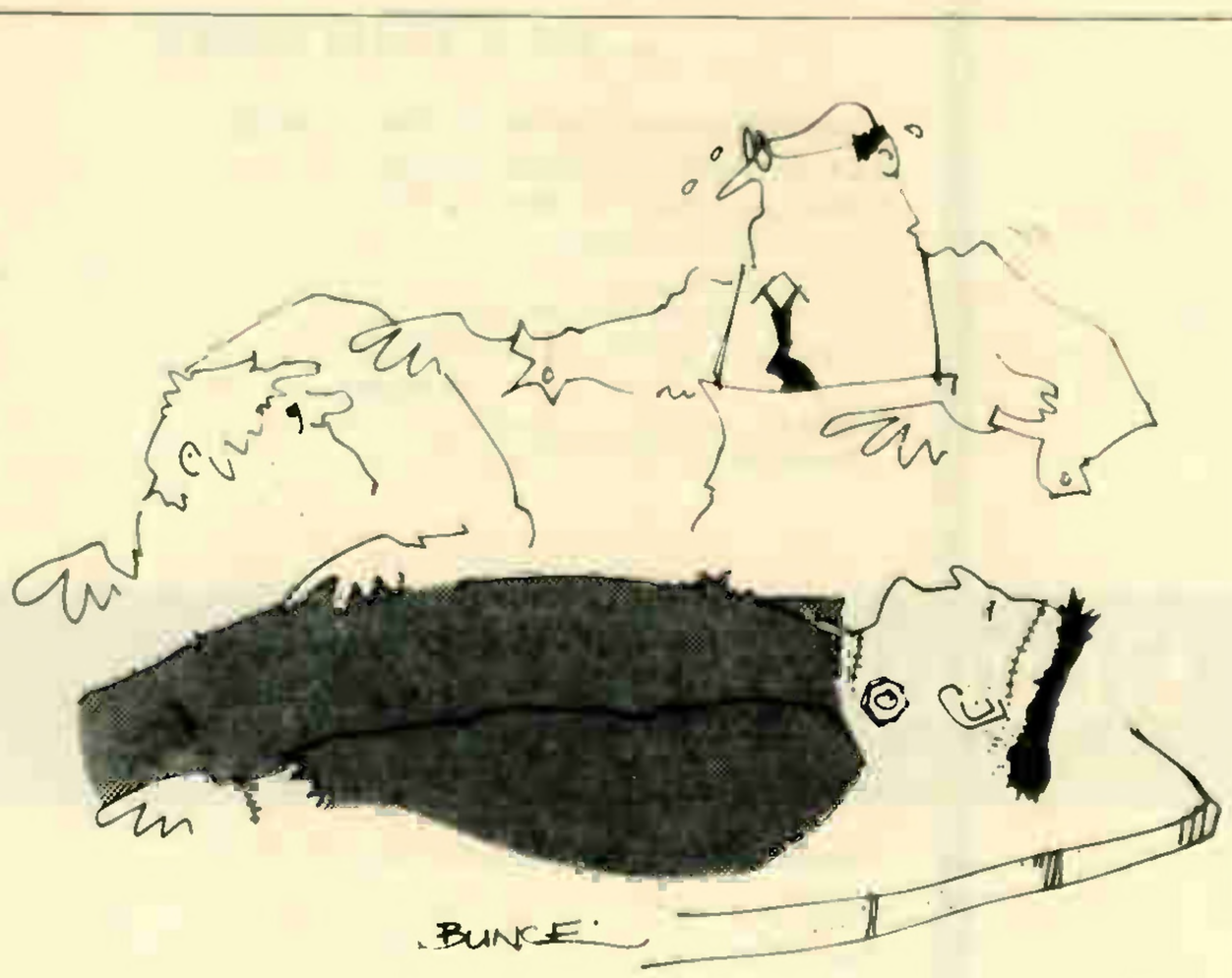


Not a patch in sight

Cassette handling

Programs are saved to and loaded from cassette using a standard format of SAVE/LOAD "program name". The Electron does not allow the baud rate to be changed, as the BBC Micro does, for example, but the 1200 baud rate is fairly fast and is compatible with the BBC machine's default mode.

Programs will auto-run on loading if CHAIN is used in place of LOAD. There is no VERIFY command, but *CAT will give a list of every program on a cassette and will indicate whether there is a complete recording on the tape. Files may be set up on cassette, and programs may be merged by saving one as an ASCII file (using *SPOOL) and loading it back with *EXEC. Machine code is saved and retrieved with *SAVE, *LOAD and *RUN. *OPT is used to control error messages and set up parameters for saving blocks of code on tape.



This time Igor! This time we have the microchip!

Function keys

The numeral keys 1-0 may be set up as 'soft' or programmable keys, allowing the user to place frequently used routines on a chosen key. Holding down CAPS LOCK/FUNCTION together with the relevant key will then execute the routine. It is useful, for example, to have a key set up to list a program in Mode 6. The function keys are programmed with *KEY, and control characters are indicated by using the '|' symbol. The BREAK key is also user-programmable and the five screen-editing keys (the cursor keys plus COPY) may be redefined by the use of the *FX command.

Documentation

Acorn seems to have learnt its lesson from the BBC *débâcle* — at least as far as documentation is concerned. The Electron comes with a 290-page User Guide and a book entitled *Start Programming with the Electron* by Masoud Yazdani. Both books are designed to tie in with the 'Welcome' cassette and, taken together with this, provide a comprehensive and painless introduction to Basic programming in general and the Electron in particular.

The User Manual follows the pattern set by the final version of the BBC Manual and is particularly strong on machine code, giving a thorough introduction to 6502 assembly language. This is one of the Electron's strong points — it features a

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ELECTRON

built-in assembler — and the User Guide devotes 60 pages or so to an easy-to-follow section to help the Electron user make the most of this powerful feature.

Start Programming with the Electron is designed to be read in conjunction with the User Guide and is helpful in amplifying points that may not be altogether clear in the Guide. It contains a section on turtle graphics (a turtle graphics program is also on the 'Welcome' cassette) and goes on to explain how to use this powerful graphics language to escape from a maze.

My only quibble as far as documentation goes is the lack of an index in the User Guide. There is a very full table of contents, but the BBC Micro's manual had an index and I fail to see why one could not have been included in the Electron manual. Some more hardware details — like a 'pin out' breakdown of the expansion port — would have been welcome. That apart, the documentation is well up to Sinclair standard and a considerable advance on most micro material.

Technical specifications

Processor	6502A, 2MHz
Memory	32k RAM, 32k ROM
Screen	UHF TV — facility for RGB or composite video
Keyboard	55 key ASCII, incorporating 10 function keys
Disks	Not yet available
Language	BBC Basic

Conclusions

The BBC Micro has done wonders for Acorn — its use in schools has ensured it a wide user base, and its expansion facilities have made sure that it will not become outdated in a hurry. With the Electron, Acorn is making BBC Basic available to a wide range of users at a lower cost.

As such, the Electron should take a large share of the sub-£200 market currently dominated by Sinclair. In many respects, the Electron scores heavily over the Spectrum: the Basic is considerably more powerful, the graphics are much more flexible and the maximum resolution is many times that of the Spectrum's. The built-in assembler will attract those keen to program in machine code and the physical aspects of the computer — the standard keyboard and all-round attention to detail in the construction — are especially welcome.

It's a pity that the teletext mode is not supported — the extra memory available in this mode would have been very useful for applications involving the manipulation of large amounts of data, and there are one or two other features that are present on the BBC machine but are missing here. such as the ability to scroll sideways. It would have been useful if the BBC Micro's *TV command had been retained — this is used to centre the display on the television screen; on my TV the Electron's display loses half of the top line, and I have as yet found no way to cure this.

Overall, though, the Electron is one of the most impressive machines I have seen. I'll stick my neck out a bit here and forecast that this one will be *the* machine to challenge the Spectrum on its own ground. The Spectrum has the advantage of the Microdrives and by far the biggest range of software of any machine in this market sector, but the Electron positively oozes quality and there is a wide range of software currently available for the BBC Micro that will run with little or no adaptation on the new machine. The memory map is virtually identical for both machines and almost every BBC program I have tried on the Electron works a treat. The only real difference is the absence of Mode 7 on the Electron — and all that this means is that the title page of many BBC programs will contain a fair bit of gibberish as the Electron tries to make sense of the teletext control codes for things like double-height printing. I have successfully managed to load programs as diverse as the companion cassettes to *The Computer Programme* and a chess program from Computer Concepts.

Many people thought that the Oric would become the Spectrum's major challenger, but this has not happened. Ex-editor David Tebbutt used to indicate his approval of various computers by telling his readers whether or not he would buy one — as far as I can remember, the two machines to receive this accolade were the Atari 800 and Spectrum. As far as I am concerned, I'd plump for a BBC Model B — but if I couldn't raise the readies for that I'd be more than happy to settle for an Electron. This one will run and run . . .

VDU code table

Decimal	Hex	CTRL	Meaning
0	0	@	Does nothing
1	1	A	Reserved
2	2	B	Reserved
3	3	C	Reserved
4	4	D	Write text at text cursor
5	5	E	Write text at graphics cursor
6	6	F	Enable VDU drivers
7	7	G	Make a short beep
8	8	H	Backspace cursor one character
9	9	I	Forwardspace cursor one character
10	A	J	Move cursor down one line
11	B	K	Move cursor up one line
12	C	L	Clear text area
13	D	M	Move cursor to start of current line
14	E	N	Page mode on
15	F	O	Page mode off
16	10	P	Clear graphics area
17	11	Q	Define text colour
18	12	R	Define graphics colour
19	13	S	Define logical colour
20	14	T	Restore default logical colours
21	15	U	Disable VDU drivers or delete current line
22	16	V	Select screen mode
23	17	W	Re-program display character
24	18	X	Define graphics window
25	19	Y	PLOT K,x,y
26	1A	Z	Restore default windows
27	1B	[	Reserved
28	1C	\	Define text window
29	1D	]	Define graphics origin
30	1E	△	Home text cursor to top left
31	1F	—	Move text cursor to x,y
127	7F		Backspace and delete

Fig 1

Benchmarks

BM1	1.11
BM2	4.01
BM3	11.12
BM4	11.76
BM5	12.40
BM6	18.72
BM7	28.71
BM8	72.53
Average	20.05

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

Price

Acorn Electron, 32k RAM £199 END

SCREENPLAY

Tony Harrington tries out some games for the Dragon.



STAR JAMMER

Supplier: Salamander Software
Price: £7.95

This is one of the best of the Salamander range, though I am also partial to one of its earliest games, 'Golf'. Star Jammer is a sort of three dimensional version of space invaders, crossed with Defender. Instead of looking at your spaceship being attacked by hordes of alien whatevers, you are in it.

That is to say, the image on your screen is a reasonably pleasing picture of space, with the odd star dotted about, and tiny Blobs whistling towards and away from you. In the centre of the screen is your gunsight — a rectangular outline, with bevelled edges and crosshair sights.

The manual explains that you are the last hope of your planet, attacked by the usual statutory alien force (will there ever be a game based on the difficulties of starting a dialogue with aliens instead of on the delights of blasting them out of the sky?).

The most pleasing thing about the game is its command of perspective. Enemy craft of various shapes and varying points values first appear as tiny blobs. If you manoeuvre your craft towards them, using the joystick, they quickly grow in size as they approach.

You have a 'laser weapon' which can fire five times in quick succession and then goes dead for a bit while it recharges. On the screen the laser blast appears as two dotted lines which come from the bottom left and right hand corners of your gunsight and meet in the centre. To hit an enemy ship requires delicate skill and timing. It has to be exactly in the centre of the gun sight, and since it skitters around the screen in response to the slightest movement of your joystick this takes some doing.

When they get close, the enemy ships open fire. Each burst depletes your energy shield. If they get too close — which they inevitably do if you keep them in your sights and keep missing — they either gun you down or collide with you. The effect of the first is to start a growing pattern of circles on your screen, like a slow motion picture of a stone going through a windscreen. The message is: 'you're dead.' If they collide, you get a momentary larger than life view of an alien ship filling your screen, then the screen blacks out. The effect is interesting. Fortunately, you start off with three ships, so when the picture returns after a moment or so, you are once more in deep space, patrolling for enemy craft.

There are two other features. Every so often a 'star gate' appears in the form of a blue spiral which swallows your gun-sight, to the accompaniment of a series of ascending notes from the sound track. This replenishes your energy shield and adds anything up to 100 points to your score. It is possible to avoid all contact with enemy craft and steer through star gate after star gate, but it's not a very rewarding way of spending your time. If you're not in it for the combat, you may as well watch television.

The game has a final screen, when all lives have been lost, which features a 'roll of honour' listing the ten top scores to date. Getting a high score automatically sends your score moving up to the top of the table to the accompaniment of stirring, bugle-like tones from the computer. The fact that this is posthumous doesn't seem to detract from the fun.

PRESENTATION
COMPLEXITY
ADDICTION
VALUE FOR MONEY



SHARK TEASURE

Supplier: Dragon Data
Price: £12.95

This is an excellent example of a fairly ordinary, reaction-based game, that has been transformed into something rather special by excellent graphics, coupled with a staggeringly accurate use of shock tactics.

Remember the film Jaws, with its sequel (or is it sequels)? Remember what they showed us about the relationship between the way we think of sharks and our fantasies about being eaten? In the wake (no pun intended) of that there would be no point at all in a computer game which presented you with a couple of pilchards on the screen, called them sharks, and then staged some mild confrontation between them and a surrogate-you.

At first glance, except for some very sleek, mean looking sharks, which demonstrate how artistic Dragon graphics can be, Shark Treasure looks as if it is going to be precisely this — dull and pointless.

The opening picture is as follows: a broad black line near

the top of the screen and another at the bottom represent the surface and the sea bed. On the surface there is a silhouette of a boat with a diver's head and shoulders protruding out of it. On the sea bed, five white spots, placed a uniform distance apart, represent the legendary wealth of the depths. Between the two lines, a couple of sharks drift majestically across the screen, disappearing off one side only to about-turn off-stage and re-enter, moving in the opposite direction.

The blurb in the little manual which accompanies the game, paints the usual, vivid, imaginary scenario, of which the actual screen is only the palest shadow. You have just discovered the long lost galleon Santa Maria with its thousands of gold bars (those white blobs). Financing the expedition to find the wreck has left you with just $2000. Each gold bar you recover is worth $1000 which, by a striking coincidence, is just the amount you need to hire some idiot to act as a diver for you.

The only protection your divers have against the sharks, besides your skill with a joystick (which moves the diver about in the water), is three flash grenades. The game continues until you run out of money to hire divers — an inevitable end, since the more treasure you bring up, the more sharks appear on the screen. (There is a metaphor in this somewhere.)

The start of the game is as dull as it sounds. But wait awhile. The first dive is simple. Pull the joystick towards you and the diver starts his descent. Pause while a shark cruises by underneath you, then head for the sea bed and the treasure. Push the joystick sideways and the diver flaps his arms up and down rapidly while scooting sideways.

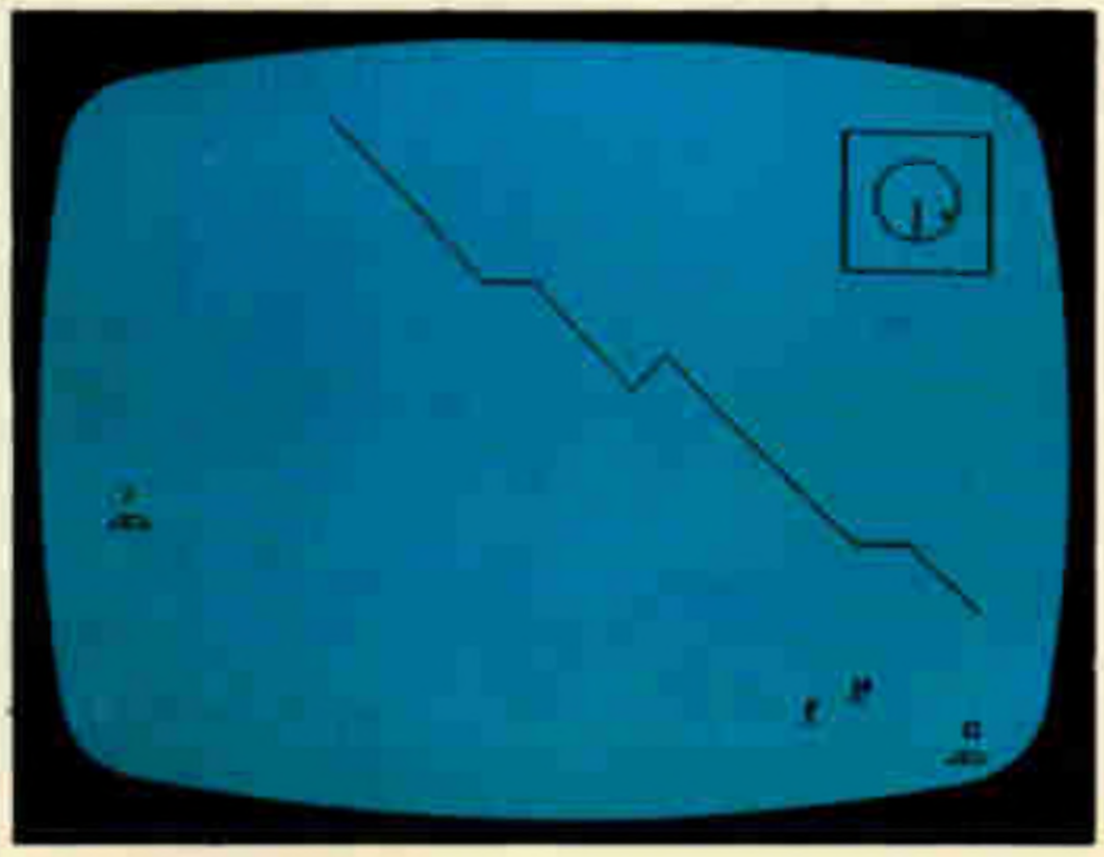
Three treasure blobs are all that can be collected at a go, then it's home time, courteously waiting for the sharks to pass first. You might make it up and down two or three times without anything happening, if you're careful. But just when you think the game's a doddle, one of those placid sharks will suddenly decide that you are in range. With amazing speed its jaws snap open and *whump*, you're one diver the less. The whole thing happens faster than your finger can twitch a joystick, and it's a real shock to the system.

What makes the game so unpredictable is that the sharks attack from what looks, visually, to be a safe distance away. They also have a habit of reaching up to snatch a diver lurking in what you thought was a 'safe' area.

I should add that once the first screen-full of treasure has been collected, the next shark that appears patrols the sea bed. The only way of getting the treasure then is to nip in once the shark has passed and hope that you can get away before he turns back. By this stage there are usually anything up to six sharks between your diver and the surface. Firing the flash grenades produces a visual image of the diver blowing up, momentarily, and the sharks reverse their direction.

One final point. The noise made by the diver when moving sideways is very similar to that made by a moth fluttering against a lampshade — psychologically, it seems calculated to attract a shark. This sound, together with the cash register tinkle that happens when you bring a gold bar to the surface, is about the limit of the game's sound effects. But both sounds are telling, in their way. I have to worry a little about the idea that you hire divers for $1000 a go, knowing full well they are doomed to be eaten by sharks — it's distinctly off, morally speaking. But then that's computer games for you.

GRAPHICS
COMPLEXITY
ADDICTION
VALUE FOR MONEY



EVEREST

Supplier: Salamander Software
Price: £7.95

Everest is a game on whose merits opinions are likely to differ sharply. It is one of a batch of three released by Salamander in the last few months (the other two being the adventure game, Franklin's Tomb, and Gridrunner).

The idea is that you are the chief strategist leading a climbing expedition in the Himalayas. There are six climbers in your party and you have to make decisions about the composition and weight of the loads which each carries. What you decide affects their fitness and the chances of the expedition succeeding.

It took me the best part of an hour to grasp the basic rules of the game, and the more I came to understand it, the better I liked it. What will irritate a great many potential players of this little strategy game is that all the action of the climb is represented by the sketchiest graphics. A jagged line for the mountain side, two stick figures (assuming you send your climbers off in pairs, you could equally well send them off alone, though this seems to increase the risk of a fall) and, if the weather turns, some lines to represent snow.

There is also a clock in the top right hand corner of the screen which ticks away the hours your climbers take to get to the camp to which you have sent them.

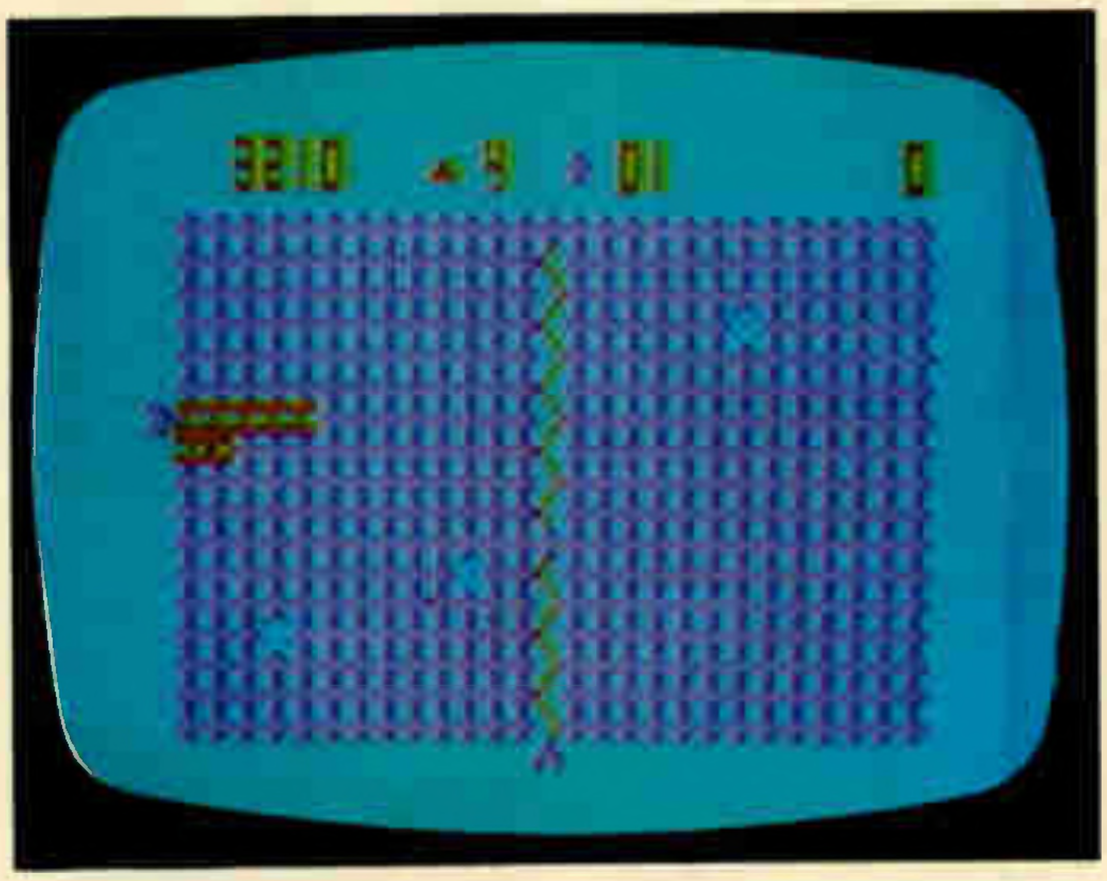
Your supplies consist of five basic ingredients, food (in 5lb bundles), tents (25lbs), oxygen (10lbs), ropes (20lbs) and ladders (20lbs). The maximum weight of supplies for an expedition is 1800lbs, though this can be made up of any combination. You can't be too random though as each climber needs a minimum of 5lbs of food a day. You need ropes past camp 2. Two climbers need one tent between them at each camp, and although you can do without ladders, meeting a crevasse, which you are bound to do, delays your climbers if you don't have a ladder. The delay generally means that they arrive at camp in a worse physical condition than would otherwise have been the case.

At any time you can call for reports on the weather, your supply status at each camp and the climbers' position and fitness. Success is a combination of luck and strategy. The program delights in generating avalanches and frequently decides that your climbers have taken a fall.

I found to my cost that although opting not to move tired or exhausted climbers on to a higher camp helps their fitness, it only does so if there is enough food where they are to keep them going. Otherwise you have to risk sending exhausted men sprinting down the mountain to a lower camp which does have the necessary supplies. If three or more climbers die on you, the expedition is formally abandoned.

You have a choice between climbing Nuptse (25,850 feet), Lhotse (27,890 feet) or Everest itself (29,028 feet) and you can mount your expedition in the spring or autumn. I failed on two expeditions on the lowest slope in the best season. When strength returns, I intend to mount yet another assault on the summit . . .

GRAPHICS
COMPLEXITY
ADDICTION
VALUE FOR MONEY



GRIDRUNNER

Supplier: Salamander Software
Price: £7.95

As Salamander Software has the grace to acknowledge, this is a copy of Jeff Minter's game of the same name for the Apple. Its graphics, on the Dragon, leave a lot to be desired. The grid lines, the droids and your grid craft all look like bits from a Lego set.

Even if the graphics were high resolution it wouldn't rate much with me. This is the kind of frantic arcade game that defeats my constitution and leaves me feeling like a wrung-out dishrag. It's all reactions and very little strategy, with far too many objects bounding about the grid for the likes of me to survive for more than a second or two.

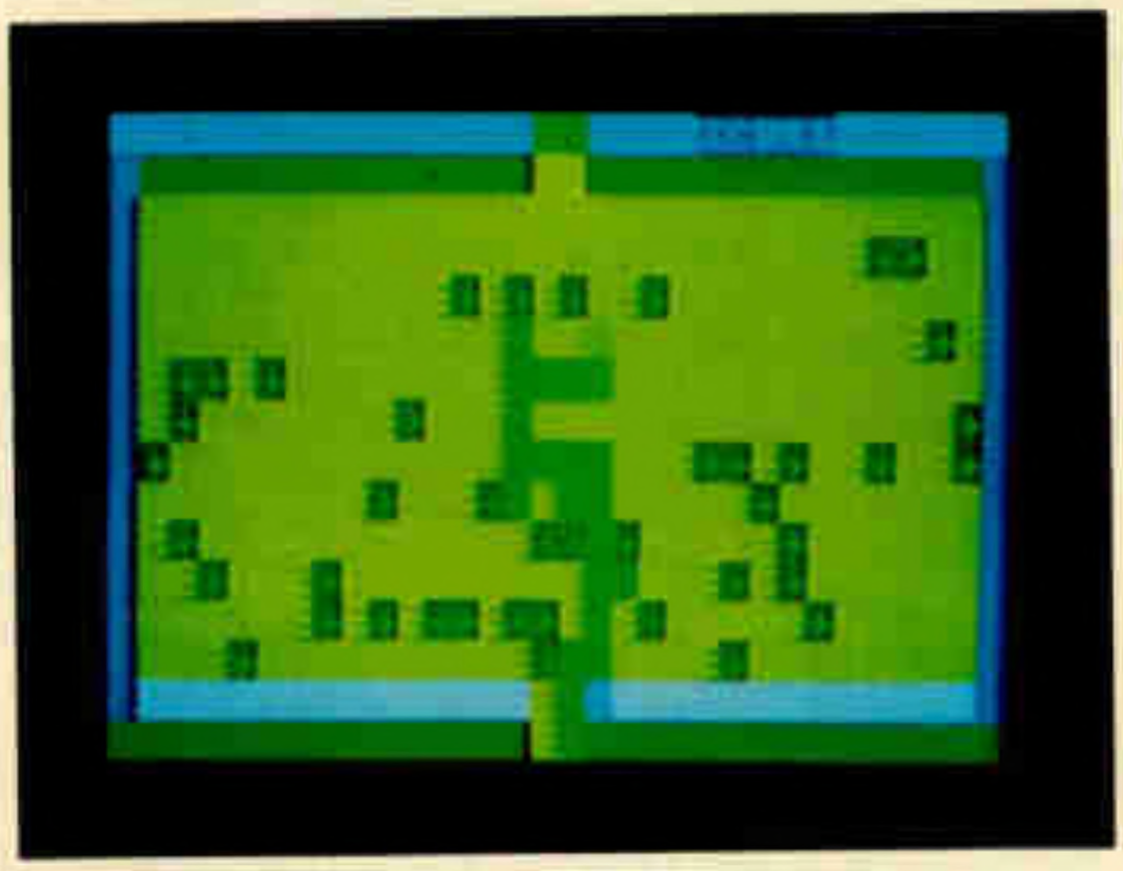
If you operate at these kinds of speeds, and like thinking with your fingertips, then perhaps this will satisfy what ever it is that drives you, for a minute or two at least.

The imaginary setting which, I may add, exists wholly on the plane of the imaginary and has absolutely nothing to do with the Lego set on the screen, is this: the grid is the last remaining source of energy in the universe. It is patrolled by droids (looking like a toy train from an Enid Blyton tale, for those of you old enough to remember Noddy). These droids explode your craft on impact. Hitting a section of the droid turns it into a 'pod', which sits on an intersection on the grid. Pods turn into blasts of energy which travel down the grid and zap your craft if it happens to be in the way.

To make matters more complicated, there are two devices called X/Y zappers which patrol the X and Y axes of the grid. These produce further pods and further blasts of energy which wipe out your craft. The grid craft itself is a bit of a sluggard as far as the controls are concerned. It doesn't respond immediately to the joystick, then takes off at a hell of a rate a moment or so later.

Since you can't move past pods and everything else is moving at a great pace, you are bound to get zapped. It strikes me the game would be much improved by some device for setting the speed of play. But for those who like frenetic games, it could be worth a whirl.

GRAPHICS
COMPLEXITY
ADDICTION
VALUE FOR MONEY



MINED-OUT

Supplier: Quicksilva
Price: £5.95

This, together with Star Jammer, represents the best of what has been achieved on the Dragon to date, to my mind. It is a very neatly conceived game, and the fact that it has been around for several months now takes nothing away from it.

Unlike the reflex, blob-chasing genre of games, this has a strong, strategic base. It also has good graphics and some great sound effects. The plot is to rescue a mythical creature called Bill the Worm, 'that star of stage and screen'. I am tempted to quote Quicksilva's entire, over-the-top sketch of Bill and his plight as it is such a marvellous example of the hammed up ballyhoo suppliers dream up to provide a framework for their games.

Its relevance to the game is thin, to say the least. 'Bill', if he exists at all, is to be found in a hole at the top of a rectangle filled with invisible mines. You start in another hole at the bottom of the screen, as a small green square. Movements are via the cursor arrow keys. Depressing a key moves you one square in that direction and, as you move, you draw a green line on an empty white background. (Colours change as you progress through different minefields.)

The only guide you have through the minefield is a message in the top left hand corner of the screen which tells you, after each move, whether you are 'safe', or whether one of the three directions before you (the fourth, of course, is the one you have just come from) contains a mine. It doesn't, of course, tell you which of the three possible moves will hit the mine. If all three directions are mined, the message '3 mines' appears on the screen and, unless you are an outright chump, it should be clear to you that you have to reverse your direction and try another route.

The tricky bit is to devise strategies which will allow you to use the screen clues to thread your way through the minefield. Hitting the wrong key results in a cartoon explosion flashing on the screen, with accompanying sound effects. Then a picture of the actual minefield appears and it retraces the movements you made up to the point where you hit the mine. This provides a neat, graphic representation of all the points where your nerve failed or your wits dried up.

The first minefield is relatively simple to get through. But it is immediately replaced by a second, more heavily mined, field, then a third and so on. Which field is the final field, the field at the heart of the minefield, so to speak, I never did discover. For after the third field a little 'bug' appears, which moves patiently about after you, muddling your thoughts by its presence. It destroys you, of course, if it catches up with you. And it gets more aggressive as you progress through the various minefields. There are worse games, hundreds of them, but this will live on for quite some time yet.

GRAPHICS
COMPLEXITY
ADDICTION
VALUE FOR MONEY

END

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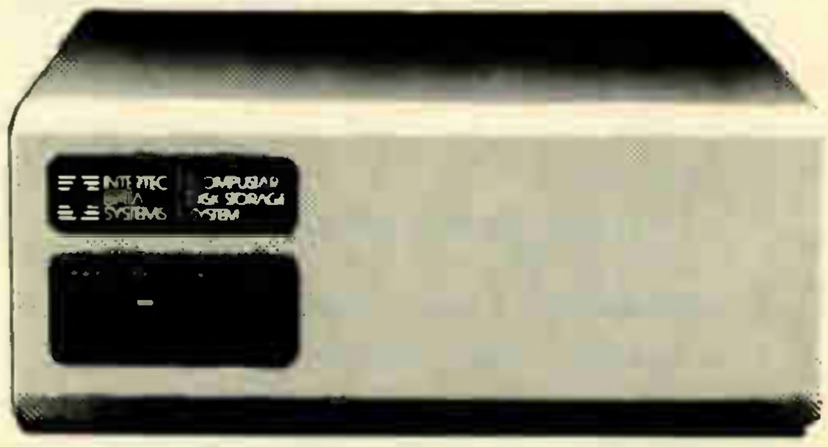

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SOFTWARE

WHICH SPREADSHEET?

PERFECT CALC

Mike Liardet finds out if 'Perfect Calc', a spreadsheet package for both CP/M systems and the IBM PC, really does live up to its name.

Perfect Software Inc has recently injected a range of software products into the UK market-place. These products include what our US cousins term 'the big three' applications: word-processing, database and spreadsheet. But can this Californian company, distinguished by being based *not* in Silicon Valley but over the Bay in Berkeley, actually come up with the perfection it so proudly proclaims?

Getting started

Initial impressions of Perfect Calc are very favourable. It comes as a shrink-wrapped manual, slightly larger than a paperback, with disks and quick-reference card enclosed. Tearing off the wrapping reveals 350 pages of documentation, liberally illustrated, nicely laid out and easy to read — at least this is the impression from a first brief glance.

The system is available for both CP/M systems and the IBM Personal Computer. My review copy, kindly loaned by Pete and Pam Computers, was for the Apple II (with CP/M and 80-column display enhancements), and accordingly arrived on three separate diskettes. Apple's notoriously low disk capacity is not big enough for everything to be packed onto one disk. The disks are somewhat confusingly titled: an 'applications programs' disk (with demonstration spreadsheet data files), an untitled disk (with the Perfect Calc programs), and a 'lessons diskette' (with the text of various lessons, in the form of 'saved' spreadsheet data files.

Opening the manual at page one, where I always like to see 'getting started' instructions, I was instantly treated to an 'overview'. This consists of several pages of advertising copy for Perfect Calc, but it contains, on the very last line, the vital reference to installation instructions. For some obscure reason Perfect Software has buried this essential information in an appendix.

Quickly finding the right page, I was disappointed to discover very little information: a bare nine pages, actually less content than the overview. Any problems Perfect Software might have had, with documenting the system for two operating systems, have been neatly side-stepped by giving very scant information on either. The 'create working disk' section is liberally peppered with 'use appropriate utility' instructions — not a great deal of help to the newcomer.

The rest of the appendix comprises instructions for using the Perfect Calc configuration program which actually embeds information on your VDU or printer. Until this is done the Perfect Calc program will not work at all. As it happens, the Apple II versions of Perfect Calc come preconfigured, so there is not a great deal of work here, except that the Apple has a slightly non-standard keyboard, and this fact was not taken into account in the preconfigured version.

The configuration program should permit problems with keyboards, etc, to be sorted out, but in this instance it actually failed to do so. For example, the control-A key stroke, taken by Perfect Calc as the signal to move the cursor to the start of a row, cannot be generated on the Apple. (Push the 'control' and 'A' keys on the Apple and nothing happens — it actually has a 'local' function as a lower case/upper case switch.) Now the configuration program does permit the predefined conventions on keystrokes to be changed. You press the keystroke as it currently is, then the keystroke as you want it to be. Unfortunately the control-A keystroke is just as invisible to the configuration program as it is to Perfect Calc, so you are unable to specify what it is you want to redefine! Anyway, the problem can eventually be solved by resorting to Apple CP/M's 'CONFIGIO' facility, but not without some false starts and difficulties — so watch out Apple owners and anyone else with a non-standard keyboard!

Simple facilities

Once over the various installation 'hurdles' we are ready to get started properly. Simply key-in 'PC' in response to the operating system prompt and you enter the world of Perfect Calc.

After a few seconds of disk reading, the screen clears and a fairly typical spreadsheet display materialises: columns headed with letters of the alphabet and the rows prefixed with numbers.

In the standard configuration, the cursor is moved around by using four different keystrokes: 'control' and 'F' for forward a column, . . . and 'B' for backward, . . . and 'N' for next row, . . . and 'P' for previous row. Unlike most spreadsheet systems the keystrokes for these fundamental operations are not arranged in a diamond-pattern, but scattered over the keyboard. Of course, the choice of keystrokes is based on a mnemonic name and not the relative direction of movement. Personally I prefer the diamond arrangement, which can be touch-typed even by a novice, but in fact anyone who objects to the arrangement can readily change it by using the configuration program. A word of warning: the manual is written exclusively using the standard keystrokes, so it is obviously preferable to leave things as they are until complete mastery of the system is achieved!

Another peculiarity with regard to keystrokes: sometimes a double keystroke is needed, for example 'escape' then 'V' (two separate keystrokes) jumps the cursor right by several columns, whereas 'control' and 'V' (simultaneous push on both keys) jumps it down by several rows. In fact, many of the row operations use 'control and-' strokes, and their column equivalents use 'escape then-', both with the same letter.

In case I am confusing the newcomer let me digress a little, on what I shall pompously entitle: 'the subject of keystrokes ergonomics, and why it is worthy of such attention.'

Firstly, computer keyboards are very like typewriter keyboards, but have one or two extra keys labelled such things as 'ESC' and 'CTRL'. Now nearly every key on the keyboard causes a code to be transmitted to the computer. Two exceptions to this are the 'CTRL' and 'SHIFT' keys (but note — not 'ESC'). If you push either of these keys on their own then no code is transmitted and nothing happens. However, if you use them in conjunction with some of the other keys, notably the letters, (correct way is to hold down 'CTRL'/'SHIFT', then push other key),

then a modified key is transmitted — the upper case version of the letter if it is 'SHIFT'ed and a'control-code' if it is 'CTRL'ed. (The 'ESC' key is different from anything else since it generates a control-code, but without any help from 'CTRL'.)

Since a control-character has a completely different code from any other visible character, some computer packages, particularly highly interactive word-processors and spreadsheets, use them for 'control'. Ordinary keystrokes are generally treated as basic text or numeric entry, and control keys perform the special functions such as cursor moves or deletions.

With well thought-out packages the control keys can be quickly learned and easily used: the fewer the number of keystrokes needed to perform a particular function, the easier to remember and the quicker to use. When you are confronted with a keyboard for the first time this speed factor may seem irrelevant, as irrelevant as a hyper-fast gear stick when you are learning to drive. But after a while you start to get frustrated by packages where you can never find overdrive, or even worse — those that slip into reverse at 90mph! End of today's seminar!

By moving the cursor to the required position and then simply typing away, it is very simple to enter numbers and text into the spreadsheet. Formulae must be preceded by an '=' keystroke. If you forget to press '=' then Perfect Calc will assume you are entering either text or a number, a minor irritation until you eventually start remembering to use it.

It is possible to jump the cursor around the spreadsheet in various ways. There are keystrokes for jumping back/forward several rows/columns at a time, and also for jumping to the first and last entries in a row or column. Jumping to the first entry in a row is achieved by the infamous control-A mentioned earlier, and it is possible to jump the cursor to any named cell.

In general, I found Perfect Calc's keystrokes quite confusing and difficult to remember. Apart from the basic move keystrokes — up, down, left and right — which are based on mnemonics, there would seem to be no rationale for the keystrokes whatsoever, and there is no simple short cut to remembering what does what. One of the advertised features of Perfect Calc is that its 'command structure is identical . . . to Perfect Writer', the word processor from the same stable, so at least, once learned, the keystrokes will also apply to one of Perfect Software's other packages. While being all in favour of standardisation, I must say that this is certainly one standard that should not be widely adopted!

Perfect Calc formulae have the usual sort of syntax used by many spreadsheet systems. One source of confusion stems from the fact that it uses both upper and lower case letters to identify different columns. Thus cell 'A1' is actually 26 cells along from cell 'a1'. You have to be careful with your use of the shift key with perfecT calC! Actually a similar problem is encountered with certain command sequences, for example, 'escape then y' is recognised, but 'escape then Y' is not. This sounds trivial, but it is fairly easy to get confused if your VDU has a shift-lock and commands stop working because you are accidentally locked in upper case.

Perfect Calc has a fairly extensive library of maths, or what it calls 'math', functions including logs and trig. There is also an intriguing reference in the aforementioned 'overview'. It evidently has a 'user extendable functions library'. Evidently you can 'add your own functions to the system, or even modify the existing ones'. Unfortunately this is the only reference to the facility that I can find in the entire manual. It would certainly be a very powerful feature it it does exist. Or possibly it is just a slightly over-excited description of the multiple spreadsheets (see below).

As with most spreadsheet systems, Perfect Calc has a replication facility, although it handles replication very much in its own unique way. Used in the simplest way, a single formula can be copied across a row or down a column, but it can also be copied into an area (and it is also possible to copy more than one formula at a time).

First the formula to be replicated must be placed into a 'save-buffer'. This is achieved by a single keystroke, once the cursor is located over the cell with the formula.

Incidentally, this buffer also receives any information that may be deleted, so the information is not lost immediately and a deletion in-error can be recovered — quite a nice touch. Once the formula is in the save-buffer, the area to receive the replications must be marked out. A mark is set in the top left hand corner of the area (two keystrokes) and the cursor then moved to the bottom right hand corner. Of course, single columns and rows are just a special case, where top left hand corner and bottom right hand corner happen to lie in the same row or column. It is slightly irritating that the marked cell is not highlighted in any special way, so you just have to remember where it is. Anyway, two more keystrokes, and Perfect Calc asks whether the cell references in the formula are to be changed in a relative or absolute fashion. This is the usual facility that permits a formula, say, constructed for January, to change slightly in its February to December copies, so that the copies act on February to December data as appropriate.

Perfect Calc has fairly powerful formatting facilities: column widths can be individually or globally varied, and there are a variety of numeric formats, including scientific, financial (with commas every three digits) and even a crude 'graphics' facility which is just about capable of handling bar charts. It is also useful to be able to see the formula for all cells *in situ*. Normally, only the formula for the current cell can be seen, displayed on the status line. Perfect Calc provides an option for this. Figs 1 and 2 give snapshots of the screen showing some of these features.

Finally, the simple Perfect Calc features include the ability to printout the spreadsheet. Printing can be to disk, for inclusion in a word processor document, for example, or as normal, to a printer. Pagination and breaks to deal with reports too wide for the printer stationery can all be handled automatically.

Advanced features

The wide range of advanced facilities in Perfect Calc provides a major incentive for using it. Of course, it is possible to do most of the usual formula replications such as row insertion and deletion — all of these facilities are commonly available in most of its rival spreadsheet systems. But there are also some highly sophisticated facilities noticeably absent from its rivals. Regrettably, some of these facilities are marred by confusing documentation and program bugs. It is to be hoped that Perfect Software will quickly rectify these problems, since they are all that stand in the way of it being a very advanced system indeed.

Virtual memory

When Perfect Calc is running on a CP/M system with 64k of RAM only 20k of RAM is actually available for the storage of the spreadsheet itself. The remaining 44k is reserved for the CP/M operating system, and the Perfect Calc software. In fact, Perfect Calc provides 64k of space for storing the spreadsheet: 20k in RAM and 44k on disk. Perfect Calc organises this 'invisibly', and as far as the user is concerned all 64k might as well be in RAM.

Well, almost! In fact, the 'virtual memory' facility causes a great deal of reading and writing to disk, and this slows everything down considerably. For example, there can be a few seconds delay, to get the data into RAM, after jumping to a new area of the spreadsheet. Global recalculations also take much longer since all disk data has to be read into RAM before it can be recalculated. But the effects of all this are not noticeable until the 20k limit is exceeded; that is everything happens in RAM up until that limit is exceeded. Moreover, automatic recalculation can be switched off or confined to selected areas of the spreadsheet, so it is possible to have some control over the longer delays.

Although the manual does not mention it, the virtual memory facility would run considerably faster if used in conjunction with a 'silicon disk'. A silicon disk is actually a spare RAM board inserted in the computer and not normally accessible to programs. But it is possible to buy special software that fools a CP/M program into thinking that it is a disk drive — hence 'silicon disk'. It behaves exactly like a real disk in every respect, except speed. Data from a silicon disk should be available virtually instantaneously, whereas real disks take time to build up speed, move disk heads and actually physically read the data.

Unfortunately, the virtual memory facility did not work reliably enough to run the Benchmarks, but such measurements as were obtained do indicate that virtual

memory slows the system down. The supplied demonstration programs performed well enough themselves, and all the problems seemed to arise with the Benchmarks, so presumably they are doing quite a good job of testing the software to the limit. Typical problems included a system crash when it ran out of memory, and unstoppable screenfuls of 'Bad page write' error messages. The manual has no mention of these errors (or any other error messages), and no advice on what to do about them either.

Program overlays

This is a rather indirect facility. Basically the Perfect Calc software does not all permanently reside in RAM, but is swapped between disk and RAM as particular keystrokes invoke different bits of it. This is of no direct advantage to the user, but the indirect benefit is that Perfect Calc can be more extensive than otherwise, and so more facilities with all the bells and whistles can be fitted in! In fact the Perfect Calc programs require 75k of storage space, and only about half of that could be squeezed into the program space of a 64k RAM system.

As with the virtual memory facility, program overlays can be read in far more quickly if they are available on a silicon disk. The advantages are not quite as great as with virtual memory, because overlays do not hugely slow the system anyway. It is only when you call on a facility not currently in RAM that you get delayed at all. And since the program code does not change, it is not necessary for the system to waste time writing code out prior to it being overwritten (unlike virtual memory).

Multiple spreadsheets

Like many sophisticated spreadsheet systems, Perfect Calc has a split screen facility. It is possible to split the screen at some arbitrary point, into two 'windows', each looking at possibly quite different areas of the spreadsheet.

Perfect Calc takes this one stage further. Each window can actually be a window onto a physically different spreadsheet. The main value in this facility comes when information can be transferred from one sheet to another, and Perfect Calc provides good facilities for this. Each spreadsheet has a name, and formulae in one spreadsheet simply reference locations in another by using the name and location together, in a fairly natural way. For example spreada (j29) accesses the value in cell j29 of spreadsheet spreada. It is also possible to lay one spreadsheet on top of another, new values overwriting the old without erasing anything else.

In fact, Perfect Calc can simultaneously handle up to seven spreadsheets, only two of which can be displayed at any given moment, one in each window. Switching displays can be achieved in just a few keystrokes. The cursor can only be in one spreadsheet at a time, and normally recalculations will only affect that one spreadsheet, thus saving a lot of time that would otherwise be spent waiting for a complete global recalculation. For recalculations to permeate through to the other spreadsheets, they need to be 'linked'. This is relatively easy to do.

I found the manual fairly weak on this aspect of the system, particularly with respect to suggested uses. The manual writer confesses ' . . . we must admit that the concept is so new and powerful that we ourselves have only scratched the surface of its potential capabilities.' At any rate, it ought to be possible to handle consolidation, and also possibly simplify links to other software, and neither possibility is mentioned in the manual.

Icing on the cake

There are a few other advanced facilities, perhaps not revolutionary in concept, but nice to have nonetheless. For example, there is 'formula-locking', the ability to protect a cell from accidental or intentional erasure or overwriting. There is also a special keystroke, which will quickly move the cursor from one UN-locked cell to another. Thus once a spreadsheet model has been set up and defined, all formulae can be locked, and data entry can be made as fast as possible.

It is also possible to force row and column titles to remain on screen, even when the cursor is somewhere right in the middle of the spreadsheet, and there are other niceties such as synchronising windows so that the columns (or rows) in the two windows always align correctly.

In short, a superb range of facilities.

Conclusions

I would have no hesitation in highly recommending Perfect Calc, except for one major problem: I could not properly run the Benchmarks due to recurring system errors. Certainly the system performed reliably enough with the accompanying (and extensive) demonstration data, but it just would not behave itself once I started replicating the Benchmark formula down more than forty rows or so.

As for other aspects of the system: there was a huge breadth of documentation material describing an extensive range of facilities. Generally the system had a feel of quality, but with occasional annoying glitches. Once the teething troubles are gone, however, this will be a very good package.

It barely needs to be said, but I will answer my original question at the start of the article: 'Perfect Software?' Well, not yet, anyway!

END

a	b	c
1january	8,250.73	151b2/min(b1:b12)
2february	9,123.45	151b3/min(b1:b12)
3march	4,567.12	151b4/min(b1:b12)
4april	11,000.45	151b5/min(b1:b12)
5may	123.54	151b6/min(b1:b12)
6june	1,199.77	151b7/min(b1:b12)
7july	5,435.34	151b8/min(b1:b12)
8august	7,654.23	151b9/min(b1:b12)
9september	4,567.23	151b10/min(b1:b12)
10october	8,000.45	151b11/min(b1:b12)
11november	6,543.23	151b12/min(b1:b12)
12december	4,566.44	151b13/min(b1:b12)

Fig 1. Different column widths. Column 1: Left justified. 2: Financial. 3: Formula display

a	b	c
1january	8,250.73	
2february	9,123.45	
3march	4,567.12	
4april	11,000.45	
5may	123.54	
6june	1,199.77	
7july	5,435.34	
8august	7,654.23	
9september	4,567.23	
10october	8,000.45	
11november	6,543.23	
12december	4,566.44	

Fig 2. Same column widths. Column 1: Left justified. 2: Financial format. 3: Graphics

Benchmarks and other measurements

Up to seven spreadsheets, each with — maximum number of columns: 52, maximum number of rows: 255.
Numeric precision: 13 digits. Individually variable column widths up to full width of display.
Benchmarks: These marks are fully described in *PCW* Feb '83. Evaluation of Perfect Calc's performance has been postponed following repeated system errors encountered for the Benchmark 1 tests. One timing successfully completed: recalculation of 40 rows took 2 minutes 14 seconds.

Checklist

Documentation: attractively packaged 350-page manual with tutorial and reference material and index. Reference card and also help screens and a considerable amount of tutorial demonstration data.
User-friendliness: poorly chosen key-hits for commands. 'Crashed' system on several occasions.
Facilities: extensive. Virtual memory extends maximum spreadsheet size, multiple linked spreadsheets. Comprehensive maths, replication, deletion, row and column inserts, automatic-manual and localised recalculations, extensive formatting and most other facilities shared by comparable spreadsheet systems.
Supplier: Perfect Software Inc, 1400 Shattuck Avenue, Berkeley, California. Available in UK from several sources including Pete & Pam Computers on 0706 227011.

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BENCHTEST

HYPERION

The Hyperion's selling advantage over its rivals must be its portability and its noticeable superiority in the IBM PC look-alike field. Bearing this in mind Guy Kewney set out to discover the machine's secrets.



Photography by Ian Dobbie

Here is why I am quite excited about the Hyperion.

For around £3000, IBM will provide you with an enormous box. It will blot out acres of your desk, and can be loaded with expensive programs. You will need to buy a word processor, a spreadsheet, and probably a communications program. You will be given 64 kbytes of memory unless you ask for more. It will not drive a colour display without expensive add-in cards. And it will be limited in the peripherals that you can plug in.

For around the same price, Bytec Gulfstream (from now on 'Gulfstream') will sell you a neat, compact machine. It will run most IBM diskettes (see table) without any fuss and will come with 256 kbytes, colour output as standard, a built-in display, with not just Basic but a big database information management program included in the price. It has the option of a better than adequate text editor for an extra £100, an excellent spreadsheet (Multiplan) for £185, plus a good selection of operating system utilities, including powerful assembly program writing facilities. You also get features like both serial and parallel printer links, without add-in cards. And it also has two very friendly programs designed to give explanations of everything it does, and help in actually doing it, in 'Explain' and 'Help' commands. And finally, it has a special feature to make it run (sometimes) as much as twenty times as fast as anything else like it — a 'RAM disk'. Soon there will be a telephone link to other computers including automatic dialling and automatic phone answering, for an extra £350 including the modem electronics and very sophisticated phone number retrieval software.

And this machine will be the neatest of neat portables, taking very little of your desk space, and with a natty little tote bag in which to carry its 21lbs around. About the only thing I really wish it would do, and it can't, is run Concurrent CP/M-86 as an alternative operating system. That, and Microsoft's Flight Simulator game program.

Right at the start, you should know that this machine is something special. The whole point of testing a machine is to find its vices, and where they have been found, they are detailed here. But this computer's vices are mostly trivial.

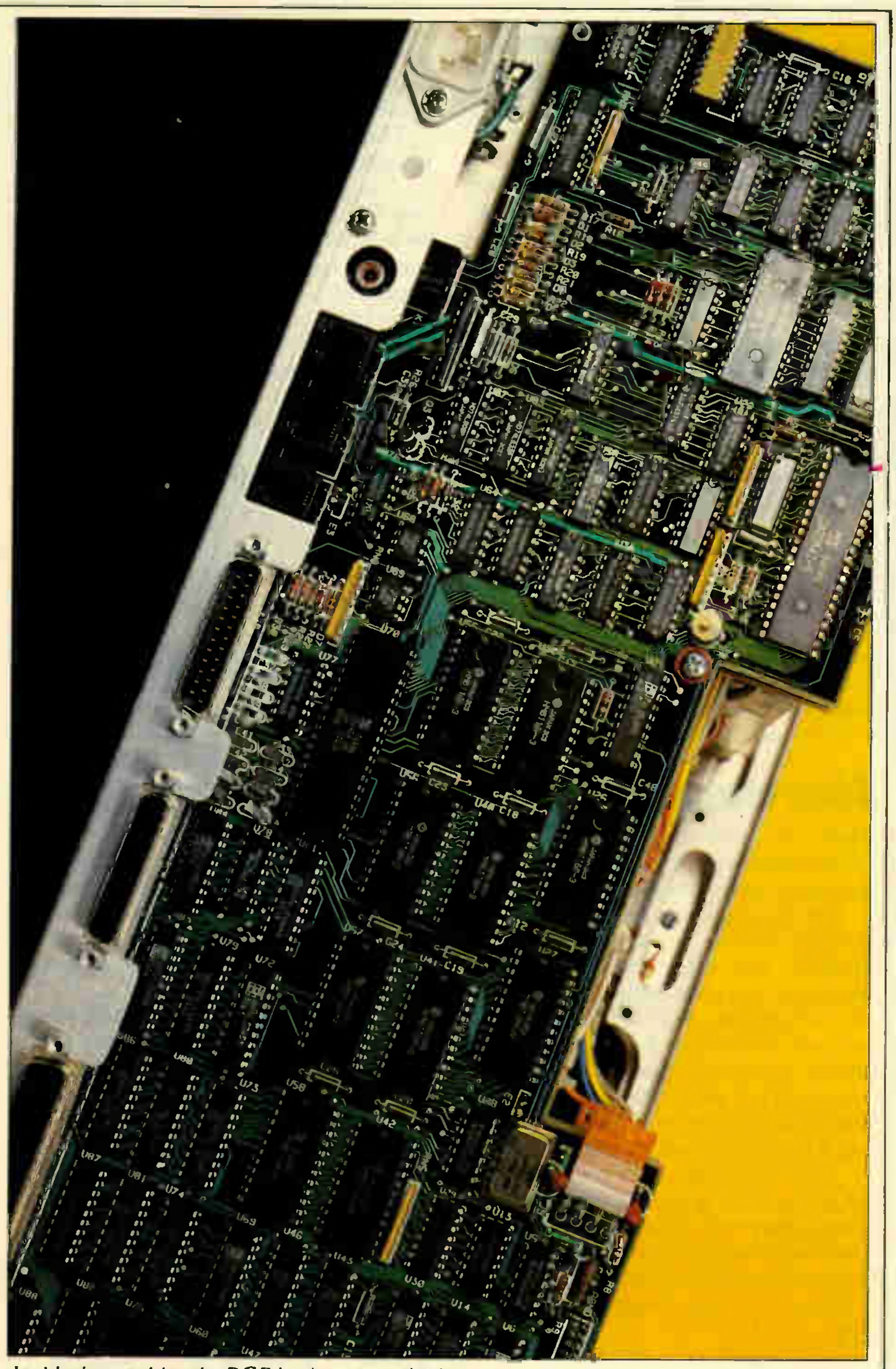
Something which sets it apart from its rival imitation IBM machines is the program calle 'Explain'. This is a Hyperion special, like the optional text and telecoms programs. 'Explain' will tell you everything you need to know about the computer and its software: all you do is ask it to 'explain' whatever is puzzling you.

Type 'explain Hyperion', and you will be told:

Hyperion was one of the Titans of Greek mythology. He was the father of the sun, the moon, and the dawn.

A famous thoroughbred in the 1920's who sired many of the great winners of recent years was also named Hyperion.

Hyperion is normally pronounced 'High/ Peer- Eon'



Inside the machine the PCB looks neat and tidy

A delightful tale, but before going into the details of the machine, it's probably worth trying to clear up some of the modern day mythology about it and the company that makes it.

History

Originally, Dynalogic was launched a year ago as a company in Canada, making a Dynalogic desk-top imitatiorf of the IBM computer. It was one of the first look-alikes to reach the market.

On the strength of that machine, Dynalogic re-organised to launch itself as Dynalogic Info-Tech, and subsequently, the info was replaced with By, and it became Bytech (from now on 'Bytec'). The company designed the portable version, which it showed at the big American exhibition, Comdex, last November. At that time, the idea was to provide a very low-cost system, weighing only 15lbs, with only a single disk drive, for around $2000.

The machine appeared in public in Britain some months later when a company called Anderson Jacobson ('AJ') took journalists up to the top of the Hilton Hotel and showed them the 'Ajile' claiming it was 'the most powerful 16-bit machine on the market'.

Here, we get lost in mythology.

It is true that, as AJ said, the company lives just down the road from Bytec in Canada, and it is also true that it has negotiated a deal with Bytec, to be a distributor in Canada and America.

But a new company called Gulfstream (mentioned above) had arranged to be distributor of the Hyperion in Britain, and Gulfstream's plans called for Anderson Jacobson to produce a different design of Ajile. Under the Gulfstream contract, the Ajile could not be sold as a Hyperion with a different label: it had to be 'significantly improved'.

HYPERION

Gulfstream subsequently got taken over by Bytec, and became a subsidiary. Anderson Jacobson seems to have assumed that this put its UK status on a par with its US distributor status.

Not so, retorted Gulfstream: and you'll get no more Ajiles until we are satisfied that you are sticking with *our* interpretation of the contract.

Still protesting that this was (a) untrue. (b) unfair, and (c) unenforceable, and that (d) it would damn well sell the things anyway. Anderson Jacobson then rather spoiled its own propaganda by firing its sales manager in the UK, with two sales staff.

In the circumstances, you will forgive me if I don't offer any predictions of what will actually happen to AJ's Ajile. The Hyperion, however, looks like becoming very freely available very soon.

Now a look at the Hyperion.

Hardware

There are obvious features of general interest and worth commenting on before getting down to nuts and bolts.

The Hyperion is a portable computer. Today, portable means something much smaller, but when the Hyperion was designed, 'portable' meant that it was built for desk-top use, with the constraint that, not only should you be able to move the whole system with one hand, but you should, if you so wished, be able to take it with you in the cabin of an aeroplane and stack it under the seat in front of you.

As design constraints go, it's a pretty good one — not because people will particularly want to have the computer in their hand baggage, but because a computer small enough to go into hand baggage is a far nicer-looking design to have on a desk top.

More significantly, as historians will one day point out, it compels the designer to limit the display to about seven or eight inches diagonal — something which no user would ever ask for, nor be particularly impressed by, but which, nonetheless, will make the user's life much easier.

This is no place to ride hobby horses, but it really is important that designers do start to realise how the human eye behaves — and that reading lines twelve inches long with letters quarter of an inch high is no way to treat an eyeball. Even if — no, especially if — people's prejudices lead them to ask for a 'big, clear screen'.

And for those who do want a 'big clear screen' the Hyperion can be plugged into a normal monitor, at no extra cost except the price of the monitor. This feature may, however, need some tweaking to suit British monitors. On the Hyperion's own screen, the display was delightfully stable, but there was noticeable 'wobble' on the test machine played through a monitor. (Gulfstream assures me that this is unique to my own monitor.)

Compatibility

The technical specifications (see table) are mostly those of an IBM personal computer with a built-in display. The 8080 chip is the same, the 8087 maths co-processor option is the same, and the operating system and Basic are virtually the same.

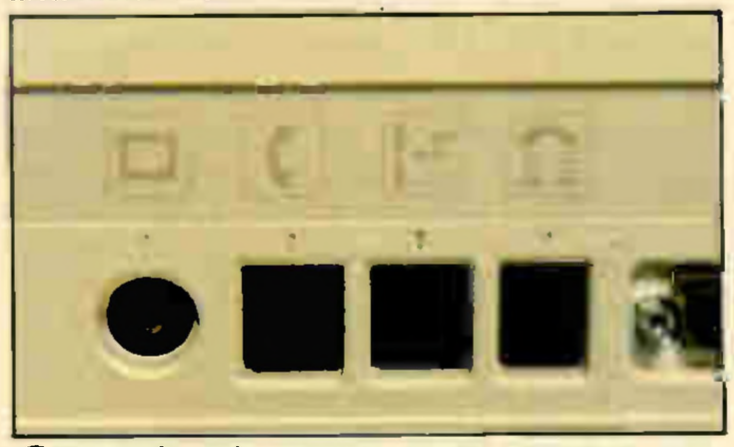
Hardware differences which are not deliberate improvements on the IBM do, unfortunately, exist. Possibly, they aren't crucial to more than one or two users: as far as I can see, they lie in the keyboard and the diskette controller electronics.

It isn't obvious why Bytec would change the keyboard electronics. Changing the keyboard itself is fraught with risks, which have been negotiated very well (see below) but apparently the reason that Flight Simulator (from Microsoft) doesn't run is that Microsoft did not use the BIOS (basic input-output system) of MS-DOS to respond to the keyboard.

Instead, it uses direct readings of the keyboard, for greater speed (not in response, by the way. The greater speed is to ensure that the processor is not distracted too long from calculating the changing landscape and displaying the changes).



Keyboard slots into a shelf under the display and diskettes



Comprehensive comms ports

Apart from Flight Simulator, few other programs will fall foul of direct keyboard reads.

The diskette controller may be more crucial. No information to confirm or deny this was available from Gulfstream, but it does seem, on the face of it at least, that there may always be problems loading encrypted IBM program disks onto the Hyperion.

The IBM uses a disk controller circuit based on chips from NEC, whereas the Hyperion uses the Intel 8272.

Now it is widely accepted that the most clever diskette controller circuitry on the market today is that built by Western Digital, and the way it shows its cleverness



Keyboard layout is IBM PC compatible with 84 keys including 10 function keys and numeric keypad

is in being extremely highly programmable. It can be used to read diskettes formatted by just about any other diskette controller, which means that (with the right program) an Osborne can read data from something like 22 other microcomputers. A Morrow Micro Decision, which uses the NEC, cannot.

But the Micro Decision could quite possibly be programmed to load encrypted IBM program diskettes! (No, it couldn't run them, but that's not the point.)

The purpose of encrypting diskettes is to ensure that you can load them all right, but can't copy them. Copying them fails to pick up certain magnetic makings which, by a quirk of the diskette controller, actually affect its performance or behaviour — to make it skip data, for instance.

Using a controller that doesn't share these quirks, says Ben Rosen at Compaq, might mean that you couldn't load these diskettes. Of course, he would say that, because his Compaq uses the NEC chips. But then again, it will load the highest proportion of IBM diskettes, and run them, of any IBM look-alikes so far tested. It may not be a coincidence.

What little information I have at press time about the 8271 does not suggest that it shares the NEC quirks at all, nor that it could be programmed to do so. Bytec will argue that it doesn't really matter, because the company will make sure that these exceptional encrypted diskettes are provided in formats suitable for their users. But the point of the look-alike game is to avoid exactly that.

The other major hardware difference is the ability to expand the system.

As of today, it is possible to plug extra cards into the IBM, and it is possible to plug them into the Compaq — but not into the Hyperion. To make it possible to add memory, to add local area networks, to plug in Z80 processor cards, and so on, there is a socket on the back of the Hyperion, designed for an 'expansion box'. This will offer up to four hard disk drives, as well as IBM card slots; but although Gulfstream guessed that the box would be available before the end of 1983, that is only a guess. Anyone needing a hard disk system must look elsewhere for an IBM-compatible system.

The competition

As a desk-top portable, the machines with which people will compare the Hyperion are the Osborne(s) and the Compaq. As an IBM look-alike, it will be compared with the Future Computer (in Britain) once that machine does really become available.

Compared with the Osborne 1, it is almost three times the price of the cheapest Osborne I've seen advertised. Compared with the Osborne Executive, however, it is only a third extra, and has the advantage of being, today, every bit as compatible with the IBM as the Osborne Executive model II is likely to be, assuming the Osborne IBM-compatible board ever becomes a reality. The Hyperion has twice the internal memory of the Executive and four times the memory of the Osborne 1. It has nearly twice the diskette capacity of the Osbornes, too.

Compared with the Compaq, its biggest asset is simply that it is available in the UK. The Hyperion also looks to be a bit cheaper especially when you consider that the Compaq will not have any give-away software when it is released. On the other hand, the Compaq will (probably) run a much greater proportion of IBM software, including Flight Simulator and Concurrent CP/M-86, direct from the IBM diskettes. And the Compaq, as sold in this country, is expected to have a dual-voltage plug — it will be able to tell what the mains power voltage is, and adjust itself to use it. For a portable computer, that's a significant point.

But the difference between the two is that the Compaq is meant to be an exact replica of the IBM, but portable. Hyperion is a deliberate attempt to produce a noticeably superior machine.

Outside the portable business, the Future Computer appears to have the clear edge, technically, and on price. It will offer a wide choice of operating software, a local area network, and fortunately I don't have to rabbit on for too long, because the thing is Benchtested in this issue and you can look the copy up for yourself. This, too, is a machine that aims to be 'superior' to the IBM. And on the Future, the claim is that no compatibility has been sacrificed in gaining the superiority.

On the Hyperion, there have been some sacrifices. For my money, the sacrifice is worth it, and were it not for the simple fact that I need an IBM around to test IBM software, I would rather have this machine, any day. The reasons are: the appearance, the speed, and the friendliness.

In use

The photographs will show you all you need to know about the appearance of this machine — the way the keyboard slots cleverly into a shelf under the display and the diskettes, for instance.

What you will not see from photographs, is how very easily it can be carried around, with that little recess between screen and disks. It is perfectly balanced for moving from office to office with one hand. Another point that pictures won't show is the impressions one gets on just plugging it in and turning it on.

There is a quiet fan to cool the electronics down. It runs at a gentle whisper, until the disks run, when it seems to speed up. The disks themselves buzz a bit when in use, but that's hardly a continuous hazard, especially compared with the noise of an IBM searching for a new data track.

There are contrast and brightness controls. I couldn't see any difference between them: with both turned up full, you could read in bright daylight (though not direct sunlight, not easily) and with either turned down, the screen was easy on the eyes in dim-lit rooms.

The only snag of consequence on the Hyperion is that the screen does not 'look at you' when you put the machine on a desk-top. It is watching your lower chest, and everybody who has used it mentioned a desire to tilt the thing further up. I suspect most customers will get a little shelf for its usual desk, to raise it six inches or so higher.

The doors of the diskettes are smooth, positive, and easy to operate — but not foolproof. I very nearly reformatted one diskette (which would have been a disaster) because the system said was blank — and what had happened was that the centre spindle had trapped the diskette itself off centre. The result was that the thing was not spinning round concentrically, so no tracks were under the read/write heads. So you obviously do have to learn how to push the media in, carefully, and make sure it is in straight.

We will come to speed at the end. For now, after appearance, friendliness. How about 'HELP?'

HELP

The tenth 'special function' key on the keyboard is a HELP key. It relates to whatever special function key you have just hit.

The result is that you can lose the manuals without anxiety. Once you have read the introductory tutorial manual (the 'setup guide'), you really can explore almost everything from there on by yourself. All the complex application programs, supplied by Bytec for the computer, have HELP files which can prompt you whenever you get stuck.

Even the complex utilities which configure the system (and can do things such as pretend that this is an IBM machine with a colour display, or change the printer to behave in different ways, or dial remote computers) have tables of information relating to whatever is going on at the moment.

The HELP feature has been as well thought out as it can be, though there is a flaw; some functions reject it. For example, in the process of saving a text file, the message 'save to what disk file?' is displayed at the top of the screen. You may try pressing the HELP key if you like. All you get is one of the very many beeps that can drive you scatty on this machine. To avoid this, the HELP key should be able to generate an interrupt: that is, it should override whatever is going on. Failing that, more care should be used to turn off the HELP display at the bottom of the screen for those functions that won't accept HELP as an input. I do think if you're going to do something like HELP, you should do it properly.

The 'Explain' program has a similar function to HELP, except that it runs *before* you actually peform the operation. 'HELP' functions are all very well once you already have the program up and running, but I well recall my frustrations with Supercalc, which has a tremendous HELP table — and I could never get far enough into the program to invoke it!

Friendliness even extends to the operating system. For example, the way to load

programs is with MS-DOS commands. If you are using MS-DOS, then you want to take advantage of the 'template' which can recall the last command line you used. Say, for example, you have tried to copy a file from one disk to another. You would tell MS-DOS something simple (!) like:
"COPY A:AFILE.1ST B;AFILE.2ND"
and only after getting the bland message "O file(s) copied" would you realise that you'd typed a semicolon after the disk drive b:, instead of a colon.

Under CP/M this is a disaster. It is possible under MS-DOS — but I defy anybody actually to do it without looking up the commands in the manual — to recall the command, and edit it, with very complex editing functions. I can't even do it *with* the manual.

On the Hyperion, the pre-coded function keys include one labelled 'LASTLN' which calls back the 'last line' typed in command mode. Even better, this line can not only be edited, but it can be easily edited, by inserting, deleting and changing characters *simply by moving the cursor to the right spot and insert-typing or overtyping, or rubbing out.*

Care extends to other areas. The 'delete' function under MS-DOS is normally lethal. You type 'DEL *.BAS' and only after it is done do you realise you have not just deleted 'JUNK.BAS' but also 'BIGPROG.BAS' and 'INDEX.BAS' for ever and ever.

On the Hyperion, there is the option to type 'DEL/P' instead of DEL — and the difference is that it actually asks your permission, file by file, before going ahead. And on the Hyperion, DEL/P (or ERASE/P) is the standard option you get with the soft function key when the operating system command line is running.

Similarly, the DIR directory function is on the soft keys, and is there as DIR/P, which means that it displays a page at a time, before running through to the end of the list of files. So you can see the beginning of the directory, not just the last screenful. I noted, also, that there are a lot of operating system messages which seem to be friendly to a degree over and above normal PC-DOS messages.

Start copying a diskette with DISKCOPY, for example, with the original 'source' diskette in one drive being copied onto a blank diskette in the other. Put a disk from somebody else's Apple in the blank drive. 'Source and destination diskettes are not formatted identically,' it says. Not 'unformatted disk in b'; or Bdos error on b; or Disk read error on b; or (worst of all) just go ahead and wipe out somebody's two weeks of Apple assembly work. 'Continue copying?' it says, instead. And when you say 'yes' it then tells you 'Formatting while copying'.

On those occasions where it finds a good reason for not obeying you, it doesn't come back with those 'are you sure (Y/N)' messages. I've met versions of those which actually accept just about anything that isn't *NO* as yes. On this system, instead, it sets up a *YES* function key, and a *NO* function key. You have to hit the right one.

Documentation

It was nice to be able to say that: 'the manual is something you really aren't likely to need.' Because now, it has to be said that if you really did need the manuals, you would be in some trouble. The friendliness doesn't extend to the manuals. Here, Gulfstream agrees with me, and I understand that new documents are being prepared.

This isn't altogether a tragedy. From one or two other users of the system, I have been given the clear message: 'get IBM manuals, and use those for the Basic and the disk operating commands — they are much better.' I don't find this hard to believe, but it is reassuring to know that they are so similar.

However, a quick look down at my comments on 'IN:Scribe' on printing will illustrate some of the problems.

Hardware friendliness

There is one hardware feature which is *enormously* friendly — a clock.

All MS-DOS machines have a 'real-time clock' which you have to set each time you turn the system on. On this one (as on ACT's Apricot — see the Benchtest in this issue) the system has its own digital electronic watch with its own batteries, and when you turn the system on, you are not faced with a request for 'today's date' in American form. The clock can be accessed from Basic, using the TIME$ function, which I found very useful in testing the Basic speed.

While on hardware features designed for friendliness, I noted one minus point. On the keyboard, the 'caps lock' key doesn't have a red light, but when the normal screen display is on, a little arrow comes on to show that caps lock is down. Similarly, the 'NUM LOCK' key which turns the cursor pad into a numeric key-pad, has a mark on the screen — but not every program displays this. Better than nothing, but a caps lock key really ought to stick down so that you can see it's down.

Keyboard

The keyboard, that apart, is wonderful. The keys are perfectly balanced. Tap them gently, and they register. Press them firmly, and they travel right down to the bottom of their springs. They are also the sort of thing with which IBM PC users will feel at home.

Making IBM users feel at home may sound a low priority design point. If you've got an IBM computer, you don't need another, do you? In fact, it is vital, for two reasons: first, software is written for the IBM, and second, IBM users *do* want another computer, despite what you might think.

The point about software is that manuals are written for it. And programs like Lotus 123 have manuals full of pictures of the IBM keyboard, with the names of keys like 'Pg Dn' and 'Pg Up' and 'Del' and 'F1' and 'Brk'. You want to try finding your way around these manuals on 'look-alike' machines with 'improved' keyboards, and see how long you retain sanity.

Of course, these other look-alike machines will get their own Lotus 123 manuals — one day. And they may be produced by Lotus, and be identical to the IBM ones, with different pictures. Or they may be produced by the manufacturer of the look-alike, and be incomprehensible muddles. What do you bet?

The other point — that IBM users want other machines — refers to the fact that a company which has bought a couple of IBM machines, may decide to buy a few portable machines to match. People may be switching from one system to another, and would prefer not to get confused.

So there are few changes in the Hyperion keyboard — except that it has a proper RETURN key, and that its special function keys are in the right place. The RETURN key is larger and wider than the IBM's. It is also closer to a typist's fingers in the 'home' position, so you don't dislocate your little finger reaching for it.

The function keys on an IBM are in two columns. On the bottom of the screen, there is a special line, which is designed to

This is my test of Hyperion printing.

Normally, one wants one's word processing package to print stuff out onto a piece of paper.

Just typing the words out is easy enough: but with today's clever printers, you have the option of doing all sorts of other things. In particular, you can have condensed print (on an Epson, 132 characters per line instead of 80) or expanded print (40 characters instead of 80 or even 60 instead of 132) and superscript and subscript.

Some of these things can be put into a block of text by IN:Scribe, and here is a demonstration of how they look on the printer.

From here to the end of this paragraph, I am going to ask for boldface text.

That should have been that. On the screen, it appeared as a block, inverse characters, with extra brilliance. When the "Cancel" command was used, it remained brilliant, but ceased to be inverse (though you might imagine that the "cancel" command would undo what you had just done, it doesn't).

Now this paragraph is going to be defined as an underlined block. It should either have the underline character printed under each letter (the normal Wordstar trick) or else it should take advantage of the cleverness of the Epson MX80, and drag the bottom matrix needle along while printing.

We should be able to print superscripts, as in maths. so the line:

$Y = X^2 + A^3$

should print properly as on the screen.

Now I am going to save this file, and see if it prints with the various methods of printing available.

Hyperion printout

carry function key legends. You can see ten little legends to show what these special function keys do at any given moment. It makes such obvious sense to have your ten function keys in a horizontal line underneath these ten little marks, that I'm totally at a loss to explain why IBM didn't do as the Hyperion has done, and line up the function keys in one row, matching the display on the bottom of the screen — so that you can work out which one actually is number seven without counting.

Apparently the system saves a lot of power by turning the screen off after three minutes of not being used. I found this very disconcerting, whatever they say, because it looked as though the machine was switched off, and people tended to turn it off in the belief they were turning it on. As a result, when using it in a crowded office, I was glad to be able to disable this function. I would rather it did as Apple's Lisa does, and dimmed itself, because even with the screen off, a program may be running, and some sign that the thing is working would be welcome, to stop people thumping the keyboard, making strange things happen.

Friendliness again: unlike many systems, this one checks all previous disks (including the RAM disk) for a program, before reporting 'bad filename or command'. So, assuming you are logged on to drive 'C:' if you forgot to type the disk drive name 'B:' first, it puts it in for you, after checking 'A:'.

Basic

The Basic had me squirming with joy, because it (like the IBM's Basic) has a 'full screen editor'. This is standard IBM Basic, of course, where it is known as Gee Whizz — GWBasic. Bytec has not tampered with it much, but people who are used to Microsoft Basics will probably not realise just how nice it is. The manual for programmers actually starts with a rather severe notice about Microsoft, to the effect that Microsoft was a bit late with the Basic.

'Dynalogic (that is, Bytec) is committed to providing Hyperion Users with a an optimal balance between IBM PC compatibility, and enhanced capability,' it says. This means that the company recognises that people want the IBM machine because it is IBM, but those who actually want the things that the IBM might be expected to do, will want something better. 'The GW-Basic (tm) provided with all Hyperions produced during the first quarter of 1983 does not meet our criteria for either compatibility or enhanced capability,' it continues. 'Microsoft,' it adds very sternly, 'producers of the GW-Basic, were unable to meet stated delivery deadlines for the IBM compatible version.'

This refers to the little-known fact that Microsoft was trying to sell GW-Basic without making it clear that the team which produced it was not the same bunch of programmers which produced IBM Basic. Several manufacturers got very hot under the collar about this.

In fact, my version was okay; it was 'BASICA.EXE, not GWBASIC.COM. So I can't send the one in and get it replaced with the other.

The reason for mentioning this is not merely to gloat over Microsoft. There is the question of bugs, and how you handle them, and Microsoft is not a model in this matter.

Grown ups recognise a simple fact: that all programs have their faults, and the way to cope with these bugs in programs, is to keep and to publish a list of all the known faults, whether or not this is intended to rectify them. Children keep the faults hidden, and hope that nobody will notice. The result of childishness when applied to languages, is that people who use the languages write programs which do not work and then can't understand why.

Microsoft has been notorious for not supplying lists of bugs, and I'm very pleased to note that Bytec is having none of this. In the manual, it has listed all the bugs it knows in the Basic, with an explanation of what it ought to do, what it will do one day, and what to do today to get round the problem.

I'm a bit puzzled about one thing in all Microsoft 16-bit Basics — the inability to use more than 64 kbytes of memory. Experts will tell you that it doesn't matter — that very few Basic programs are in fact likely to be longer than 32 kbytes, and that there are a great many ways of getting round the problem besides extending the memory used. But there are always the exceptions, and if you've got 256 kbytes, why not use some of it?

It would be nice if, in producing this version of GWBasic, Bytec had also chosen to leave the ridiculous idea of line numbers out. I've written a fair bit in Newsprint on this subject, related to both the Hyperion and the Tandy 100, so there isn't much point in repeating it here, apart from the fact that line numbers serve no purpose in editing programs that have proper full screen editors.

The point (for those who don't want to read Newsprint) is that line numbers were useful references for quick changes to a program held on somebody else's computer. On something like the Hyperion, with a proper text editor like IN:Scribe, you can find any part of a stream of text you like by moving up and down the text file. You can use the micro for this, you don't have to take a printed listing away into a corner with a pencil. So why use line numbers? Just change the line on the computer, surely?

I note that the assembler manual actually suggests using Microsoft's EDLIN text editor for writing assembler code. EDLIN (to my mind) is Microsoft's way of proving that it could write an old-fashioned, out-of-date line-number editor to rival CP/M's dreadful ED.

Either way, with EDLIN or with IN:Scribe, it was an opportunity missed.

Like all complex machines, this one suffers from confusion over what is happeining, and what is just left over from last time. You can set the screen, for instance, to 40 or 80 character display. And changing from one to the other is very quick and simple. The trouble is that: when the user switches, from, say, Basic to Multiplan or word processing, sometimes these attributes are retained, and sometime, they are reset. It really isn't easy to sort out which.

Software packages

A review of the software for the Hyperion is not possible, nor necessary.

The database program Aladin was not available at press time, but it is a known product — I believe it is intended to have it available on the Apricot from ACT — and presumably it will be tested by database experts in due course.

The communications program, IN:Touch, looks unique — in America and Canada. Over there, it includes a modem, and a phone extension — and the idea is that the computer becomes the phone dialler. It can dial all your calls, whether you intend to send the computer data to another computer, or to talk to a human.

In the UK, the hardware for communications with the US is there, but useless — because of the old problem of differences between Bell and CCITT modem standards. Gulfstream reckons that a UK equivalent program and hardware will be available 'soon' with several important (but unspecified) extras. Estimated cost will be £350 for hardware and software, I was told.

That leaves the text editor, 'In:Scribe'.

Text editing and printing

I feel in two minds about IN:Scribe, and I think I can explain it quite simply. I feel like a history teacher, who on asking an examination question on 'the life and times of Napoleon' receives a brilliant essay on the subject of the pupil's small cat, Napoleon.

It may be very good, but it isn't what we've been talking about all term.

If you get near a Hyperion, or an Anderson Jacobson Ajile, here is a question to ask it:
'Explain print'

It will answer this question — and you will get a confusing dissertation on three modes of printing. The first is the simple connection of the printer to the screen — an old CP/M trick which ensures that every character displayed is also printed. The second is a 'page print' facility, which ensures that everything already 'on the screen' gets printed, whether that makes sense or not. And the third is another old trick, involving the temporary assignment of the printer as part of the filing system, using the 'copy' command. None of these things are mentioned in any of the menus of IN:Scribe.

Gulfstream sounded quite aggrieved that one weekly magazine actually reviewed the program and concluded that 'it cannot print text out once you have composed it'. I'm not surprised. Not

HYPERION

mentioned, either in manual or 'explain' is the fact that what you are expected to do is 'save the document to the printer'.

Saving the file is easy. 'To the printer,' is an option which isn't going to occur to you. This is what happens when you start looking for the word 'SAVE'. It is all quite sensibly organised, and very easy to do. First, you hit a special function key called 'SAVDOC' and instantly, on the top line of the screen, you will seen the question 'Save to what disk file?' followed by the suggestion that you save it to the disk using the name you have been calling it all the time. To print it, then, you must save it to a file on drive A: called 'PRN.' — including the full stop. Yes, obvious, isn't it?

Before you do this, there is one small warning: under no circumstances should you now print it! You will never see the text on your computer again if you do — it will disappear into the printer as totally as if you'd used a typewriter.

First, you should save it to disk. Either go ahead and do what is suggested, using the filename you gave it to start with, or else mark the whole file as a 'block' and 'write the block to disk'.

This, by the way, is what you do each time you want to make a safety copy, on disk, of what you've written so far. There is no single operation to 'save text so far, and carry on writing'.

Once you start the official 'save' operation, you have finished editing, and if you want to do some more, you have to load the whole 70 kbyte editor program again.

There is one more, smallish problem: which printer do you have? Whatever it is, you need the appropriate 'printer filter' to translate all the bold fact, underline, and whatever else you have put on the page, into the appropriate codes for your printer. Then you have to go to the system 'MODE' program, ask for the settings to be changed for the line printer (called LPT1:, obviously), by asking for 'output translation' to be, not 'OFF' nor 'STRIP' but 'External' — and to the word 'external' you add the name of your print filter. Mine was called 'EPSON. PRN'.

The manuals that come with the machine have indexes, in which the word Print does not appear. It lists the '/P parameter' (pronounced slash P, which seems a little unfortunate). There is the page, the set size of page and the remove new page; even the soft key page, the pagtop soft key. There is a section or two on parameters. There is comment on the Phone command, the Power button, the Power cord, the pulse, and something about protocols. But nothing about printing. There is a single page which (unindexed) does touch on the subject — but it is less informative than the 'Explain' page.

I've made a meal of this, I know. After all, the darn thing can print, can't it (I hear you say)? Well, yes. It's just that on an ordinary system, this sort of carelessness would be reprehensible. On this ultra-friendly system, it stands out like the Home Office in a democracy. And anyway, with a fast RAM disk (see below) it *must* be possible to devise a system of printing 'in background' without preventing the user from carrying on typing?

There are a few other problems. Within an hour, I found that the program could create text, justify it, move blocks around, write blocks to disk, fetch blocks off disk, and even append text to the end of disk files.

There were bugs — a good example would be the 'Adjust' function. This was defined on the HELP page as: 'Reorganise all of the words between the current cursor position and the next blank line, such that as many words as possible are on each line, within the currently set left and right margins.'

The idea is to turn bits and pieces of broken up lines back into nice, neat paragraphs. In fact, it eliminates paragraphs! You need a 'blank line' between adjusts, and the only way to get that is to hit the return key *twice*.

There is a truly lovely facility called 'UNDO' which cancels whatever you have just done to a line. It is a safety net for those accidental erasures of the wrong line. Its only limitation is that it is not universal. It just applies to the line, not the block.

Let's give IN:Scribe a nice high mark of 80%. That, marked out of 40, means its final rating is around 30%. Could do a lot better.

RAM disk

Finally, the question I raised right at the beginning — the speed of the system.

The hardware feature which sets this system apart from others is a 'RAM disk'. This is an area, normally 90 kbytes, of the system memory. There are 256 kbytes total, 20 kbytes used for display, and as much as you like for the RAM disk.

What it does is to store data *as if it were on a magnetic diskette* but in semiconductor form. The difference between semiconductor and magnetic memory is simple: the read-write head doesn't have to move before you start getting the data, and it comes off many times faster.

This simple trick can make several functions enormously faster. A good example is the re-organising of a long text file which is being edited. Another is the loading of a 'program overlay'.

Remarkable though the speed improvement can be, you will see no sign of it in our Benchmarks, which really is a dead giveaway.

As *PCW* popularised a series of standard Basic Benchmarks, computer reviewers are always asked to produce a list of timings. And machine manufacturers such as Olivetti do dreadful tricks with them. I've done them, and so here they are with some comments on special circumstances.

Benchmarks

Benchmark 1

Using TIME$ instead of 'PRINT "start"', the loop took 12 seconds for 10000 iterations. With 1000 iterations it took one second(!). The same technique was used for timing all the Benchmarks, so there are no fractions of seconds. This doesn't significantly affect them, since a human with a stopwatch pressing buttons on a computer with the other hand has to be some kind of freak to judge fractions.

Benchmark 2

5 seconds

Benchmark 3

10 seconds

Benchmark 4

10 seconds

Benchmark 5

12 seconds

Benchmark 6

This one wants the Basic to define the size of an array variable a thousand times. It won't run on the Hyperion, where you can't redefine an array. Makes sense, of course.

It took 21 seconds, with a REM statement instead.

Benchmark 7

Naturally, this wouldn't run, either. It seemed not to need to have the variable array dimensioned, and took 33 seconds with a REM instead of the DIM statement. Running it with a DIM statement first, it took 33 seconds. No surprise.

Benchmark 8

35 seconds

Having religiously done all that, I have some comments to make.

First, these Benchmarks have become a dead waste of time. There was an age of computing when micros had no commercial software, and had enormously different versions of Basic. The Texas 99/4 is a relic of those days, as is the Apple and the PET.

In those days, it was worth running the Benchmarks just to make sure that a manufacturer's claims for his Basic — the only way of programming the thing, remember — didn't have something drastically wrong with it.

And the Texas and the Sinclair ZX81 were good examples of why that approach had value. They were amazingly slow.

Nowadays, however, nobody seriously sells programs written in Basic, unless speed is of no consideration. And the speed of a perfectly standard Microsoft Basic on two machines with identical chips, identical memory, and identical clock speed, is obviously not going to vary by enough to get excited about.

On the other hand, the arrival of complex plotting and drawing standards has made one machine as different from another as chalk from cheese. And when it comes to using diskette storage, there are machines that can take minutes to do work that others might take mere seconds to do.

The Benchmark timings for the Hyperion here, on their own, are pretty ordinary. This just goes to show what a waste of an hour of my Sunday they all were, because this machine is *fast*.

Now for illustrative purposes, I ran my own Benchmark on drive C: — which is the imitation disk in normal memory. The programs I used are listed in the table. For

```
  100 REM prog 1 to call prog 2
110 X=PEEK(10000)
120 X=X+1
130 LOCATE 10,10
140 PRINT X;
150 IF X=255 THEN PRINT TIME$:STOP
160 POKE 10000,X
170 RUN "prog2"
180 END

100 REM prog 2 to call prog 1
110 X=PEEK(10000)
120 X=X+1
130 LOCATE 10,10
140 PRINT X;
150 IF X=255 THEN PRINT TIME$:STOP
160 POKE 10000,X
170 RUN "prog1"
180 END

100 REM start program
110 CLS
120 POKE 10000,0
130 LOCATE 9,10
140 PRINT TIME$
150 RUN "prog1
160 END

10 KEY OFF:SCREEN 0: WIDTH 40:CLS
20 LOCATE 25,5
30 PRINT DATE$
35 LOCATE 25,24
36 PRINT TIME$
40 SEC = VAL(MID$(TIME$,7,2))
50 IF SEC=SSEC THEN 20 ELSE SSEC=SEC
60 IF SEC=0 THEN 1010
70 IF SEC=30 THEN 1020
80 IF SEC<57 THEN 20
1000 SOUND 1000,2:GOTO 20
1010 SOUND 2000,8:GOTO 20
1020 SOUND 400,4 :GOTO 20
1030 END
```

Benchmark programs

those who don't like puzzling through Basic code, they are very simple indeed; the first one prints the starting time and loads the second. The second loads the third, and third reloads the second, and they do this until programs have been loaded 255 times. All the POKE instruction does is to keep count.

Using the RAM drive C: they took 12 seconds.

Using the standard floppy drive B: they took a yawn-stretching three minutes and 24 seconds.

Just for comparison: on a Sirius, the same operation using a fast hard disk took 52 seconds. On the Sirius's floppy disk, much larger in capacity than the Hyperion's floppies, it took seven minutes and 50 seconds; compared with 12 seconds, remember, on the Hyperion's 'RAM disk'!

By putting the interpreter program BASICA.EXE onto the memory 'disk' or drive C: and by putting a basic program on that drive too you could type:
BASICA CLOCK,
and before you had time to start your imaginary stopwatch, the program was running. The program in this case simply printed date and time on the bottom line of the screen and, as a purely snide matter of interest, I got it out of the manual, and it didn't work. (The corrected version is listed.)

I haven't listed the IBM Basic functions and statements. The main difference between IBM Basic and this is the SCREEN statements and functions. These switch between Hyperion characteristics and IBM characteristics. Mainly, Hyperion attributes offer much more detail in plotting and other graphics.

Cost

Gulfstream will not be selling single drive machines, because of problems of production in the US. It will charge £2695 if you insist, and won't let you get it until after a six week wait. That price includes MS-DOS, Basica and Aladin.

A dual drive machine, including the same software, costs £2995. IN:Scribe costs £100, Multiplan costs £185, making a total cost of £3345 for a system with all software bundled.

Gulfstream will sell IN:Touch and a US modem with a standard warning: it should not be connected to the main phone network. There are people using intra-company phone systems where this will be usable anyway. Within a couple of months, they will start listing a UK modem and program, and targeting £350 as the ideal price for hard and software.

There is a neat little bag, in which to carry the machine around the streets. The bag comes for £65.

Conclusions

Summarising, then, I would rate the hardware as excellent.

The software included (Basic, and Aladin), and available (In:Touch communications program, IN:Scribe 'executive text editor', and Multiplan), pushes the total system price up to around £3700. This makes the system pricey.

The documentation, despite my doubts above, is at least acceptable.

The fact that a good Basic and a full list of operating system utilities (including assembler and debugger) is also provided, sets this machine apart from its rivals. The fact that it is the only portable imitation IBM freely available in Britain means that despite the high price, it should sell quite well. END

Supported software

Word Processing	BLS	Fact Track
Easywriter II	Desktop Plan	**Accounting Software**
Easy Speller	Financial Reporting	Cyma Software
SpellBinder	Inventory	Realworld
WordStar	Tax Decisions	General Ledger
MailMerge	RFS Report	Padmede Software
SpellStar	Micro Modeller	Inventory
WordMate	Multiple Regression	Incomplete Records
Word Plus	EasyCalc	Compact Software
WP	**Compilers and Utilities**	IUS Software
Mail List	Fortran	
Database Management	Cobol	**Printers Supported**
Systems	Pascal	NEC3500
Visifile	**Games and Home**	Cent X352
25th Hour	**Applications**	CITOH
Easyfiler	Question	Tally 160
Freeform	Millionaire	DABLO360
Visidex	Print It	Epson-FX
Dbase II	Adventure	IDS480
Data Base Man	Arithmetic Games I	OK193
Busipost	Arithmetic Games II	Epson
Financial Planning	Sideways	MT1000
Perfect Calc	Real Estate Investment	QUME11
VisiCalc	Money Decisions	Daisy
Loan Planner	The Home Accountant Plus	PROWRITR
Money Decisions	Money Matter	Epson-RX

Technical specifications

Processors	Intel 8088 at 4.77MHz, optional 8087 floating point.
Memory	256k user RAM with parity. 20k display RAM out of 256k. 8k ROM.
Keyboard	Low profile ergonomic design meets European DIN standard. Compatible with IBM PC keyboard layout. 84 keys including 10 function keys and numeric key-pad. Tactile feel with optional audio key-click.
Display	7in non-glare CRT with amber phosphor for viewing comfort. Separate brightness and contrast controls. Alphanumeric screen format, 25 lines of 80 characters.
Diskettes	Double-sided, double-intensity with 655k capacity. Capable of reading and writing IBM single and dual-sided diskettes.
I/O	RS232C/RS423 serial ports. Centronics parallel printer port.
Weight	21lbs (9.6kg)
Other features	Time and date clock with battery back-up. Programmable sound system.

CHECKOUT

THE MIGHTY MICRODRIVE

Now that the age of the Microdrive has finally arrived, Steve Mann assesses how the Spectrum's popularity will be further enhanced.



With the Microdrive Sinclair has opened the door to a whole host of serious applications.

Fifteen months after it was first announced, the Sinclair Microdrive has finally made an appearance. The past year and a quarter has seen rumour upon rumour about the drive's constituent parts — disk or floppy tape? — and Sinclair has played its cards close to the chest: all Clive would admit was that his Microdrive contained an 'interchangeable storage medium'.

Now, finally, the questions can be answered.

The tiny Microdrive cartridge contains an endless loop of high-quality tape, measuring approximately 15 metres by 1.9mm. Each cartridge has a quoted capacity of 85k, although in practice this is often higher — typically 89 or 90k. A maximum of eight Microdrives may be linked together, giving a total capacity of 680k or more. The drives are powered by the Spectrum power supply, and are connected to the computer via the 'ZX Interface 1'. This simply slots into the edge connector at the rear of the Spectrum and is secured by removing two of the screws from the base of the computer and replacing them with two screws attached to the interface. This should avoid the 'wobbly RAM pack' problems associated with the ZX81 and has the added bonus of tilting the Spectrum keyboard to a comfortable angle for typing. Those of us who have replaced the Spectrum keyboard with a 'proper' model will have problems here — there is certainly no room for the interface in any of the cased keyboards available.

The ZX Interface 1 (Interface 2 will apparently provide a slot for cartridges and a joystick interface) enables the Spectrum to drive an RS232 printer and also allows up to 64 Spectrums to be linked in a network. But its major function — and the one concentrated on here — is to control the Microdrives.

A single drive is attached to the interface via a short length of ribbon cable. Further drives slot together by means of rigid connectors (one of which is supplied with each drive), and are stabilised by means of a bracket which screws into the underside of each drive.

The interface extends Sinclair Basic to include file-handling and communications facilities and uses Basic as an operating system. The Microdrive and Interface 1 manual gives full details of the Basic extensions and how to use them, as well as detailing the new set of error codes associated with the Microdrives. Wherever possible, the syntax associated with cassette storage is retained, with extensions to indicate that the Microdrive is attached.

Using the Microdrive

Assuming the Interface has been attached to the Spectrum, and at least one Microdrive connected via its ribbon cable, the first task is to format the blank cartridges. This is done simply by entering FORMAT "m";1;"name". "m";1 identifies the Microdrive in use (in this case, number 1) and 'name' can be anything of 10 characters or less. Formatting takes about 30 seconds and during this time the screen border will flash, clear and flash again before the 'OK' message is displayed. Formatting is essential for the computer to identify any areas that can't be written to or read from and to mark them as unusable. Once done, formatting need never be repeated — but it does provide a convenient way of erasing an entire cartridge, so reformatting the demonstration cartridge supplied with the Microdrive will allow its use for other purposes. Typing CAT 1 (again, the '1' assumes that drive 1 is in use) will display the name you have given to the cartridge, the names of any files present, and the remaining capacity. Write protection is achieved by snapping off a small plastic tag — as with cassette tapes the cartridge may be write re-enabled by the simple expedient of sticking a bit of tape across the gap.

To save a program on Microdrive, the command SAVE* "m";1;"name" is given — the star tells the computer that the program should go to Microdrive rather than cassette and "m";1; identifies the drive in use. VERIFY works in a similar way — so VERIFY* "m";1;"name" will make sure that your program has been stored correctly. To load a program from Microdrive, the syntax is LOAD*"m";1;"name".

Programs may be merged by using MERGE*"m";1;"name" and the usual Spectrum auto-run facility is available by appending LINE x to the SAVE instruction. The Microdrive also has a special auto-run facility — to avoid repetitious typing of LOAD and RUN, one program on each cartridge may be accessed by simply typing RUN. This facility is set up by naming the relevant program 'run' — this is typed in letter by letter: the Spectrum keyword RUN will not work — making sure that the cartridge is in drive 1. This facility must be used immediately after switch-on or after typing NEW. The program is saved by typing SAVE*"m";1;"run" LINE number. Entering the keyword RUN will load and run this program. It should be noted that the

Photography by Richard Kemp

MERGE statement will not work with any program saved using LINE.

All of the above assumes that you are loading and saving Basic programs — but machine code routines are easily dealt with in the usual Sinclair manner by tacking CODE onto the end of the relevant instruction. One annoying feature is that the list of Microdrive contents accessed by CAT does not differentiate between machine code and Basic programs. When cassette storage is used, Sinclair Basic provides a helpful indication of the type of program being loaded by means of various prefixes — 'Program', 'Bytes', 'Number array', etc — and it would have been helpful if this practice had been continued with the Microdrives. As it is, no indication is given — if you omit the CODE suffix from a machine code program you will simply be greeted with an error message.

Erasing a program or file is simplicity itself — all that is needed is the command ERASE"m";1;"name". Care must be taken when loading and saving — if BREAK is used while saving the cartridge will contain an unclosed file. This cannot be loaded, and any attempt to do so results in the error message 'file not found'. The ERASE statement will delete an unclosed file —eventually — but this will take 30 seconds or so as the computer checks the cartridge several times in an attempt to find the end of the file. In general, care must be taken not to remove a cartridge from a drive while the red LED is lit, and power must never be switched on or off with a cartridge in the Microdrive.

Data channels and streams

All of the above assumes that the Microdrive is being used for storage of programs. Where the drive really comes into its own, though, is in the storage of data for use in programs.

For this, the concept of channels and streams is introduced. 'Channels' are merely the various parts of a computer system — data may be sent to the screen, ZX Printer, Microdrive, another Spectrum if both computers are linked in a network, or the RS232 interface and thence to a printer or other peripheral. Data may come from the following channels: the keyboard, a Microdrive file, another networked Spectrum or the RS232 interface, a modem or terminal.

Data is sent to and from these channels via 'streams'. The concept of streams may already be familiar to Spectrum users: the Basic Introduction Manual gives brief details and users may have utilised streams for printing on the lower two lines of the screen, for example. The Spectrum supports 16 streams, numbered from 0 to 15: stream numbers are always preceded by a hash mark (#). Four streams are permanently linked to channels — stream #0 and stream #1 output data to the lower part of the screen and input from the keyboard; stream #2 outputs to the upper screen but cannot input; and stream #3 outputs to the ZX Printer but also cannot input.

Each statement that produces input or output uses one of these streams. It can therefore be seen that the PRINT statement is, in fact, shorthand for PRINT#2; and LPRINT is a shorter form of PRINT#3. Any statement may use a different stream by using the relevant number — LPRINT#2, for example, will direct output to the screen instead of the printer.

The user is not restricted to these 'established' streams — numbers #4 to #15 are free for any task. Various channel specifiers allow the user to indicate the required peripheral — 'K' (keyboard), 'S' (screen), 'P' (ZX Printer), 'T' (text — used with RS232), 'B' (binary — also RS232), 'N' (network) and 'M' (Microdrive).

To make use of these streams and channels, the OPEN# statement is required. OPEN#4, "S" will open stream 4 and link it to channel S (the screen). Typing PRINT#4;"text" will produce 'text' on the screen. It should be noted that K, S and P are established channels and require the use of commas as separators in OPEN# statements. Other channels allow either commas or semi-colons. The manual advises against OPENing streams#0,#1 or #2, warning that the results may be unpredictable. Note also that the hash mark does not need to be typed but appears automatically with both OPEN and CLOSE.

So how are these streams and channels used?

After a data file has been opened, say, by using OPEN#4;"m";1;"numbers" (thus setting up a new channel "m";1;"numbers" and attaching this channel to stream#4), data may be entered. The manual gives as an example a data file of numbers between 1 and 10 and their squares. A simple program

```
10 FOR n = 1 TO 10
20 PRINT 4,n'n*n
30 NEXT n
```

produces the required information. It might be assumed that running this program will store the figures on the Microdrive cartridge — in fact the computer will not transfer anything until the Microdrive buffer is full (the buffer is 512 bytes) or until the CLOSE statement is used — in this case CLOSE#4 will do the trick. As with OPEN, streams 0-3 should not be closed.

To read back the data from the Microdrive file "numbers", the following program could be used:

```
10 OPEN#4;"m";1;"numbers"
20 FOR b = 1 TO 10
30 INPUT 4;m;n
40 PRINT "The square of ";m;" is ";n
50 NEXT b
60 CLOSE#4
```

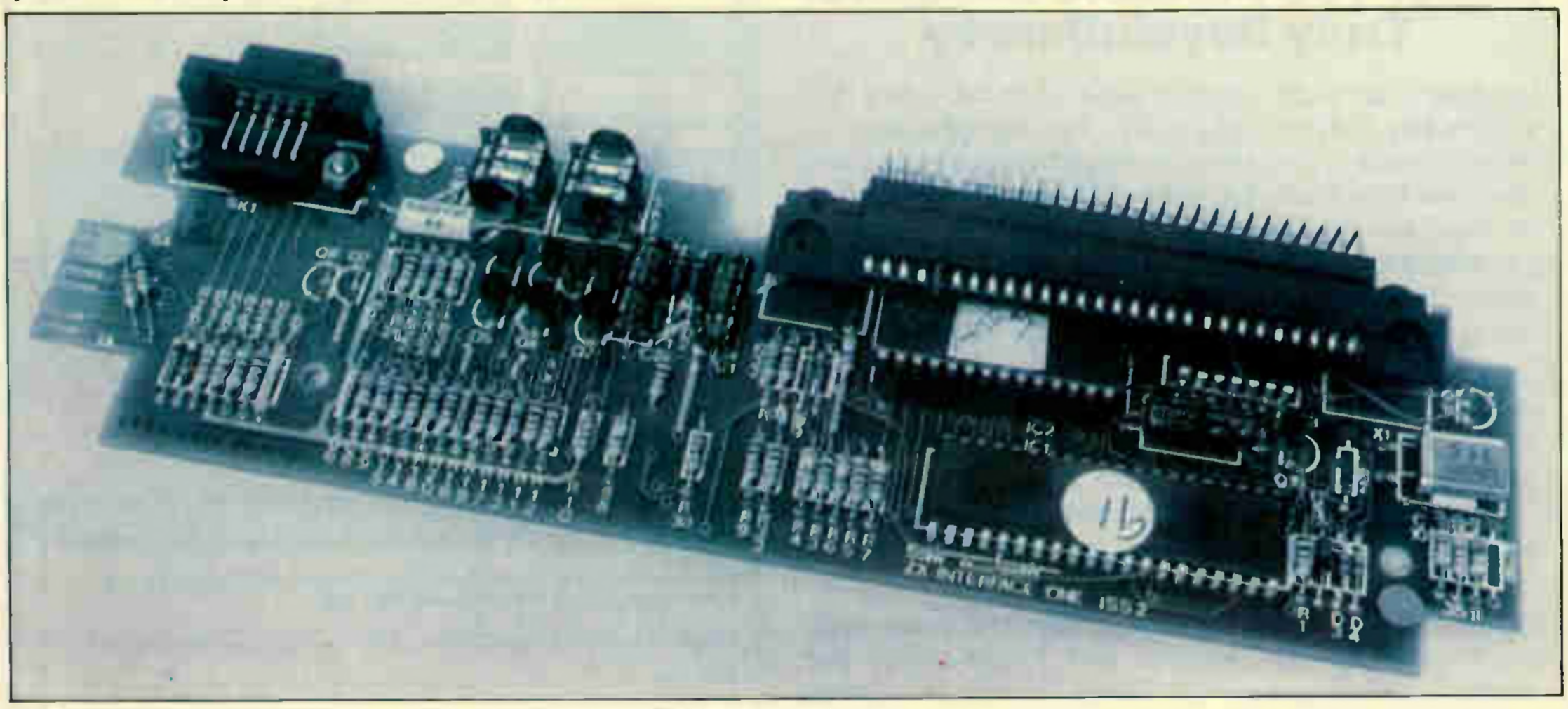
INKEY$ may also be used to read back from a file — it will always give the next character.

A point to be noted when using INPUT is that the computer always expects 'ENTER' after a number or string. So if you are printing to a file from which you expect to INPUT, items must either be printed singly —

```
10 PRINT#4;2
20 PRINT#4;3
```

or separated with an apostrophe as in

```
10 PRINT#4;2'3
```



The ZX interface also enables up to 64 Spectrums to be linked in a network.

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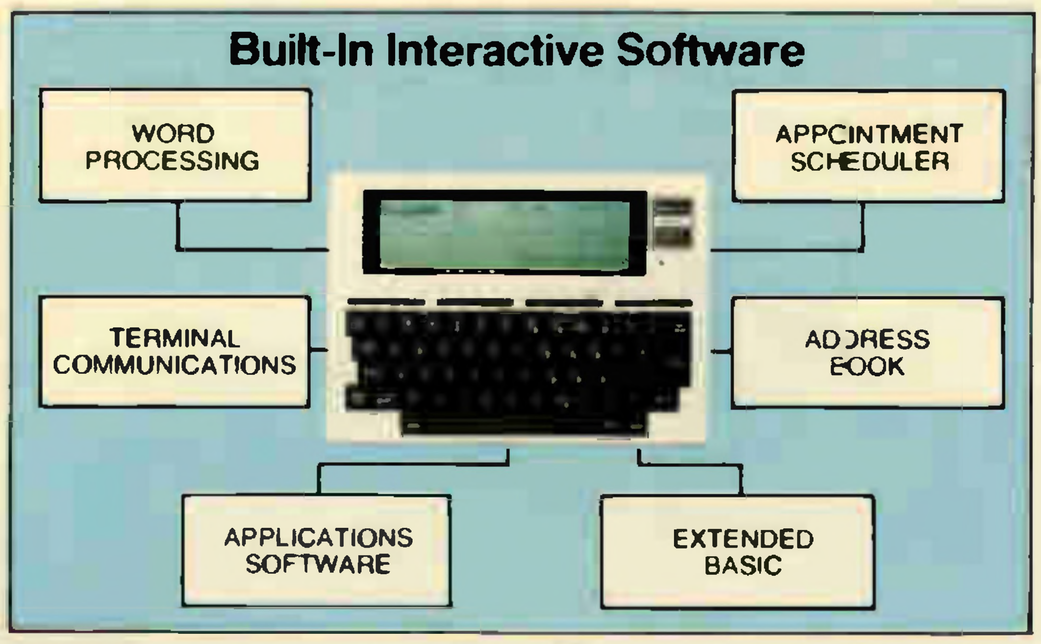

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The interface slots into the edge connecter at the rear.

Care should also be taken when inputting a string containing quotes. The safest way to deal with this is to use LINE — ie, use LINE a$ rather than simply a$.

After using a channel other than the screen, it may be found that INK and PAPER statements don't work. Entering PRINT; before setting the colours will solve this.

Files are automatically catalogued — up to 50 files per cartridge — and the output of CAT may be sent to a stream, allowing the contents of a particular cartridge to be printed out, for example. A file may be 'hidden' (ie, it won't be listed when CAT is used) by adding CHR$0 to its title — a line such as OPEN#4,"m":1;CHR$0 +"PCW" would ensure that the file entitled 'PCW' does not appear when CAT is used.

An important Microdrive statement is MOVE. As its name implies, this allows data to be moved from one channel to another. To move data from keyboard to screen, for example, MOVE #1 TO #2 would be utilised. Anything typed at the keyboard will now appear on the TV screen. BREAK will not work after MOVE — instead it simply prints a space. The solution to this is to keep keying 'ENTER' until the print position reaches the bottom of the screen and the 'scroll?' prompt appears. BREAK will now work normally. The manual warns against moving data from the keyboard to any other stream as it may be impossible to break out of such a mode.

MOVE may be used to examine file contents — MOVE "m";1;"numbers" TO#2 will print the contents of the file called 'numbers' on the screen. MOVE will also copy files —

MOVE "m";1;"numbers" TO "m";1; "numbers2"

will copy the contents of the file 'numbers' to the file 'numbers2'. Simply changing the Microdrive number will enable back-up data files to be made on another cartridge — syntax for this is:

MOVE "m";1;"numbers" TO "m";2; "numbers2"

This applies only to data files — to copy a program it must first be loaded into the Spectrum and then resaved.

Documentation

As we've come to expect with Sinclair documentation, the manual for the Microdrives and Interface 1 is comprehensive and easy to follow. There's a full list of Basic extensions and the system variables used by the Microdrives, local area network and RS232 interface, together with a breakdown of user RAM that is taken up by the drives. Every time a file is opened, a channel of 595 bytes in length (this includes the 512-byte Microdrive buffer) is set up in the area designated CHANS. A network channel will take 276 bytes. This is unlikely to cause problems with any but the longest of programs, but it will have an effect on any machine code routines that are stored in REM statements — routines stored above RAMTOP will not be affected.

The manual also includes full information on setting up a network of Spectrums and details of the various RS232 connections — neither of which I have been able to discuss here but which I would certainly like to investigate when time permits.

Timings

Not really Benchmarks — these figures are more a rough indication of comparative speeds of Microdrive and cassette. Being an endless loop, the drives feature serial access rather than the true random access of disk drives. To Spectrum owners who previously have relied on cassettes, the speed increase is phenomenal, although those accustomed to disks may find the time taken to find and load a file somewhat disappointing. Serial access means that finding a file can often take longer than loading it — the maximum time for finding a file is quoted as 3.5 seconds, although the actual figures depend on the file's position on the cartridge.

I used a selection of Basic and machine code programs to test speed — these were loaded from cassette and the time taken noted, then resaved on Microdrive before being loaded into the Spectrum once again. As expected, the most notable time-saving occurred with long programs — Addictive Games' Football Manager (a 35k program) took 3 minutes 25 seconds to load from cassette, while loading from Microdrive took a fraction under eight seconds.

	Cassette	Microdrive
Basic program (35k)	3.25.0	7.8secs
Machine code program (7000 bytes)	40.0	7.5secs
Data (DIM a(4000))	1.21.30	6.8secs
SCREEN$	32.0	3.8secs

Conclusions

With the Microdrive, Sinclair has done it again — for the first time home computer owners have access to low-cost mass storage with a (comparatively) fast transfer rate. This opens the door to a host of 'serious' applications for the Spectrum and should have the side effect of extending the machine's 'life' in the market-place.

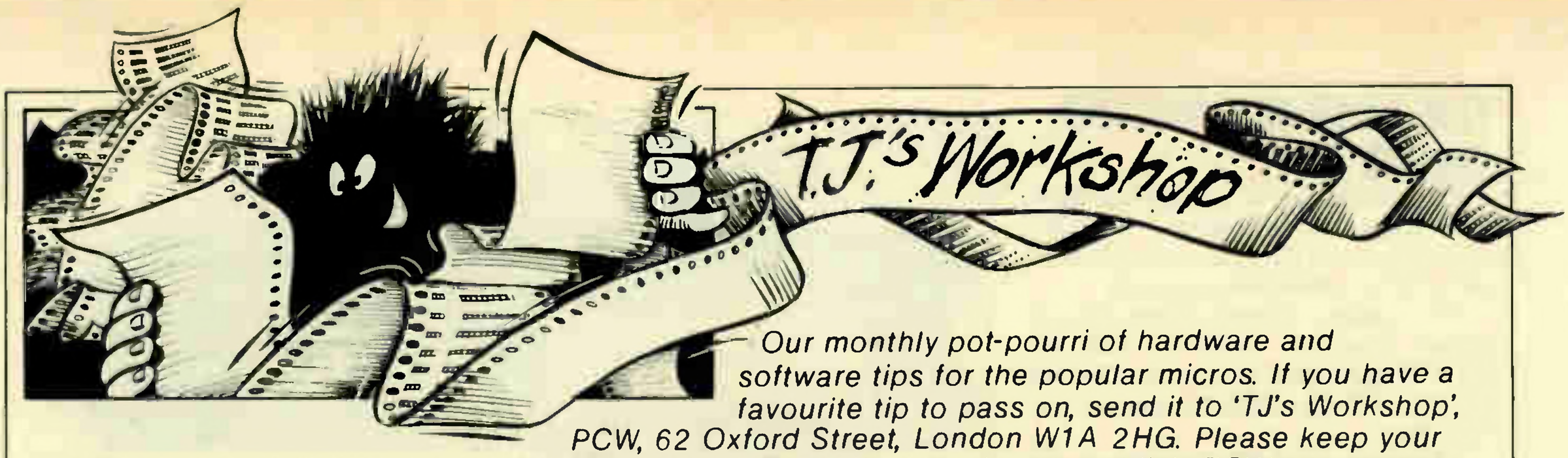
It remains to be seen how many Spectrum owners will want the Microdrive — I suspect that it will be a very high percentage indeed.

Certainly Sinclair is remaining faithful to those who suffered last summer — order forms are initially going out to the first few thousand people to order Spectrums and each early customer is restricted to two drives. This means that it is likely to be quite a while before Microdrives are available over the counter — it may be the end of the year before you can buy one at W H Smith.

It's a pity that the Microdrive-associated commands are so convoluted but this is understandable in that it uses the already-familiar cassette syntax with extensions to indicate that the Microdrive is in use. This is where function keys would be a boon: it would be nice if one could set up a separate key for loading, saving and verifying. It's also annoying that there is no direct way of making back-up programs: data files may be copied via the MOVE statements, but programs must be loaded into the computer before they can be copied.

The cartridges themselves are tiny and I foresee a glut of custom-designed, neat, petite storage cabinets in the near future. It remains to be seen how robust they are — I certainly had no trouble but then I had the Microdrive for a week only. The tape is high-quality, video-style material, but Sinclair warns that the life of a cartridge is unknown and, as with any storage medium, back-ups should be made as a matter of course.

Suffice it to say that the Microdrive is probably a more important development than even the Sinclair computers, influential though these have been over the past three years. With Microdrives hooked up, the Spectrum can be used as a small business machine and applications such as word processing and spreadsheets will come into their own. But, more important, the Microdrives will undoubtedly set the standard for cheap home computer data storage. No doubt the situation will arise when they are linked to other makes of machine, but their major influence will almost certainly be on the cost of disk drives — at a cost of £50 per drive and £30 for the interface (when purchased with a drive) the Microdrive is going to make it very difficult for manufacturers to charge £200-plus for a single disk drive. Sinclair has been instrumental in bringing low-cost computing to the general public — with the Microdrive the trend continues. More power to his elbow — and, remember, the ZX83 should be along pretty soon! END



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MULTI-TASKING ATOM

Have you ever wished that you had two computers? Perhaps you are just writing that incredible assembler program when you want to load your disassembler. Perhaps you are teaching your husband to program, and want a separate machine to show him some neat little trick.

It is possible, on the Acorn Atom, to move between 'text spaces'. This, however, has some disadvantages. For one thing, you have to type something unwieldy like '?18=#82', remembering which 'space' you are already in. Also, variables are common to all text spaces, and may not be preserved when you return to the original space.

The routine below enables the Atom to be used as two independent machines, each with its own variables, vectors and so on.

To use the routine, first type the assembler program as given, then RUN it. The very last line printed gives the address to which you must link to initialise the system. Above that, the last line of the assembler listing will show the address of the last instruction assembled. Note both of these numbers. Then LINK to the 'Initialise' address. Provided you have typed it correctly, the screen should clear, and the words 'DUAL ATOM' will be displayed. You should be able to list the assembler program as before. Now type 'SHUT 1' (The '1' is a dummy parameter, and can be any number). You should now return to the 'DUAL ATOM' screen. This is the 'second machine'. You can now type in (or LOAD) a program and run it, altering as many variables as you like. Simply repeat the SHUT command to return to your assembler program and original variable values.

As it stands, the program sits in the floating point variable space, and uses some of the graphics memory for storage. This means that the floating point variables cannot be used, and neither can graphics. These memory areas can be changed by altering the values given to variables at the start of the program.

After being assembled once, the program can be saved by typing
*SAVE "DUAL" X Y Z
Where
X is the start of the code (#2800)
Y is the end of the code + 1 (#28C9)
Z is the initialise address (#286A)

After this, the machine can be set up by typing *RUN "DUAL" and then loading the code from tape.

Russell Mulcahy

```
DIM LLO
P=#2800                 Start assembly at 2800
S=#8000                 Screen address
Q=#9600                 Screen storage area (512
                        bytes)
E=#9300                 Zero page storage area (767
                        bytes)
Ü=#82                   Address of second text space
Z=#12                   Basic's text space pointer
R=#21A                  Vector for "SHUT" command
W=#28FF                 Workspace for routines

GOSUB f                 Assemble "FLIP" Routine
GOSUB i                 Assemble "INITIALISE"
                        Routine
PRINT''"INITIALISE AT",&I'
END

s PRINT"SWAP PAGES",&F,&T s is "SWAP PAGES" Macro

[                       Swaps 256 consecutive bytes
LDY @O                  Y Reg indexes the memory
:LLO
LDA F,Y;STA W
LDA T,Y;STA F,Y
LDA W ;   STA T,Y
DEY;BNE LLO
]
RETURN

i PRINT"initialise routine"'   Assembles INITIALISE
                        Routine
I=P                     Remember address of routine
[JSR#F7D1;]             OS "Print string" routine
?P=12; P+1="dual atom"  String to be printed, incl $12
P=P+LEN(P)              Move assembly past string
[NOP                    NOP marks end of string
LDA @G&#FF   ;STA R     ) Store address of FLIP routine
LDA @(G/256)&#FF;STA R+1  ) at the vector for "SHUT"
                        ) command
]
F=S;T=Q;GOSUB c         ) Copy screen to Screen
F=F+256;T=T+256;GOSUB c ) Save area
F=O;T=E;GOSUB c         )
F=#200;T=T+256;GOSUB c  ) Save parts of Zero Page
F=#300;T=T+256;GOSUB c  )
[
LDA @U ;STA E+Z         Save address of second text
                        space
LDA @13;STA U*256       ) Effectively "NEW" space
LDA @ FF;STA U*256+1    ) two
RTS;]
RETURN
f PRINT"flip routine"'
G=P                     Remember address of flip
                        routine
F=O;T=E;GOSUB s         )
F=#200;T=T+256;GOSUB s  ) Save parts of zero page
F=#300;T=T+256;GOSUB s  )
GOSUB v
[RTS;]

v F=S;T=Q;GOSUB s       Routine to swap screen in two
F=F+256;T=T+256;GOSUB s halves
RETURN
c PRINT"COPY",&F," TO",&T '   COPY Macro, copies 256
[                       consecutive bytes of memory
LDY @O                  Y Reg indexes the memory
:LLO
LDA F,Y;STA T,Y
DEY;BNE LLO
]
RETURN
```



BBC CLI

R Grubb's problem of not being able to execute *SAVE "file" A% B% (Feb 1983) can be solved in a more interesting, succinct and above all more intelligible way using one of the BBC machine's more exciting features; namely, the Command Line Interpreter. The manual tells you about the CLI on page 463, but I am sure that not many people use it. Its main use is probably for accessing MOS commands from machine code: but it is also useful when programming in Basic because it allows the user to build up a complex command bit by bit — thus instead of using the boring and unintelligible OSFILE routine as R Grubb does, why not:

```
10 DIM A 50
20 INPUT"Enter start "A%" end "B%
30 INPUT "Filename "NAME$
40 $A="SAVE "+NAME$+" "+STR$"A%+" "STR$"B%
50 X%=A MOD 256
60 Y%=B DIV 256
70 CALL&FFF7
```

Line 10 allocates more than enough memory to the command line that you assemble.

Lines 20 & 30 set the information from you.

Line 40 (note the $A indirection) builds up the command line in memory — when scanning through a program this line will quickly be spotted because of the SAVE.

Lines 50 & 60 tell the CLI where the command line is in memory, and line 70 actually calls up the CLI.

Tom Honeybone

LOADING PROGRAMS WITHOUT LOSING VARIABLES

If you *LOAD a BBC Basic program instead of LOADing it, the Basic interpreter will not be given the chance to clear the variables.

If the variables start after the end of the *LOADed program (either the previous program was longer than the new one, or LOMEM was altered to start high enough), then you can use all the variables created by the previous program in the *LOADed program provided you use GOTO instead of RUN to start the program.

I have found this extremely useful when assembling large amounts of machine code from several programs without losing any labels.

Adrian Stephens

LYNX SAVER

The Lynx Basic has a SAVE command which will only allow you to save a complete program. The following procedure allows you to save any part of your Basic program. It could be used to output data statements and save them for use later in a simple file structure.

The addresses used (61FA and 61FC) contain the start and end addresses of your Basic program and are temporarily changed during execution of the procedure. The constant &80 acts as an end of program marker and is essential.

To run the procedure code the statement PROC SAVER (A.B.). A is the starting statement number, B is the last statement number you wish to save. The SAVE statement can contain any name you wish.

```
DEFPROC SAVER(S,E)
Y=DPEEK(&61FA)
Z=DPEEK(&61FC)
Q=PEEK(LCTN(E)-2)
R=LCTN(E)+Q-7
Q=PEEK(R)
POKE(R),&80
DPOKE(&61FA),LCTN(S)-7
DPOKE(&61FC),R
SAVE"PROG"
POKE(R),Q
DPOKE(&61FA),Y
DPOKE(&61FC),2
ENDPROC
```

LCTN returns the address of the Basic statement. LCTN-2 is the length of the Basic statement, as explained in the Lynx manual.

R P Freeman

APPLE II EXEC FILES

This is a small program which I have written for use on my Apple II to help in maintaining EXEC files. It will work equally well on any ASCII text file. Files may be created or modified, and listed to screen or printer. When saving an amended file the option is given to save it with a new file-name.

My system is an Apple II Europlus 48k, DOS 3.3, and a Silentype printer. If any changes are needed to the program for other configurations, they should be fairly minor. The following notes should be of interest.

Any line number ending in '1' (eg, 3001) is branched to from somewhere.

All commands (at lines 2001 and 3001) are truncated to the left most character before being examined. So, for example, to END the program the command EEK (or even EXIT!) would work just as well.

The question ".... CONTINUE?" at line 3210 expects a reply of YES; again only the first character is used.

The ADD command adds new records after any existing ones. To terminate this command enter a null record — ie, just press RETURN.

The program will currently hold up to 200 records — to alter this change the value of NT at line 1200.

When the Apple INPUTs a record/line a comma is treated as a separator, which causes two problems. When reading an old file from the disk the records may contain commas (eg, POKE 103,0). The routine at lines 2130-2141 therefore uses GET to read each character. The second problem occurs when entering a new line from the screen: if this line contains commas (or colons) then the whole text must be enclosed in string quotes. These quotes are not stored as they are removed by the Apple INPUT routine.

When listing to the screen, the program asks for a delay value. This is used to slow down the listing, and is really intended to give time to examine long files before the lines scroll out of sight. If no file will exceed 20 records then lines 4610 and 4620 can be deleted and the FOR...NEXT loop in line 4640 removed.

W R Wood

SYSTEM SAVE

After extending the MZ-80K's Sharp Basic SP-5025 with a toolkit such as Knight's Commander, one may find it impossible to use USR(33):USR(36) to save a permanent copy of it. This is because the contents at addresses 1102H and 1103H (length of file), 1104H and 1105H (file starting address), and 1106H and 1107H (execution address) are changed to those of the toolkit while loading it. One may PEEK (4354) to (4359) before loading the toolkit and note their contents. POKE them back in afterward as follows.

```
POKE 4354,0:POKE 4355,48:POKE 4356,0: POKE 4357,18:POKE 4358,0:POKE 4359,18.
```

USR(33):USR(36) will then copy the extended version of Sharp Basic.

One may also do the same to save the Basic plus program onto tape (warm start). In this case, the contents of addresses 4356 to 4359 will be 0,18,96,18 respectively. For 4354 and 4355 (1102H and 1103H), one will have to find out the program size by PEEK (4354) and (4355), and add them onto the program starting address which is usually 6 and 72 for 4356 and 4357 respectively.

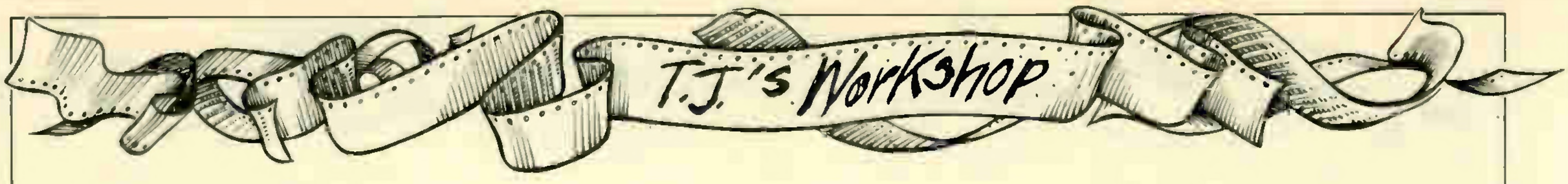
```
A=PEEK(4354):B=PEEK (4355):C=256*B+A +256*72+6-256 *18+1:D=INT(C/256) :E=C-256*D.
```

Now do

```
POKE4354,E:POKE4355, D:POKE4356,0:POKE4357,18: POKE4358,96:POKE4359,18
```

and then USR(33):USR(36) will save both the Basic and the program.

K S Chua



LEAP FROG

The following program in Basic will relocate any machine code routine to any other part of the memory, and will change the JMP addresses in the routine, so that it will still work in the new space.

This can be used to copy ROM into RAM for changing routines, or for your own routines that you wish to move; for example, from the second cassette buffer to the top of memory. I have found it particularly useful for moving a cassette-based toolkit of mine down RAM to leave room for my own routines.

The data in lines 5000 to 5070 are the number of bytes taken up by each instruction; a zero means that the instruction does not exist.

This routine should work on any machine with a 6502 processor—it has been tested on a PET, BBC, Microtan 65, VIC, and Acorn Atom. It will not deal with data in a routine, but it will tell you where the data is. The best way to relocate programs with data in them is to relocate up to the data, then relocate the data with a FOR . . . NEXT loop, then relocate the rest of the routine.

To use the routine, RUN it and type in the start and end addresses of the machine-code to be moved, then type the start address of the new location. The program can take a longish time to run, because it checks each address to see whether it is a JMP instruction, and then each JMP to see whether it addresses the program itself, or an external routine.

C Steadman

```
1 dimn%(255):fori=0to255:readn%(i):next
10 input"where does the routine currently lie (from where to
where)";a,b
20 input"where should it lie";c
30 ifa 0orb 0ora 65535orb 65535orc 0orc 65535orb a then 10
40 df=a-c:i=a
45 ifi bthenend
50 f=peek(i):ifn%(f)=0thenprint"not machine code at
address"i:end
60 ifn%(f)=1 thenpokei-df,f:i=i+1:goto45
70 ifn%(f)=2
thenpokei-df,f:pokei-df+1,peek(i+1):i=i+2:goto45
80 iff 76
thenforj=0to2:pokei-df+j,peek(i+j):next:i=i+3:goto45
90 x=peek(i+1)+256*peek(i+2):ifx aorx
bthenforj=0to2:pokei-df+j,peek(i+j):next:i=i+3:goto45
100
x=x-df:pokei-df,76:o=int(x/256):pokei+2-df,o:pokei+1-df,x-o*256:i=i+3:goto45
```

```
5000
data0,2,0,0,0,2,2,0,1,2,1,0,0,3,3,0,2,2,0,0,0,2,2,0,1,3,0,0,0,3,3,0
5010
data3,2,0,0,2,2,2,0,1,2,1,0,3,3,3,0,2,2,0,0,0,2,2,0,1,3,0,0,0,3,3,0
5020
data1,2,0,0,0,2,2,0,1,2,1,0,3,3,3,0,2,2,0,0,0,2,2,0,1,3,0,0,0,3,3,0
5030
data1,2,0,0,0,2,2,0,1,2,1,0,3,3,3,0,2,2,0,0,0,2,2,0,1,3,0,0,0,3,3,1
5040
data0,2,0,0,2,2,2,0,1,0,1,0,3,3,3,0,2,2,0,0,2,2,2,0,1,3,1,0,0,3,0,0
5050
data2,2,2,0,2,2,2,0,1,2,1,0,3,3,3,0,2,2,0,0,2,2,2,0,1,3,1,0,3,3,3,0
5060
data2,2,0,0,2,2,2,0,1,2,1,0,3,3,3,0,2,2,0,0,0,2,2,0,1,3,0,0,0,3,3,0
5070
data2,2,0,0,2,2,2,0,1,2,1,0,3,3,3,0,2,2,0,0,0,2,2,0,1,3,0,0,0,3,3,0
```

TRS-80/GENIE SOUND INPUT

This short Basic subroutine will allow an unexpanded Genie or TRS-80 to respond to any sound.

First, connect a microphone to the MIC socket of your cassette recorder or amplifier. (If you have a built-in microphone to your cassette recorder, you will not need to do this.)

Most cassette players will need to be set to record so that they become amplifiers. To do this, open the cassette magazine, push your finger down on the record prevention tab inside, press RECORD and PLAY and let go of the tab—the cassette recorder should now be 'recording' although there is no cassette inside. Alternatively place a cassette in the recorder and set it to record.

Connect the EAR socket to the computer. TRS-80 users can use the normal cassette port, but most Genie owners will have to use the second cassette port.

To make the computer respond to sound, use the subroutine 65520 OUT 255,4:FOR L=1 TO 5:NEXT:NOISE=INP(255) AND 128:RETURN. If there has been a noise, the variable NOISE will hold a non-zero value.

You may find that this is too sensitive (eg, it responds to someone rustling a newspaper). To remedy this, adjust the volume control, or, if you have no volume control, stick a lump of Blu-tack or plasticine over the microphone.

For example:

```
200 PRINT "SNAP FINGER
TO CONTINUE"
210 GOSUB 65520:IF
NOISE=0 THEN 210
...rest of program
```

NB: If using the second cassette port, you will need to add OUT 254,16 at the start of your program and OUT 254,0 at the end.

Steve Goldman

ORIC-1 VOLUME CONTROL

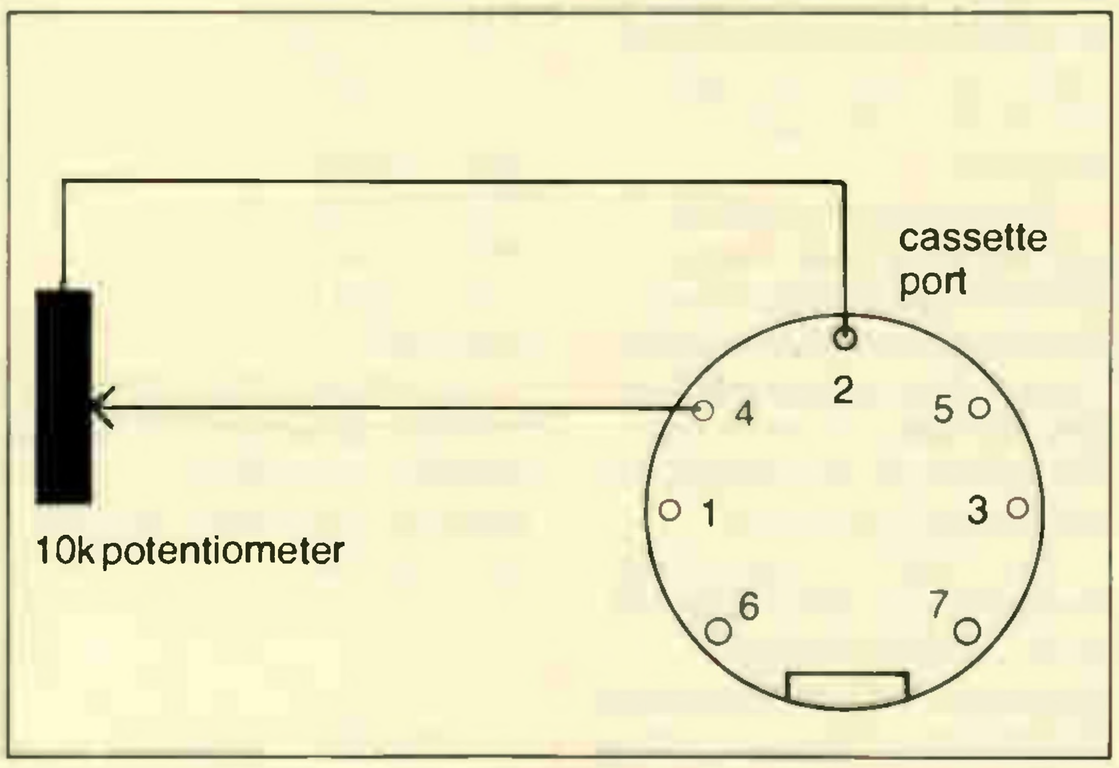
When using Oric sound commands it is not normally possible to control the volume, except on MUSIC and SOUND commands, and it is time consuming to change these. But ZAP, EXPLODE, PLAY, etc, have no volume control at all!

The answer is to connect a 10k potentiometer across the output intended for amplification.

This gives you variable volume control on all sound commands. The volume control is capable of turning the sound right down to Spectrum level and when on full gives Oric's normal ear-shattering blast.

The potentiometer can be connected to the cassette lead plug and does not affect loading and saving.

Stephen C Bates



T.J.'s Workshop

VIC RENUMBER

The accompanying Basic program stores a relocatable machine language routine for renumbering VIC Basic programs. Since it is relocatable the user may determine where the routine resides by changing the constant in the POKE statement.

Location 673 was chosen as the default since this does not reduce the memory available for Basic programs or inhibit the use of the data set.

To renumber a program, the line number increment (1-255) and the initial line number (0-255) must be POKEd into locations 251 and 252 respectively and then the routine invoked by a SYS to its start location.

This routine will not alter line numbers referenced in GOTO or GOSUB statements. It is a good idea to load and execute this Basic program immediately after powering up so as to have the renumber routine available during a programming session.

Marvel A O'Neal

MBASIC 'PRINT USING'

The PRINT USING command in MBasic is used to print strings or numbers using a specified format. The most frequent format variations used in a program will generally be:
—variations in the width of string fields; and
—variations in the width and number of decimal places of numeric fields.

The four functions shown below will handle the most commonly used formats in a very simple way, so that PRINT USING FNUS$(X); A$ will print A$ in a field width of X PRINT USING FNU0$(X); A will print A in a field width of X with no decimal places, and likewise FNU1$(X) and FNU2$(X) will format numbers with one and two decimal places respectively.

The choice of 'US', 'U0', 'U1' & 'U2' is, of course, arbitrary: I used 'U' to represent USING, 'S' = string, '0' = no decimal places, etc.

Joe Ryan

MORE CHARACTERS PER LINE

This short program enables 64 characters to be printed across the paper on the ZX Printer — not only will this save paper and money, but also look better than the squat ones normally printed.

The only difficulty with the program is getting the print output into the printer buffer. In the example program I have achieved this by directing the screen print output so that the PRINT statement can be used instead of LPRINT. Using the latter method a string longer than 64 characters should not be printed.

The printer buffer is from 1644 to 16508, the 65th character being NEWLINE. USR16655 directs print output into the printer buffer and should be omitted if other methods of loading the buffer are employed. USR 16514 prints the characters in the buffer and redirects print output to the screen at 0,0.

SHARP GET ROUTINE

Here is a very fast GET key routine and some useful pokes for the Sharp MZ-80K.

First type in the following program and run it.

```
10 FOR T=1 TO 7 : READ A :
POKE 24552+T,A : NEXT
20 DATA
205,27,0,50,240,95,201,0
```

From now on USR(24553) : I=PEEK(24560) will return the ASCII value of any key pressed and put this value into I.

For unextended Basic POKE10167,1 will have to be entered first.

Some useful POKES —
POKE 6636,133 defines the left shift key as shift and break.
POKE 4360,1 and POKE 10680,1 disables the list and saves functions. To restore use 0.
POKE 5412,35 disables the POKE command until POKE 5412,80 is entered. POKE commands can still be used in programs.
POKE 10682,1 before saving a program will make it auto-run when loaded.

M Slater

HIT AND RUN

The manuals for neither the Tandy Colour nor Dragon 32 computers mention the availability of an auto-repeat function. The keys currently being depressed are stored in locations 338-345 of the memory and are therefore accessible through the PEEK command. This is demonstrated by the following program:

```
10CLS
20 FOR X=0 TO 7
30 PRINT @ X*64+2, USING
"PEEK (###) =";X+338;
40 PRINT PEEK (X+338)
50 NEXT
60 GOTO 20
```

It can be seen while RUNning this program that, on depressing various keys, the numbers stored in these locations change — for example, depressing 'C' on the Tandy causes the contents of memory location 341 to be reduced by one while on the Dragon the contents are reduced by four.

From this demonstration, it can be seen that a table can be made summarising the ways in which the depression of the keys affects the memory. The table for the Tandy is below.

For example if 'Q' is depressed then location 339 will read 251 (or 239 on the Dragon) and if '1' is depressed at the same time then this location will read 235 (or 238 on the Dragon).

To demonstrate the way this can be used to improve programs the following program may be run:

```
10 CLS:INPUT "DO YOU
WANT
A) TO MOVE A DOT OR
B) DRAW LINES";D$
20 CLS0
30 X=31:Y=16
40 XR=X:YR=Y
50 X=X+(PEEK(343)=247)
-(peek(344)=247)
+(X>62)-(X<1)
60 Y=Y+(PEEK(341)
=247)-(PEEK(342)
=247)+(Y>30)-(Y<1)
70 IF D$="A" THEN RESET
(XR,YR)
80 SET(X,Y,7)
90 GOTO 40
```

If you are using a Dragon 32 then remember to change 247 to 223 when it occurs in lines 50 and 60.

While RUNning this program, note that you can move the block using the cursor keys and may combine the keys to move diagonally.

On the Tandy Color and Dragon 32 computers, while a program is RUNning, the memory location 135 contains the last character entered on the keyboard, as shown:

```
10 CLS
20 PRINT @ 64,CHR$
(PEEK(135));
30 PRINT @ 66, "WAS THE
LAST CHARACTER
ENTERED"
40 GOTO 20
```

A D Rowe & D D Chirico

Memory Location Affected	Subtracts From 255: 1	2	4	8	16	32	64
338	@	H	P	X	0	8/(	ENTER
339	A	I	Q	Y	1/!	9/)	CLEAR
340	B	J	R	Z	2"	:*	BREAK
341	C	K	S	↑	3/#	+/;	—
342	D	L	T	↓	4 $	,/<	—
343	E	M	U	←	5/%	-/=	—
344	F	N	V	→	6/&	./>	—
345	G	O	W	SPACE	7/'	//?	—

Whereas with the Dragon subtract 1 instead of 1 and subtract 2 instead of 16 and subtract 4 instead of 2 and subtract 2 instead of 32 and subtract 8 instead of 4 and do not change 64 subtract 16 instead of 8 and subtract 32 instead of 8 and

BENCHTEST

THE TULIP

The Dutch-designed Tulipsystem I is a 16-bit business micro with a lot to be proud of. Peter Jones finds out if these narcissistic tendencies are justified.



Photography by Tony Sleep

Compudata is a Dutch company which started in the microcomputer field by importing Exidy Sorcerers. In 1979. Teleac, the Dutch television education company, planned to offer a televised microcomputer course which included delivery of a micro in the price. DAI, the Belgian firm originally involved, could not deliver its personal computer in time, and Compudata was able to move in and pick up an order for two thousand machines (does this story sound familiar?). As a result, Compudata entered into an agreement with Exidy to manufacture the Sorcerer under licence in the Netherlands.

Part of this agreement contained, in very general terms, provision for the development and marketing of a 16-bit machine in co-operation with Exidy. When Exidy, an American company, pulled out of the micro market. Compudata decided to develop its own 16-bit machine as a successor to the popular (in the Netherlands, anyway) Sorcerer. Work began in early 1982 with the whole design and development project being carried out in-house and the first batch of machines, named the Tulipsystem I, was shipped at the end of July 1983.

Hardware

The system comes in two parts. There is the keyboard/computer unit which at 512mm is almost the same width as the IBM PC keyboard unit but, since it also houses a lot of the electronics. considerably deeper at 366mm. Then there is the monumental looking edifice housing the disk drives and the screen, appropriately called the video-disk tower. The base. and the widest part. is in the form of a bridge to allow the keyboard unit to slide underneath when not in use. On this is mounted a slightly narrower box containing the disk drives. Above this. standing on a pedestal is a very imposing monitor, reaching a height of some 56cms above the surface of the desk and, with a depth of 48cms, overhanging the lower units at the rear by a considerable margin. Apparently. this exaggerated depth was a bit of design overkill — the cabinet was decided upon before the colour tube had been picked, so the company erred on the large size to make sure.

The whole system is finished in an attractive combination of dark brown and light beige. At a quoted weight of thirty kilos, this is obviously a system designed to be placed on a desk and stay there. The monitor is adjustable for both swivel and tilt, having a horizontal swing of 60 degrees and tilting forward up to 15 degrees from the vertical. The two 5¼in Mitsubishi disk drives, despite being slimline, are mounted horizontally side by side. I was told by the manufacturer that this facilitated the installation of a hard-disk controller board.

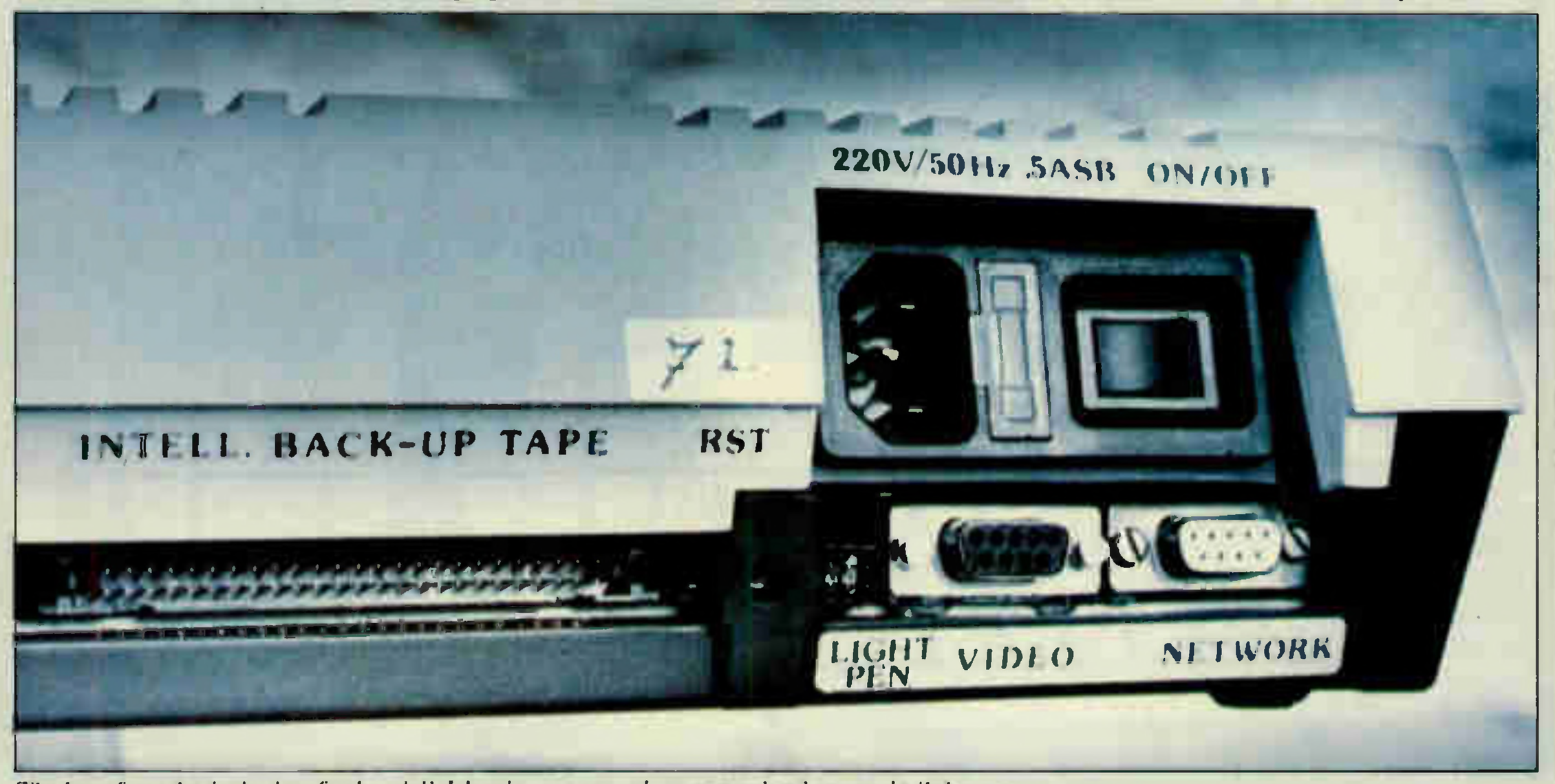
The rear of the keyboard/computer unit, from left to right looking from the back. has a serial (RS232) interface. a disk drive interface. a hard disk controller interface. an interface for connection to a back-up tape system for hard disks, a reset button (rather too well concealed, you need a pencil to get at it). a power socket. a light pen socket. the video outlet. an on/off switch and a network communications interface. An extractor fan, audible but unobtrusive, is also mounted in the keyboard unit. On the left. above the keyboard itself, are two LEDs: a green one to show that the power is on and a red one which lights up on power-up to indicate that the memory check is being executed. If a fault were to occur the light would remain on and the appropriate error message would be displayed on the status line of the screen.

Keyboard

The keyboard. made by Honeywell Bull in the States, has 103 keys. variously coloured beige or brown according to the function and to match the rest of the machine. Every key that can logically use the auto-repeat function has it on depression of the key for more than one second. The main alphanumeric keyboard is fairly standard (qwerty in this case). but I do object to a shifted colon, given the frequency of use in the operating system (MS-DOS). The caps lock key (actually marked ALPHA LOCK) is provided with a red LED which illuminates when the key is functioning. There is also an additional key inserted between the Z key and the left hand shift key, as on the IBM PC, which needs extra care if you are a touch-typist and, judging by the criticism I have seen in the American press on this feature, will infuriate our cousins across the Atlantic. Personally, I found it (as a touch-typist) a minor annoyance at the beginning which soon goes away.

The keyboard, assisted by an eight-character type-ahead buffer, was very satisfying to use. light of touch and with that nice, positive tactile feedback so essential to accurate high-speed typing. Directly above the main keyboard there is a row of twelve keys, in groups (from left to right) of eight, three and a single one. The eight keys are for programmable functions, and, with the use of the shift key, give you the possibility of defining sixteen functions each up to 64 characters long. The next group of three, each with its own LED, are respectively marked COLOR, GRAPH and REV. Pressing the COLOR key, followed by a number between 1 and 7, changes the colour of text subsequently printed on the screen. The use of the GRAPH key will only become apparent when the optional high resolution colour card becomes available, I was told by Compudata. The REV key produces a reverse video effect on subsequent text on the screen. The isolated key is ESCape.

To the immediate right of the main keyboard there are two vertical rows of seven keys which provide basic cursor control (up, down, left, right, start of line, end of line. home). plus keys for word



The interfaces include slots for hard disk backup, network communications and a light pen

processing functions: CHARacter DELete, LINE DELete, ForWarD(screen), BackWarD(screen) and INSeRT). INSeRT also possesses its own LED indicator. Finally, there is a CLEAR key and a PRINT key. The former clears the screen and the latter will send the text contents of the screen to the printer at any time (graphic symbols being represented by a dot), whether you are in a word processing application or not. A bit-image screen dump is also possible through the use of the PRTGRAPH utility, apparently, but this was not provided on the system disk. I think that the cursor controls are unsatisfactory, being arranged as 'up' and 'down' next to each other, and 'left' and 'right' underneath these. I found myself constantly hitting the wrong key and feel that the more logical diamond layout would have been preferable.

On the extreme right of the keyboard is what appears to be an ordinary numeric keypad. Closer inspection, however, reveals some unusual and interesting features. There is a main pad containing the numbers 0–9 and a double zero, a treble zero, minus, plus, decimal point, a clear(C) key, a clear entry(CE) key, and an ENTER key. Above this is a row of four keys; CALC and percentage, divide, and multiply.

Pressing the CALC key turns the keypad from its normal data entry function into a five-function calculator. This can be done at any time, even in the middle of a running program, which will be halted and not resume until the ESCape key is pressed. After pressing the CALC key, the message 'Functionkey-number / Number of decimals: 2' is displayed on the 25th (status) line of the screen. The calculations (operations and results) are displayed on the status line, and the result will remain there after the CALC mode is cancelled until the RETURN key is pressed. The result is also stored under function key 16 (shift F8) and can be retrieved if needed as input to a running program. If you wish to have a higher number of decimal places in your results, this can be obtained by pressing the CE key to clear the 2 and entering the required number of decimal places up to a maximum of 15. If you cancel the 2 and select a number between 1 and 15 followed by the letter 'F' you can program one of the fifteen available function keys.

This built-in calculator is more cumbersome to use than a normal pocket calculator, requiring ENTER to be pressed after every operation. You cannot do 2×3×4×5 and then press ENTER for the result, but must push 2×3 ENTER×4 ENTER×5 ENTER. The 15 places of decimals are not to be sneezed at. But I feel that given the general availability of inexpensive, and significantly more sophisticated (in most respects) pocket calculators, this is one feature that could have been left out. Perhaps some people will like it.

Inside

Removing four Philips screws underneath the keyboard unit enables the cover to be lifted off to reveal a neatly laid out main board. The power supply is located on the left at the back and on the right side are four rows of sockets for the 64k RAM chips. There are nine sockets to a row since the Tulip uses the ninth bit for parity checking. The CPU is an 8086 running at 8MHz and the machine comes equipped with 128k RAM as standard and can be expanded internally up to 896k, 512k in the existing sockets on the main board using double (piggy-backed) chips, and the remaining 384k on a piggy-back board. A battery backed-up, real-time clock is also included in the basic system.

Disks

Each disk drive has a formatted capacity of 780k, using double-sided, 80-track, soft-sectored disks. Loading from the disk into RAM is reasonably fast, a 30k file loading in three seconds. The CONFIG utility supplied on the system disk permits individual drives to be reconfigured for other formats, namely. 40 tracks, single or double-sided and 77 tracks, single or double-sided. This means that a drive could be reconfigured to accept IBM PC disks.

Additional 'disk' space is available if you



Two DS 80-track drives give a total capacity of 1560k



The keyboard houses a lot of the electronics

have more than the basic 128k of RAM fitted to the machine. Any additional memory, in 64k blocks, can be designated as a third 'virtual' drive. By loading applications which frequently access disk, such as a database or a spreadsheet program, onto this 'silicon' disk, significant time savings can be made. A word of caution: remember to transfer any files which you have created to a real disk before you turn off!

Screen

The monitor has a 12in green screen as standard but colour is available as an option. The test machine had the monochrome screen, and Compudata also provided a separate KAGA TAXAN RGB colour monitor working in tandem with the main screen so that the colour possibilities could be examined. This is the same make of colour monitor that would go inside the video-disk tower if the colour option were specified.

The display can show three different text formats: 80×25, 64×31, and 40×25. In each case the last line is used as a status line. Format changes are made using the very useful CONFIG utility referred to above. The display is perfectly steady and easy to read, the letters being 9×7 in an 11×8 matrix when the 80 characters by 25 line format is being used. The exceptions are the capital 'W', which looks as though a 'to the power of' symbol has been superimposed on the lower half of it, and the lower case 'u' which is also a bit mutilated. In the 64×31 mode the descenders have been reduced, like the standard set on the Epson QX10, to a single dot below the line, but this does not seem to affect legibility.

The 40×25 mode has been included for compatibility with the Dutch Viditel system. Both the screen and keyboard can be modified, under software control, to accept one of eight different national alphabets. These are: Netherlands/USA, France/Belgium (the French-speaking part, anyway), Germany, United Kingdom, Sweden/Finland, Norway/Denmark, Spain, and Italy. This is yet another function accomplished by the seemingly all purpose CONFIG program.

Additionally, it is possible to reconfigure the whole keyboard to any layout you require under software control, so I could get rid of the shifted colon that offends me. There are seven colours, in addition to black, available on the colour display: red, green, yellow, blue, magenta, cyan, and white. The red and blue are rather dark and do not show up too well on the screen, but the remaining colours are perfectly acceptable. Half-intensity, flashing, reverse video and underlining are also selectable. Overall, the definition on the colour screen is not as sharp as the monochrome, but holds a full screen of 80×25 characters with no loss at the edges. The WordStar word processing package provided with the test machine uses yellow and cyan for its display, which significantly improves readability when compared to the monochrome screen. Low resolution graphics (160×96) are possible and you can switch between two graphic symbol generators which are assigned ASCII values between 128 and 255. These include a series of blocks for use with the Dutch equivalent of Prestel as well as a whole range of scientific symbols.

Options

Hard disk drives: one of the floppy disk drives may be replaced by either a Syquest 5Mb or Miniscribe 10Mb fixed Winchester drive. Another option soon to be available will be also to replace the other floppy disk drive with a 5Mb removable hard disk cartridge.

Maths co-processor: the board has been designed to accept the Intel 8087 mathematics processor.

DMA controller: the Intel 8089 DMA controller can also be plugged straight in.

High resolution graphics: the NEC 7220 graphics chip, complete with its own 96k RAM, can be mounted on a piggy-back board above the main PCB. This will give a resolution of 786×288 pixels, each pixel being individually addressable in any of the eight colours provided. This will work independently of the standard 6845 CRT controller and will mean two planes, one of text, the other of high resolution graphics, can be displayed on the screen at the same time.

Communications interface: a high speed communications interface is referred to in the documentation but no details were available at the time of testing.

All the above extras can be installed in the existing cabinet without recourse to plug-in peripheral equipment.

In use

All the connections for the keyboard/computer unit are made under the bridge of the base, including power. So to set up the machine, having made these connections, all one needs to do is to plug the one power lead into the mains and turn on. The Tulip is equipped with the MS-DOS operating system, version 2. At power-up the machine automatically does a check of memory, taking about one second for each 100k installed. The red LED on the keyboard is illuminated during this check. The Mitsubishi drives make quite loud clunks and squeaks in operation, which I find somehow reassuring. At least I know something is going on! The system monitor is then activated which automatically boots MS-DOS if it finds a system disk in drive A, failing which it gives the message 'DISK UNIT NOT READY' followed by the monitor prompt. ESCape will boot the system once a disk has been inserted in drive A.

Once the system is booted, the MS-DOS copyright heading is shown, followed by a message that the memory driver for the RAM disk is being loaded (if the system has been configured for this), and then the current date and time, with the invitation to modify these if you so wish. Finally the A> prompt is displayed.

An irritating bug was quickly revealed: if you attempt to address an unformatted disk on another drive, or if there is no disk present in that drive, then the system hangs up and will wait all day if necessary until something acceptable is placed in the drive or the reset button is pushed.

Documentation

The standard MS-DOS and Microsoft MBasic-86 documentation was provided, together with a Tulip users' reference manual. This was preliminary, incomplete, and written directly in English by a Dutchman, not translated from an original Dutch manual. I have a great deal of admiration for the high standard of English exhibited by a large majority of the population of the Netherlands, and I do not wish to denigrate the efforts of the author of this manual (I should like to be able to do the same thing in Dutch!). The English is excellent, for a Dutchman, and that's my point. It is extremely difficult to write impeccably in a language which is not one's mother tongue, and even more so when it is a question of a technical manual.

I was told that the preliminary manual is now in the United Kingdom undergoing revision and so we can expect that the manual delivered with the machine in England will be up to scratch. That said, the manual, incomplete though it was, enabled me to operate the machine with not too many problems and without too many phone calls to the manufacturer.

Software

The test machine came provided with MS-DOS version 2, MBasic-86 and the WordStar word processing package. The CONFIG program, already referred to several times in this Benchtest, is one of the most useful on the system disk. You can use it as follows:

(1) to cancel the read verification after writing to a disk (if you want to live dangerously);
(2) to change the configuration of your disk drives (already described);
(3) to opt for two different levels of information when an operating system error occurs; the full version providing you with track, sector, and side number in addition to the basic error message;
(4) to select the initial colour of the screen on boot-up;
(5) to change the screen modes (already described);
(6) to implement an automatic carriage

Benchmarks

BM1	1.0
BM2	3.7
BM3	6.0
BM4	6.1
BM5	7.8
BM6	15.5
BM7	23.3
BM8	17.5
Average	10.1

All timings in seconds. For an explanation and listing of the Benchmark tests, see PCW Vol5 No 11 November 1982.

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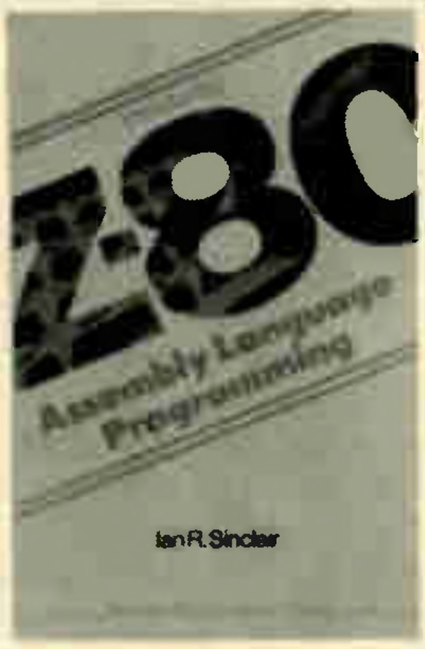

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THE TULIP

return and line feed when the last column is reached;
(7) to select a national character set (already described);
(8) to define the function keys (an alternative to the CALC mode of entry); and
(9) to choose between a daisy-wheel and a dot matrix printer to receive output.

Another useful utility is the Televideo terminal emulator. Since most applications contain a Televideo option in the terminal menu of their installation programs, by running a program that will convince the Tulip it is a televideo terminal you can greatly simplify the configuration of such applications to run on the Tulip.

The MBasic-86 provided is a standard version, not enhanced in any way by Compudata to take advantage of additional features of the machine. This means, for instance, that if you want to play about with the colours, have them blinking, reversed, half-intensity, or underline text, then you must use a series of escape sequences, which makes a Basic program look very messy as well as causing a great deal of drudgery to the programmer. The company explained that it wished to keep the Basic in its original state to retain compatibility with the compiler, but that machines equipped with the high resolution graphics card would have graphics Basic to go with them. I think that not to enhance the Basic interpreter was a mistake. I would much prefer to have the colour commands available while developing a program and then substitute the escape sequences for the compiled version. At least you would only be typing them once! The version of WordStar provided was terrible. Painfully slow, in both its access to disk and with screen output, where the screen was continually being rewritten in its entirety rather than specific locations being addressed directly, it makes nonsense to use such an application on such a fast machine (see Benchmark results).

Technical specifications

CPU:	8086, running at 8 MHz
RAM:	128k with parity checking, expandable to 896k
Display:	80 characters × 25 lines; 64 × 31; 40 × 25 monochrome (optional colour)
Keyboard:	103 keys including eight function keys, full cursor control, eight character type-ahead buffer
Disks:	Twin 5¼in floppy, capacity 780k per disk
I/O:	RS232, Centronics parallel, light pen interface, back-up tape interface, communications interface
Operating system:	MS-DOS 2.0
Languages:	MBasic-86, Pascal, Cobol, Fortran
Applications:	Multiplan, dBASE II, WordStar, Spellstar, Mailmerge

Languages and applications

Apart from the MBasic-86 interpreter, which is included in the basic package, four compilers are presently available for the Tulip: Basic, Pascal, Fortran, and Cobol, all by Microsoft. As far as applications are concerned, there is a spreadsheet, Multiplan; a database, dBase II, and the word processing trio from Micropro, WordStar, Mailmerge and Spellstar.

Prices

Prices for the United Kingdom were not available at the time of the Benchtest, so the following list is a rough translation of the original Dutch prices in pounds sterling.

	£ (excl VAT)
Keyboard/computer unit with 128k RAM	1113.64
Video/disk tower (twin floppies & green screen)	1440.91
Video/disk tower (one floppy & 5Mb hard disk)	2772.73
Video/disk tower (one floppy & 10Mb hard disk)	3068.18
Colour monitor in place of monochrome, add	397.73
Memory expansion to 256k RAM	170.45
8087 maths co-processor	250.00
High resolution colour graphics board (7220)	250.00
8089 DMA controller	45.45

Conclusions

The Tulipsystem I is a nice computer. Forget the advertising hype that speaks of the 'Fourth Generation' and carries on as if it's announcing the millennium. That wonderful it isn't. But it is a well-designed, good-looking (if a little overpowering), fast business machine with lots of nice features that should make it go down well in an office environment. It's tidy, with no cables snaking all over the place, just the one lead to the mains socket. It's compact, in the sense that it retains the same exterior whether it's the basic system with twin floppies and 128k or the full-blown affair boasting 896k RAM, 10Mb fixed disk, 5Mb removable, high resolution graphics and the rest. It has an excellent keyboard, which makes it very suitable for word processing and it seems to be reliable (it was running for sixteen to eighteen hours a day during the week I had it at home for testing and behaved impeccably). And, as far as can be judged, it looks to be competitively priced, when you look at how much you are getting for your money.

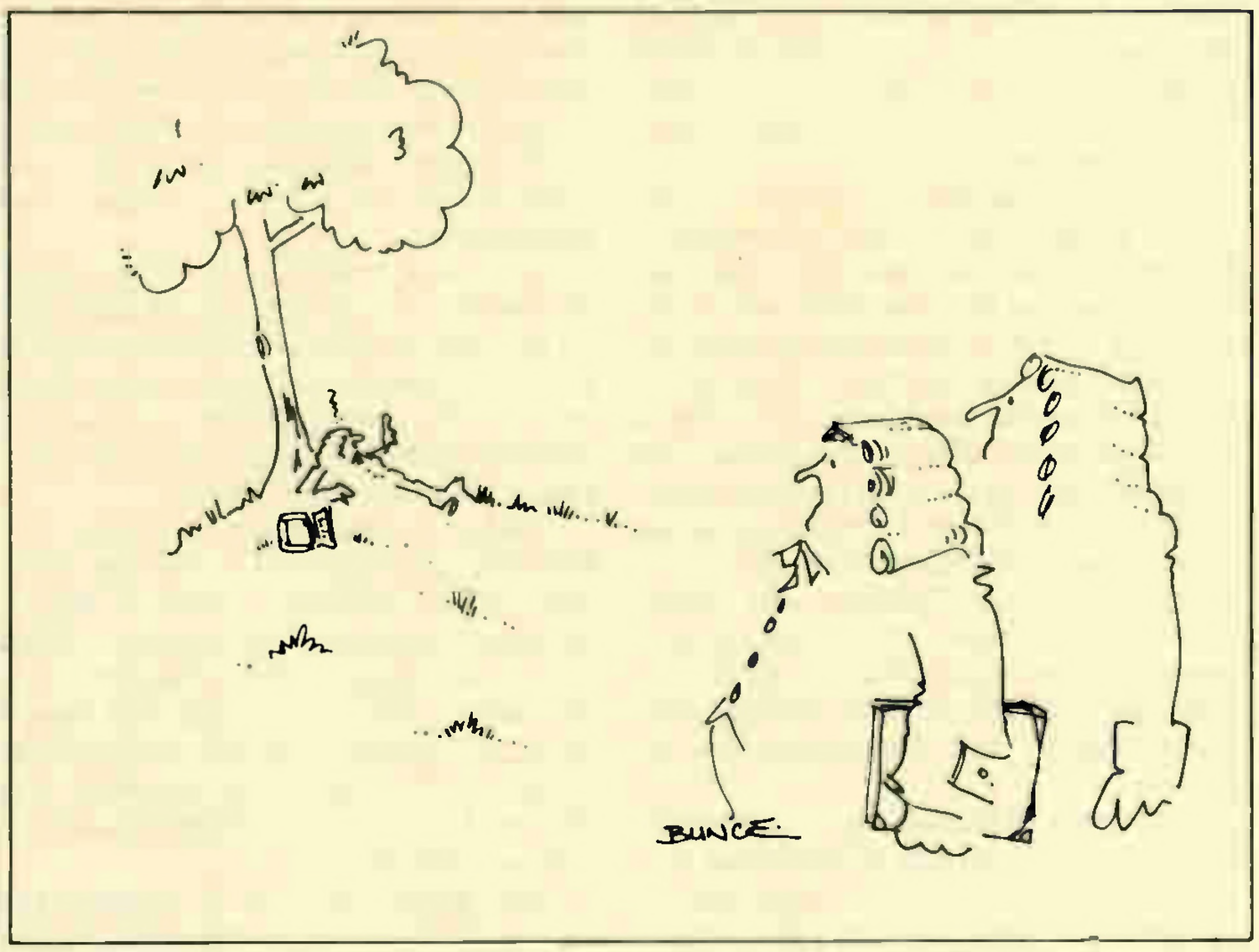
The Tulip has been given a different marketing pitch in the UK where it is expected that many users will want an entry level system at around £2000.

To this end a separate disk unit is available in Britain with either 1 × 400k for £522.73 or 2 × 400k for £772.73. A separate green monitor is also available at £135.23.

'This means users will save over £700 by not having to buy the tower which is effectively a fancy moulding unit and an extra 800k of disk,' said Chris Newport, director of Newport Technical Services which is the UK distributor for the Tulip. But it is anticipated that some users will still prefer the 'ergonomically' designed disk/monitor tower.

Newport is appointing a network of dealers for the Tulip around the country.

Details from Newport Technical Services Ltd, Bush House, Prince St, Bristol BS1 4HU. Tel Bristol (0272) 290651.



END

MICRO CHESS

INTER-GALACTIC MOVES

Tony Harrington finds out what the future augurs for the Novag Constellation Chess Computer.

1983 will probably go down as a vintage year in the history of computer chess. Several suppliers have already released, or are about to release, machines that are significantly stronger than the best of their predecessors.

There is the new Mephisto, the prototype of which is competing in the *PCW* Tournament. There is the Fidelity Prestige, which is already on the shelves (and which is not competing, for reasons best known to Fidelity). And there is the Novag Constellation which is available now. At the time of going to press it is thought likely to compete in the Tournament. Negotiations, as they say, are underway.

I had an opportunity recently to play against the Constellation, and to talk to Peter Auger, the chairman and founder of Novag. At less than £150 (£149.95 to be exact), the Novag Constellation must be a likely contender for the title of the strongest machine in its price range. My game against it does not really count. I tell myself, since it was played between pauses while talking to Paul Cohn, the UK distributor of Novag chess computers. At sometime during the discussion I suddenly found myself in the middle of various awkward tactical complexities and reverted to being a journalist instead of a chess player.

If Novag does pluck up the courage to submit its current pride and joy to the test, I will be very interested to see how it fares over nine rounds. But as Auger explained, a commercial supplier has a huge disincentive against entering any tournament it is not certain of winning. And who can be certain?

'The majority of the chess playing public,' he pointed out, 'cannot beat even the last generation of chess computers, never mind machines like the Constellation. But human nature is such that everybody wants to own the strongest machine. If I put my little Constellation against some other supplier's prototype machine which is based on hardware that will never be sold to the public, and it loses, then I get bad publicity in seven countries.'

It is a consideration. But fortunately for the future of tournaments like the European Microcomputer event, it is also true that suppliers who don't enter competitive events, don't get seen at all. It is nice to have experimental entries from suppliers, since it makes the tournament what it should be — a forum where ideas can be tested in competitive play. But it is also important that the tournament include a sample of the best of the currently available machines, to provide a standard, a kind of Benchmark, against which the new ideas can be measured.

At the time of writing Auger was torn between entering a prototype model only, or entering a prototype and the Constellation as Cohn was urging him to do, or entering nothing at all in any tournament before the Budapest World Championship in October. It's a difficult life, being a supplier.

So how did Auger become involved in computer chess in the first place? Unlike many of the other suppliers profiled in this column, Auger's involvement with computer chess can be seen as the logical development of a family tradition.

The Auger family is a long established firm of toy makers in Nuremburg. Auger's father was a toy maker of the old school, where high technology meant clock-work mechanisms, not computers. After the Second World War Auger moved to Montreal and set up his own toy distributing business.

The Far East was then, perhaps even more than now, the centre of the toy industry. Many of Auger's supplies came from there, and this led to what military men call 'uncomfortably extended lines of supply'. Distribution and trade problems kept Auger flying to and fro often between Canada and Hong Kong so that inevitably it soon came to seem more sensible to move there permanently.

Besides being the toy mecca of the world, Hong Kong was also a boom town for the electronics industry. Add the development of the microchip, and it was merely a matter of time before someone decided to connect all three. Chess stood out as a game that would obviously benefit from a good deal of computing power and Auger decided to see what could be done.

His first venture into computer chess has already featured in this column, in a profile of SciSys. Ernest Winkler and Auger teamed up to produce and market this first model. Auger asked Winkler to do the technical research while he looked after the packaging and distribution side of things.

That was in 1978. After several months a machine appeared, but Winkler and Auger found the edges on each other's personalities a little too sharp for comfort and decided to part company — in the best of spirits, of course. Winkler went off on his own and founded SciSys, while Auger carried on with Novag.

The first machine to be produced by the Winkler-less Novag was displayed at the Las Vegas exhibition in January 1981. A spate of new products followed, including Micro Chess (a pocket computer set), Savant, the Super Sensor 4 and a prototype of Novag's self moving set, with a robot arm (though problems with the latter meant that it was only shown at the 1982 Show).

1982 saw Novag produce a cheap, simplified version of the Super Sensor 4, called the Dynamic, as well as a second, more powerful version of Micro Chess called, not surprisingly, Micro Chess II. Last year turned out to be a pleasant one for the company, since it won two packaging awards for the quality and appearance of its products. Gabriella Auger looks after this side of things.

Although Novag has sold well in the rest of Europe, especially in West Germany, it is still not particularly well known in the UK. Paul Cohn, who acquired the UK distribution rights for Novag towards the end of last year, intends to change that — and the strength and price of the Constellation should help him achieve his aim.

Cohn is unique among the distributors that I have met in that computer chess for him is not simply a product. It's a passion. His company, Eureka Electronics, was in the electronics instrument business, selling oscilloscopes, function generators and multi-meters to schools, colleges and polytechnics.

Then, back in 1978, a friend by chance showed him one of the earliest Challenger 3's to reach the UK (priced at that stage at £140 for a three-level machine). Someone else, shortly after, gave him a Chessmate machine by the Hong Kong based supplier Cassia, and Cohn was hooked.

'During a conversation one day, this friend of mine said that he thought there must be two thousand people in Britain who would want to buy the machine,' Cohn said. 'I thought at that time that there were only one or two other lunatics like myself about, who enjoyed playing chess against computers. It occurred to me then, that perhaps I was wrong. Perhaps I wasn't so unique, after all!'

Cohn asked Cassia for 25 samples. He had no idea then how any potential market



Peter Auger, chairman of Novag, decides his next best move.

for chess computers could be reached. But the electronics shops in Tottenham Court Road, London, struck him as a possible outlet. A long day spent going up and down that road resulted in one manager ordering five sets. Ten days later that same manager rang up Cohn and asked for 12 more. This continued, and Cohn developed other outlets. By the end of his first year (1979) Cohn reckons he sold well over the 2,000 sets forecast by his friend.

In September 1981, Cohn went to Hong Kong and got Cassia's first sample version of Computer Chess, a pocket set priced at £29.95. While in Hong Kong, he met Peter Auger for the first time. They talked, but it was only in late 1982 that a mutually satisfactory arrangement was reached, and Cohn took over the UK distribution of Novag products.

According to Cohn, his experience in the UK indicates that the demand for chess computers is split into two different levels. Sales of the cheap pocket chess computer, Micro Chess II, run into five figures, he claims. Sales of the more expensive Constellation are a long way short of this.

'People buy the machine that suits their pocket and their playing strength. Of the three million or so people who play chess in the UK only the top 60,000 or so can get the full benefits of a strong chess computer. But every player can enjoy a game against the travelling sets.'

Cohn pointed out that recent breakthroughs in computer ches concerned the length of playing time, as well as the strength of programs.

'You can now get 20 hours playing time on one set of batteries on the Constellation instead of the six hours or so which were all the previous generation of machines could muster,' he said.

Close up of the Constellation.

This bodes well for those who like taking their sets on long train or plane trips.

Games section

White: Constellation. Black: Fidelity Elite. Queen's Gambit Declined. Notes by David Levy.

1	d2-d4	d7-d5
2	c2-c4	e7-e6
3	Nb1-c3	Ng8-f6
4	Bc1-g5	Bf8-e7
5	Ng1-f3	0-0
6	Qd1-c2	c7-c5
7	d4xc5	d5xc4
8	e2-e4	Nb8-a6

(Not 8...Be7xc5? 9 e4-e5 h7-h6 10 e5xf6 h6xg5 11 Nf3xg5 (threatening mate on h7) 11...g7-g6 12 Ng5-e4, with a clear, possibly winning advantage for White.)

9	Ra1-d1	Na6-b4
10	Qc2-b1	Nf6-d7
11	Bg5-e3	Qd8-a5
12	Bf1xc4	Be7xc5
13	Be4-b5	

(If 13 a2-a3 Nb4-c6 14 b2-b4? Qa5xa3 15 Be3xc5 Qa3xc3+, when White is a pawn down.)

13	...	Bc5xe3
14	Bb5xd7	Be3-h6?!

(An unnatural square for the bishop. It would have been more sensible to retreat to c5 or b6. On h6 the bishop is out of play.)

15	Bd7xc8	Ra8xc8
16	a2-a3	Nb4-a6

(Why not retreat to c6?)

17	0-0	Bh6-f4

(Intending to deploy to a better diagonal, but White has other ideas.)

18	Rd1-d7	Qa5-b6
19	e5-e5!	

(Keeping the black bishop shut away from c7 and b8.)

19	...	Na6-c5
20	Rd7-d4	Bf4-h6

(So now this bishop is doomed to a dismal future.)

21	b2-b4	Nc5-a6
22	Nc3-e4	Rf8-d8
23	Ne4-d6	Rc8-b8
24	Rf1-d1	Rd8-f8
25	Qb1-d3	

(Completing White's domination of the d-file.)

25	...	Na6-c7
26	Nd6-c4	Qb6-b5
27	Qd3-c2	Nc7-d5
28	Nc4-d6	Qb5-a6
29	Qc2-b2	

(Protecting the a3 pawn and preparing Nd6-f5.)

29	...	Rb8-d8??

(A terrible positional blunder. Black should have prevented White's next move with 29... g7-g6, which would also help to improve the position of the h6 bishop which could then come onto the long diagonal at g7.)

30	Nd6-f5!	

(This move forces liquidation to a

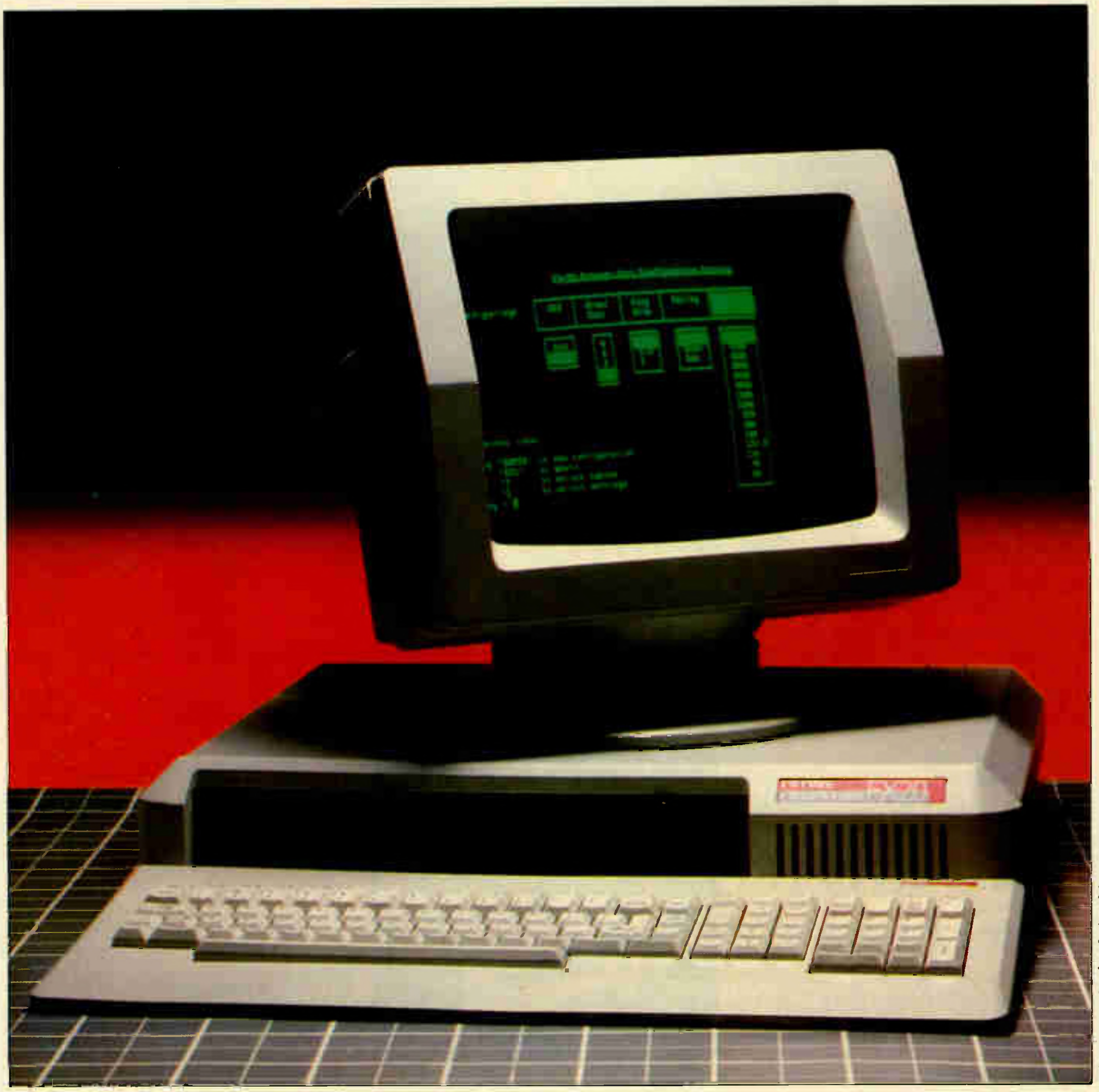
GOTO page 252

Photography by Tony Sleep

BENCHTEST

FUTURE FX20

A British company, Future Computers Ltd, gazed long and meditatively into its crystal ball before manufacturing its powerful business micro, the FX20. Peter Rodwell predicts the machine's viability.



Photography by John Mason

Only a couple of years ago, you could expect to pay at least £2000 for a typical business micro with twin disks, 64k of RAM and an 8-bit processor driving it all.

Now, a new British manufacturer, Future Computers Ltd, has come out with a 16-bit business micro complete with disks and 128k of RAM for well under £2000 — £1875 plus VAT, in fact. Such, friends, is the way the micro industry progresses, and in a couple of years from now we'll probably be buying 32-bit, half-megabyte machines for the same price!

The micro computer industry is all about high volumes and the low unit costs which result. Chips are made by the million and are therefore very cheap; so too are the computers based on them, provided manufacturing is on a large enough scale. Until fairly recently, this basic principle seems to have eluded many British micro makers, at least at the business end of the market. We've all seen what high volume has done for Sinclair, but upmarket, there are still plenty of firms hand-crafting business micros with loving care and wondering why they're getting less and less competitive.

One problem is, of course, that to manufacture in large quantities you need a hefty amount of financial welly to get going. Capital investment is the name of the game and Future Computers got this right with the aid of venture capitalists MGM/APA, a company which is taking a great deal of interest in the micro/high tech world, and BTG, both of which have invested £400,000.

The Future Computers FX20 is the first in a planned range of products which will range from a Z80-based 'intelligent workstation' through to a 32-bit super-micro with 1 megabyte of RAM (expandable to 16 Mb and based on the Intel iAPX 286 processor).

Hardware

The FX20 comes in a very neat, stylish, three-box design, of which the main box is probably the lowest-profile computer around at only 9cms high; it makes up for this, though, with a pretty large footprint of 49cms wide by 30cms deep. The keyboard is the same width but a mere 3cms high at the back, tapering to just over 1cm at the front edge. Both keyboard and main box come in sheet steel housings, while the 12in monitor is housed in plastic.

The reason for the slimline look to the main box is that half-height 5¼in disk drives are used. These are actually bolted into the lid, making it unexpectedly heavy to take off, but this does allow uninterrupted access to the main PCB, a massive one covering almost the entire floor of the box, which houses all the electronics apart from those required to control the disk drives — these are mounted on a separate board attached to the disk drives.

The FX20 is based on the Intel 8088, the chip used in the IBM PC, the Sirius and several other new generation business machines. The 8088 is in fact a 'sawn-off' version of the 16-bit 8086. Internally it's identical to the 8086 and has the same instruction set, but externally it has an 8-bit, rather than 16-bit, data bus, allowing the memory to be configured in 8-bit bytes rather than the 16-bit words required by the 8086. This makes for rather cheaper hardware, although the cost gap is closing now.

Right next to the 8088 on the main board is a large, empty socket. This is for an 8087 maths co-processor, a chip which is in effect a separate CPU dedicated to performing floating-point maths operations. Currently, the 8087 is a very expensive chip indeed, but as more and more micros are appearing with empty 8087 sockets, we can expect its price to fall. Currently, little software is available to take advantage of the 8087 anyway, but again this will change — already some language compilers and interpreters are available with 8087 options and some quite dramatic speed improvements can be obtained. As we shall see in a moment, though, you probably wouldn't need an 8087 in this computer.

At one time, we used to list carefully all the chips of interest in our Benchtest machines. This is becoming a rather irrelevant exercise now — on business machines, that is — as users are far more interested in what the machine *does* than in what it contains. Suffice it to say, then, that the FX20 contains 128k of RAM as standard, expandable to 1 Mbyte, and that the rest of the system contains quite conventional chippery — no troublesome ULAs to increase development time, just a good assortment of intelligent controllers to reduce the chip count and hence the overall system cost.

The twin 5¼in double-sided disk drives hold 1.6 Mbytes per disk, a healthy storage capacity indeed. In fact the machine has four disk drives, for a further two 'phantom' drives are configured into the operating systems: drives I and J. Switching to either of these allows you to use IBM PC disks in the right hand disk drive, with drive I setting it up for single-sided disks and J for double-sided. Naturally, with only CP/M-86 available on the review machine, it was only possible to read IBM PC CP/M-86 disks, but I got hold of a couple of these and it worked just fine.

The keyboard is very well-equipped with 109 keys. These include 20 function keys, an editing and cursor block and a numeric pad. Scattered around the keyboard are 'help', 'cancel', 'break', 'select' and 'do' keys as well as an ALT shift key, which allows you to type in graphics instead of alphanumerics directly from the keyboard. The keyboard is well laid out and nicely sculpted: the top row of the qwerty block — the one with the numbers — is raised above the level of the function key row, for instance. Personally, I didn't much like the feel of the keyboard: it was too light and dead for my taste, rather like a SuperBrain keyboard in fact, though considerably more solid, but I stress that this is my personal preference talking now — keyboards are very much a personal matter and others may well like the FX20's feel.



The keyboard is well designed and nicely sculptured.

FUTURE FX 20

The keyboard plugs into the main box at its side, near the front. There's a second keyboard socket on the display, underneath at the back — you can plug into either socket and the machine works. Interestingly, the keyboard plug and socket are exactly the same as those now used by British Telecom for phones; I resisted the temptation to plug the keyboard into my phone socket and vice versa to see what happened. . . The keys auto repeat and produce an electronic click, which can be turned off and on using utility programs called CLICKOFF and CLICKON respectively.

The function keys and the 'help' key can all be programmed with a string of up to 32 characters for each key. This is done by printing a string preceded by the ASCII ESCape code (27 decimal) and the ASCII 'I' character, followed by an ASCII character identifying the key to be programmed. The string is terminated with a null byte.

The display gives 25 lines of 80 green characters on a black background and is crystal clear and steady. The FX20 uses the same character set as the IBM PC and a large number of escape codes can be sent to the screen to alter the attributes of the display — underlining, enhanced brightness, reverse video, and so on. The display tilts and swivels and is mounted on its own plinth which rests on the top of the main box.

Two rather curious omissions struck me when looking at the machine; I couldn't find the display's brightness control and there is no reset button. In fact both of these are controlled from the keyboard: screen brightness is altered using the shifted first seven function keys and the system is reset by hitting shift 'break' twice.

The FX20 is not exactly overloaded with I/O capacity in its basic configuration. Neatly arranged along the back of the main box are two serial ports labelled modem and printer, an RS422 serial port and two telephone sockets for a network interface, of which more in a moment. A parallel printer port would make a useful addition to this as, from what I have seen, linking up serial printers can sometimes be a fraught exercise for the user who hasn't persuaded his dealer to do it for him; parallel printers seem easier to hook up, the ports are cheap to implement, and some printers don't allow you to use all their facilities with a serial interface.

The network interface is interesting. Designed by Future to its own standard, it comes built into the basic machine at no extra cost. Currently, the network hadn't been fully completed so I was unable to test this out, but it will be a Ring-type network and will allow you to hook all your Futures together. It will require CP/NET to operate it and to reap full advantage from it you'd really need a hard disk Future somewhere in the network. I must confess to being a little doubtful about yet another network when what we really need is just *one* network standard to which lots of different machines can be connected. Future, though, envisages that its network will be used to link only Future machines together and that if other machines were needed on the network, some sort of suitable interface could probably be found.

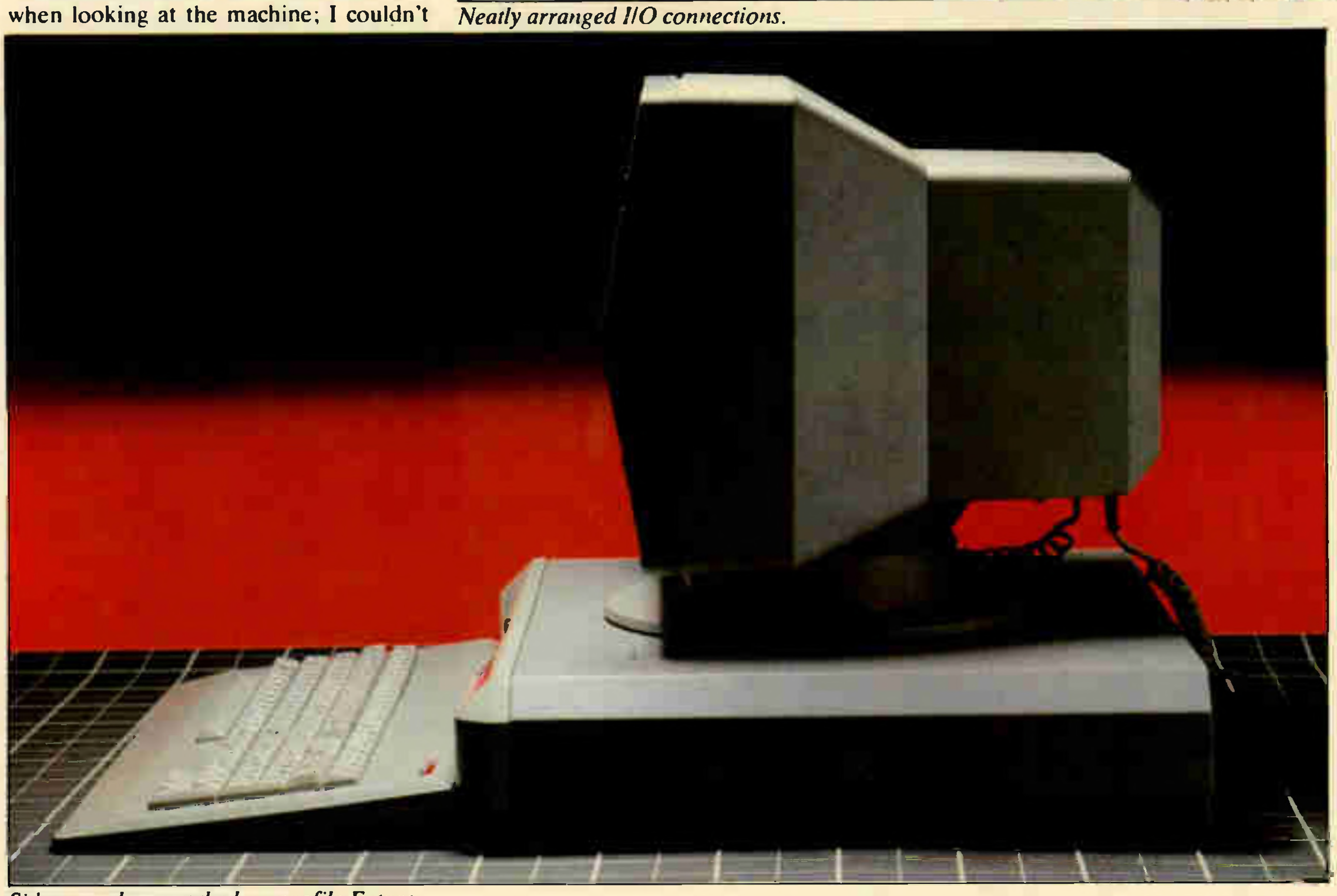
But Future deserves full praise for building in a network interface. Networks are the way the micro world is heading and make far more economic and technical sense than do multi-user systems, in which several people share the cheapest part of the system, the CPU, while paying a lot of money for some elaborate software to make it all work.

System software

The FX20 comes at the moment with just



Neatly arranged I/O connections.



Sideways glance at the low-profile Future.

CP/M-86, of which plenty has been written in *PCW* before now. Future plans to put Concurrent CP/M-86 onto the machine too, which will be a great improvement. A concurrent operating system allows you to have several programs running at once and to switch between them. In Concurrent CP/M-86 this is done with 'virtual consoles' — you start one program running, press a key to switch to another screen, start another program running . . . and so on. You move between programs simply by switching between screens. This may sound a little elaborate and unnecessary but its advantages are enormous: you can, for instance, have a database program running on one screen while you're using a word processor; when you want to look up some information in the database you switch to its screen and browse around until you find what you want. Facilities exist for transferring information from one screen to another, and while all this is going on you could be printing out another text file, or compiling a program or gathering electronic mail. . .

There appears to be some debate within Future as to whether or not MS-DOS should be made available on the machine, or whether an emulator should be provided to allow MS-DOS programs to be run under CP/M. Certainly I find it inconvenient to have two operating systems on my Sirius: most of the software I use runs under CP/M-86 but I have a couple of MS-DOS packages and it's quite boring having to insert a different disk, hit reset and go into another operating system several times a day.

Another problem with two operating systems crops up when you try to use a hard disk. All the CP/M operating systems are disk-compatible: the data is stored on them in the same way, although hardware manufacturers screw this up by using different disk formats. The nearest we have to a standard format is the IBM 8 in single-sided, single density format — you can stick one of these into any CP/M machine, 8- or 16-bit, and read what's on there from any CP/M operating system. MS-DOS, on the other hand, uses an entirely different disk format and is totally incompatible. With a hard disk machine, therefore, you are forced to choose between CP/M and MS-DOS because files for the two types of operating systems cannot live on the same disk On the hard disk Sirius, you are tied to MS-DOS, with a CP/M emulator which allows you to use CP/M programs (there's an MS-DOS utility which allows you to read files from CP/M disks). Future, it seems, may go in exactly the opposite direction, providing an MS-DOS emulator and MS-DOS file-reading utility to allow you to run MS-DOS software under CP/M-86.

Future has in fact made some considerable modifications to CP/M-86, although these are all internal matters which do not affect either the way the user sees the system or the way in which applications programs run. Principle of these modifications, as far as the outside world is concerned, is to put the character set, the set-up details for the serial ports and the function key strings into a separate file on disk, called SYSTEM.DAT.

A series of utility programs is available which allows you to modify easily and quickly the contents of this file: you can design your own characters if you don't like the standard ones, set up the serial ports to exactly the baud rates you require and generate strings for the function keys. These are then incorporated into the SYSTEM.DAT file and read by the operating system as it is loaded in on power-up or after reset. This is a far easier-to-use approach than the Sirius, for instance, where you have to generate your character set or keyboard table and then build a new operating system incorporating these and remember to transfer it to all your other disks, a lengthy process. On the FX20, you merely copy the SYSTEM.DAT file onto all relevant disks and you can much more easily configure different SYSTEM.DAT files for different disks, tailored to the software on them.

A diagnostics/system testing routine is built into the machine and operates when it is first switched on. Assuming all is well, a neat little display appears to inform you of this fact and the system proceeds to boot up the operating system. A fault — leaving the keyboard unplugged, for instance — is reported to an accompaniment of bleeps.

Future hasn't put a 'help' key on the keyboard simply to make it look trendy — the key actually does something. Pressing it (or indeed typing 'help') produces a menu of subjects on which you might conceivably want help, especially some of the CP/M utilities like PIP (*when* will they start calling it 'copy'?). You select the topic on which you require assistance simply by typing as much of its name as is necessary to identify it from other items and hitting return; you then get a screenful of advice.

The Future-originated utilities — such as the one which allows you to set up the serial ports — are all well-designed, friendly and easy to use. They included a program which displays, and optionally sets, the time and date and one which un-erases an accidentally-erased disk file — most useful.

Other software

The review machine came with Microsoft Basic and the word processing package SpellBinder; the latter will be included in the machine's price while the former will cost extra.

SpellBinder is a powerful word processor although not one which I personally find particularly easy or friendly to use. On the FX20, though, the keyboard can be configured so that many commands are executed at a single function key press, which makes life much easier. SpellBinder was reviewed in the August '81 issue so I won't go into the gory details here; it is very powerful and will, once you've learnt your way around it, allow you to do just about anything to a piece of text whichyou might conceivably want to do. The 'human interface' factor in software is, like keyboards, a matter of personal taste so don't be put off by my comments on SpellBinder: I know people who think it's the bee's knees in word processing — it just doesn't suit me, that's all.

Normally, I would have nothing further to say about Microsoft Basic other than the fact that it exists on the machine. But running the *PCW* Benchmark tests produced a big surprise: the FX20 came top of the list, beaten only by the Sage II running p-code! Apart from the fact that this will pull the rug from under Olivetti's ill-fated ad campaign, my first thought was that I'd made some terrible mistake but a re-run provided exactly the same results. My next thought was that the machine must have an 8087 in it and this version of Microsoft Basic must be a new one which uses the '87, but a quick look inside revealed an empty socket where the 8087 should be.

The explanation for the tremendous speed of the FX20 is twofold. Firstly, and more simply, the 8088 is running at 8 MHz.

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Benchmarks

BM1	1.2
BM2	3.4
BM3	6.8
BM4	7.0
BM5	7.9
BM6	14.5
BM7	22.2
BM8	17.5
Average	10.1

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

Technical specifications

CPU	8088 at 8MHz, optional 8087 maths processor
RAM	128 kbytes, expandable to 1 Mbyte
ROM	4k
Display	25 lines × 80 characters
Keyboard	109 keys inc 20 programmable function keys, numeric pad cursor control
Disks	Twin 5¼in floppy, capacity 1.6 Mbyte per disk; phantom drives configure right-hand drive as IBM PC compatible (single and double-sided); optional hard disks
I/O	1 RS232 printer, 1 RS232 modem, 1 RS422 serial port, local area network interface (Future's own design)
Software	
System	CP/M-86, Concurrent CP/M-86
Languages	Microsoft Basic and others available
Applications	SpellBinder word processor included in price, large range of other applications packages available under CP/M-86.

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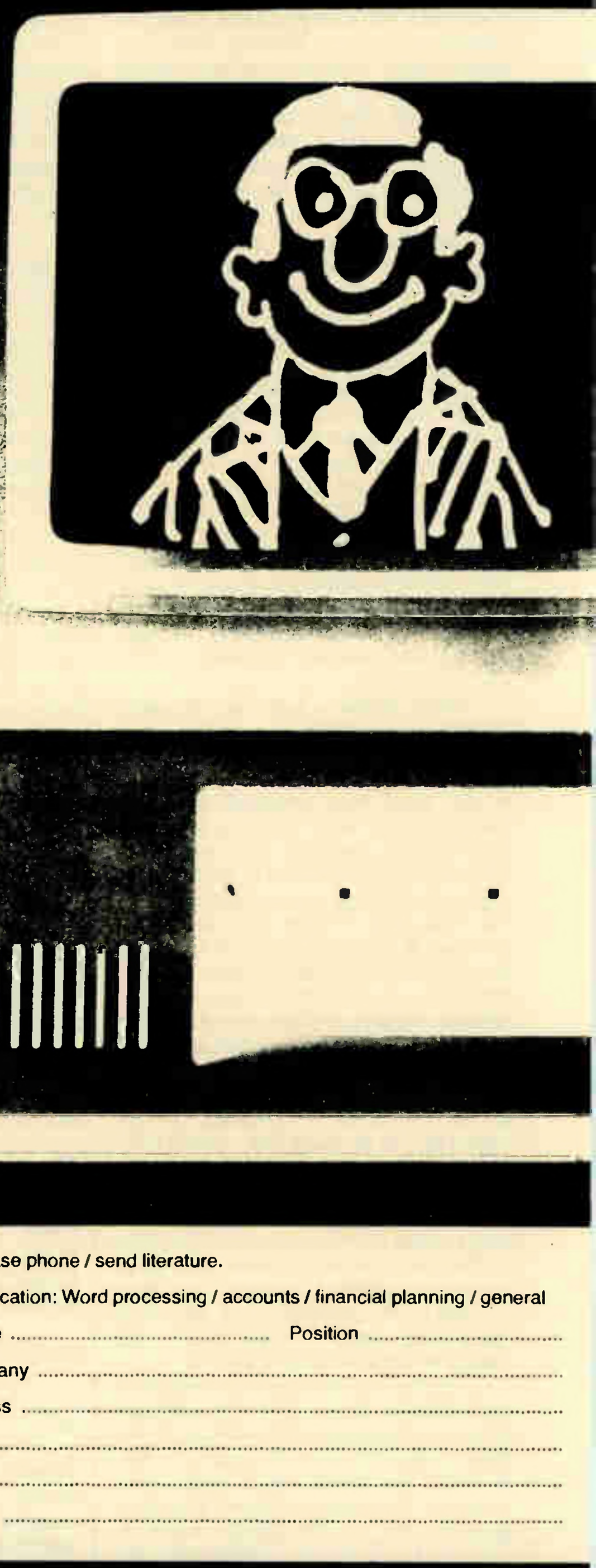

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YANKEE DOODLES

Sol Libes presents his monthly batch of juicy snippets from the Big Apple.



Random rumours

Apple is expected to introduce a new Disk Operating System for the Apple II early next year to be called ProDOS. It will be compatible with the DOS used on the Apple III, use a hierarchical file structure and allow the handling of much larger files and more disk capacity than the DOS 3.3, the current system used on the Apple II. Apple will provide a program to convert applications software from DOS 3.3 to ProDOS formats . . . There are also rumours that Apple is very close to launching the Macintosh, 68000 based system, with an expected base selling price of just under $2000, and that Apple's stripped-down version of the Apple II will be in the stores for Christmas and sell for $500 . . . There are rumours that Victor Technologies, producer of the Victor 9000 computer, will report a loss for the second quarter . . . Microsoft is expected shortly to release a whole range of new products. There will be a word processor for the IBM PC with Lisa-like graphics and using Microsoft's mouse; a user will be able to see up to 65 different fonts on the screen as well as print them out and it will work with all the popular spreadsheets and database programs. The new version of MS-DOS is expected this autumn and should have multi-processing capability. The company is also expected to introduce version 4 of its LISP interpreter greatly enhanced from the previous version. Also due is version 3.1 of Fortran with 8087 support; strangely IBM will stick with the old version. And lastly, Microsoft will lauch an ISV (Independent Software Vendor) program similar to that of Digital Research . . . At the time of going to press there are hot rumours that IBM will formally announce its $750 portable home computer by the end of August. As reported in an earlier column it is expected to use the 80188 processor, have 128k of RAM, a 5.25in disk drive, no expandability and some proprietary chips to discourage look-alikes. It will run a stripped down PC-DOS and include word processor and spreadsheet software. IBM is also expected to announce another version of the PC with even more power than the XT with better graphics (improved resolution and sprites), a Lisa-like user interface and multi-user, multi-processing capability. It will probably use the Intel 80286 processor . . . Commodore is rumoured phasing out production of its popular VIC 20 low cost home computer and readying a replacement which will *not* be compatible with VIC 20 software. The Commodore 64 is expected to still have about another year's life left in it and then it will probably be phased out.

Home computer price war

Eight years ago Texas Instruments entered the calculator business driving Commodore out of the business and nearly forcing it into bankruptcy. TI furnished Commodore with the chips used in its calculators. Commodore learned its lesson . . . it bought a chip maker achieving control over all key components. Thus today Commodore's 6502 microprocessor is used in other makers' systems, such as the Apple and Atari machines. Commodore also learned that the key to the consumer market was to bring out repeated new products and to undercut competitors' prices. The result is that Commodore now has more than 30% of the consumer computer market and is the only consumer computer maker to turn in a profit for the past year. In fact it reported $28 million profit on $675 million sales; and it is shooting for $1 billion sales for this year, while TI, Atari and Mattel all reported huge losses.

Meanwhile TI is seeking to move its large inventory of TI-99/4A home computers and has dropped the price to $89 to match better the selling prices of the Commodore VIC 20 and Atari 400. All three are currently selling for between $69 and $79.

A stockholder has filed a suit against TI charging that they sold their 99/4A computer at prices lower than actual manufacturing cost in the expectation of selling profitable software and peripherals. TI disclosed that it laid off 750 workers at its personal computer manufacturing plants and there are rumours of more lay-offs to come as TI has cut back on production. It has been reported that TI sales have fallen by almost 20%. TI has also redesigned the 99/4 internally to lower the component count to reduce manufacturing cost, and also to prevent any but TI-built ROM cartridges from being used with the unit.

Mattel Electronics also reported that it will cut 260 workers, 15% of its workforce, due to a 19% decline in sales of its home computer. All the workers were white collar employees as the company's manufacturing is in the Far East.

Price discounting has also begun impacting the small business computer market. The Osborne I, which a year ago was selling for $1750, can now be purchased on sale for $1099 with a database program included. The KayPro, its leading competitor, is currently selling for $1450 with rumours that the price will drop to $1250 next month. And Apple Computer which has fought hard to maintain pricing on its Apple II computers no longer appears to be able to hold dealers in check. An Apple IIe system, complete with 64k RAM drive, and 80 column card, can now be had for $1492, over $500 below its list price . . . The Franklin equivalent system can be had for $1199. It appears that before the year is out these small business computers may sell for under $1000.

Vendors try tele distribution

An experiment is being run by a few of the smaller software suppliers to download software to retailers, and in some cases to end users, via modem phone line connections. The expectation is to reduce inventory and to by-pass the problems of manufacturing and distributing thousands of floppy disks with the problems of returns, updates and lack of shelf space. It is the smaller software developers, who do not have access to good distributors who are trying this. With the newer, personal computer systems including modems and programs for transferring software teledistribution of software is expected to have a significant impact in the late '80s . . . particularly in the distribution of computer game software.

Micro/ mainframe links

Many of the traditional mainframe software vendors are moving into the micro software market by supplying software that links microcomputers to software used on large mainframes. Applied Data Research Inc, NY and Cullinet Software, two old-time mainframe software suppliers, have disclosed that they are developing software to allow micro users to link to their software being run on large IBM mainframes. ADR has signed an agreement with VisiCorp to use VisiOn on the IBM PC customised to enable users to view and manipulate multiple items from their mainframe software on their own screens. This software includes databases, electronic mail, and development tool

software. Cullinet is expected to provide a similar micro/mainframe link for both the Apple Lisa and the IBM PC.

VisiOn — where are you?

VisiCorp first demoed its VisiOn front-end software for the IBM PC last November at the Comdex show with promises that first deliveries would be made by the following July. Well, that time has come and gone and it is still not here. VisiCorp has been pushing delivery back and back. It is now promising to release it to end-users in October.

In the meantime VisiCorp claims to be improving it and extending its features . . . of course how would we know since we have not had an opportunity to try it. The company claims that it now has VisiOn running on DEC, Wang, Xerox, Texas Instruments and Honeywell systems as well as the IBM PC.

VisiCorp also recently acquired Digital Solutions Inc, Cupertino CA, a developer of SNA software. This is expected to enable VisiCorp to integrate its current software better with mainframe software.

In the meantime several other software companies have announced that they plan to introduce 'Lisa-like' systems for the IBM PC. Quarterdeck Office Systems, Santa Monica CA and Schuchart Software Systems Inc, San Rafael CA, say they expect to have their multi-window products out this month. Quarterdeck's package, called 'DesQ' will sell for $395 compared to VisiOn which is expected to sell for over $1700.

Zilog announces 32-bit micro

Zilog has announced its 32-bit microprocessor called the 'Z80,000', or Z80k for short. Rumoured previously in this column, its specs live up to predictions. It will be upward compatible (at binary level) with the Z8000 16-bit unit and will provide features for multi-user, multi-processor operation. It will run at clock speeds as high as 25MHz, have a 256 byte instruction cache and execute instructions in 2.2 cycles on average.

On paper it sounds like the most powerful microprocessor announced yet. Of course Motorla and Intel have not yet offically released the specs for their 32-bitters and it is likely that both will start shipping samples of their units before the Zilog promised 2nd quarter of 1984. National has also released the specs for the 16032 32-bit microprocessor and can be expected to start sampling before Zilog.

In any event, we can expect to begin seeing computers based on these 32-bit chips being introduced by mid 1985.

IBM expands retail outlets

IBM is adding another 300 stores to its distribution organisation to bring its total up to 1100 stores. This means that more than almost half of the computer stores in the country will soon be carrying the IBM PC. Further, IBM is expected to double the number of IBM retail stores (called 'Product Centers') to close to 100 by this time next year. IBM has also begun an aggressive program of paying referral fees to independent software and system vendors who refer customers to IBM sales offices.

There is no doubt that IBM has become the most aggressive marketer of small business computers to appear on the personal computer scene. As reported last month it spends as much on advertising as all its leading competition combined and will soon have more outlets for its PC system than any of the competition.

It is interesting to note that IBM has not had similar success in marketing the PC in Great Britain and the rest of Europe.

In the law courts

Computerland has filed suit against Microland Computer Corp, Newark CA, claiming infringement on its trademark name and advertising logo. This is the second such suit Computerland has filed. It lost the first suit.

Commodore has filed a $30 million suit against a keyboard supplier charging that it had to abondon its Max home computer after assembling 35,000 units that had keyboard problems.

MicroPro International has filed a $10 million copyright infringement suit against United Computer Corp, Culver City CA by renting MicroPro software. MicroPro has charged that UCC removed the MicroPro customer agreement from its software packages and substituted one of its own, and that this encouraged copying of the programs. UCC has been renting programs such as WordStar and VisiCalc for 15% of their retail price for a ten-day period. There is also a $125 (business software) or $50 (entertainment software) initial membership fee.

Western Electric enters software market

Western Electric has introduced its first two software application packages. As expected they run under the UNIX operating system. WE's only previous activity was to license the UNIX operating systems to OEMs. Now WE is expected to be an important force in the UNIX software market-place.

The two packages are: UNIX Writer's Workbench and UNIX Instructional Workbench. They run under UNIX System V. The first program is a word processor selling for $4000 for the first CPU and $1600 for additional CPUs. The second package is a WP for novice users and is priced at $2500.

US magazines boom

There are now over 75 computer magazines being published in the US, most catering to the specialised interests of particular system users or specialised areas such as games, education, etc. The magazine with the largest circulation is *Computers and Electronics,* a Ziff-Davis publishing rag putting out close to 700,000 copies a month. And a record was recently set for magazine size when another Z-D magazine, called '*PC*' published an issue with 640 pages and weighed 2.8lbs, an all-time record for any magazine published in the US. It had 407 pages of ads.

There have been major buy outs of what were previously independents by major publishing houses. McGraw-Hill bought two magazines (*BYTE* and *Popular Computing*), CW Communications bought eight magazines (*InfoWorld, Kilobaud,* etc.), Ziff-Davis bought four (*Creative Computing, PC,* etc.) and CBS recently bought one (*Compute*).

Random news bits

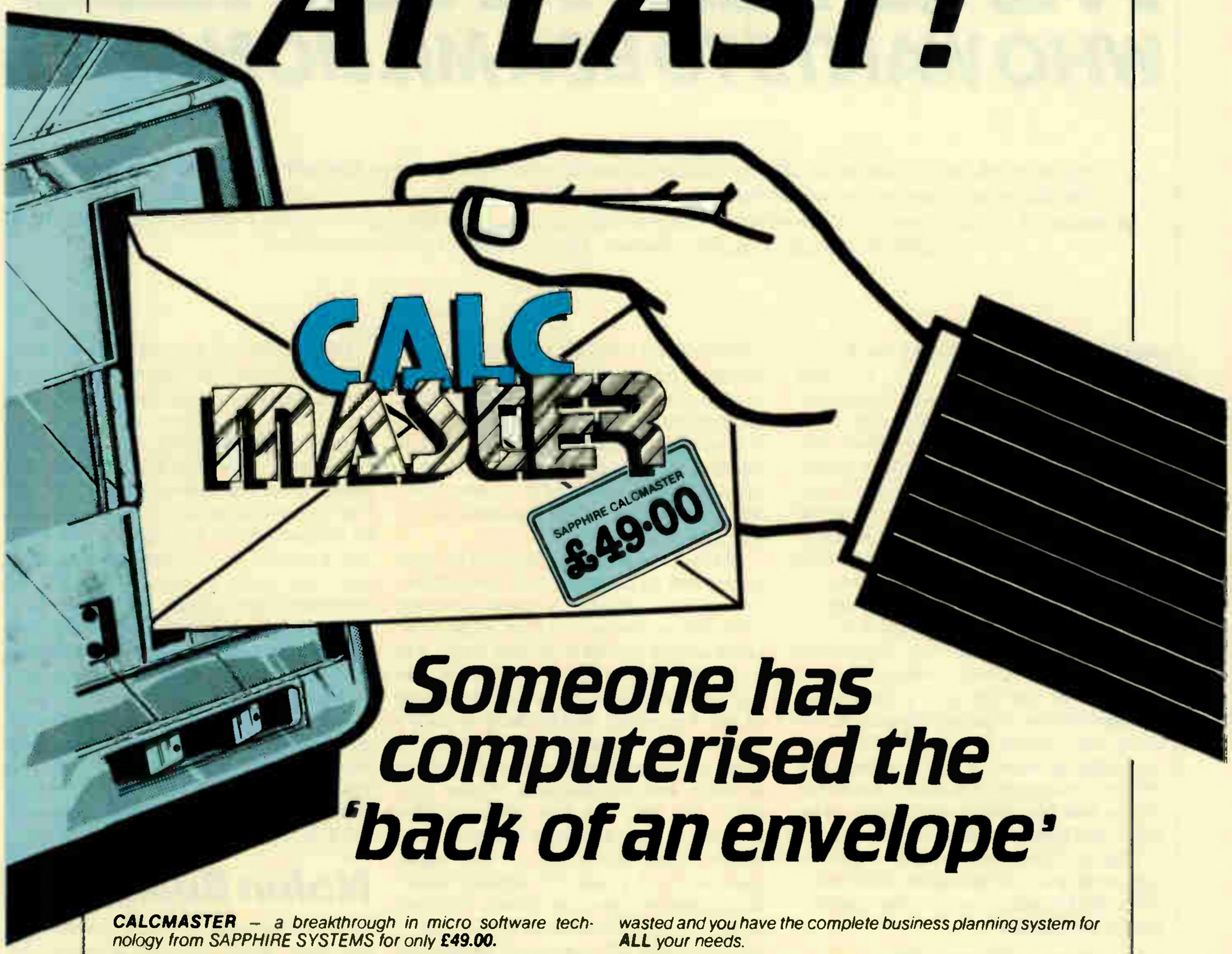
IBM formally made public its Local Area Network scheme at a recent meeting of the IEEE LAN committee meeting. IBM will license the technology for a mere $2000 one time charge . . . Intel seems to be having design problems with its new 80186 microprocessor which will delay introduction of about 500 products now in design. The part which is about 50% faster than the 8086 integrates the functions of the 8086 and several support chips and is rumoured scheduled for one of IBM's new personal computer products. Intel has been sampling it for several months now but production quantities are not expected to be available until next year.

Quotation of the month

'The competitive microcomputer arena is a dangerous business.' Akio Morita, Chairman and Co-founder, Sony Corp.

END

AT LAST!



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MASTER PROFILES

WHO WANTS TO BE A MILLIONAIRE?

Two men whose lives are dedicated to making dreams come true are Clive Sinclair and Nolan Bushnell. Sinclair made a major impact by introducing the world's first true pocket calculator and Bushnell by inventing the video game. Both men went on to further successes and they have recently both started what can best be described as idea incubators. David Tebbutt takes up the story . . .

America has its Silicon Valley and Britain has Cambridge. Both are breeding grounds for high technology companies and are densely populated with very clever electronic engineers, many of them with good product ideas. But what these people often lack is sufficient business know-how to get their products to market. Now two engineer entrepreneurs, Nolan Bushnell and Clive Sinclair, have come up with answers to this particular problem. In Bushnell's case, he has created a company called Catalyst Technologies which creates brand-new high technology companies around original ideas. Sinclair, on the other hand, has created a division of Sinclair Research called Metalab to develop new products around which new operating divisions of Sinclair Research will be constructed. Their ideas appear so similar that I decided to learn more about these pied pipers of the electronic age.

I'll describe each man's history separately up to the point of starting his 'incubator'. After that I'll thread the two tales together. First, Clive Sinclair . . .

Clive Sinclair

Clive Sinclair's schooling was a pretty haphazard affair. He somehow managed to attend 13 schools before leaving at the age of 17 to become a technical author. While he was at school he taught himself about electronics and when the time came to go on to university, he discovered that no-one taught the sort of electronics courses he felt in need of. The subject at that time was very much a subset of the physics courses.

So, a writer he became and he churned out more books in four years than many people manage in a lifetime. Seventeen to be precise, plus a large number of articles in *Practical Wireless*. At the age of 22, he was inspired to borrow £50 in order to start his first company, Sinclair Radionics, which sold electronic components by mail order. In the early days of his company, he managed to pick up 1,000 computer transistors which had failed Plessey's quality control checks. He had realised that they would be perfectly adequate for less demanding work so he wrote a couple of books and an article explaining their uses and promptly sold them at seven times the price originally paid. I first noticed his advertisement when he was flogging a kit for 'the smallest radio in the world'. I seem to remember it was the size of a matchbox and I agonised for months over whether to buy one. In the end I didn't and I think it was because I thought the man pictured in the ad looked a bit shifty. It was Clive Sinclair sporting what appeared to be tinted glasses.

His business expanded into hi-fi kits and all seemed to be going well. Within five years the company turnover reached £100,000 and it moved to Cambridge. Five years later it moved to St Ives and it was from this base that Sinclair took the calculator world by storm with the launch of the Executive. Before long Sinclair's turnover was running into millions of pounds and he started to invest heavily in research and development of new products. By 1975 the first results of this investment were announced, the cleverly-named Black Watch and his first digital multimeter. A pocket TV was still under development when the Black Watches were found to be unreliable. Nylon carpets were causing all sorts of production problems and then, once the things were on sale, cold weather got at them and they conked out. There was an awful fuss and ITT, the chip maker, ended up paying Sinclair £50,000.

The Black Watch fiasco (there was more to it than I've told you) caused such financial strain that Sinclair approached the NEB for funding for the pocket television. Lord Ryder, who was in charge of the NEB at the time, gave very strong personal backing to the project and the investment was approved. This partnership continued for almost three years and produced two versions of the Microvision along with five calculators and three new digital multimeters. Behind the scenes, Sinclair was working on a computer project which was destined to spawn the NewBrain but, before that saga had run its course, things started to get a bit tense between Sinclair and the NEB. Lord Ryder left and the new people saw a future in instruments whereas Clive saw a rosy future in consumer electronics. The split was inevitable and soon afterwards the NEB, claiming the television had cost them £7,800,000, sold it off to Binatone who then found it couldn't make it at a profit.

Clive received a modest 'golden' handshake and went to his 'lifebelt' company in the background called Science of Cambridge. I've just looked in the very first issue of *PCW* and there on page 8 is an advertisement for the MK14 which you could buy for just under £40 (plus VAT and P & P). It was from the S of C premises that he formed Sinclair Research in July 1979. Seven months later he launched the ZX80 and just over a year after that he introduced the ZX81. Thirteen months later, the Spectrum appeared. Sinclair has also gone into partnership with Cambridge bookshop owner Patrick Browne and formed Sinclair-Browne, a book publishing company. It's no secret that he has an electric car under development which will theoretically see the light of day in 1984. In July 1983 Sinclair announced his incubator, Metalab, which is effectively the R & D arm of Sinclair Research.

Nolan Bushnell

Bushnell managed a more conventional schooling than Sinclair, although his father's death when he was 15 must have caused problems at a difficult age. He went on from school through college and university studying engineering, economics, philosophy, mathematics and business. He first got interested in computers in the mid-sixties when he was still at university. Like Sinclair, he worked for someone else for the first four years after completing his formal education. In 1971 he raised $500 and started his own spare-time company, Syzygy, which developed a video game called Computer Space. He was employed as an engineer by an arcade game manufacturer and somehow persuaded him to take on the game. It flopped mainly because it was too complicated to learn and too boring once you'd taken the trouble. Bushnell then took on his own engineer to develop a tennis game. His employer refused to touch it and threw Bushnell out. Bushnell then tried punting it around but no-one wanted to know. In the end, he christened the product Pong, renamed his company Atari and the rest, as they say, is history.

Pong became a mighty hit in arcades all round the world. Money poured into the Atari coffers at an amazing rate and was squandered almost as quickly on new and

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unprofitable ventures. Inevitably, Pong lost its appeal and the cash started to dry up. Just in time, another product called Gran Trak came to Atari's rescue and it turned out to be just the first in a sequence of arcade successes. Then the market for domestic video games opened and that was the key to unbelievable growth for the company. Bushnell and his colleagues had created the market for video games yet at this time they controlled only about 10% of it. They desperately needed cash to expand their production capability. Bushnell went to Disney and MCA, both of whom turned him down, but Warner Communications decided to take the plunge.

In 1976, Warner paid $28,000,000 for Atari, almost half of which went straight into Bushnell's pocket. He stayed on as chairman but suddenly his motivation for 26-hour days had gone. The partnership, like Sinclair's with the NEB, was not a particularly happy one. Bushnell thought Warner was 'stuffy' and it thought he was irresponsible. Two years later he bought back the rights to one of his ideas, Pizza Time Theatres, from Warner. Warner didn't really think much of the idea anyway and cheerfully dropped the project. There are now over 200 Pizza Time Theatres around the world, each one around nine times more profitable than the average pizza parlour.

The key to this success was Bushnell's recognition that the 20 minutes you have to wait for a pizza to cook could be turned to profit. He installed arcade games, amusement park rides and performing animal robots with names like Chuck E Cheese. The robots entertain while the rides and arcade games absorb the punters' money. Bushnell reckons that there will be 1,000 Pizza Time Theatres around the world by 1986.

Since launching Pizza Time in 1978, he has formed a few more companies. The first, started in 1980, is called Axlon and produces hand-held terminals, memory expansion boards and other bits of microprocessor wizardry. Magnum Microwave Corporation manufactures microwave components for satellite communications companies and Compower Corporation makes switching-power supplies for computers.

In December 1981 he formed his incubator, Catalyst Technologies, which is a holding company for several high-risk, high technology start-up companies. On the side he has also managed to create one of the valley's more pleasant restaurants, the Lion and Compass in Sunnyvale. If you ever find yourself out that way, drop by. It's not bad but, typical of most of Bushnell's activities, you will need to throw quite a few dollars his way.

The incubators

There's very little difference between the concepts of Metalab and Catalyst Technologies. They both exist to develop new, high-technology, high-risk ideas for later exploitation. In Bushnell's case the participants are set up as separate companies, whereas Sinclair treats Metalab as a division of Sinclair Research. As Bushnell's products hit their stride the company is 'graduated' to stand on its own feet somewhere in the Santa Clara valley, while Sinclair's plan is to make maturing products the foundation of new independent operating divisions of Sinclair Research. The differences are technical ones, really. In each case, the man at the top is the driving force and quite often comes up with the original product ideas, too.

As far as the buying public is concerned, both companies are generating things which people will want to buy. They are creating demand for new products which didn't exist before. They are creating jobs for some people and making fortunes in the process. Sinclair and Bushnell are both risk-takers and both currently have the money to be able to take those risks. Could you imagine the public outcry if the British government decided to sink tens of millions of pounds into something as off the wall as Pizza Time Theatres? Yet commercially, it has been a resounding success.

It seems to me that Bushnell and Sinclair's motivations differ. Bushnell lives in America, which is extremely success-oriented. Success over there tends to relate to the number of noughts on your salary cheque or your personal fortune. I even know some people who are hailed as heroes because their company turnover is so many millions. The fact it makes a loss on those millions doesn't seem to occur to anyone as perhaps being a teeny weeny bit of a failure. One can't blame Bushnell then for saying his aim in life is to create a billion pound company that will last forever. Sinclair, on the other hand, would seem to be motivated more by seeing his ideas turn into reality. Money is almost a by-product of this activity. It is also the fuel which enables his future ideas to follow the same route. It looks to me as if Bushnell pursues ideas because they'll make money and Sinclair because he feels things need to be done.

Bushnell gets things going by rummaging around Silicon Valley for people with bright ideas or those who are capable of implementing such things. He gives them the key to an office on the desk of which are 35 contracts to sign. Once this ceremony is over, a company exists, its staff are insured, they have premises, equipment, telephones, credit — all the things to enable them to get on with the job of creating their product. Catalyst Technologies provides everything else. At Syzygy, Bushnell worked nights being creative because the day was completely filled with simply running a company. He doesn't want other creative people to have to exist like that. His approach, which provides management, secretarial and administrative staff, is reckoned to cut six to nine months off the development time of a project which must be good both for cash flow and for hitting the competition.

Clive Sinclair is getting his staff by advertising. Already he has received several hundred replies from his recent campaign. He is looking for top-notch scientists and engineers who can work under the peculiar pressures induced by high-risk projects. They will be classically trained, unlike Sinclair himself who cheerfully admits that he might not qualify for a job in Metalab. They will be employees of Sinclair Research and, as such, are freed from the worries of having to run a business just as Bushnell's are.

Metalab and Catalyst both rely on peer pressure to motivate their teams to produce results and at the same time they use the community approach to encourage the free exchanges of information and ideas between the participants in the various projects. In each case, up to a dozen or so projects can run concurrently in the incubator. Bushnell described it somewhere as 'a warm, cuddly environment for success'.

I think Bushnell's activities are entirely self-funded whereas Sinclair is not averse to taking the odd 30% government grant when it's offered. Both men place enormous trust in the people they take on. They expect them to respond with a responsible attitude towards work, results and requests for equipment. Both will give their people everything they need to achieve success. This is one area in which publicly funded and large-company funded projects go haywire, certainly in the UK. Sinclair thinks it odd that people are employed in this country at salaries of, say, £25,000 yet the employer will often balk at spending a couple of hundred pounds on equipment.

Although Sinclair welcomes ideas from outside, his word was 'exogamous', he will not undertake contract research at Metalab. (Incidentally, I had to look that word up, too. It means 'outside marriage' from the Greek words 'Exo' and 'Gamos'.) At the moment the Sinclair projects are the next computer, the flat-screen television, battery technology and a number of other things which he prefers not to discuss just now. Sooner or later he expects the electric car to move in there too.

Bushnell has among his projects at the moment a robot maker, a computer camp for kids, a video home shopping outfit, a high-resolution television (have you ever seen American TV?) and a games company he bought a couple of years ago. He dreams of holographic games which are played in the space between machine and its operator. Since his agreement not to compete with Atari expired on 1st October 1983 you can look forward to a lot of excitement soon. The company to watch will be called Sente Technologies. The name was chosen because Atari is the Japanese word for check whereas, in Go, Sente is the nearest equivalent to checkmate.

Bushnell believes he is motivated by boredom. He feels he always has to have something interesting to work on. I read somewhere that he even regards sleep as a personal insult! Sinclair is driven by the excitement of seeing his ideas become reality. Sinclair's achievement orientation

GOTO page 256

WARNIER ORR PROGRAMMING
PART 4: TECHNIQUES

Paul Overaa brings his programming series to a close by crystallising some of the ideas which are useful for designing and writing programs.

This month is the last in the current series and I want to conclude by generalising some of the thoughts of the last few months. By now you have seen some of the uses that Warnier diagrams may be put to, and I have tried to illustrate some of the ways in which such diagrams may be used to describe the structure of data and of programs themselves. The emphasis has been centred around the separation of the logical problems of programming from the physical problems of actually coding the solution for a particular language or a particular computer.

This approach relies on the fact that such solutions will not be restricted in practice by problems concerning, for example, the way data is stored, the order or the need for more than one arrangement of the data. Last month I looked at normalisation and the benefits that the third normal form has in terms of avoiding such restrictions.

I'm sure that some of you have, during the last few months, considered what happens if you make a logical error as you prepare a Warnier diagram. Such errors will sometimes occur but you will be less likely to make such mistakes because the diagrams represent your logical solution in a very 'pictorial' fashion. Frequently you will know that a fault exists just by looking at the diagram. You can then take steps to make the necessary modifications. Used in this way, the Warnier diagram becomes a 'prop' to lean on as you are working towards a solution.

It is possible to be more rigorous in the use of the concepts that we have looked at and, since there exists a relation between the defined objectives of a problem, the correct Warnier representation of the problem, and the efficiency of the final implementation, I thought it would be useful to consider one way to make sure your Warnier diagram is faultless.

Since the use of these diagrams for program design has been examined in earlier articles, I have up to now only reiterated those conventions that were actually needed for the discussions. Consequently, before examining further ideas it is necessary to explain some other conventions that are used.

If two or more options (subsets!) within a program are mutually exclusive, then they are written separated by a circle with a cross in it ⊕. Such a sign serves to indicate that only one of the options shown to the right will be performed. It is also conventional to show the logical opposite of a statement by placing a bar over the statement. Fig 1 shows a simple case.

We are describing a routine called CHECK SAMPLE NUMBER. If the check shows that the sample exists then the subset of actions called RETRIEVE RECORD is performed. If the check shows that the sample does not exist, then ERROR ROUTINE is performed. The options are mutually exclusive and only one of the subsets would be performed at a particular time. These types of statements can be programmed using coding as is indicated in the following pseudo-code:

```
GOSUB "SAM-CHK"
IF SAM-CHK = O.K. THEN GOSUB
"RETRIEVE-RECORD" ELSE
GOSUB "ERROR"
```

The appropriate subroutine would be called according to the result of the check carried out on the sample number. The subroutine RETRIEVE-RECORD might consist of several parts. Firstly, the record address may be computed as a hash function of the sample number. Secondly, the record will be retrieved. Thirdly, a log might be updated to show that the record has been in use. All this can be shown as in Fig 2.

The combined description can be built up as shown in Fig 3:

In this way we use our practical requirements to build the Warnier diagram using the diagram as an iconic model of the logic we are attempting to describe or create. In doing this the Warnier diagram is actually mapping out the program structure required to implement our solution.

The building of a program design in this fashion is in most cases effective and results in programs that are logically well structured but . . . it is necessary to take care in the construction or your documented solution will be incorrect or inefficient.

Warnier does not concern himself with

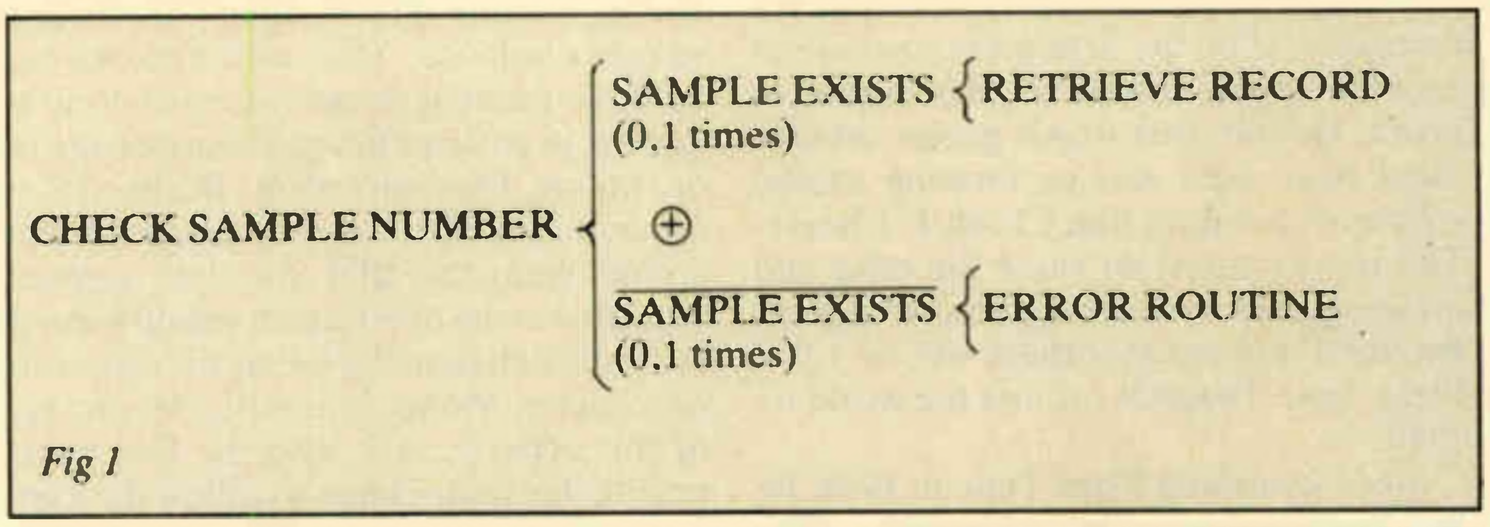

Fig 1

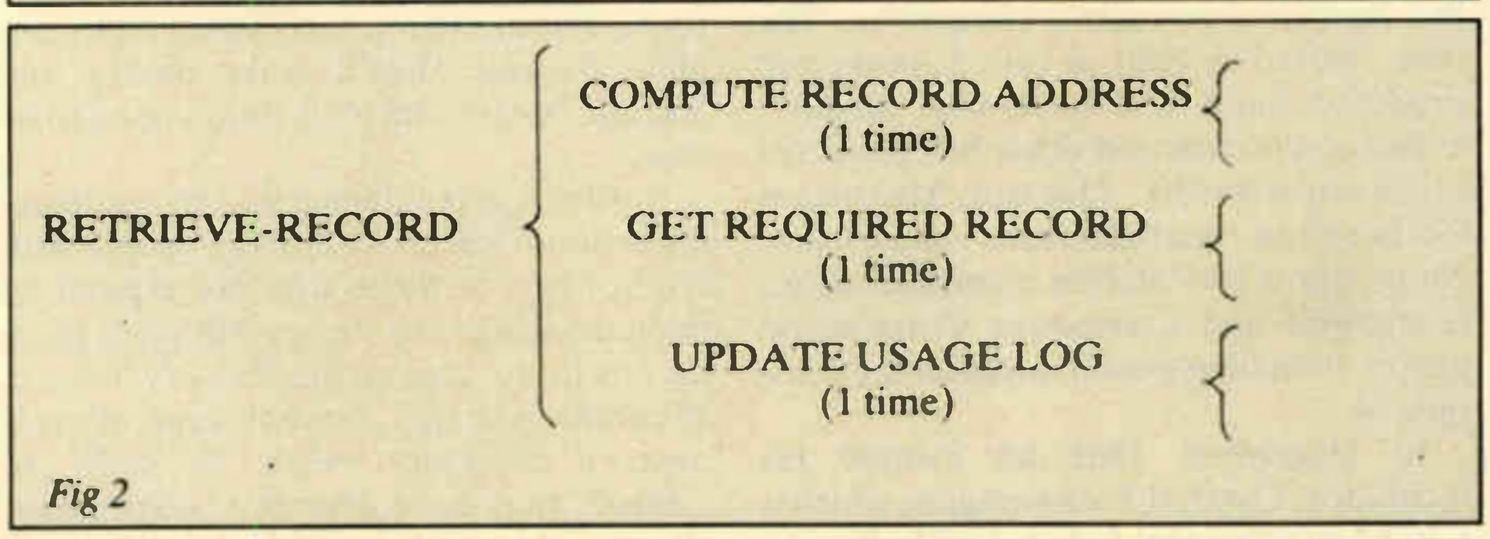

Fig 2

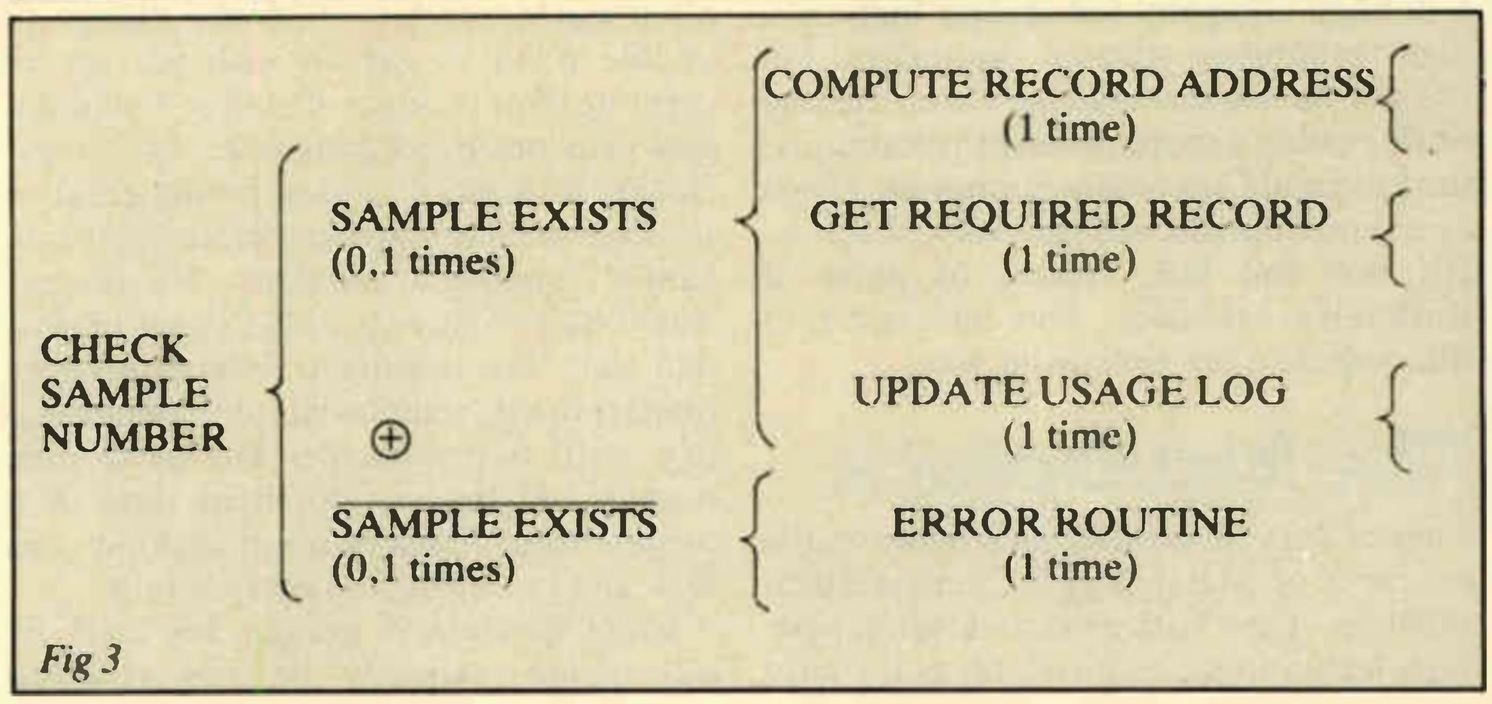

Fig 3

these aspects because the use of these diagrams as a design tool for analysing problems is not fundamental to his approach. Those of you that have studied any of Warnier's works will realise that to a large extent he attains a correct logical solution using various techniques including Boolean Algebra, Karnaugh Maps and Decision Tables. Such solutions are then represented by a Warnier diagram. The program is then constructed from the diagram as indicated.

I am, therefore, using the Warnier diagrams in a rather different way to that originally employed by Warnier himself, because I frequently use these diagrams to analyse and document my thoughts on a problem, ie, I am using the diagram as a design tool to provide an iconic model that helps me to achieve my solutions by a process of 'iterative refinement'.

It is sometimes helpful, when using the Warnier diagrams in this way, to be able to verify the efficiency and correctness of your implied solution. One way to do this is to translate the diagram into an algebraic expression using the Algebra of Sets, Boolean Algebra or any other isomorphic algebras with which you might be familiar. I will take a simple example and describe what is done at each stage. (In case you think all this comes easy to me I can assure you that it doesn't. The reason I persevere is that I can see immense practical benefits from being able to analyse a program structure with mathematical techniques like these.)

Let us take a very general example of a Warnier diagram and use the letters A, B and C to represent three conditional tests that are present in the structure of the program. Let us also define U1, U2, U3 and U4 as subsets of actions that are performed in accordance with the logical description shown in Fig 4.

There is nothing special about the example other than the fact that it was made purposely inefficient. You can regard U1, U2 . . . etc. as being subroutines that are called as desired. If, for instance, condition A is true and condition B is also true then the top third from left bracket will be performed. If in the course of carrying out the operations in this bracket the test C fails — ie, is not true — then subroutine U2 would be called. If the test C did not fail — ie, condition C was true — then subroutine U1 would be called instead.

We get a clue about verifying such a diagram from one of the ways that Warnier uses to solve his logic problems. At times he will get a solution from a decision table of possible options in terms of a Boolean Algebra expression. He would then procede to describe the solution with a Warnier diagram. The implication is straightforward . . . . if you can convert a Boolean expression into a Warnier diagram then you can convert a Warnier diagram back into a Boolean expression. Having done that, you can manipulate the expression and reduce it to its simplest form (or confirm that it is already in its simplest form). It is then perfectly easy to take the simplified expression and convert it back to the Warnier diagram form. The resulting diagram will then be correct and will represent the simplified logical solution.

If you study Fig 4 you will see that subroutine U2 is called in two places. Firstly, if test A is true and test B is true but test C is not true then U2 will be called. Secondly, if test A is not true and test B is true and test C is not true, then again subroutine U2 will be called.

We can express the fact U2 is dependent on these two condition requirements in the following way: $U2 = A.B.\bar{C} + \bar{A}.B.\bar{C}$. This is a Boolean Algebra expression of the set of conditions under which subroutine U2 is called. We can, in a similar fashion, write down expressions for all of the subroutines U1 to U4. If we do this we get the following results:

$U1 = A.B.C + A.\bar{B}.C + \bar{A}.B.C. + \bar{A}.\bar{B}.C$
$U2 = A.B.\bar{C} + \bar{A}.B.\bar{C}$
$U3 = A.\bar{B}.\bar{C} + \bar{A}.\bar{B}.\bar{C}$
$U4 = \bar{A}.B.C + \bar{A}.\bar{B}.C$

The notation is derived from Boolean Algebra but the way you describe the expressions in words is up to you. U2 can be described as the subroutine that is carried out when either 'A and B are true but C is not true', or 'B is true but A and C are not true'.

To follow the reduction of the above expressions all you need to be aware of is the fact that you can treat the right hand side letters as you would treat unknowns in an equation. The object of the exercise is to regroup the symbols so that we can bracket together complementary terms such as A and $\bar{A}$ because we can then eliminate them.

Look first at U2 and follow through the reduction:

$U2 = A.B.\bar{C} + \bar{A}.B.\bar{C}$

First we note that $B.\bar{C}$ is common to both expressions and rearrange accordingly:

$U2 = B.\bar{C}\,(A + \bar{A})$

This immediately leads to the reduced expression for U2 as:

$U2 = B.\bar{C}$

Now we try to reduce U3 in a similar way:

$U3 = A.\bar{B}.\bar{C} + \bar{A}.\bar{B}.\bar{C}$
$U3 = \bar{B}.\bar{C}\,(A + \bar{A})$
$U3 = \bar{B}.\bar{C}$

With U4 we procede as follows:

$U4 = \bar{A}.B.C + \bar{A}.\bar{B}.C$
$U4 = \bar{A}.C\,(B + \bar{B})$
$U4 = \bar{A}.C$

Lastly we can reduce U1 in the following manner:

$U1 = A.B.C + A.\bar{B}.C + \bar{A}.B.C + \bar{A}.\bar{B}.C$
$U1 = A.C\,(B + \bar{B}) + \bar{A}.C\,(B + \bar{B})$
$U1 = A.C + \bar{A}.C$
$U1 = C\,(A + \bar{A})$
$U1 = C$

We have now simplified all of the original expressions and have obtained the following results:

$U1 = C$
$U2 = B.\bar{C}$
$U3 = \bar{B}.\bar{C}$
$U4 = \bar{A}.C$

How do we convert these expressions back into an efficient Warnier diagram? The first thing to do is to rearrange the expressions so that the most frequent condition test comes first on the right hand side. Then the next most frequent, and so on. If we do this we obtain the following:

$U1 = C$
$U4 = C.\bar{A}$
$U2 = \bar{C}.B$
$U3 = \bar{C}.\bar{B}$

Look closely at the way the reduced forms have been arranged and then look at the Warnier diagram in Fig 5. We can draw the diagram directly from the rearranged Boolean expressions.

You will notice that we have effected

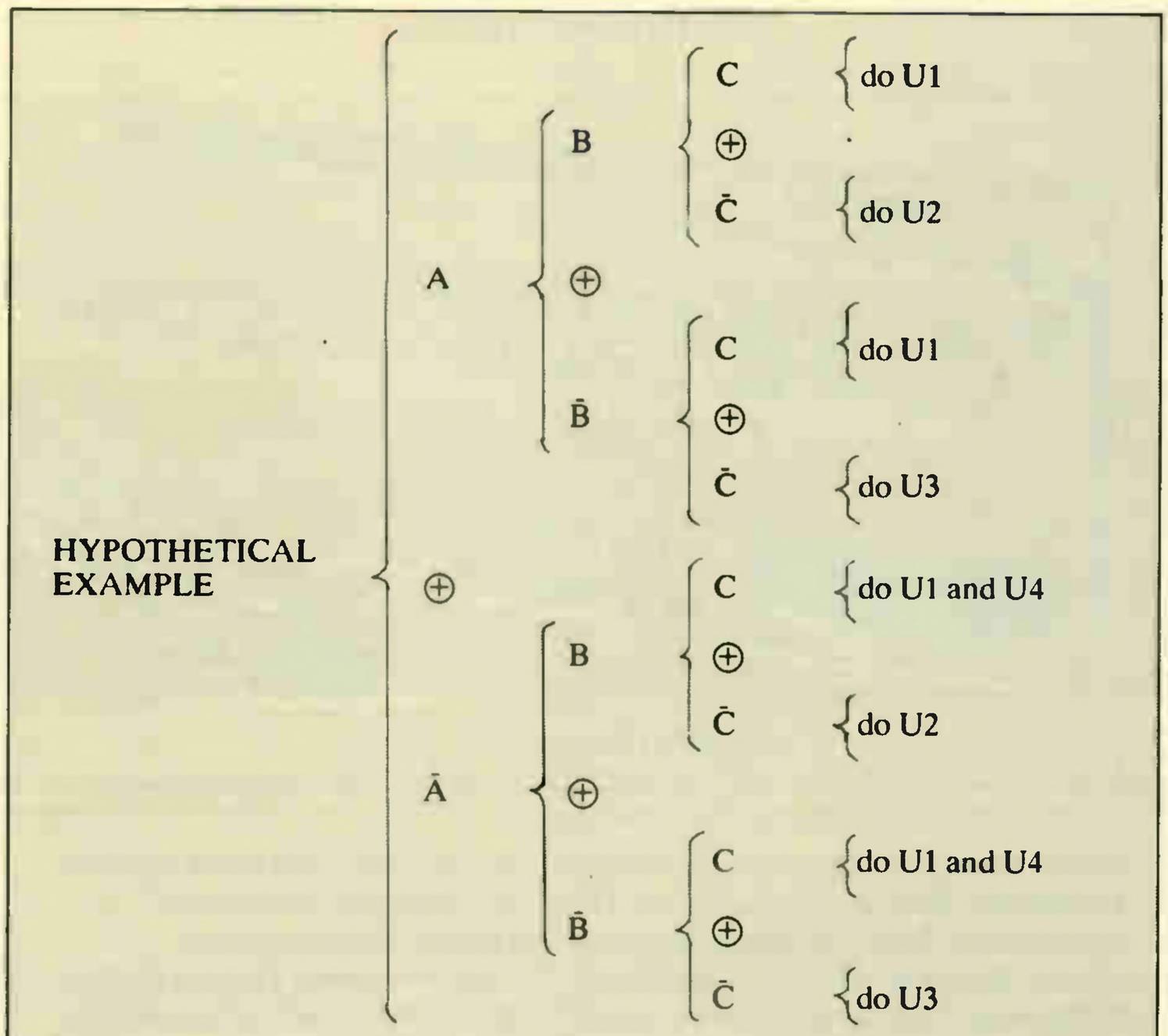

Fig 4

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PART 4: TECHNIQUES

quite an improvement on the logical structure of our hypothetical program. If we consider some of our earlier thoughts we can see some useful concepts emerging. We can use Warnier diagrams to represent our problem pictorially as we come to terms with the various constraints and can create a 'picture' of our logical solution. We can also check the validity of a solution by translating the diagram into algebraic form and attempting to reduce the expressions we obtained. If we find reduction is possible then by translating back we can improve the original solution. The final Warnier diagram will describe the necessary structure of the program in a way that is easy to translate into computer code.

The correspondence between a Warnier diagram and Set Algebra or the isomorphic Boolean Algebra provides a link into realms of mathematics which, I should imagine, has several implications concerning the correctness of the structure of a program.

I promised last month to show you one last use of the Warnier techniques. As you know we can regard a program as a set of instructions. We can divide such a set into subsets and represent the inherent structure using a Warnier diagram. It is equally advantageous in systems design to consider the system as being divisible into subsets of actions. Such a subset defines a set of logically related actions that may be combined into a program module.

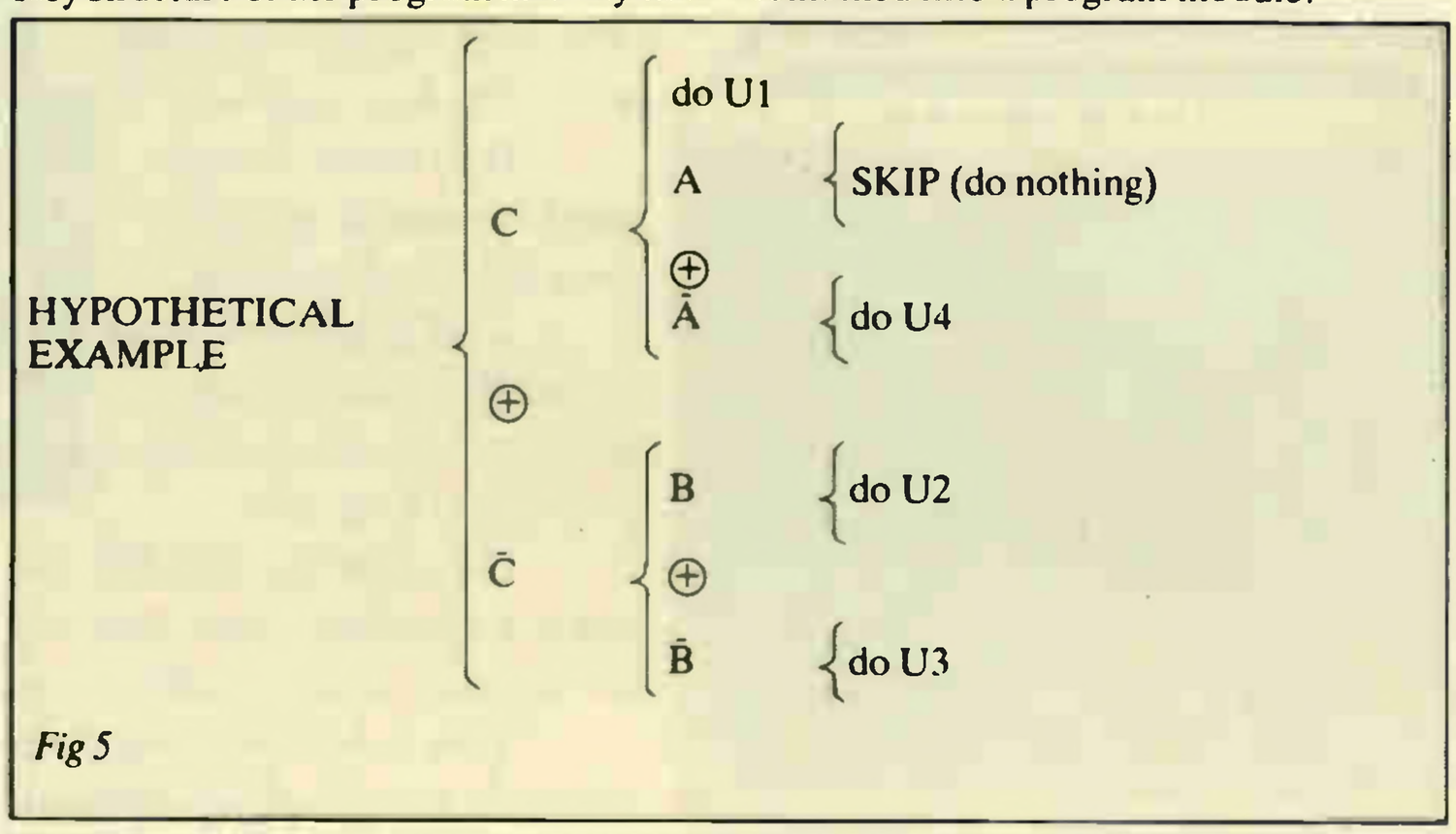

Fig 5

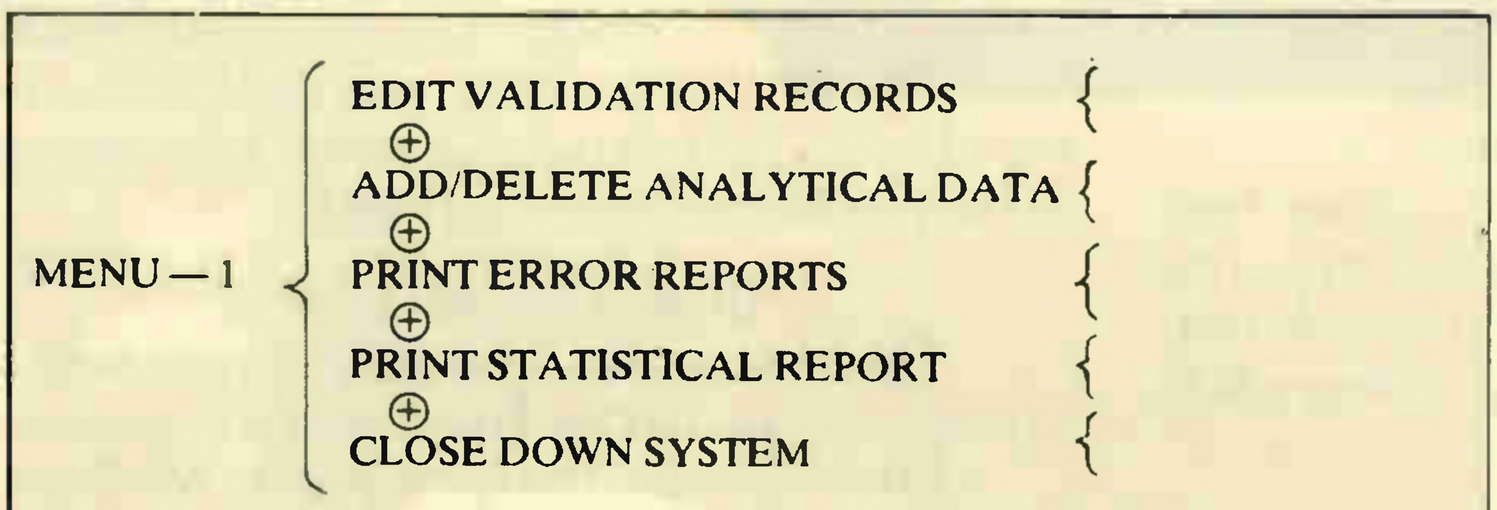

Fig 6

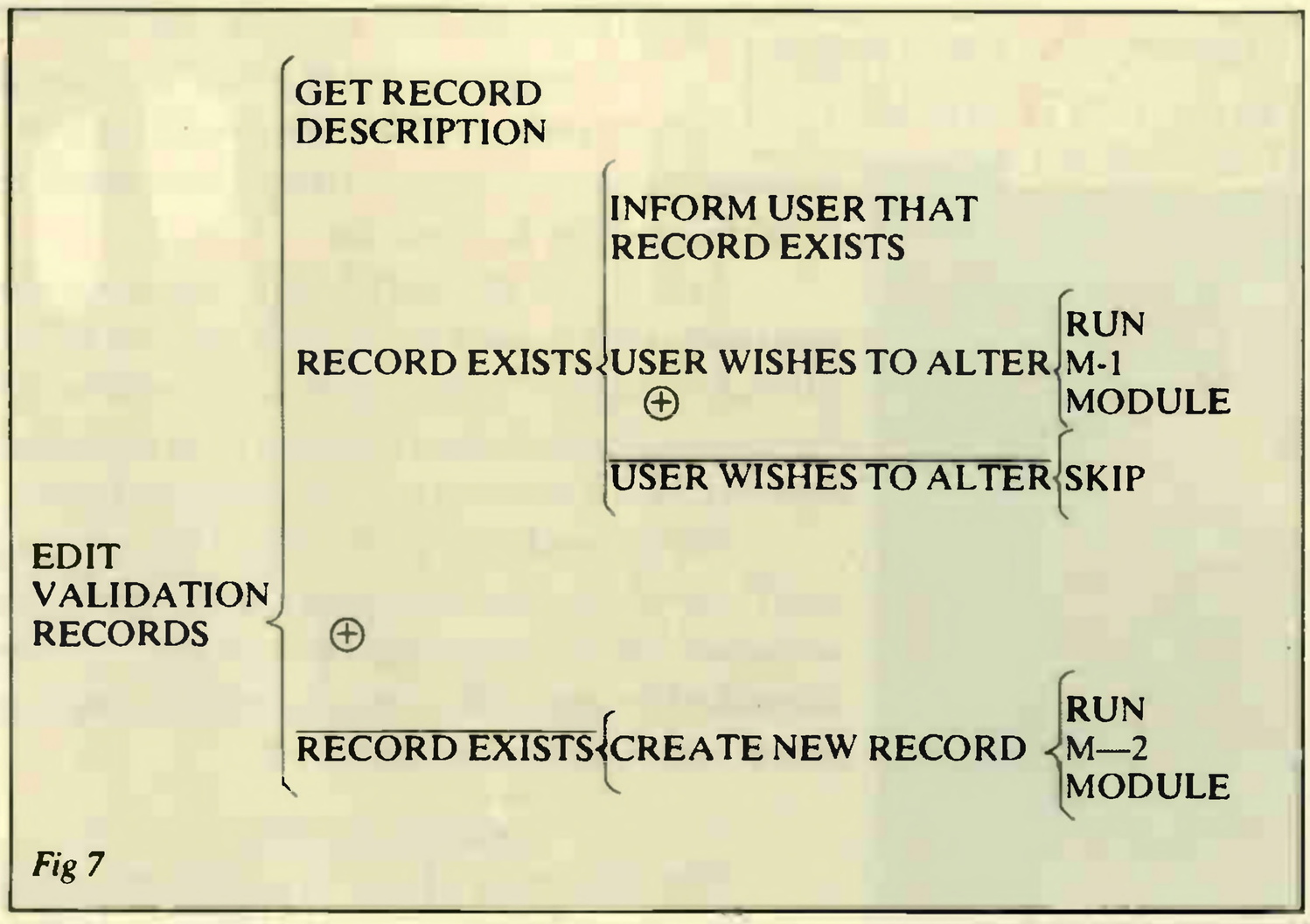

Fig 7

Imagine, for instance, that we are designing a system around the statistical analysis problem that we have been using during the last few months. In practice we would need to be able to add data, delete data, analyse it, print reports, and so on. We could decide on a menu driven system and could describe the highest level menu in Warnier form as in Fig 6. Here all options are mutually exclusive.

Such a diagram indicates the bare essentials of what we want our system to do. Each term can obviously be expanded into much greater detail. The simple statement in Fig 6 'EDIT VALIDATION RECORDS' can be expanded to incorporate some additional ideas as in Fig 7.

We can see, by using these ideas, that there is no fundamental difference between designing a system and designing a program. It is just as easy to develop a logical coherent system as it is to develop a logical program.

Conclusions

This brings me to the end of this particular series. I have tried to emphasise some new ideas that seem to me to be of practical use in our quest for better methods of writing and designing programs. There is no doubt in my mind that the work of Jean Dominique Warnier is of fundamental importance in this search. We dealt initially with some ideas connected with how we solve problems and the usefulness of having 'pictures' or 'iconic models' to relate to. We have also seen how the basic concepts of a set can provide interesting and useful descriptions of both programs and data. The use of the Warnier diagram to picture these descriptions and the ideas of working backwards from the output requirements was shown in Part 2. Part 3 covered Normalisation and showed one way in which we can make our data structures more flexible. In this last part I dealt briefly with one approach to verifying your solutions and have suggested that the design of systems or 'sets of programs' is really no different from designing programs themselves.

Obviously such ideas do not solve all problems, and many other useful techniques and approaches exist. My purpose was quite simply to consider some ideas that I find of use and show you the way that I use them. I hope that by keeping the examples and the ideas fairly basic I have not clouded the underlying concepts. If you are new to computing, then use the ideas that you have understood and concentrate on the underlying essentials. If you are not a beginner, you can be assured that the concepts I have covered may be taken much further. I hope that the ideas have provided 'food for thought'. Perhaps, like me, you will consider that the unity of some of the underlying concepts may indicate that it is no longer necessary to regard good programming as 'magic' or 'an art'. Good programming can be taught just as easily as we teach other subjects . . . providing we use the right techniques and ensure that the underlying fundamental ideas are understood. END

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<u>How to get your Electron.</u>

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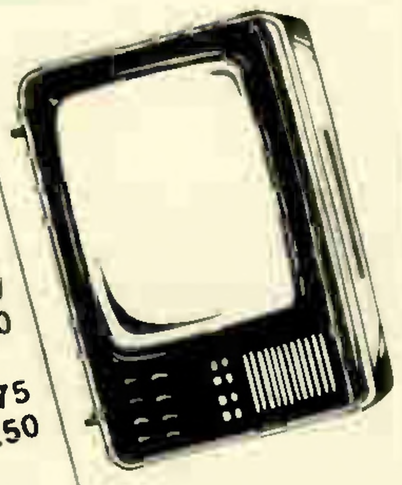

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COMPSOFT'S DELTA -SON OF DMS?

Kathy Lang examines Delta and determines its success as a modified version of its well-known predecessor, DMS.

Once upon a time — as all the best stories go — there was a straightforward, no-frills, high successful data management package for the PET and for CP/M systems, called DMS. DMS had — indeed has — its limitations, but it is also a highly regarded piece of software, which won the Rita award last year. As you would expect from a widely used piece of software, Compsoft, its author, had a lot of suggestions from users as to how the package might be further improved. So last year Compsoft took the basic design of DMS, put together all the good ideas from users and dealers, and came up with a new data management package, called Delta. DMS has already been reviewed in this series (March 1982), so I was looking forward to seeing how the new development compared both with its predecessor and with the large number of competitors in the CP/M-80 and MS-DOS markets.

Delta's basic approach is to consider information at two levels. Each set of records may consist of a 'master' set, together with up to eight 'transaction' sets. A master record can be associated with any number of transaction records within any of those eight sets. So a doctor could have a master record with a patient's name, address, sex, date of birth, etc, a set of transaction records about the consultations with that patient, and another set of transactions recording drugs prescribed to the patient showing, for example, adverse reactions, if any. However, Delta can only display or report on the master record plus one transaction set at a time. The package is used through menus in the main, though some sections also use question-and-answer techniques. The main Delta menu is divided into three groups of activities: setting up file structures, setting up formats and processing requirements, and acting upon the format and processing instructions set up in the second phase. In this respect the development form DMS is very clear, as this distinction between set-up and action is also central to DMS.

Data structures, access to information, report layouts and facilities for modifying data structures are all much more flexible and powerful than DMS. When a package is developed to give extended facilities then there is a grave danger that the system will become difficult to use. In the current version of Delta (1.2), Compsoft has added some features to help people who want to get started without developing screen and report formats in detail themselves, and the Quick facility seems to go a long way to easing the task of the inexperienced user.

Constraints

The major constraints are summarised in Fig 1. In addition, there is the limitation already mentioned which prevents reporting or display of more than one transaction grouped with the master records. Record types permitted are character, numeric and date (which may be one of five, including both dd mm/yy or mm/dd/yy — you choose which option when the system is set up initially).

File creation and indexing

When a file is set up, all the fields in the master record and each set of transaction records are described, by first specifying the master fields, then the first set of transaction fields, and so on. The first field in each set of sub-records is used as the key field, and is indexed and used for most direct retrieval. A question-and-answer sequence is used to describe the attributes of the field. Fields may be calculated during input, but this process is specified separately. Transactions may be stored in ascending or descending order of the key field, or in order entry: these options give plenty of flexibility in dealing with a variety of types of transaction.

Once the basic record format is decided, you may then if you wish also create a 'mask' through which the records are displayed on the screen. This is not obligatory — using the Quick form of entry gives a simple default format for screen display.

In addition to the main indexes based on the first field of each master and each transaction record, which are automatically kept up-to-date as records are updated, you can also create other indexes through which to access the information. These indexes are created during the 'extract and sort' part of the package, and allow the user to browse through the file with limited editing facilities. These indexes are not kept up-to-date automatically, and must be recreated after records are added, or amended in ways which would affect the index order.

Data input and updating

Three methods are provided for retrieving and editing records interactively. Firstly, there is the 'quick' method, in which you retrieve the record by the major key, and specify by name or number each field you want to amend. Secondly, you can create a mask with which the record is to be displayed. This mask may involve every field in the record, or just a selection of fields, so that you can prevent the display of confidential items in an otherwise 'open' record. You can also inhibit changes to fields, so that a field may be displayed but not changed. Calculation can be included, so that the value of one field can be calculated from others. When a record is retrieved through a mask, editing is allowed using the full screen cursor controls. Using the mask, you can either retrieve the record by the key field, or else by any other field using the 'Browse' option if this has previously been set up. The mask option also allows you to specify that each change is to be logged to a special

transaction log, thus giving a simple audit trail.

The 'quick' and 'mask' methods of display have already been mentioned: suffice it to add that the mask option gives full 'paint-a-screen' facilities for display. In addition, report formats intended for printing may be displayed on the screen alternatively.

Printed reports

Delta provides a quick report facility which is executed immediately, and which involves just specifying the names of the fields to be printed, with layout and headings fixed by Delta. You can also dump the contents of any data screen to the printer. The more sophisticated features comprise a letter-writing facility, label printing, and two levels of tailored reports.

The letter-writing feature allows you to create a standard letter up to 88 lines long, which may have variable items embedded within it in the conventional Mail/Merge fashion. Where these items are embedded in running text, Delta can adjust the length of lines so that each line of text is filled. Labels may be printed up to '5-up' across the page. Tailored reports can be requested by using a standard layout, specifying the fields required, but with field headings specified by the user, and data taken either from the full file or from an extract file containing a subset of records. The printing of each field is regulated only by the amount of space in the report — you can't request the printing of the middle of a field. The formats of these reports are stored by Delta and later executed, so that two stages are involved; however, this does mean that they can subsequently be amended. Finally, the user can also exercise control over the actual layout if desired, either by designing the report format from scratch, or by adapting the format set up by Delta when a standard report is requested.

Reports can consist just of detail lines from the individual records, but may also include sub-totals and totals. Three sets of sub-totals are permitted, as well as totals, and page break fields may be set up separately. As with screen display, you may report on the master file and one transaction file at the same time.

Selection

Selection is a two-stage process: first the rules are set up, and then executed to produce an extracted file. Selection may be on whole fields or parts of character fields. For numeric fields, the usual range of comparison operators plus a range of values are available, and for character fields you may select within a range or using a 'window'. This allows you to search for a string of characters within a field, something which is often required in library applications and the like. Comparison may be with a constant or with the value of another field, and you can select on the basis of just one field or on several fields in combination. If a combination is required, then Delta uses similar rather obtruse rules to those in DMS for combining conditions in pairs with either AND or OR. Thus it is possible to select a record which matches one of several values for a field — for instance, all the customers who live in London, Manchester or Birmingham — but specifying this is a bit tortuous.

Transactions can be selected by the same rules as master records, and also by some additional tests appropriate to the nature of sub-records.

Security and reliability

Delta provides quite a lot of protection against unauthorised access, at the file and the field level. Complete files and masks may be protected by password, so that you can prevent any access to a file or access through any particular mask. You can also set up masks which display only particular fields, and you can use masks to protect files from deletion and fields from alteration. So much for prevention. You can also provide, through a mask for 'transaction logging', which will record all the changes made during a session. Then, if errors are found subsequently, repair is possible by referring to the log. This approach can also give limited protection against fraud.

Delta provides most file utilities internally — deletion, copying and a simple directory are all available within Delta. Only for disk formatting and for information about file sizes would you need to go out to the operating system.

Delta provides two utilities for copying

Summary

Package Type	Data management: fixed length records, stored in master file and up to eight transaction files.
Facilities	Two-level file structure plus transaction processing features. Main key; other keys allowed but not kept up-to-date. Flexible reporting with letter-writer. Record structure can be reorganised without major copying. Masks provide flexible display and protection. Can set up chains of operations and design own menus.
Drawbacks	Selection methods clumsy. In general, two-stage 'set-up then action' approach rather tedious. Multi-file use limited to one-to-many, master-slave data structures.
Ease of Use	Menu-driven plus Q and A. Quite clear once used to basic approach and location of features.
Error Messages	Reasonably clear.
Documentation	Clear, but rather intimidating in bulk. No 'Road Maps' in reference summary.
Costs (ex VAT)	£495 purchase, £100 per year support which includes 'hot-line' telephone support and membership of user group.
Supplier	Compsoft Ltd, Guildford, tel: (0483) 898545

Max file size	Operating system limit
Max no records	32,000 master and 32,000 records per sub-file, maximum eight sub-files
Max size record	2,000 characters
Max no fields	90
Max field size	80 characters, 14 digits
Max no keyfields	No limit
Field types	Numeric, character, date (five formats)

Fig 1 Constraints

BM1	Time to add one new field to each of 1,000 records	26mins 15secs*
BM2	Time to add 50 records interactively	2secs per record + typing time
BM3	Time to add 50 records 'in a batch'	NA
BM4	Time to access 50 records from 1,000 sequentially on 25-character field	4mins 17secs
BM5	Time to access 50 records from 1,000 by index on 25-character field	2mins 23secs + 6s/record
BM6	Time to index 1,000 records on 25-character field	6mins 38secs
BM7	Time to sort 1,000 records on 5-character field	3mins 30secs
BM8	Time to calculate on one field per record and store result in record	9mins 55secs
BM9	Time to total three fields over 1,000 records	12mins 9secs
BM10	Time to import a file of 1,000 records	56mins 50secs

Note: NA = Not available in an appropriate form; *scaled up from time for 100 records

Fig 2 Benchmark Times

to and from ASCII character files, in commadelimited format. It is not necessary, as it is in DMS, to use these utilities when you want to add or delete fields from a record structure — the copy features are simply for import and export when using another package or your own program.

User image

Delta provides mainly menu-based facilities, though there are some hooks into the underlying programs which can be invoked directly by name. Within sections of the package, a combination of menu and question-and-answer techniques are used. Throughout, Delta aims to give people simple access to basic facilities first, and gradually lead them into the use of more complex features. On the whole it succeeds in this approach, though I think the user image of the most complex features shows too much of the same simplistic approach of the basic facilities. Equally, though, it is this same desire to let people grow into the harder features which dictate the 'set-up followed by action' approach. I find that very tedious in a situation which should be fully interactive. The combination of menus with set-up-action means that it can take appreciably longer to set up a browse through a file than would be the case in a command-driven package. On the other hand, I thought the approach to transaction facilities was well thought out, and well-oriented towards that kind of data structure. Once again, this is a horses for courses situation: certainly someone with little computing experience should find it much easier to become expert using a package like Delta, especially where the data was of the 'master-slave' type, than would be possible with many command-based packages.

Sorting

Again, this is a two-stage process — the sort rules are set up first, and then the sort is carried out. Records may be sorted by a maximum of five fields, in ascending or descending order. Part fields may be specified if they are of character type, and case may be ignored if necessary.

Calculations and tables

All calculations may use the normal arithmetic operators plus brackets (DMS does not allow brackets). Two types of calculation processing are permitted. Calculations may be included in masks, and implemented either at input time or at amendment.

Alternatively, there is a batch processing/extraction facility in which you can also use three sets of work areas, which make it possible to accumulate across sets of transactions or across all records. With these facilities you can, for instance, make a calculation based on the elements of a transaction record and store the results in a master record, as well as the more obvious requirements such as incrementing all prices by 10%.

Delta also provides a table facility. This allows you to set up a table consisting of a set of values, and then include pointers to the entries in a mask. An example of the usefulness of this option might be records in which foreign currency exchange rates are used. You would set up a table of values of francs, marks or whatever to be used for conversion of sterling, and then include in your mask references to the franc, mark or dollar entry in the table. The alternatives would be either to use the rates as constants, or to take up a field in each record for the rate. With the table method, when exchange rates change, all you need to do is to change the one entry for each rate, and this will take effect in any subsequent calculation. In Delta, tables are not associated with any particular mask, but may be used by any mask in the system.

Tailoring

Delta has two features to help the person who wants to tailor a system to special needs. Firstly, you can ask the system to 'learn' a sequence of operations so that they can be executed in the same sequence each time. However, you still need to specify all the data file names. To take tailoring a stage further, you can set up your own menus, replacing the Delta standard menu. This is carried out outside Delta, using a special program provided with the package.

Multi-file use

Delta provides only for one form of multi-file record, the form often described as master-slave, in which one master record may be linked to one or more slave, or transaction, records. In Delta, this approach is taken to very powerful ends, with up to eight *sets* of transactions or sub-files allowed for each set of master records. However, this still limits the kinds of record linkage which can be achieved. In the jargon of database, Delta allows one-to-many relationships, but not many-to-many. So, for instance, you could set up a file of stock items and a sub-file of requisitions, but this would only work properly if each requisition was for one item of stock. It would not seem to be possible in Delta to implement a full stock control system, in which one order could contain references to several stock items, and equally each stock item will be referenced by many orders.

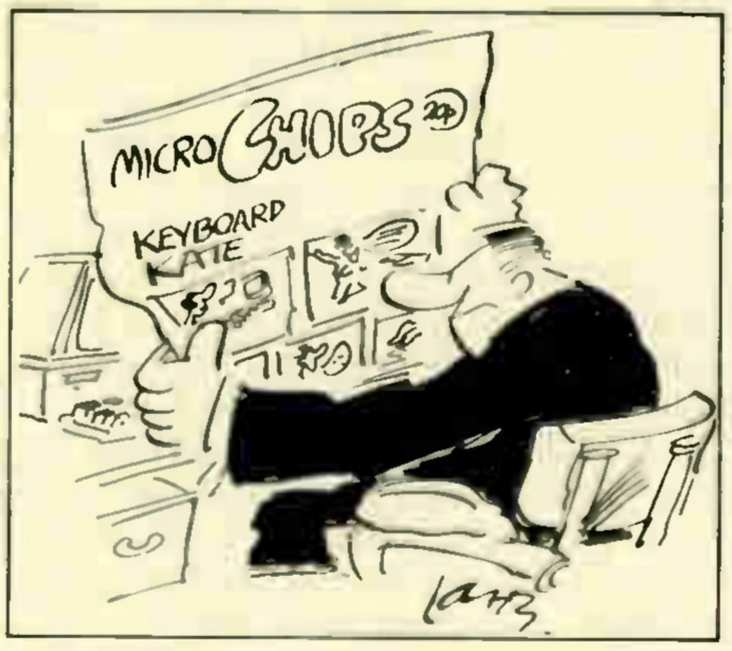
Documentation

Delta comes with a manual which begins as a kind of tutorial, and becomes a reference manual, and a reference card. The first couple of chapters of the manual are intended as an introduction to the novice, and include some help on how to analyse your information and set up an appropriate file structure. Transactions are introduced as a central idea at the beginning, which I think is helpful. The manual is much more comprehensive than was the DMS manual, but correspondingly more bulky and intimidating. I didn't find the large, rather opulent-looking binder any help in diminishing that impression. Furthermore, because it uses a 'one chapter per option on the main menu' approach, it is firmly solution oriented, rather than starting from the user's problem first. There are quite a lot of straightforward examples of individual features, and a number of example data structures, which help here. But more use could have been made of examples, especially a complete one followed through the manual and the facilities. The manual has an index, and though this is not as full as one would wish, I suppose one should be grateful that there is one at all!

The Reference Card is a brave attempt, but would have been much more effective with a Road Map of the features and how they are accessed from the menu options. Most menu-driven packages are easy enough to find your way around once you get used to them — but it isn't always so easy to acquire that familiarity.

Conclusions

When I came to use Delta, one question I wanted answered was whether or not Compsoft could produce a package which had more comprehensive features and a more flexible data structure than DMS, yet retain simplicity of use? On the whole, I think it has succeeded. The company has also provided an efficient package — see the Benchmark results in Fig 2. The next question is: will it suit you as a user better than the alternative offerings? If you have a multi-file application which can be handled by Delta's master-transaction sets approach, then you should look closely at it in comparison with Tomorrow's Office, which I reviewed in June and which takes a quite similar approach. Since you can only handle any two sets of Delta records together during display and reporting, its approach has something in common with dBASEII; while Delta's data structures are less flexible, it has more features directly aimed at processing transactions, and would be easier for most users in practice. So if you are looking for a powerful yet easily used data management system, with the added bonus of reasonably powerful record structures, then Delta is well worth a good look. END



A BEGINNER'S GUIDE TO PROGRAM CONVERSION
PART 2: SIMULATING STATEMENTS

Last month Surya looked at the factors to consider when choosing between a program conversion and a complete rewrite. Here he assumes that a conversion is appropriate and analyses the procedure in detail.

The initial steps to be taken when converting a program from one dialect of Basic to another are much the same as when coding from scratch and just as much discipline is required. The starting point in either case is to have a clear understanding of what you're setting out to achieve. Make sure you can follow the logic of the program before you attempt to modify it. Spend a little time working out why the author has done things in that particular way. All this may seem unnecessary at first, but it's time well spent: the greater your understanding of the program, the easier the conversion will be.

Once you're satisfied that you have a clear overview of the program as a whole, you can look at each section in detail. Break the program down into its component subroutines. This is only possible with a reasonably structured program, but as mentioned last month, programs with poor or non-existent structuring are best left alone.

When examining each routine, take a special look at the variables. Determine which are global and which are local. Global variables are those used throughout the program. Typical global variables include scores in games, some counters, printer-settings and so on. Local variables are those whose values are used only within a given subroutine: once the routine has been exited, the values are no longer required and the variables may be used for a different purpose within another routine. Typical local variables are counters in FOR-NEXT loops and flags used to check validity of data.

The reason you need to distinguish between the two is that local variables may be freely changed or discarded as appropriate, but global variables need to be treated with a great deal of care — the program as a whole is dependent upon them. If you're lucky, the programmer will have gone to the trouble of listing all global variables in remarks at the beginning of the program, and used fixed local variables so that, for example, w is always a FOR-NEXT loop counter. Failing that, there are utility programs available that will locate variables for you (BBC owners need look no further than this month's Programs).

Coding

(Note: in the examples given below, I am using A$ to represent any string variable and 100 onwards whenever line numbers are required. These choices are purely arbitrary and have no significance.)

During the process of converting a program from one machine to another, you will very often come across a keyword in the original program for which your machine has no equivalent. While experienced programmers will soon find a way round the problem, those a little newer to the game may find themselves stuck for a solution. What I have done below is to look at some of the common offending statements and methods of achieving the same effect using standard Microsoft. The keywords covered are not in any particular order.

INKEY$: This statement is an almost statutory presence in just about every Basic program ever written. This statement tells the computer to scan the keyboard to test for a key depression and place the result into a specified variable. The standard format is A$=INKEY$; the most common variations are A$=GET$, GET$=A$ and GET A$.

The statement takes one of two forms. On most machines, the processor will carry out a single sweep of the keyboard: if a key is pressed during this scan, the value of the key pressed will be placed into the variable A$. If no key is pressed, A$ will be null (empty). On some machines, however, the computer will carry out a continual series of sweeps until a key-press is detected. A few machines (the BBC and Oric being cases in point) offer both forms.

A continuous scan using the former version of inkey$ is straightforward: 100 A$=INKEY$:IF A$="" THEN GOTO100. The BBC, however, goes a step further in offering a timed keyboard scan in the form A$=INKEY$(time), where time is given in 100ths of a second. To simulate this using the standard INKEY$ statement, we use a FOR-NEXT loop thus: 100 FOR A=0 TO (value):A$=INKEY$:NEXT. The value of the variable will need to be adjusted to suit. Since different machines have different processing speeds, you'll have to experiment with different values to establish some kind of relationship between the value of the FOR-NEXT counter and real time.

Of course, the example given above would return the final key pressed if there were two or more key depressions during the scan period, but this is easily overcome:

```
100 FLAG=0:A$=""
110 FOR A=0 TO (value)
120 B$=INKEY$:IF NOT B$="" AND
    FLAG=0 THEN A$=B$:FLAG=1
130 NEXT
```

The value of the first key depression is now stored in A$. If no key was pressed, then A$ will be empty.

INSTR: This statement is used to search one string to find out whether it contains a second string. The format is INSTR(main string, sub-string) where the starting position of the sub-string is returned on a successful match and 0 is returned if the search fails. INSTR("PCW","C") would return 2 while INSTR("PCW","X") would return 0.

We might, for example, want to find out whether NAME$ contains the sub-string 'Rev.'. Using INSTR, we would do this like so:

```
100 IF NOT(INSTR(NAME$,"Rev.")
    =0) THEN PRINT NAME$;" is a
    vicar."
```

To simulate this in standard Microsoft, we use MID$. In the above example, we would do so thus:

```
100 FLAG=0:FOR A=1 TO
    (LEN(NAME$)-4)
110 IF MID$(NAME$,A,4)="Rev."
    THEN FLAG=1
120 NEXT
130 IF FLAG=1 THEN PRINT
    NAME$;"is a vicar."
```

Note that on an Atari, line 110 would read as follows:

```
110 IF NAME$(A,4)="Rev." THEN
    FLAG=1
```

and on a Sinclair machine, it would read:

```
110 IF NAME$(A TO A+4)="Rev."
    THEN FLAG=1
```

These differences are due to the non-standard forms of MID$ supported by these machines. The original example should work on all other dialects of Basic.

PROCEDURES AND FUNCTIONS: User-definable functions are supported in varying degrees of sophistication by a number of machines, but you are most likely to come across the extended use of procedures and functions in BBC programs. Procedures and functions make programs infinitely neater and more readable, but they don't actually achieve anything which cannot be duplicated using ordinary sub-routines.

Some dialects of Basic will allow you to GOTO or GOSUB a variable which greatly aids readability — the Basic Converter Chart will tell you which machines do if you look under GOTO.

Sharp Basic SP-5025 has a number of weaknesses which are discussed in the article 'Sharp Logic' in the September issue.

REPEAT-UNTIL and WHILE-WEND. These are two forms of the same control loop, one being the logical reverse of the other. WHILE-WEND checks that a given expression is true and then executes all statements up to the first WEND statement encountered. The computer then returns to the original condition to check whether it is still true. If the condition is false, the statement following the WEND statement is executed.

GOTO page 256



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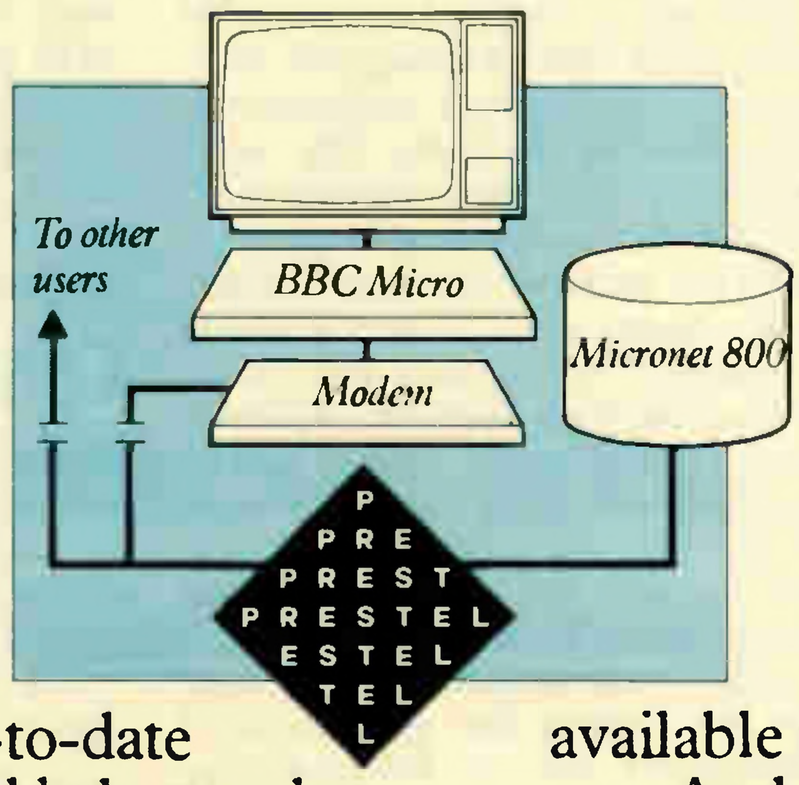

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SOFTWARE

ACCOUNTING PACKAGE

SAGE 400

An accounting package that promises to be of real benefit to the businessman? Alan Secker looks beneath the surface to see what the Sage 400 has to offer.

Most accounting packages, integrated or otherwise, quote prices per module that are within pounds of the figure quoted by Sage Systems Limited for its complete suite.

The question immediately surfacing is: 'Does it do the job?' The answer is: 'It depends.' Yet within certain constraints, which I will explain, it does indeed do the job and represents excellent value for money.

Documentation

The manual, one of the best I have seen, is beautifully laid out and printed on a thick paper or card in a large font with plenty of white space around it. Representations of screen images are printed as white upon green, the whole being enclosed in a specially designed loose leaf binder that can be made to stand up on the desk while in use. Behind the main section was a separate green booklet containing demonstration routines and the customary plastic wallet containing a diskette designated for the system I was using — the Victor 9000.

Most of the descriptions are clear, although the manual I received had been slanted at Osborne users and incorporated instructions specifically for them.

Versions

In addition to the Sirius/Victor version which runs under MS-DOS, I also partially evaluated a CP/M 2.2 version running on a standard IBM 3740 single-sided density format disk that used to be known as a CP/M Standard release until the IBM PC came along. The CP/M version was unconfigured for my system and did not incorporate an automatic start procedure. The Victor version, however, was configured for a serial printer.

This review refers to the MS-DOS version, except where otherwise mentioned.

Interface

Few pieces of off-the-shelf software can 'know' about the hardware combination with which it is intended to work. Despite using a printer that takes 9.5in to 10in width paper, I wanted to use part of my heavy stock of 8.5in listing stationery. This is too narrow to print comfortably at 10 characters to the inch. The notes accompanying the Sage manual mentioned that this version had been configured for use with a serial Epson MX80.

Oddly enough, most printers and software acquired for use with the Victor/Sirius machines is configured for a parallel interface. In this case I used a parallel Epson FX80 with an initialisation routine which executes on a cold boot. I thus needed to 'tell' MS-DOS that the list device was the FX80 on a parallel port and that I'd like condensed print and a left hand margin of 10 characters. On boot up I therefore wanted this to be followed by the loading of the main program which should then begin to run.

Now, although CP/M Plus can autoboot, (it looks for a file called PROFILE.SUB) CP/M 2.2 cannot unless it is modified. However, you can run a batch file with suffix.SUB. MS-DOS on the other hand looks for AUTOEXEC.BAT and executes it. The instruction to the printer I put in a Basic file. The new Personal Basic from Digital Research accepts Microsoft format files so the following will also work under CP/M-86.

On the fourth line enter Control-Z (ALT-Z on the Victor/Sirius). The new batch file, AUTOEXEC.BAT, SAGE.SUB or PROFILE.SUB now exists. As you boot up under MS-DOS, the system will automatically set itself up. Under CP/M 2.2 you have to type: SUBMIT SAGE <RETURN>. The file SUBMIT.COM has to be present of course.

Configuration

My standard practice with all new software is to see how far I can go before I get stuck or crash and then to see how easy or otherwise it is to recover with the aid of the manual.

The CP/M 2.2 version required configuration. Although I found it easy, there were several anomalies between the explanatory documentation provided, and the screen images revealed. Sage claims this has now been improved.

The configuration program writes parameters to a data file called CONTROL.DTA. This is a Random Access File containing a number of 10 byte records. Each record is further divided into five fields of two bytes each. Thus a single parameter may have up to five characters. Each character however must be represented by its ASCII decimal code number.

For example: Suppose the 'Clear

```
10    '-------------------- EPSON.BAS --------------------
20    '
30    '   LPRINT CHR$(15)                    'Print Condensed
40    '   LPRINT CHR$(27);"1" CHR$(10);
50    '                                      'Tab in 10 characters
60    '   SYSTEM                             'leave Basic
```

The above file can be written using the basic interpreter. The following use PIP under CP/M or COPY under MS-DOS.

Enter from the A>

MS-DOS	CP/M
COPY CON AUTOEXEC.BAT<RETURN>	PIP SAGE.SUB = CON:<RETURN>

At the end of each line entered, you will have to print a Line Feed as well as a Return.

SETIOIST=LPT	STATIST:=LPT
MBASIC EPSON	MBASIC EPSON
ACCOUNTS	ACCOUNTS

Screen' command for the HOKI-COKI 2000 was ESC, A, B, C, D. The ASCII codes (in decimal) for these are: 27,65,66,67,68. If less than all five available fields are used, zeros *must* be inserted. Entering <RETURN> produces an error message.

The parameters for most terminals or printers should present no problem but I can envisage some in respect of Cursor Addressing on some older machines. If you think you may have problems, let your dealer look through the manual for your VDU. However, details of one experience may be useful. One of my terminals requires an offset of 32 (20Hex) on both X & Y axis to avoid conflict with Control characters. When installing a similar terminal for a different version and experiencing problems, we tried 32 (1FHex) with success.

Note: Sirius/Victor Users. As you know, this machine has a 'soft keyboard'. I used the keyboard Table 'BRIT02.KB'. Using this table, the key at the top left of the keyboard executes the Escape Character. On my machine this is labelled CLR with HOME beneath it. To use a particular keyboard Table and save the current one at the end of the session, use the MODCON.-EXE utility. You can introduce it into your batch file to handle these things automatically. If you are unable to identify an escape key or execute the code for it, then I'm afraid you are butchered.

Operation

With the Sage program disk in drive A, I typed DIR W and obtained:

COMMAND.COM	ALLOCATE.EXE
STARTUP.EXE	SETIO.COM
STARTUP.EXE	STATEMENT.EXE
	DCOPY.COM
ACCOUNTS.EXE	
NOMINAL.EXE	REPORTS.EXE
	CONTROL.DTA

I assumed STARTUP to be what was required. This asks:
Startup or reconfiguration procedure (S/R)

I entered R. However this routine is not well described and has nothing to do with system configuration but purging a disk whose data contents are no longer required. 'S' meanwhile invites you to place a clean, formatted disk in Drive B. At this stage you can press <ESC> to do just that or <RETURN> to continue. These escape features are present throughout the program and represent a comforting feature to the new user.

Number of accounts

The release I was reviewing allowed 999 Nominal Ledger Accounts and a combined 999 for Purchases and Sales Ledgers. You could allocate these as you wished. However, under option S of STARTUP.EXE one has to define how many accounts are wanted under each heading. For test purposes I chose 30 sales, 40 purchase and 29 nominal. The program accepted those and also told me 135 nominal categories had been created! The program then advises that it is complete and returns to the A>. By a strange quirk, although the number of Sales Ledger Accounts are requested first, it is the Purchase Ledger Account numbers that get allocated the low numbers in the 0 to 999 range

ACCOUNTS.EXE

This is the main core of the suite. On entry the copyright notice including the user's name (which appears on all Reports) is put up on the screen followed by the program's single menu (Fig 1). Both the versions I used displayed the menu across only two thirds of the 80 column screen, presumably a throwback to Osborne 1 compatibility. The remainder of the displays use the full screen. No attributes other than Cursor X-Y addressing are employed. All layouts are simplistic yet easily understood. Selections from the option prompt are all two digit 01 – 29. No <RETURN> is needed. Unfortunately, because input is 'buffered' an inadvertent <RETURN> was remembered and became, as it were, my response to the next prompt. This gave me nasty turns on several occasions until I became conscious of it.

The menu has four (and a half) blocks of options.
Data Disk Specifications — Option 01 to 06
Data Entry Routines — Option 07 to 15
Sales/Purchase Ledger — Option 16 to 20
Nominal Ledger — Option 21 to 26
followed by Options 27, 28 and Return to System.

```
No Entries: 0
SAGE ACCOUNTS MENU
DATA DISK
SPECIFICATION
01). Allocate Sales A/Cs
02). Allocate Purchase A/Cs
03). Allocate Nominal A/Cs
04). Amend Layout of A/Cs
05). Print Account Names
06). Enter Opening Balances
DATA ENTRY ROUTINES
07). Sales Invoices
08). Sales Credits
09). Sales Receipts
10). Cash Book Receipts
11). Purchase Invoices
12). Purchase Credits
13). Purchase Payments
14). Cash Book Payments
15). Journal Entries
SALES/PURCHASE LEDGER
16). Sales Ledger
17). Purchase Ledger
18). Account Balances
19). Aged Analysis
20). Pre-Statement Listing
NOMINAL LEDGER
21). Nominal Ledger
22). Reconciliations
23). Journal Entries
24). VAT Return
25). Trial Balance
26). Monthly Accounts
27). Monthly Journal
28). Information Trail
29). Exit to System Prompt
Which Option:
```
Fig 1

Option 01, 02 and 03 — Allocate Accounts

These enable one to assign an account name to an account number in each of the three ledgers. Under the SETUP routine, I had allocated 30 accounts to Sales Ledger. Thus in routine 01, I could not select account number 31 and give it a name as this had been allocated to Purchase Ledger. The screen mask for both Options 01 and 02 is the same. (See Fig 2.) Because of the 'sharing' of 999 Accounts (9999 in the September '83 release), one might allocate, say, account number 1 to 300 to Sales Ledger and the remainder to Purchases. If it wasn't for the increase to four digits I would regard this as a serious flaw. Sage 400 reserves four fixed nominal ledger account numbers which are:
38 Debtors Control Account
65 Creditors Control Account
69 VAT Account
89 Bank Account

```
*** ALLOCATE SALES/
    PURCHASE ACCOUNTS ***

A/C Existing Account Name
--------------------
41 UNUSED ACCOUNT
New Account Name
----------
>----------
```
Fig 2

Option 04 — Layout of Trading Account and Balance Sheet

On entering this routine, a table is entered on the screen and you are invited to select a line number following which the cursor will jump to that line, enabling you to enter a description and other data associated with that line in order for the system to format the Trading Account and Balance Sheet according to your needs.

Unfortunately line numbers below ten are shown as a single digit and on entry you need to press a <RETURN> in order for things to happen. If instead of entering a 1 for line number 1 you entered 01, the carriage return would not be required.

Once you have entered a particular table, and have reached the last part of the last line, <RETURN> will get you to the next table. Unfortunately the demonstration routine handbook does not mention this. The routine allows the grouping of the contents of a defined range of Nominal Ledger Accounts against a description. This description appears in the Trading Account or Balance Sheet with the total beside it. For example, 'Fixed Assets' might contain the contents of all fixed asset accounts, less depreciation accounts. Again the expansion to four digits will aid layouts, particularly for Companies Act 1981 compliance requirements. Apart from descriptions and amounts, no freedom is given for column position, lines and underlines. Even so I found this example in the demonstration file reasonably familiar in style.

Option 05 — Print Account Names

Once this routine is loaded, it asks for S/P or N and produces a list of account numbers by name with a clear heading. One oddity, with the exception of the full Sales Ledger and Purchase Ledger reports, none of the headings on the other reports were underlined.

The Nominal Account Names listing

SAGE 400

thoughtfully gave the Option 4 group names used in the Profit and Loss account balance sheet, followed by the account numbers and names that formed that group (Fig 3).

Option 06 — Enter Opening Balances

This might better have been described as enter Opening Trial Balance and simply asks for an account number. It returns the corresponding account name and then jumps to the debit column; a <RETURN> moves the cursor to the credit column. Once an entry has been made, it is aggregated into a batch total near the top of the screen. (I would have placed this at the bottom!)

All the data entry routines enable editing of the contents of the screen using a simple coordinate approach. Every column is lettered and every row is numbered. If you specify V6 the cursor jumps to V6. A <RETURN> sends you to the foot of the screen. It is very easy to get used to.

Option 07, 08, 11 and 12

These are invoice/credit note data entry routines for sales ledger and purchase ledger respectively. They all appear the same on the screen and all ask for the same classes of information:

Account Number
Date
Invoice Number
N/C (Nominal Ledger Account Code)
Details
Nett Amount
VAT Amount

Unfortunately in this release, *every* entry requires a six digit date in the form DDMMYY and there are no defaults such as a <RETURN>. Again, sadly the program appears to accept a <RETURN> but the transaction is in fact ignored. Back-space will move the cursor back to a previous field if the line of entry is not completed and, as mentioned above, there are edit facilities if you realise you've made a mistake while still in the routine. Sage advises that its September 1983 version will improve error recover documentation and introduce date defaults.

The Invoice Number fields accept a maximum of six digits. You cannot make a posting to an unnamed account.

A clever feature that I've not seen elsewhere is the calculation of VAT. Most people would enter the amount shown in the invoice. Some invoices, however, are VAT inclusive and indeed there are times when it would be convenient for a computer to behave like a computer and compute!

An amount entered in the net column can be treated for VAT purposes as:

(i) Net from which VAT and Gross can be computed
(ii) Gross from which VAT and Net can be computed
(iii) Net enter VAT manually.

An amount entered in the net column and followed by <RETURN> and then a < is treated as a gross sum from which VAT is deducted, the computed net being put in its place.

```
                              ***  NOMINAL ACCOUNTS  ***

Sales
 101          Systems Sales                  102      Software Sales
 103          Supply Sales                   104      Miscellaneous Sales
 105          Discounts
Purchases
 110          System purchases               111      Software Purchases
 112          Misc. Purchases
Subcontract Work
 115          Subcontracted Work
Labour
 116          Labour
Salaries
 120          Director's Salaries            121      Admin Salaries
 122          National Insurance
Rent & Rates
 125          Rent & Rates
Electricity
 127          Electricity
Travel & Entertaining
 129          Travel & Entertaining
Motor Expenses
 131          Petrol                         132      Motor Expenses
Postage & Carriage
 135          Postage & Carriage
Telephone
 137          Telephone
Bank Charges & Interest
 139          Bank Charges & Interest
Sundry Expenses
 141          Sundry Expenses
Petty Cash Control
 143          Petty Cash Control
Depreciation
 145          Depreciation
H/P interest
 147          H/P Interest
Fixtures & Fittings
 1            Fixtures & Fittings
Company Cars
 2            Ford Cortina                   3        Ford Escort
H/P Outstanding
 7            H/P Outstanding
Depreciation
 5            Depreciation
Trade Debtors
 38           Debtor's Control Account
Bank Account
 89           Bank Account
VAT Account
 69           V.A.T. Account
Trade Creditors
 65           Creditor's Control Accoun
PAYE & Ni Creditor
 66           PAYE & NI Creditor
Bank Account
 89           Bank Account
VAT Account
 69           V.A.T. Account
Share Capital
 91           Share Capital
Director's Loan
 93           Director's Loan A/C
Capital Reserves
 92           Capital Reserves
```

Fig 3

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SAGE 400

If followed by >, the amount is treated *as* net and the VAT computed on it. If you enter an amount followed by <RETURN> the program accepts it as the VAT.

Unfortunately this release cannot compute a valid VAT return because it cannot identify the differences between export sales, other zero rated outputs, exempt inputs and or outputs and items outside the scope of the tax. However, the September 1983 release should have added an extra column to the data entry screen which will allow up to nine VAT analysis codes.

Options 09 and 13 — Sales Receipts and Purchase Payments

Both sales and purchase ledgers operate only as open item ledgers. These two routines enable one to allocate cash received or paid against specific invoices and provide all the necessary information on the screen to enable this to be done.

Option 10 and 14 — Cash Book Receipts and Cash Book Payments

Normally these would be used for nominal ledger items only, the odd refund on the one hand or outgoings such as wages, PAYE, VAT or bank charges. However, they both possess a feature which can be turned to advantage in, say, a cash business. The field headings on the screen are:

Account Number (N/C)
Date
Cheque Number
Details
Nett
VAT

A cheque number is not much use in a receipt routine but the Nett and VAT columns can be very useful for businesses not using a sales ledger — a retail business for instance. It would obtain its split between the various classes of output from its till and enter that as separate components of a day's bankings. Similar possibilities exist of course for businesses operating the 'slip system' and not using a purchase ledger. This has fallen out of use for many limited companies because of possible non-compliance with Section 12 of the Companies Act 1976 but some people still pay all their bills every month end and may find this useful.

Option 15 Journal Entries

As I would expect, this refers wholly to the nominal ledger and has all the text book components with one significant drawback. It does not permit narrative relating to the transaction as a whole. As you will see from the listing (Fig 4), three separate journal entries appear consecutively with no general narrative as to their purpose.

Option 23 — Produces the Report forming Fig 3.

Option 16 to 20 — Sales and Purchase Ledger Account

You may see account after account on the screen or print them on your printer. Options 16 and 17 give them in detail, Option 18 gives you just a straight list of balances with account names and numbers. The presentation is quite good but see note 2. (See Fig 5.)

Option 18 will also provide a printed listing of sales or purchase ledger accounts.

Option 20 enables you to produce a pre-statement listing. This is very useful if you do not want to send a statement to every customer. In practice, once it has served its purpose it would be discarded. This listing does not recognise perforations and just trundles straight through. The statement routines are not accessible from the main menu.

Nominal Ledger Reports

Option 21 allows you to examine the ledger on the screen account by account and to print it (Fig 6). Like the sales and purchase ledgers, only a one or two line spacing is allowed between accounts. Quite frankly I would have liked to see an option, Form Feeding, at the end of each account so that one could have a ledger with a page for each account. This is especially important if you wish to collate the results of 12 months for future reference.

Option 22 — Reconciliations

This option then invites a 'B' or a 'V' for a 'Bank Account Reconciliation' and a 'VAT Account Reconciliation' respectively.

The former is quite close to what software people euphemistically call a Cash Book. Whether in practice it is of any use I could not be sure. After all Option 27 unhelpfully called Monthly Journal is the point from which all the day books (including Bank Lodgements and Payments) are printed — all in one heap without allowing you to pick and choose (but see below); and the nominal ledger account for the bank account will hold the totals so the need for such a document is unclear.

VAT Returns (Fig 7)

Similarly Option 24 produces a VAT return summary, perfectly clearly, and, if all the changes promised for September have been introduced, should prove to be quite a little time saver. So, what the VAT account reconciliation is used for beats me. I might add that some of the reports produce a great deal of descriptive detail which is inappropriate and just slows down printing.

Options 25 and 26 — Trial Balance, Trading Account and Balance Sheet

These are well laid out and appear in true text book style. I would have liked to adjust some of the underlinings and column position a bit though.

Option 27 — Monthly Journal

Without a doubt these are excellent reports. I cannot fault the presentation.

Sales Invoice Journal
Sales Credit Note Journal
Sales Receipt Journal
Purchase Invoice Journal
Purchase Credit Note Journal

Journal Entries Posted From : 01/01/83 To : 31/12/83 Page : 1

No.	Type	Date	N/C	Details	Debit	Credit
104	JC	28/ 1/83	143	Petty Cash Disbursement		100.00
105	JD	28/ 1/83	131	Petrol - Jan P.C.	36.00	
106	JD	28/ 1/83	129	Travel - Jan P.C.	14.00	
107	JD	28/ 1/83	135	Postage - Jan P.C.	15.50	
108	JD	28/ 1/83	141	Sundries - Jan P.C.	29.10	
109	JD	28/ 1/83	69	VAT - Jan P.C.	5.40	
110	JC	28/ 1/83	66	PAYE & NI - jan		708.31
111	JD	28/ 1/83	121	Admin Tax - Jan	272.21	
112	JD	28/ 1/83	116	Labour Tax - jan	216.10	
113	JD	28/ 1/83	122	N.I. - Jan	220.00	
124	JD	15/ 7/83	5		0.00	
125	JD	1/ 1/83	125	BRIDGE STREET	275.00	
126	JD	1/ 1/83	127	HIGH STREET	113.00	
127	JC	1/ 1/83	65	ACCRUALS		388.00
				TOTAL	1,196.31	1,196.31

Fig 4

*** AGED DEBTORS ANALYSIS *** BALANCES AS AT :31/12/82 Page: 1

A/C	ACCOUNT DESCRIPTION	CURRENT	1 MONTH	2 MONTHS	3 MONTHS	OLDER	BALANCE
51	Associated Heat Services	1,320.40	264.84	0.00	0.00	2,817.50	4,402.74
53	Adcal Services Ltd.	0.00	0.00	0.00	0.00	431.25	431.25
57	Border Series Ltd.	0.00	3,641.50	0.00	0.00	672.75	4,314.25
61	D.M. Carroll & Son	0.00	299.79	115.00	0.00	51.75	466.54
73	Errington Reay & Co.	0.00	768.51	0.00	0.00	431.25	1,199.76
76	Galaxy Catering	0.00	0.00	0.00	0.00	994.75	994.75
80	Hoke International	0.00	0.00	0.00	0.00	3,490.25	3,490.25
81	H. Irwin & Sons	0.00	0.00	0.00	0.00	138.00	138.00
86	Penshaw Coaches	2,456.39	0.00	0.00	0.00	224.25	2,680.64
87	Peakin Enterprises	376.50	0.00	0.00	0.00	2,052.75	2,429.25
90	Riverside Rentals	0.00	1,271.56	0.00	0.00	0.00	1,271.56
94	Trident Products Ltd.	0.00	0.00	0.00	0.00	2,087.25	2,087.25
95	Tru - Fit Kitchens	3,126.41	0.00	0.00	0.00	0.00	3,126.41
		7,279.70	6,246.20	115.00	0.00	13,391.75	27,037.65

Fig 5

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Purchase Payments Journal
Nominal Payments Journal
Nominal Receipts Journal

On presentation a little double underlining beneath the totals would have been appreciated.

Option 28 Information Trail

If I have a pet hate it's those things called 'Audit Trail' and sometimes 'list of all entries' but in this package it's 'Information Trail'. It is literally a chronological list of every entry that went into this system. It serves no useful purpose in accounting and is only *ever* used when things have gone wrong (and I mean very wrong).

Statements

Before dealing with statements you need a separate name and address disk. If you do not already have one, format a new disk.

To handle the statement routine you have to execute Option 29 from the main menu. This brings you back to the system.
Execute
A>STATMENT <RETURN>
(Note no 'E' in Statement)

You will next be asked to remove your data disk and insert your name and address disk. At this point insert your blank disk in Drive B. After a few seconds the following appears:

*** STATEMENT MENU ***

1. Enter your Customer Name and Address
2. Enter Amend Customers' Names and Addresses
3. Print Customers' Names and Addresses
4. Print Customers' Statements
5. Print Labels for Envelopes
6. Create space for address list
7. Exit to System

Which Option?

Option 6 has to be executed first.

Nominal Ledger Listing Date :31/12/83

Account 1 Fixtures & Fittings

No.	Date	Inv	Details	Debit	Credit
			Opening balance	3,418.00	
131	0/ 0/70				150.00
130	0/ 0/70				130.43
129	0/ 0/70				0.00
			Total amount to date :	3,137.57	

Account 2 Ford Cortina

No.	Date	Inv	Details	Debit	Credit
			Opening balance	5,760.00	
			Total amount to date :	5,760.00	

Account 3 Ford Escort

No.	Date	Inv	Details	Debit	Credit
			Opening balance	4,376.00	
			Total amount to date :	4,376.00	

Account 5 Depreciation

No.	Date	Inv	Details	Debit	Credit
			Opening balance		2,191.00
124	15/ 7/83	J6		0.00	
			Total amount to date :		2,191.00

Account 7 H/P Outstanding

No.	Date	Inv	Details	Debit	Credit
			Opening balance		4,239.00
97	22/ 1/83	D/Debt	H/P payment on Car	191.60	
			Total amount to date :		4,047.40

Fig 6

Option 1 is not required if your name and address are already in your statement forms.
Option 2 is self evident as is Option 4.
Option 3 simply prints a list of all account numbers, names and addresses.
Option 4 allows a test pattern to be printed if desired. There is no flexibility allowed for the layout of the statement. You have to design your statement around the fields produced by the program or use plain white paper or letterheads.

Final Points

1. Once Reports are printed, the prompt asks you to <RESET> whereas the other routines request <ESC>. The reason is that no system disk is present at that point. In my view a prompt suggesting it be replaced and followed by <RETURN> would remove a tiny bit of tarnish.
2. Like many of its competitors Sage doesn't bother to check to see whether data is present before charging off and printing report headings only to eject yards of empty listing stationery to the annoyance of the user.

Conclusions

In the review above I have referred to changes to be implemented in the September release 1983. I have not have not had a chance to test them but I list them here:

1. Account number increased from three to four digits.
2. Ability to allocate credit limits to sales and purchase accounts.
3. Ability to allocate a budget allowance to a nominal ledger.
4. Sales and purchases ledger reports to show credit limits and flag accounts exceeding those limits. (This applies to aged listings too.)
5. Up to nine VAT analysis categories will be available.
6. VAT calculations will be by reference to VAT code.
7. The VAT return summary is to be amended to allow analysis by VAT code.
8. At present multiple entries for one invoice are requested separately on all ledger printouts. Those are to be aggregated to produce a single line of report per invoice number.
9. The same applies to statements.
10. Default values are to be incorporated for dates (upper and lower), account numbers and transactions, starting and finishing positions.
11. Printouts will allow a break (press <RETURN> to continue, <ESC> for menu).
12. There will be a new report to compare budget with actual for month and year to date reports including the percentage variation.
13. The balance sheet layout is to be improved, negative values will, where appropriate, be in brackets.
14. The monthly journal report will (I am glad to note) split the giant printout into eight separate reports.
15. Illegal dates such as 31st April will be trapped.
16. Printed headings will be modified to

GOTO page 257

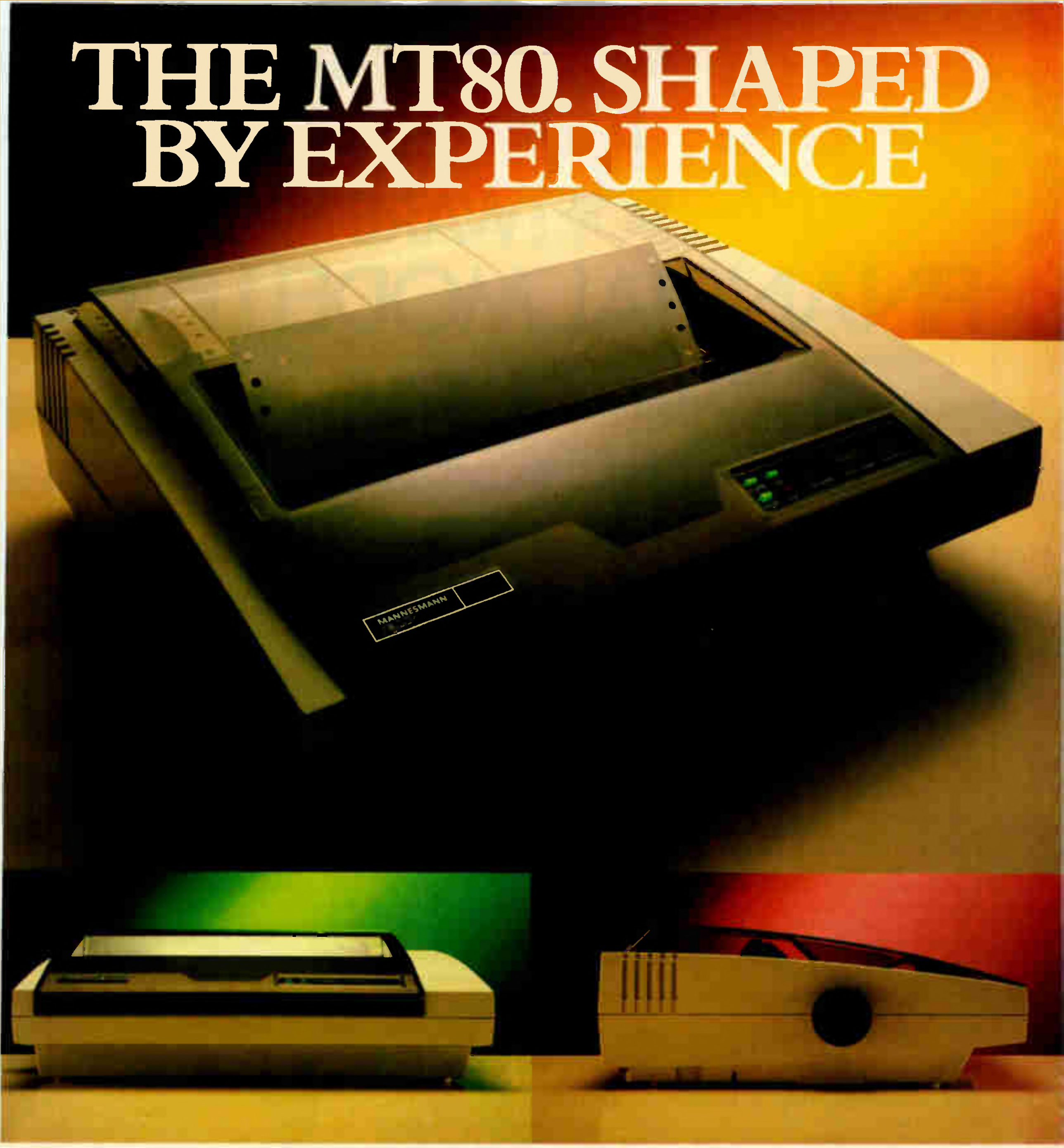
VAT RETURN Period:01/01/83 To 31/12/83

SALES INVOICES & CREDIT NOTES

TYPE	INV.	DATE	DESCRIPTION	DEBIT NETT AMOUNT	DEBIT VAT AMOUNT	CREDIT NETT AMOUNT	CREDIT VAT AMOUNT
SI	7623	5/ 1/83	Computer , Printer			1,785.00	267.75
SI	7624	5/ 1/83	Accounts progra			375.00	56.25
SI	7625	6/ 1/83	Computer, Printer			2,960.00	444.00
SI	7626	6/ 1/83	Diskettes			60.00	9.00
SI	7627	6/ 1/83	Listing paper			45.00	6.75
SI	7628	7/ 1/83	Payroll Progra			195.00	29.25
SI	7629	10/ 1/83	Accounts Progra			375.00	56.25
SI	7630	11/ 1/83	Diskettes			150.00	22.50
SI	7631	14/ 1/83	Computer , Printer			1,785.00	267.75
SI	7632	14/ 1/83	Costing progra			295.00	44.25
SI	7633	14/ 1/83	Listing paper			30.00	4.50
SI	7634	14/ 1/83	Listing Paper			30.00	4.50
SI	7635	17/ 1/83	Computer, Printer			5,355.00	803.25
SI	7636	18/ 1/83	Computer			2,450.00	367.50
SI	7637	18/ 1/83	Accounts progra			375.00	56.25
SI	7638	19/ 1/83	Accounts progra			375.00	56.25
SI	7639	19/ 1/83	Payroll Progra			195.00	29.25
SI	7640	20/ 1/83	Diskettes, Papr			210.00	31.50
SI	7641	21/ 1/83	Diskettes			75.00	11.25
SI	7642	21/ 1/83	Accounts progra			375.00	56.25
SC	C7635	17/ 1/83	Discount	267.75	40.17		
SC	C7630	15/ 1/83	Return of Disks	30.00	4.50		
SI	111222	12/ 7/83	cooked chickens			0.00	0.00
SI	123	12/ 7/83	cc			123,456.12	0.00
SI	000001	1/ 1/83	Sundry Pencils			150.00	22.50
			Totals:	297.75	44.67	141,101.12	2,646.75

Fig 7

THE MT80. SHAPED BY EXPERIENCE



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SOFTWARE

FINANCIAL MODELLING

Tony Harrington tries out Micro FCS and Masterplanner, two financial modelling packages which claim to be more sophisticated than their predecessor, VisiCalc.

Selling businesses the idea of using financial modelling packages to plan their affairs has turned out to be a very successful way of selling them microcomputers. VisiCalc, the first of the electronic spreadsheet packages, was responsible for selling vast numbers of Apples and other micros.

In this article I look at two recent modelling packages which aim to provide users with more sophisticated modelling facilities than VisiCalc and its many imitators — the two being Micro FCS and Masterplanner.

Micro FCS

At £1250, Micro FCS, by EPS Consultants (the people who wrote the mainframe modelling system, FCS), is not the kind of financial modelling package you would expect a corner shop to buy to work out its likely income for the year ahead. It is a high-powered program designed for companies in the Times Top 500 category — the sort of organisation that has complex consolidation problems to solve as well as extensive planning needs.

It has a large number of facilities including, I should add, many features which are designed to make the system easier for the user. But it is still a very demanding system for anyone without computer expertise to use to the full. However, it includes a full programming capability and this provides a way of building 'user-friendly' menu driven systems, so that once a model has been set up, a naive user can run and update it without having to learn all about the program.

Micro FCS is a command driven program and, as with all such programs, you have to be prepared to spend time working with the manual in order to find your way around. The documentation provided by EPS is of a high standard, as one would expect for the price. The manual is logically laid out, clear and easy to use.

Assuming that the user already knows something about how to build a financial model. there are then 'n' steps to be worked through. Before anything can be done, at the start of each session with Micro FCS, you have to specify how many columns your model will have. FCS uses the MS-DOS operating system, and as soon as it is loaded (by typing FCS at the A prompt), it produces its own prompt 'SYSTEM>' and then waits for a command.

The command 'Set Columns n' (with a maximum of 60 columns) doesn't produce any visible sign on the screen, but it lets the computer know at least one dimension of your model. The next steps are to define the logic to be used by your model, enter the data it will use, tell the machine to calculate the model, design reports and, finally, carry out various sensitivity tests and 'what if' analyses with it. Each of the first three stages, logic, data and reports, are kept in memory as separate files and have to be given separate names when moved out of the computer's internal memory and saved to disk.

The model, in effect, is kept in three separate pieces — more, if you like, since there is nothing to stop you using the same logic file with a different set of data, or different report layouts. This makes it very flexible, but it also adds to the elements of which the user has to keep control.

Defining the logic is a relatively simple matter if you already know what sort of model you want to build. If you don't you shouldn't be sitting at the computer screen trying to work it out. That is really a pencil and paper job. Getting into Micro FCS's 'logic' mode is simple. Typing 'Logic' in response to the SYSTEM> prompt is all that is necessary.

This changes the SYSTEM> prompt to a special 'logic' prompt, namely a '+' sign. This is a feature of all Micro FCS's various modes. They are all identified by a prompt sign unique to that mode. The logic defines what each of the rows of the model will be, as well as setting up relationships among the rows. An example might be as follows:

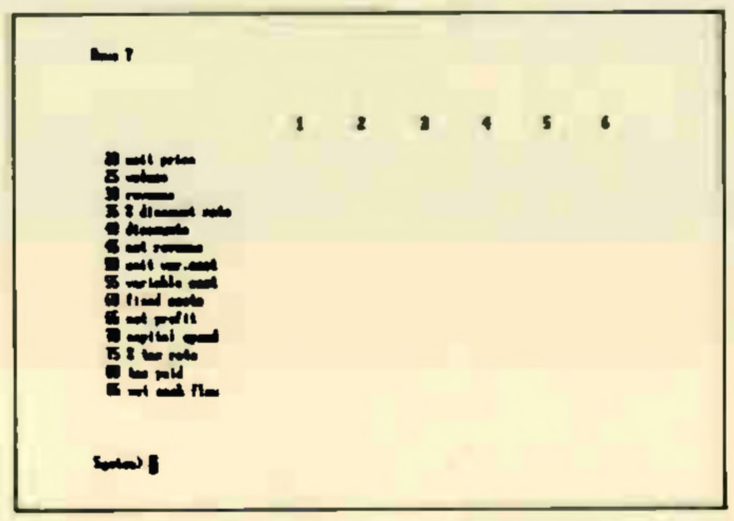
```
+ 20 'Number Sold'
+ 22 'Price/Machine'
+ 24 '% Discount Rate'
+ 26 'Revenue'='Number Sold'*'Price/
Machine' AT100.0 – ('% Discount Rate')
+ 20 'Material Cost/U'
+ 30 'Manpower Cost/U'
+ 32 'Other Cost/U'
+ 34 'Variable Cost'=('Material Cost/U'
SUM 'Other Cost/U') * 'Number Sold'
+ 38 'Fixed Cost'
+ 40 'Profit'='Revenue' – 'Variable Cost'
– 'Fixed Cost'
```

This example calculates the variables 'Revenue', 'Variable Cost' and 'Profit' from a series of inputs including 'Number Sold' and 'Price/Machine', and is taken from one of the many illustrative studies provided in the Micro FCS manual.

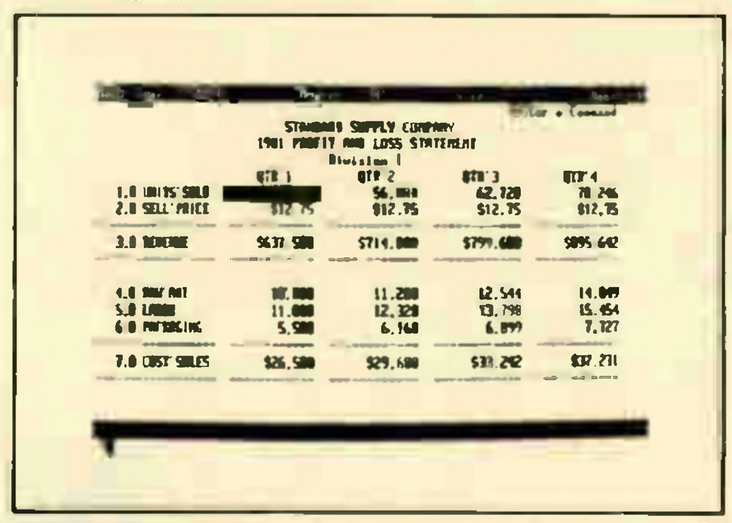
The first point to be made about it is that there are obviously a number of features being used (apart from the strictly financial ones, which this article can't go into) which need some explanation. Although the logic is governed by a fairly simple set of rules, it is not 'transparent' to a naive user.

Each row of logic has to begin with a line number, much like a program line number. Any mistakes in typing in a row which result in statements the program doesn't understand are spotted and the line is reprinted with the error indicated. The actual row titles — the narrative descriptions you are going to want to see displayed — are input enclosed in single inverted commas.

As line 26 demonstrates, it is perfectly possible to specify that one row should be the results of arithmetic operations carried out between other rows. Or, to use the words of the Micro FCS manual, new variables can be defined in terms of existing variables. The maximum number of characters in a line is 132, and new lines can be added to the end of a logic set, or inserted in the middle of it. As with writing a Basic program, if you enter the same row number twice, the logic replaces the first



FCS logic follows row number sequence



Masterplanner's standard example of a model



Illustration by Edward Barker

entry with the second entry, and you lose all record of your first version of that row.

One important point about Micro FCS's logic is that the program carries out its operations in strict row number sequence. It assumes the existence of all rows between the lowest and the highest row numbers used, so, if you number your rows in steps of 100 (ie, row no 100, 200 . . .), the model assumes that all the 'empty' row numbers exist.

Another point is that since it is possible to use row numbers in calculations and in report layouts, a way has to be found to tell the program when a number refers to a row and when it is a 'real' number. A row such as this: + 18 'Daily Revenue' = 16/365 would be interpreted by the program as 'Daily Revenue' equals the contents of row 16 divided by the contents of row 365. To avoid this, you have to specify that you are using a number rather than a row number, by putting a decimal point after all numbers. (That is 'Daily Revenue' = 16/365.0 will have the contents of row 16 divided by the number 365, which means that row 16 had better be the total revenue for the year.)

There is nothing particularly difficult about mastering these little points and the manual is very good at leading you through this and other quirks. But it does illustrate the complexity of this system compared to the 'Calc' type modelling programs.

In addition to the arithmetic operators, +, −, / and *, FCS has a set of special functions. 'AT', for example, multiplies by a percentage specified by the user. The % sign calculates a percentage of some value, and LEAD and LAG refer back to future and previous columns respectively. These are all vital operators for a modelling package of any sophistication.

Other special operators include COMP, DISCOUNT, NPVAT, COL, PERINC, and many others (the manual lists nearly four pages of row operators and functions). There is also, of course, the usual range of 'truth' tests (greater than, less than, etc, all of which can be used with AND and OR to link conditions). In this area FCS is as strong as, if not stronger than, many modelling packages designed to run on mainframe systems.

Having set up the logic for the model, the next step is to input the data. FCS has a number of features which the user can draw on to simplify the task of data entry. Getting into data entry mode is no problem. You type 'END' after your last line of logic and are automatically returned to the SYSTEM> prompt. Typing DATA here produced the data prompt '*'. The standard input format used is 'row number' (this number has to be the same as the logic row number to which this data applies), followed by a data code and then the numeric values. It is also possible to identify a row by its narrative title rather than its row number, but that is a fairly tedious way of doing things.

Data codes carry out a number of different functions. They can be used as a way of telling the program the numerical scale of the values being input. So the codes U,K,M and C refer to units, thousands, millions and hundredths. 12.M,20, for example, would mean that the first column in row 12 would have the numeric value 20,000,000 inserted in it. Repeated values can be input across a number of columns in the row by using 'x'. For example, 12,M,x 20 would write 20 million to all columns in the model in row 12.

They can also be used to deal with forecast trends when setting up the model. The codes, G, I and A are used to indicate geometric growth, incremental growth and arithmetic growth from one column to the next in a particular row.

At any point during data entry, the user can type 'LIST row x' and get a display of what the model will look like for that particular row or rows.

Once the base data and calculation rules have been established, they can be 'filed' for later use and cleared out of the computer's work area. Files all begin with a '/' and there are a maximum of eight characters following the '/'. It is as well to use the first few characters to identify the type of file (logic, data or report).

Calculating the model is simply a matter of calling the correct data and logic files into play (the command form is LOGIC or DATA USING plus the file name), then typing CALCULATE. The results can then be displayed on the screen, using the List command.

For more stylish formatting, the Report mode is used. This is a full report writer which allows user defined format. The same data and logic can be used in a number of different ways during one session to produce several different, user specific reports. Once again, there are a number of features which the user has to master. The Report system prompt is a colon, and it automatically supplies sequence numbers for editing and listing purposes (these numbers have nothing to do with row numbers).

Using the Report mode it is possible to suppress rows or columns, to set the column width (which has a default width of eight characters), insert commas between thousands, millions, etc, enclose negative values in brackets, have dashes instead of

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blanks or zeros for zero values, and so on. Text can be added at any point in a report using the 'Text' command. It can be lined up under columns, or inset any number of places from the left margin. And row names can be changed for reporting purposes.

Once a report layout is complete, it can be filed for later use.

There is also a SENSITIVITY mode, which allows you to enter temporary changes to data in order to do 'What If?' type analyses on a completed model. Working reports are produced for listing to screen or printer, but the original data in the computer work area is unaffected by data changes made in this mode.

Finally, FCS has a 'Command File' feature for its programming capability. This is used to run models which are used on a regular basis, such as a weekly cash flow model. Entering the command file mode is via the EDIT command to a SYSTEM prompt. This mode allows the user to set up a dialogue at the terminal which will prompt a naive operator to enter whatever data the model needs.

The command mode generates line numbers, like the report mode, for editing purposes. Typing a '?' after a line number signals the start of dialogue, in that the program will pause when being run, to allow input after that point from an operator. For example, 30 ?'Please input logic file name', will stop the program with the prompt displayed on the screen, so that the operator can respond.

There is also the facility to enter reminder prompts to the operator. This is done through the 'talk' and 'back' commands. For example, 20 Talk 'Enter your data in the format: row, column, items — type BACK to END data input'.

All in all, with its ability to swap data backwards and forwards between micro-based models and EPS Consultants' mini and mainframe versions of FCS (assuming compatibility between the micro and the larger machine), this is a very powerful system. It would have to be, at the price.

Masterplanner

Comshare's Masterplanner is the second of its micro-modelling packages and it provides a development path for those who have been using Plannercalc, Comshare's cut price answer to VisiCalc.

There is a certain irony in contrasting Masterplanner with Micro FCS, since Comshare specialises in providing financial modelling systems and for many years it used EPS Consultants' mainframe FCS programs (replaced first by a version of FCS written by Comshare, and then, more recently, by its Wizard mainframe modelling package).

Comshare reckons that its target clients are the Times Top 1000. But although it has a number of sophisticated features, its program leans more towards the traditional, easy-to-use spreadsheet approach adopted by VisiCalc and its imitators. At £245 it is around a fifth of the price of Micro FCS and, since it doesn't have as many features — and adopts the spreadsheet approach — it doesn't pose quite such a learning problem to computer naive users. Against this you have to set the fact that you cannot shift models and data to and fro between the micro-based system and Comshare's mini and mainframe modelling programs. There is no upward growth path from Masterplanner.

There are two different ways of using Masterplanner to build a model. The more sophisticated user can work directly onto a 'worksheet', while the beginner can use a specially formatted display screen. The worksheet approach defines every aspect of a model line by line down the screen — for example:

Heading 1 = The Top Ledge Company
Centre Heading 1
Line 1.0 Sales = 101000.,146000.,473000., 500000
Line 2.0 COGS "Cost of Goods" =1200.,1300.,1340.,1400
. . . and so on

The display mode, on the other hand, is simpler since it gives the user a blank model on the screen, with columns one to five listed at the top of the screen, and a column wide cursor (called a 'locator') which can be moved from one column to the next and from one row to the next. In this way, the screen becomes the equivalent of the 'electronic spreadsheet' so beloved of the Calc type programs.

This display screen in 'Command Mode' is the first thing the user sees when Masterplanner is loaded. There is a status line at the bottom of the screen, which is used to display error messages, prompts and warnings. There are help screen facilities which you can call on at any time to get explanations of commands.

There are five different 'modes' which the user can move in and out of. In addition to the command mode already mentioned, there are the display, edit, print, deferred and immediate modes. Briefly, the command mode allows you to build up a model by line or by column; display mode lets you view a model you have created, and the locator can be moved over any cell in the model (a cell being the intersection of a column and a row); edit mode allows the display to be changed or amended; print mode is self-explanatory, and the last two modes refer to the execution of calculations. These can be processed as you enter them (immediate mode) or deferred until the model is completed.

Masterplanner comes with a standard example of a model, and the manual (which, again, is clear and well illustrated with screen pictures) uses this as a teaching device to explain to a new user how to go about creating a model. All models can be filed on disk, and they are recalled from the disk into the computer's work area by typing 'RECALL modelname' at the command mode prompt.

As only a portion of any reasonably sized model can be seen on the screen at any one time, you can scroll in all directions to view the completed model. It is also possible to split the screen vertically or horizontally, or even into four quarters if you wish. One set of columns can be fixed while the rest are scrolled. All the joys of the VisiCalc spreadsheet approach are available for your use.

As with Micro FCS, the first step in creating a new model is to specify the column numbers. This is done with the 'SIZE' command. If no size is specified, the program provides a default number of five columns. Then you have to specify the width to be allowed for each column (the default value here is 10). Models can be described with up to 250 lines of headings and or footings, though, as the manual points out, using this generous allocation will severely restrict the amount of memory available to you. So you are better off using a few lines only of descriptive narrative for headings and footings.

The maximum possible size of the model you can build depends largely on the kind of microcomputer you are using. The program limitations are reached on 1000 column models, which are somewhat larger than most organisations will need.

One of the nicest features about Masterplanner is that details for a model are entered through simple English-like dialogue. To allocate names to columns, for example, all that is necessary is to move into command mode, and to type 'COLUMN 1 1ST'QUARTER' (the apostrophe is necessary since no spaces are allowed in entering column names — the apostrophe appears as a space in the model and on printed reports). It doesn't matter in what order column names are entered. Provided they are numbered correctly, they will be allocated to the right columns.

Row labels, called 'line labels', are entered in similar fashion. You can either enter the data for a line at the same time as the line number (as in the worksheet example above), or later, using the edit facility. Moving between display and worksheet modes is achieved by typing 'MODEL' and 'RESULT' respectively.

As with Micro FCS, there are a number of devices for speeding up the input of data into columns (though the range of such devices is far more limited, as one might expect). The program has all the usual arithmetical operators which can be input to carry out line calculations, and there are also exponentiation, power of e and natural log functions.

As far as reporting is concerned, there are several report formatting commands, including underline, indent, number of columns printed per page, page breaks and so on.

While Masterplanner is not quite as sophisticated a system as Micro FCS and lacks the latter's programming and file handling capabilities, as well as its upgrade path to a mini or mainframe version, it is still a modelling system to be reckoned with. It is the more 'user-friendly' of the two systems, and has all the attractive features of the Calc programs as well as some of the more sophisticated features which they lack. **END**

NEWCOMERS START HERE

This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in PCW. *While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!*

Probably the first thing you noticed on picking up this magazine for the first time was the enormous amount of unintelligible-looking jargon. Well, in the words of *The Hitch-hikers' 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 as opposed to a typewriter which can only be used for typing, a calculator to perform calculations, a filing-cabinet to file information and so on. A micro can do all those things and more.

If it is to be of any use, a general-purpose device needs some way of having a function assigned to it. 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 only 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* include **Forth, Pascal, C** and **Comal**. These are known as **high-level** languages because they approach the sophistication of a human language. You'll also see references to the **low-level** languages, **assembly language** and **machine code**. We'll look at high and low-level languages in a moment.

The heart of a micro, the workhorse, is the **processor** or **Central Processing Unit (CPU)**. The processor usually consists of a single silicon chip. As with computer languages, there are a number of different types of processor around, the Z80, 6502 and 8088 being the three most common. The processor is nothing magical — it's just a bunch of electronic circuits. It's definitely not a 'brain'.

Being 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 is 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 there is no binary equivalent of a comma or the letter 'a', for example, 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.

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 language. This makes it slower to run than a compiled program, but easier to edit.

There are two strange-sounding 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 which part of the machine's memory the processor will use to 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. It's a compromise between Basic and machine code.)

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 known as **R**ead **O**nly **M**emory **(ROM)** and the badly-named **R**andom **A**ccess **M**emory **(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**, which consists of 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.

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.

There are numerous forms of **permanent** or **backup** storage, but by far the most common are the **floppy disk** and **cassette**.

Floppy disks or diskettes are circular pieces of thin plastic coated with a 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 'playback' 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 do seem to have begun to acknowledge that this situation can't go on forever, and they are working on making their disks compatible with each others.')

Since the computer needs some way of tracking the whereabouts of everything on the disk, we have a program called a **Disk Operating System**, more usually known simply as the **Operating System (DOS** or **OS)**. The operating system does all the 'house-keeping' 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 two most popular OSs are **CP/M** (Control Program for Micros) and **MS-DOS** (MicroSoft Disk Operating System).

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 is adequate for games and the like.

Another type of disk you'll see referred to is the **hard disk**. This is an extremely efficient method of storing large amounts of programs and 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, etc) may all be built in to a single unit or they may be separate, connected by cables.

Take this paragraph slowly and it makes 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 8 wires we can transmit/receive information one byte at a time (8 bits = one byte, remember). **Serial I/O**, in contrast, uses a single wire to transmit a series of bits one at a time 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 standard 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. Both methods use the public phone network. The simplest and cheapest method is to use a device **known as an acoustic coupler**. This simply plugs into your computer, and has a receptacle into which you place your telephone handset. However an acoustic coupler is slow and not exceptionally reliable.

A more sophisticated (and correspondingly more expensive) 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.

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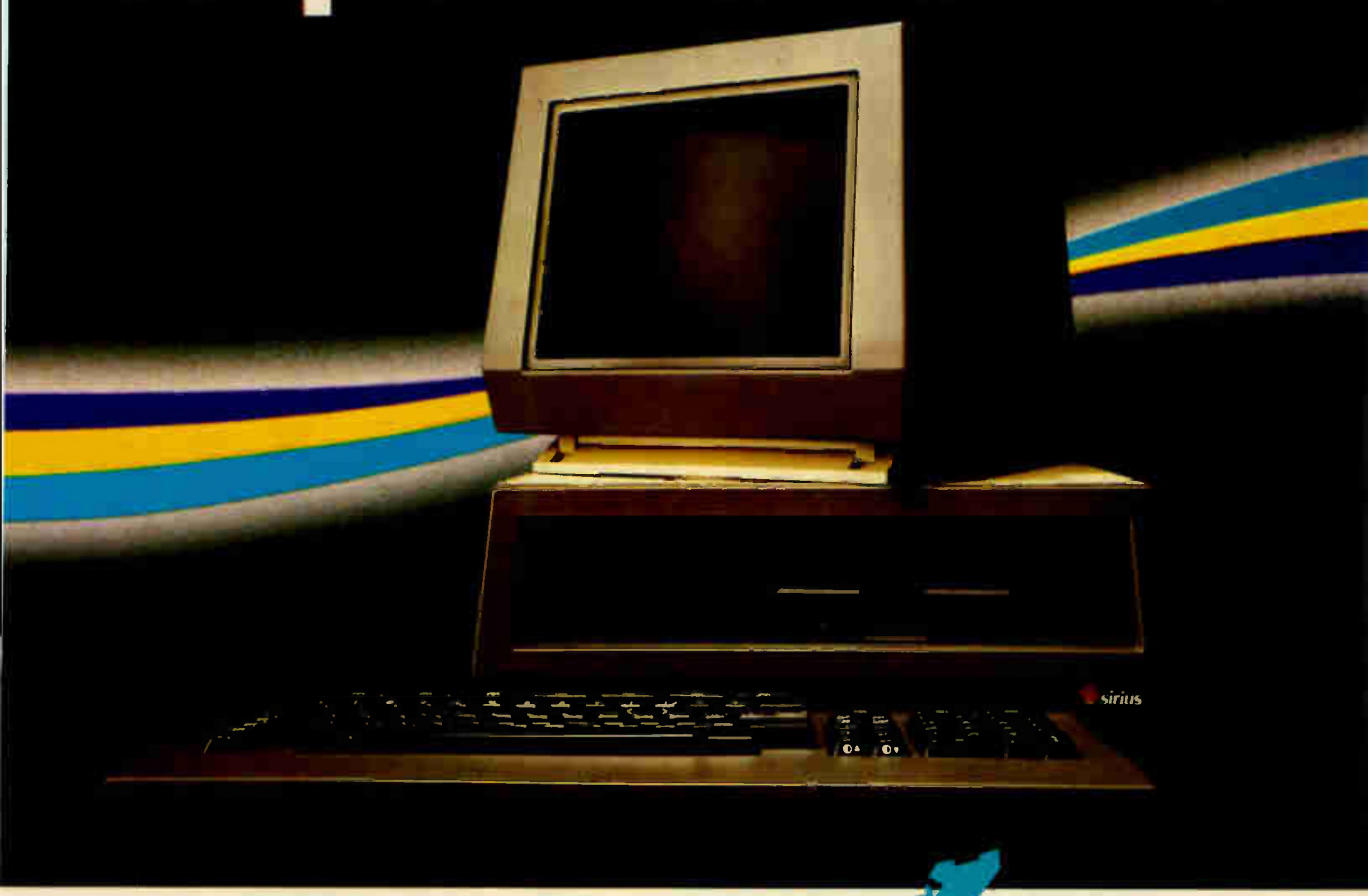

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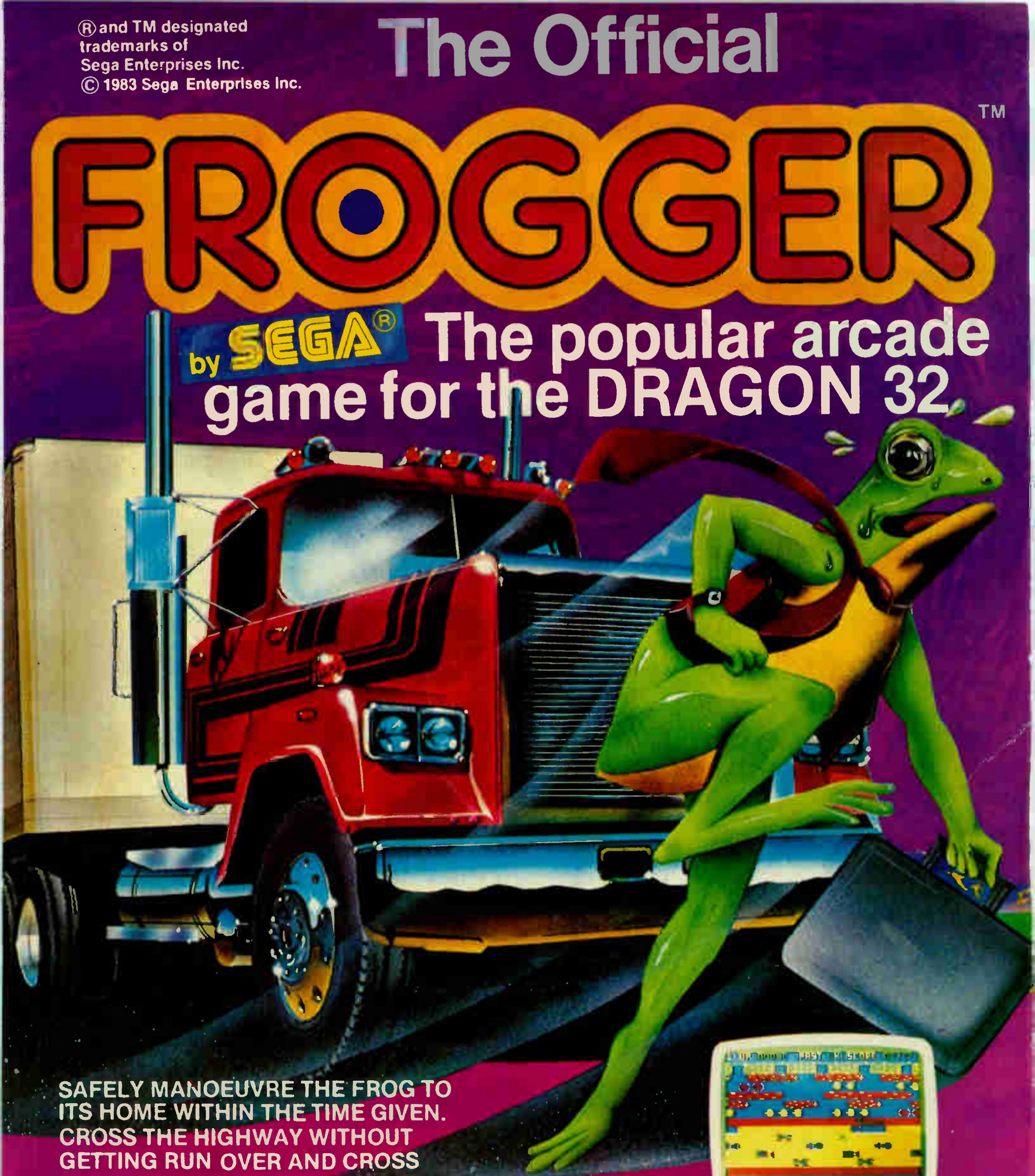

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SIRIUS GRAPHICS
PART 2: GRAPHICS SCREEN EDITOR

Alan Osborne follows up last month's article on the MAGUS graphics board ('Sirius Graphics') with a colourful report on the merits of the Graphics Screen Editor.

In last month's article, I reviewed the recently marketed MAGUS graphics board for the ACT Sirius Victor 9000 microcomputer. The ROM on this board contains 16 high resolution graphics routines which may be called from Basic programs running under CP/M-86 or from Basic, Fortran or Pascal programs running under MS-DOS. The Graphics Screen Editor (GSE) which has recently appeared enables these routines to be used by simple one-key strokes, without any programming at all. There is also provision for moving blocks of diagrams and text around the screen at will in the same manner as text can be manipulated in word processor packages such as WordStar.

The GSE and linker programs come on a disk with an excellent manual which is clear and well illustrated and contained in a loose-leaf binder. This manual incorporates the manual for the graphics board and errors in this former manual have been corrected, although one or two minor errors remain. The GSE uses an updated ROM (Version 2.2) which comes in the form of two chips which replace the two plug-in ROM chips (Version 2.0) on the original graphics board. I understand that the board is now being supplied with Version 2.2 so that if the GSE is bought at a later date, this modification will not be necessary.

The linker program supplied with the GSE is also an updated version, which makes it possible to release areas of memory previously reserved for diagrams without rebooting the system. A further graphics routine called SETLINE has been added to the original 16. This routine allows different line types to be defined in terms of the length of dash and length of gap.

The GSE allows the user to define his own symbols in 32 × 32 pixel areas and, once defined, these are easily stored on the disk for future use. Larger symbols are defined using the 32 × 32 as modules which can be easily assembled into place when required. The symbols can be defined by drawing them on the screen and saving them or by using the Symbol Editor which is a more sophisticated version of EDIT. This is much quicker in use and can be operated from within the GSE program. A maximum of 32 symbols may be defined in one symbol file.

Three 'screens' called the Work, Alternate and Symbol screens respectively are provided and it is very easy to swap or merge diagrams between screens, so that diagrams can be produced in pieces and then assembled to their final form. On loading GSE, a 6-element menu appears which allows one to:

1) Enter Graphics mode and clear the Work screen;
2) Enter Graphics mode and keep the Work screen;
3) Enter Symbol Edit mode;
4) Set the skip length for fast cursor mode;
5) Display a disk directory.

The sixth option returns to MS-DOS. From then on, apart from entering data, complete control is achieved by single key strokes. Choosing option 1 results in a clear screen with a line border and the cursor, in the form of a large cross, in the centre of the screen. Above the top border is displayed information about the 'state-of-play' such as which screen is being displayed and the x,y co-ordinates of the cursor.

When the cursor is moved, it leaves behind a small replica of itself which stays in position until RETURN is entered when it jumps to the new cursor position. The two cursors define the line and boxes which are used by routines B,C and J. The cursor can be moved to new co-ordinates using I or M, but more easily by using the key-pad on the right of the keyboard, where the numbers are positioned around "5" as eight points of the compass and cause the cursor to move appropriately (eg. "6" causes movement to the right). 5, itself, is used to toggle on and off a trailing line from the moving cursor. Movement is by one pixel per key-stroke but pressing "." toggles this with a 10-pixel movement for more rapid cursor positioning. Alternatively, the step for pixel movement can be independently set using option 4 of the menu. "O" is used to toggle erase mode. As the cursor is moved, its current co-ordinates are displayed above the top border.

Most of the keyboard functions are self-explanatory. W writes text from the current cursor position using any character set loaded with L. Two character sets can be used at any time with W without a further L command. S and L perform the same operations with the symbols, which are referred to by number (1 to 32). One problem with writing text or putting in other data is that there is no buffer, so that it is not possible to correct mistakes before they are entered. Thus, if a wrong key is inadvertently pressed while entering a string of text, the only way to correct it is to box the string, clear, and start again. O would not do this, as it would overwrite the area without erasing the original. However, this is not so time-consuming an operation as it may seem. Putting in incorrect data while drawing a shape using E would need to be rectified similarly, or by using E again with the same (incorrect) data and in 'undraw' mode.

X is used to define symbols without resort to the Symbol Editor and Z clears the currently displayed screen.

E is identical to the routine 'Shape' described last month and can be used not only for drawing ellipses and circles but also for regular polygons. Automatic Aspect Ratio correction may be slected as an option in using this routine. F uses a standard selection of six filling modes or, alternatively, one can define one's own filling patterns and store them for future use. When J is used, one has the choice of solid line, broken line or erase mode. In solid line mode there is a further choice of single or double width line and in broken line mode, there is a choice of five line patterns or, again, one can define one's own pattern of broken line and save it. The current symbols, shading and line patterns can be viewed together by displaying the symbol screen.

Finally, there are N and T. These are an extremely powerful pair of routines used for moving blocks of diagram around and for fine positioning of blocks or whole diagrams. N defines a rectangular area or block of diagram according to the current positions of the cursors as in B and C or according to the x,y co-ordinates of diagonally opposite corners. Having defined an area, it may be moved with T to another place either on the same screen or, to another screen. The moved area can be made to merge with, or replace what is already there. If it is found that the block has been incorrectly positioned, it can easily be 'picked up' again and repositioned without disturbing anything on the screen beneath. This is analogous to having the block on tracing paper and moving it around over a diagram until the correct place is found, before finally transferring it to the diagram. This makes it possible to construct complicated diagrams in minutes, which would take hours if done by writing a program in Basic and the techniques can be learned by any intelligent operator very quickly.

Just as office staff have found that manipulating text with WordStar without reference to the manual quickly becomes second nature, so manipulating graphics with GSE is surprisingly easy. I found that I became acquainted with all of its features in one evening and, as one who uses microcomputer graphics on a day-to-day basis, I look upon it as a very exciting development indeed.

END

1983 PCW SHOW PREVIEW

WONDERFUL THINGS

Once again PCW *Show time is here. Maggie Burton takes a peep through the keyhole as the finishing touches are being made . . .*

With only a matter of weeks to go at the time of writing, preparation for the UK's biggest and best micro computer Show is well under way.

Endless variety, a good measure of comedy, a drop of pure panic, several hundred fixed grins and a horde of whirring disk drives and bleeping micros will conspire to make the 6th *PCW* Show the tastiest silicon cocktail for some time (well — since last year's *PCW* Show, anyway).

If you're not too straight-laced we hope you'll take some time off from databases and WPs and drop in on the games section to be shot at by bristling aliens and get lost in dreadful caverns and castles for a while. And we also hope that boggle-eyed games fans will tear their sticky eyeballs off those nasty bright TV screens and meander into the serious bits as well — who knows, word processing could be the best game you've ever played . . .

Whatever your inclination, one thing is certain. You'll find something worth seeing and probably a lot worth buying as well. All the most up to date computer products and plenty of good old favourites will be vying for your attention.

Note the names in the Preview that follows this frenzied tirade — all the big boys and many of the interesting little ones as well. Some interesting new arrivals include Lotus Development Corporation — the makers of 1-2-3, Micronet 800 — the electronic magazine, and Softsel, a big American distributor supplying packages for just about every micro that counts. Microwriters, we notice, have dropped in price by £100, now selling for £299. A certain member of *PCW*'s staff (modesty forbids us from mentioning which one) learned Microwriting in an hour . . . Io Research will blow our minds with a completely new 24-bit graphics system, allowing each pixel on a screen to be mapped to any of a mere 16 million colours. Semi Tech Electronics will introduce the new portable Pied Piper to *PCW* visitors and Sinclair — at last — will have the Microdrives on view for all to see. Acorn's Electron will be solving a few mysteries and ACT now boasts a new beast as well — the Apricot (the sexiest computer this side of the Black Stump). Oric is going to show off the Oric MCP-40 four-colour printer.

Favourites from last year include REWTEL, *Radio & Electronics World*'s very own bulletin board, Grundy with the good ol' NewBrain — now complete with disks and CP/M, Computers, now with a grown-up 96k or 128k Lynx and disks and Sharp, now boasting the new MZ700 home micro.

As always, *PCW* will provide a generous selection of features.

Chess masters (no, not people — computers) will battle head to head for the full four public days until a new (or returning) European champion is found. If you're interested in computer chess, this is the place to be.

CTUK! will dole out helpful advice to the lost and lonely in the big new wide world of micros. They'll also be on the lookout for new people to start 'Towns. The nation's computer literacy project aims to put on some interesting and helpful demonstrations of all sorts of computer software and hardware.

The Federation of Microsystem Centres, now backed by the DOI as a service to aid small businesses in choosing a micro, will provide free advice on introducing computers to your business. The Federation began as a branch of the National Computing Centre and is still co-ordinated by it. It provides a range of literature and consultancy services.

On top of this lot, computer clubs and Micros and Primary Education will also add their miscellaneous micro information, micro advice and micro interest to the whole proceedings.

All in all, we know this Show's going to be a good one. As you can see, a good proportion of the exhibitors haven't told us what they've planned yet, so you're in for a lot of surprises and fun. Whether you be a beginner, an enthusiast, a business user or an expert we can guarantee you will find plenty to interest you.

Don't forget that the first day, the 28th, is a *trade only* day to enable all the industry moguls, pundits and sages to get together and plan some strategy — and also to give journalists an exclusive day out! So if you're not a trade person then please don't come. You won't be allowed in. If you are a trade person, ACT wishes to announce its seminar on Concurrent CP/M-86, the new operating system that lets you run several different programs on one computer. This will be held for all trade visitors on the 28th in one of the Barbican conference rooms, so all are welcome — the more the merrier, in fact.

Special accommodation arrangements have been made for those wishing to stay in London for a few days. For this, contact Montbuild Ltd, 11 Manchester Square, London W1, tel: 01-486 1951. Montbuild will also advise on party discounts. Tickets to the Show will otherwise cost £3.00. And don't forget the dates — 28 September trade only, 29 September – 2 October is a free for all.

So we'll see you there. And we hope you're all looking forward to it as much as we are!

Special packages

Special accommodation arrangements are available for Show faithfuls who want to stay overnight in London. Places are available at the St James Hotel, Victoria. Rates are £16 per person in a twin room with a supplement of £7 if only one person is in the room.

Reduced rate rail tickets are also available.

For more details, contact: Pharoah Hughes Associates, Lamb House, Church St, Chiswick, London W4 2PD. Tel: 01 9958995.

Stop Press

PCW and the organisers are very sorry to announce that, due to unforeseen and insurmountable difficulties, the Scrabble contest has been called off until next year. We apologise to all those who will have been disappointed by this turn of events.

Abrasco Ltd Stand No F204
The Grange Barn
Pikes End
Eastcote
Middlesex HA5 2EX
Tel: 01 866 2518

Abrasco specialises in software for home computers. The range covers four of the most popular machines: VIC-20, Commodore 64, Dragon 32 and ZX Spectrum. The *PCW* Show will see the debut of a new and exciting series of products for the Spectrum and '64.

Acorn Computers Ltd Stand No 323
Fulbourn Road
Cherry Hinton
Cambridge
Tel: 0223 245200

Details unavailable at press time.

ACT (Holdings) PLC Stand Nos 401,415
111 Hagley Road
Birmingham B16 8LB
Tel: 021 501 2284

The *PCW* Show will be the first public launch of Apricot, Britain's new fourth-generation executive computer. Portable, weighing only 23 pounds, the Apricot offers full 16-bit processing and incorporates unique user-friendly features including 3½in microfloppies and a keyboard microscreen. Also on show for the first time will be the new networking system for the ACT Sirius.

Addison-Wesley Publishers Stand No 456
53 Bedford Square
London WC1B 3DZ
Tel: 01 631 1636

A major feature of Addison Wesley's stand will be three new books on the brand new Acorn Electron: *Start Programming With The Electron, The Electron Book, Basic Sound and Graphics and Assembler Language Programming on the Electron.* As well as all these, the stand will feature a bumper selection of other important new titles as well as popular and established ones.

Adman Electronics Ltd Stand No 408
Ripon Way
Harrogate HG1 2AU
Tel: 0423 62642

Speech synthesis — the product speaks for itself — is the highlight of Adman's 1983 exhibition. A brand new range of products for the VIC-20 and other computers will be introduced, including the infinitely programmable speech synthesiser, 16k nd 8k RAM packs and a three-port expansion motherboard.

Anirog Software Stand No 259
29 West Hill
Dartford
Kent
Tel: 0322 92518

Details unavailable at press time.

Artic Computing Stand No 267
Main Street
Brandesburton
Driffield
YO25 8RG
Tel: 0401 43553

Artic will demonstrate a selection of software for most home computers. This ranges from arcade games, adventures and chess to utilities and toolkits. Special interest programs will be a graphic adventure and a new jigsaw program.

Atari International Inc Stand No 130
Atari House
Railway Terrace
Slough
Berks
Tel: Slough 33344

Details unavailable at press time.

Audiogenic Ltd Stand No 273
PO Box 88
Reading
Berks
Tel: 0734 586334

Audiogenic will exhibit a selection of home and business software for the VIC-20 and Commodore 64.

On the games side, there is a new range of Commodore 64 products, including Motor Mania, Word Feud, Renaissance and Grand Master, as well as Alice in Computerland — a new and unusual game.

Business software includes two major products for the CBM64. These are the word processor Wordcraft 40 and Magpie, Audiogenic's new database, available with optional disk-based programs covering specific applications.

Basicare Microsystem Ltd Stand No 271
12 Rickett Street
London SW6
Tel: 01 385 2135

Basicare's Organic Micro System is compatible with the ZX81 and Spectrum. It offers a wide range of options, including additional memory, sound synthesiser, analogue to digital converter and control of external devices. A number of preprogrammed sets will be demonstrated, illustrating the system's versatility.

BBC Publications Stand No 138
35 Marylebone High Street
London W1
Tel: 01 580 4468

A range of software packs has been specially developed to make the most of the British Broadcasting Corporation Microcomputer.

These packs enable use of the computer for a huge range of activities. Together with British Broadcasting Corporation computer books and a new range of software packs (to be launched at the Show), they will be on sale from the stand and will also be demonstrated.

BiBi Magnetics Ltd Stand No 203
101/105 Plough Road
London SW11 2BJ
Tel: 01 223 5955

Details unavailable at press time.

BICC-Vero Electronics Ltd Stand No 159
Industrial Estate
Chandlers Ford
Eastleigh
Hants SO5 3ZR
Tel: 04215 62829

BICC-Vero Electronics will exhibit its complete product range including Speedwire (own brand insulation displacement system of interconnection).

The range of Veroboard boxes and accessories will be available for immediate purchase as featured in the Hobby Herald, plus all the connectors for your micro add-ons.

Biodata Ltd Stand No 361
6 Lower Ormond Street
Manchester M1 5QF
Tel: 061 236 1283

Biodata manufactures the Microlink computer interface for connecting laboratory and monitoring equipment to microcomputers such as CBM, Hewlett-Packard and Sirius. Microlink is fully modular, consisting of a mainfarme cabinet with an IEEE-488 interface and power supply. 30 modules are available for analogue, digital and BCD inputs and outputs, timing and counting.

British Computer Society Stand No 308
13 Mansfield Street
London W1M 0BP
Tel: 01 637 0471 ext 207

The British Computer Society is the major representative body of the British computing profession. There are three professional grades — Associate member, Member and Fellow.

Those interested in computing but ineligible for full membership may become affiliate members. This enables them to participate in and benefit from the Society's activities.

Bubble Bus Stand No 274
The Computer Room
87 High Street
Tonbridge
Kent TN1 1LS
Tel: 0732 355962

Bubble Bus will be flaunting its new range of software for the VIC-20 and Commodore 64. Among these products will be Kick Off, a table football game for the '64 (this uses sprite graphics and good sound effects plus the speed of machine code), and Hustler, a Pool-type game, also for the '64.

Bug-Byte Software Ltd Stand No 201
Mulberry House
Canning Place
Liverpool L1 8JB
Tel: 051 709 7071

The *PCW* Show is an opportunity for you to see Bug-Byte's new games for the ZX Spectrum and BBC, nestling alongside old favourites for the VIC-20 and ZX81.

You can battle through Styx, grapple with the Sea Lord, cope with Oblivion, fight an Election, curse in the Castle and even go mad in the 20 Caverns of the Magic Miner!

Camputers Ltd Stand No 212
33a Bridge Street
Cambridge CB2 1UW
Tel: 0223 315063

Camputers' Lynx is designed to grow from an easy to understand 48k machine to an advanced and enhanced 96k or all the way to a fully-fledged 128k professional business system running CP/M and an 80-column screen. Camputers' stand will feature the Lynx range of products.

CDS Micro Systems Stand No F201
10 Westfield Close
Tick Hill
Doncaster DN11 9LA
Tel: 0302 744129

Details unavailable at press time.

CentreSoft Ltd Stand No 229
Unit 16
Tipton Trading Estate
Bloomfield Road
Tipton
West Midlands DY4 9AH
Tel: 021 520 7591

CentreSoft is a distributor of American and British products for the Atari, Commodore 64, BBC and Spectrum. As from September the full Atari range will be available. CentreSoft is the first British company allowed these distribution rights. Dealers will be pleased to know they can rely on a 24 hour delivery service.

CK Computers Ltd Stand No 104
6 Devonia House
High Street
Worle
Weston-super-Mare
Tel: 0934 516246

Details unavailable at press time.

Commodore Business Machines (UK) Ltd Stand No 124
675 Ajax Avenue
Trading Estate
Slough
Berks SL1 4BG
Tel: Slough 74111

Commodore will be exhibiting a wide range of hardware, peripherals and software for business applications. For the home enthusiast, VICSoft, Commodore's club for its home computer owners, will be demonstrating and selling a range of home and hobbyist programs.

Compsoft Ltd Stand No 428
Hallams Court
Shamley Green
Nr Guildford
Surrey
Tel: 0483 898545

Compsoft is showing its popular database programs, DMS (Data Management System) and Delta. These will be up and running on a wide variety of computers, including the IBM PC, Sirius and DEC Rainbow. Compsoft won a RITA software product of the year award and is well known for its database software.

The Computer Bookshop Stand No 127
30 Lincoln Road
Olton
Birmingham B27 6PA
Tel: 021 707 7544

The Computer Bookshop is a distributor of some of the most popular home computing titles and software packages. Its range covers such machines as the BBC, Dragon, VIC-20, Commodore 64, ZX Spectrum, ZX81, Oric, and many more. Business machines covered are IBM, Osborne and NewBrain.

The Computer Bookshop is the sole UK distributor for Sybex and Compusoft books. The full range of these titles and books from all other major US and UK publishers will be on display.

ComputerTown UK! Stand No 458
c/o *PCW*
Evelyn House
62 Oxford Street
London W1A 2HG

CTUK! is a nationwide network of computer literacy centres aiming to introduce people to computers in a friendly, helpful atmosphere.

CTUK! welcomes anyone wanting an informal introduction to computing activities and will demonstrate a range of different computers and software to the inexperienced user. It is also looking to expand the scope of its ministrations to computer novices by adding to the number of ComputerTowns in the UK! If you're already a computer expert or hobbyist and would like to start a 'Town, a visit to the stand will provide advice and ideas on how to go about it.

Comshare Ltd Stand No 381
32-34 Great Peter Street
London SW1P 2DB
Tel: 01 222 5665

Comshare will exhibit its established range of software for financial planning: PlannerCalc, Masterplanner and Fastplan II. Comshare will also present, for the first time, Target-Task, its new micro-based critical path analysis system.

Creative Computing Stand No 251
39 E Hanover Ave
Morris Plains
NJ07950
USA
Tel: 201 540 0445

Creative Computing is one of the most popular magazines in the USA for software and applications. *Sync* is for users of Sinclair machines (Timex in America). Both magazines will be on display. Also available: a selection of new titles and old favourites from the Creative Computing Press.

Data Management Systems Ltd Stand No 426
Crown Wharf House
132 New North Road
London N1 5DA
Tel: 01 739 8692

Data Management Systems markets business systems utilising current but proven technology. It provides a full range of services ensuring that the user is not forced to seek a range of suppliers in order to run a successful installation.

Demonstrations include Silicon Office, WordStar and the accounting packages TABS and Omicron.

Digital Equipment Co Ltd Stand No 301
PO Box 110
Reading RG10 0TR
Tel: 0734 868711

Digital, one of the world's biggest computer manufacturers, will be exhibiting its entire range of professional personal computers and peripherals. On the stand will be the Professional 350 and 325, DECmate II word processor and the Rainbow 100.

Full details of the software and services for the personal computer range will be available from stand personnel.

Digital Fantasia Stand No 108
24 Norbreck Road
Norbreck
Blackpool
Lancs
Tel: 0253 591402

Details unavailable at press time.

Dragon Data Ltd Stand No 121
Queensway
Fforestfach
Swansea
Wales SA5 4EH
Tel: Swansea 580 651

Details unavailable at press time.

Duckworth Stand No 109
The Old Piano Factory
43 Gloucester Crescent
London NW1
Tel: 01 485 3484

Duckworths will display a range of books for the Commodore 64, VIC-20 and Spectrum, covering graphics, music, utilities, etc.

Elan Computers Ltd Stand No 209
31-37 Hoxton Street
London N1 6NJ
Tel: 01 739 4142

The Elan computers are a new range of home micros researched, developed and manufactured in the UK.

These computers have many outstanding and innovative features, are highly expandable and easy to use to the full.

Elcomp Publishing, Inc Stand No 277
53 Redrock Lane
Pomona
CA91766 USA
Tel: 714 623 8314

Elcomp Publishing, Inc, of Pomona, California will introduce its largest range of books, software and add-ons for the Atari 600-1200XL series, VIC-20, Commodore 64, Spectrum and Apple II. Multi tasking word processors, powerful editors/

assemblers and Forth for these machines will be available at the Show. Catalogue available on request.

Electronequip Stand No 387
36/38 West Street
Fareham
Hants PO16 0JW
Tel: 0329 230670

Details unavailable at press time.

EMAP Business/ Consumer Publications Stand Nos 432/434
8 Herbal Hill
London EC1R 5JB
Tel: 837 3699

Talk to the bughunter who'll solve all your problems . . . See a new project . . . Browse through back numbers of some well-known magazines . . . Buy a specially designed T-shirt . . .

Games, projects, business computing, electronics, education, programming, minis, micros, home computing, personal computing and software. Something for everyone.

Encotel Systems Ltd Stand No 424
7 Imperial Way
Croydon Airport Industrial Estate
Croydon CRO 4RR
Tel: 01 680 6040

Details unavailable at press time.

Environmental Equipments (Northern) Ltd Stand No 160
64 Welsh Row
Nantwich
Cheshire CW5 5ES
Tel: 0270 625115

Environmental Equipments (Northern) Ltd is the sole UK agent for the Watanabe Instruments Corporation. On display will be a range of Watanabe's digital x-y plotters and supporting software. Plotters in the range vary in size from A3 to A10 with 1, 2, 4, 6 or 10 pens. All come with a high degree of built-in intelligence.

Federation of Microsystem Centres Stand No 412
The National Computing Centre
Oxford Road
Manchester M1 7ED

Free advice for small businesses:

The Federation of Microsystem Centres wishes to thank the organisers for the generous donation of exhibition space and facilities to help establish the Federation as the first point of contact for small businesses thinking about using a micro-computer.

The Federation formed in April 1983 and is being supported in its first two years of operation by the Department of Industry and co-ordinated by the National Computing Centre.

Future Computers Ltd Stand No 424
PO Box 306
Purley
Surrey
Tel: 0323 897 469

Featured will be the Future computers — the new F30 stand alone micro, for instance, with its integral hard disk giving five or 10 megabytes of high speed mass storage.

Also on show for the first time will be the FX30 with tape cartridge backup. The FX30 is the same full specification as the FX20.

Group 18 Ltd Stand No 382
Suite 104
16 Baldwins Gardens
London EC1
Tel: 01 242 2803

Details unavailable at press time.

Grundy Business Systems Ltd Stand No 366
Cambridge Science Park
Milton Road
Cambridge
CB4 4BH
Tel: 0223 350355

The latest addition for the NewBrain microcomputer is the modular CP/M disk system. Launched recently by Grundy Business Systems, the £603 version offers an ideal introduction to the use of CP/M, and for less than £1000 the businessman can make use of the full range of CP/M programs and additional languages.

Haslemere Computers Stand No 326
25 Junction Place
Haslemere
Surrey GU27 1LE
Tel: 0428 54428

Details unavailable at press time.

Iansyst Ltd Stand No 380
Omnibus Building
41 North Road
London N7 9DP
Tel: 01 607 5845

Following the launch of the Iankey crash course in keyboard skills, the Show sees the debut of Ianstal, the installation package which makes your software portable over many micros — currently 70+ named systems. It controls: cursor position, clear screen, bright/dim, inverse video and time functions, etc.

IBM UK Product Sales Ltd Stand No 443
PO Box 32
Alencon Link
Basingstoke
Hants RG21 1EJ
Tel: 0256 56144

Details unavailable at press time.

ICE Stand No 144
Littleton House
Littleton Road
Ashford
Middlesex
Tel: 07842 47271

ICE will display its range of mass storage, multiplexing and data backup products for micros.

ICE's winchester hard disks are now available in 5, 10, 20 and 42 megabyte configurations and are supported on almost all microcomputers. The ICE multiplexor provides multiterminal access to the ICE central data store while data can be backed up on ICE's tape streamer. All products carry a full year's on-site maintenance and warranty.

Ikon Computer Products Stand No 283
Kiln Lake
Laugharne
Carmarthen
Dyfed SA33 4QE
Tel: 099 421 515

The Hobbit floppy tape system is an alternative storage system for BBC computers, price £155.25 (incl). No disk interface is required. Fully automatic and random access files are supported. Up to seven times faster than domestic recorders. Zero memory option allows Hobbit to operate without using any user memory. Also available for Nascom computers.

Imagine Software Stand Nos F202/3
28 Exchange Street East
Liverpool L2 3PN
Tel: 051 236 0407

Details unavailable at press time.

Inter-Data Computer Systems Stand No 400
c/o 494 Brighton Road
South Croydon
Surrey
Tel: 01 668 3085

Details unavailable at press time.

International Computers Ltd Stand No 362
ICL House
Putney
London SW15
Tel: 01 778 7272

Details unavailable at press time.

Io Research Ltd Stand No 139
117-121 High Street
Barnet
Herts EN5 5UZ
Tel: 01 441 5700

Io Research will demonstrate its popular British colour graphics system, Pluto. Launching major additions to the range, the company will present the Mini Palette, Pluto Palette and Mega-Res boards. For the first time, the full system will be

A History of Management Part I.





Before we designed our expanded range of business microcomputers, we took a close look into the past – from stone tablets to electric typewriter. Never before have the demands of the businessman been so formidable. Today's manager requires total control over every aspect of his operations – instant information, worldwide communications, immediate response to changes in financial and trading conditions. He needs a total business management system.

At TORCH, we sell realities not prophecies, and today's reality is a range of hardware and software versatile enough and powerful enough to meet the demands of every business from a compact single-user system up to hundreds of networked machines providing massive processing power for a multi-national corporation.

In 1982, we revolutionised computing with the first fully communicating business micros – our highly acclaimed C-Series models. Our Z80 Disc Pack proved the most effective upgrade for the BBC Model B micro, providing twin 400K disc-drives and a Z80 processor.

We celebrated American Independence Day this year, by giving every British businessman the right to be independent of imported micro technology with our new 700-Series and 300-Series machines. Our 700 models incorporate a third processor – the Motorola 68000 with 288k RAM and able to run under full UNIX SYSTEM 3. Our 300-Series machines are intelligent workstations to utilise TORCHNET Local Area Networking.

We've come a long way from papyrus and quill pens. The TORCH microcomputer system can replace your typewriters and your filing cabinets, your ledgers and your telephones – not to mention your ageing uncommunicative computers. TORCH offers the next step in business management. Welcome to the future.

TORCH COMPUTERS

Perfectly Made in Britain

displayed, allowing 24 bits per pixel. Could this be the cheapest 24-bit graphics system in the world?

Ivysoft Stand No 462
91 Cleeve Drive
Ivybridge
Devon
Tel: 07554 4088

Details unavailable at press time.

Jarman Systems Stand No 363
6a Dolphin Square
Tring
Herts HP3 5BW
Tel: 044282 6841

Jarman is showing its range of proven software which includes invoicing, sales ledger, purchase ledger, nominal ledger, payroll and stock control applications. These systems are available on Apple, IBM PC and Sirius microcomputers. The software is distributed through a network of over 60 selected dealers.

Kansas City Systems Stand No 225
Unit 3
Sutton Springs Wood
Chesterfield
Derbyshire
Tel: 0246 850357

Details unavailable at press time.

Kempston Micro Electronics Ltd Stand No 279
Unit 30
Singer Way
Woburn Road
Kempston
Beds
Tel: Bedford 856633

Details unavailable at press time.

KGB Micros Ltd Stand No 344
106 St Leonards Road
Windsor
Berks SL4 3DD
Tel: Windsor 50111

KGB Micros is pleased to be appointed one of the first Wang Professional dealers in the UK. The full 8086 16-bit system will be shown with Wang's well-known word processing software as well as Multiplan and Graphics. KGB is specialising in graphics at the Show with AutoCAD and Microchart on the Sirius.

Kuma Computers Ltd Stand No 218
11 York Road
Maidenhead
Berks
Tel: 0628 71778

Details unavailable at press time.

Llamasoft Stand No 321
49 Mount Pleasant
Tadley
Hants RG26 6BN
Tel: 07356 4478

Llamasoft markets games software for the VIC-20, Atari, Commodore 64 and Spectrum microcomputers. Jeff Minter, Llamasoft's designer, is a games addict himself, and his aim is to produce original games of high quality with good graphics and sound, etc. A new game with an original theme will be introduced at the Show.

Loadrunner/Sinclair User Stand No 455
196-200 Balls Pond Road
London N1
Tel: 01 359 3525

Details unavailable at press time.

Longs Computer Products Stand No 354
Hanworth Lane
Chertsey
Surrey KT16 9LZ
Tel: 093 28 61241

A full range of computer peripherals, furniture and supplies will be on show, including: the Hermes 621 matrix printer, offering both letter and data quality printing; the Longs Micro-Lite '80' economy mini printer; the low cost VDU terminal; and the UNI-1 adjustable universal printer stand.

Lotus Development Corporation Stand No 156
161 First Street
Cambridge
MA02142
USA
Tel: 617 492 7171 ext 4408

Lotus designs, produces and markets application software for personal computers. 1-2-3, the integrated productivity tool which combines database, spreadsheet and graphing capabilities, has been a top seller since its release. 1-2-3 is a powerful, easy to use package. Having taken advantage of the IBM PC's enhanced functions, 1-2-3 is becoming available on a broad range of 16-bit personal computers.

Mannesmann Tally Stand No 448
Molly Millars Lane
Wokingham
Berks
Tel: 0734 788711

Details unavailable at press time.

Maplin Electronic Supplies Stand No 284
Unit A
Oak Road South
Hadleigh,
Essex
Tel: 0702 554001

A wide range of home computers and software will be on demonstration for you to try. In particular, Maplin will have the new Atari XL range, a low cost modem and lots of D-I-Y add-ons for popular home computers.

Mapsoft Ltd Stand No 257
Unit A
Oak Road South
Hadleigh
Essex
Tel: 0702 554001

Mapsoft is a distributor of software for home computers to the electrical, computing, record and toy trades. Copies of its colour catalogue will be available from the stand, giving details of available products, which will be on sale through dealers throughout the country.

Marketing Micro Software Stand No 149
Goddard Road
Ipswich
Suffolk
Tel: 0473 462721

Details unavailable at press time.

Mattel Electronics UK Ltd Stand No 215
3 Fulton Road
Wembley
Middx
Tel: 01 903 8722

Details unavailable at press time.

MC2 Ltd Stand No 324
262 The Broadway
Wimbledon
London SW19 1SB
Tel: 01 540 9370

MC2 brought you the Safer Storage system. This year a name is sought for MC2's new product — suggestions invited!

McGraw-Hill Book Co (UK) Ltd Stand No 457
Maidenhead
Berks SL6 2QL
Tel: 0628 23432

In the wake of the Osborne and Byte books, McGraw-Hill is launching a books-and-software series for users of low-cost British micros. Subjects range from a children's programming book for the ZX81, through Dragon games programming to Profile 1, a professional spreadsheet file handling program for the 48k Spectrum.

Melbourne House (Publishers) Ltd Stand No 244
Unit 4
224 Stanley Road
Teddington
Middlesex
Tel: 01 977 9160

Details unavailable at press time.

Memotech Ltd Stand No 129
Station Lane
Witney

Oxon
Tel: 0993 2977

Memotech is exhibiting the MTX500 and its newly launched 64k brother, the MTX512. Both will support up to 512k internal RAM, combinations of twin 5¼in floppies, 5¼in winchester and up to 32 quarter megabyte silicon disks. The two machines feature twin RS232 interfaces, networking and run CP/M 2.2. Fast High-res graphics are to be demonstrated using Continental Software games.

Microage Stand No 230
6 Sandbrook Close
Sundale Gardens
London NW7
Tel: 01 906 3666

Details unavailable at press time.

Microcomputer Products International Ltd Stand Nos 120-122
8-11 Central House
Cambridge Road
Barking
Essex
Tel: 01 734 2907

MPI Ltd, one of the UK's largest distributors of micro software, is demonstrating a wide range of 16-bit software running on the Sirius, IBM PC, DEC Rainbow, Wang Personal Computer, NCR's Decision Mate V and the new miracle portable micro.

Microdeal Ltd Stand Nos 220/222
41 Truro Road
St Austell
Cornwall PL25 5JE
Tel: 0726 67676

Microdeal has some new games for the Dragon 32 and is looking forward to meeting up with old and new friends. Tandy models I and III, Video Genie and TRS-80 Colour programs are all available, along with some interesting new products for these machines.

Micromark Stand No 107
Adam Court
Bell Street
Henley on Thames
Oxon RG9 2DM
Tel: 049 127 7926

Details unavailable at press time.

Micronet 800 Stand No 439
155 Farringdon Road
London EC1R 3AD
Tel: 01 278 3143

Micronet 800 is a unique system offering micro users access to hundreds of pages of free software, information and communications, as well as all the facilities of British Telecom's Prestel service. Access to Micronet is simply by connecting a micro to the telephone line via one of a range of modems.

Micronix Computers Ltd Stand No 348
Suite 2
26 Charing Cross Road
London WC2
Tel: 01 240 0213

Details unavailable at press time.

Micro Products Software Ltd Stand No 307
87/89 Saffron Hill
London EC1
Tel: 01 831 8811

Details unavailable at press time.

Microwave (London) Ltd Stand No 451
637A Holloway Road
London N19 55S
Tel: 01 272 6398

Details unavailable at press time.

Microwriter Ltd Stand No 155
31 Southampton Row
London WC1
Tel: 01 831 6801

Microwriter Ltd is announcing a dramatic cut in the cost of the hand-held five key word processor — the Microwriter will now cost £299.

Microwriter will demonstrate some alternative applications for the five key keyboard. A newly introduced leasing scheme means Microwriters are now available for as little as £10 per month.

Demonstrations include communications with microcomputers, electronic typewriters, printers, cassette recorders and word processors. Visitors are welcome to try Microwriting — it really can take under an hour to learn the alphabet!

Miniature Tool Co Stand No 206
26 Queensbury Station Parade
Edgware
Middx
Tel: 01 951 1183

Details unavailable at press time.

Moranbrook Ltd Stand No 256
(Computers for *all* dealers)
72 North Street
Romford
Essex RM1 1D7
Tel: 0708 752 862

Details unavailable at press time.

National Magazine Company Stand No 200
72 Broadwick Street
London W1V 2BP
Tel: 01 439 7144

Details unavailable at press time.

NEC Business Systems (Europe) Ltd Stand No 327
NEC House
164-166 Drummond Street
London NW1 3HP
Tel: 01 388 6100

NEC will be exhibiting, for the first time, its recently announced 16-bit Advanced Personal Computer and the 8/16-bit PC-8800. NEC's range of printers has been extended to include the new Spinwriter 2000, which will also be at the Show.

Opus Supplies Stand No 204
10 Beckenham Grove
Shortlands
Kent BR2 0JU
Tel: 01 464 5040

Details unavailable at press time.

Oric Products International Stand No 202
Coworth Park
London Road
Ascot
Berks
Tel: 0990 27641

Oric Products International will be exhibiting both the 16k and 48k versions of the Oric-1 microcomputer and offering visitors the opportunity of hands-on experience. Also on display will be the Oric MCP-40 four colour printer and sales and technical staff will be available to give advice and answer queries.

Paperlogic Ltd Stand No 440
12 Nottingham Place
London W1M 3FA
Tel: 01 935 0480

Details unavailable at press time.

Peachtree Software International Ltd Stand No 309
43/53 Moorbridge Road
Maidenhead
Berks
Tel: 0628 32711

Details unavailable at press time.

Pete & Pam Computers Stand No 345
New Hall
Hey Road
Rossendale
Lancs BB4 6JG
Tel: 0706 227011

Pete & Pam Computers boasts Britain's largest range of products for Apple computers and the IBM PC. At the Show will be a number of items of hardware and software for these machines — including the accelerator board, ultraterm, 1-2-3 and many others. A varied range of printers will be on display. Last but not least, Apple's new Lisa will be demonstrated.

Phoenix Technology Stand No 385
Unit 1

129/131 Coldharbour Lane
London SE5
Tel: 01 737 3333

Phoenix Technology, an importer and distributor of monitors and terminals, will display a new range of monitors. This includes the Luxor IBM configuration, a low cost display and new dark glass Phoenix monitors. A range of terminals will also be on display.

Pilot Software Ltd Stand No 103
10 King Edward Avenue
Chelmsford
Essex CM1 1LY
Tel: 0245 68371

Details unavailable at press time

Postern Ltd Stand No 285
PO Box 2
Andoversford
Cheltenham
Gloucestershire GL54 5SW
Tel: 04516 666

Details unavailable at press time.

Power Testing (Sales) Ltd Stand No 117
65a Shenfield Road
Shenfield
Brentwood
Essex CM15 8HA
Tel: 0277 233188

To protect your computer system against loss of mains power or against spikes and surges, Power Testing (Sales) Ltd manufactures the Power Bank. This device offers an uninterruptable power supply. It connects between computer and mains, affording complete protection to your hardware and software.

Premier Publications Stand No 275
208 Croydon Road
London SE20 7YX
Tel: 01 778 1706

Details unavailable at press time.

Prentice-Hall International Stand No 376
66 Wood Lane End
Hemel Hempstead
Herts HP2 4RG
Tel: 0442 58531

Over 200 titles covering the most popular microcomputers will be displayed for purchase on the Prentice-Hall stand. There will be major new titles for the BBC Computer, the ZX Spectrum, the Commodore 64 and other popular machines.

Also on show will be software for business, education and graphics.

Protek Computing Ltd Stand No 207
Clydesdale Bank Building
High Street
South Queensferry
Edinburgh EH30 9HW
Tel: 031 331 4400

Protek Computing Ltd is launching a new simulation program for the ZX Spectrum — Hunter-Killer. The program gives you control of a submarine hunting an enemy target. Protek's full software range and Spectrum joystick interface will also be on show.

Quicksilva Stand No 234
13 Palmerston Road
Southampton
Hants SO1 1LL
Tel: 0703 20169

Details unavailable at press time.

Rabbit Software Stand No 226
380 Station Road
Harrow
Middx
Tel: 01 863 0833

Details unavailable at press time.

Radio & Electronics World Stand No 211
200 North Service Road
Brentwood
Essex CM14 4SG
Tel: 0277 213819

R&EW will give demonstrations of its REWTEL service, the UK's first privately owned computer-accessible bulletin board, database and ordering system.

Exciting products from recent issues of R&EW will also be on show as well as a comprehensive range of leads, connectors and spares from the world of radio and electronics.

Rapid Terminals Stand No 118
Rapid House
Denmark Street
High Wycombe
Bucks
Tel: 0494 26271

Details unavailable at press time.

Romik Ltd Stand No 272
24 Church Street
Slough SL1 1PT
Tel: Slough 71535

Details unavailable at press time.

Salamander Software Stand No 254
27 Ditchling Rise
Brighton
East Sussex
Tel: 0273 771942

Details unavailable at press time.

SBD Software Stand No 268
15 Jocelyn Road
Richmond
Surrey TW9 2TY
Tel: 01 948 0461

Details unavailable at press time.

Semi-Tech Microelectronics (Europe) Ltd Stand No 349
145-147 Ewell Road
Surbiton
Surrey KT6 6AW
Tel: 01-390 6179

STM (Europe) Ltd introduces to the UK a versatile, portable business computer. This machine provides a built in floppy disk with a 1 megabyte capacity. It comes 'bundled' with software from PSI for word processing, database, dictionary and spreadsheet analysis, all for £1066.

Shards Software Stand No 253
189 Eton Road
Ilford
Essex IG1 2UQ
Tel: 01 514 4871

Shards is an expanding software house, specialising in the Dragon 32 but also producing software for the BBC, Spectrum, Lynx, Oric and the new Memotech MTX 500. Shards projects itself as a family-oriented company. producing educational software for all age groups as well as games. There will be many new releases at the Show.

Sharp Electronics (UK) Ltd Stand No 333
Thorp Road
Newton Heath
Manchester M10 9BE
Tel: 061 205 2333

Sharp Electronics will be exhibiting its full range of computers, to include the new MZ700 home computer.

A wide range of games, educational and adventure software cassettes are available. Also on show will be the PC1500 and PC2151 pocket computers and MZ80A personal computer.

Shiva Publishing Ltd Stand No 119
4 Church Lane
Nantwich
Cheshire CW5 5RQ
Tel: 0270 629440

Shiva's Friendly Micro Series includes a range of books for the beginner wishing to program the BBC Computer, Sinclair Spectrum and ZX81, Dragon and Oric. Authors include the successful duo Ian Stewart and Robin Jones, as well as Eric Deeson, Gordon Lee, Bruce Smith, Philip Crookall and Martin Wren-Hilton.

Silicon Chip Ltd Stand No 137
302 High Street
Slough
Tel: Slough 70639

Silicon Chip's Chipsoft package for the Atari 800 will make its exhibition debut at the Show. The package caters for the first time business computer buyer and includes stock control, sales and purchase ledger, PAYE and mail-shot. A range of books and the latest Atari machines will be

displayed throughout the Show.

Sinclair Research Ltd Stand Nos 217, 219, 221, 223
25 Willis Road
Cambridge
CB1 2AQ
Tel: Cambridge 353204

Sinclair will display applications for the ZX81 and Spectrum as well as new peripherals designed to expand the memory of the Spectrum. These include ZX Interfaces, including an RS232 interface for networking, the ZX Microdrives and ZX Microdrive cartridges. No sales will be made from the stand, but information on all Sinclair products will be available to customers.

Slotree Ltd Stand No 406
46 Charwood Road
Wokingham
Berkshire
Tel: Wokingham 791718

Details unavailable at press time.

Smallway Marketing Ltd Stand No 435
6 Lower Teddington Road
Hampton Wick
Kingston KT1 4BR
Tel: 01 743 1257

Details unavailable at press time.

Softsel Computer Products Ltd Stand No 154
Central Way
Feltham
Middlesex TW14 0XQ
Tel: 01 844 2040 or Freefone SOFTSEL

Softsel offers dealers in the UK and Europe a wide range of business, recreational and educational software for Apple, Texas, Atari, IBM, Commodore, DEC, Tandy and CP/M microcomputers from 180 publishers. Softsel also offers dealers such services as Dealer co-operative advertising, technical support and rapid order processing and deliveries.

Solidisk Technology Ltd Stand No 142
87 Bournemouth Park Road
Southend on Sea
Essex SS2 5JJ
Tel: 0702 618144

The *PCW* Show will be the official launch of the STL-PC, a 16-bit personal computer. For £1200 you'll get: Basic-86, Basic Compiler, WordStar, Supercalc-2, CP/M-86 or MS-DOS operating systems, 256k RAM, two double-sided, double-density 5¼in floppies, green monitor, IBM keyboard, two RS232s and nine expansion slots. Numeric processor and 10 megabyte hard disk are options.

Sportscene Specialist Press Ltd Stand No 152
14 Rathbone Place
London W1A 2HG
Tel: 01 631 1433

Details unavailable at press time.

Stirling Microsystems Ltd Stand No 304
241 Baker Street
London NW1 6XD
Tel: 01 486 7671

Details unavailable at press time.

System Stand No 105
12 Collegiate Crescent
Sheffield S10 2BA
Tel: 0742 682321

System produces high quality educational software for school, college and home use, and computer based training for industrial and commercial applications. For the serious programmer there are several tools and utilities. System also provides a complete advisory, programming and translation service for software producers.

Systematics International Microsystems Ltd Stand No 442
Cleves House
Hamlet Road
Haverhill
Suffolk CB9 8EE
Tel: 0440 61121

Details unavailable at press time.

TABS Ltd Stand No 336
Sopers House
Chantry Way
Andover
Hampshire
Tel: 0264 64166

TABS will be exhibiting programs to suit all levels of business at this year's Show. The new product range, EasyTABS, designed for smaller businesses and first time users, will be displayed. This will be together with the full TABS range, covering all accounting, order processing and office automation functions.

Tandy Corporation Branch UK Stand No 363
Tameway Tower
Bridge Street
Walsall
West Midlands WS1 1LA
Tel: 0922 648181

Details unavailable at press time.

TDI Ltd Stand No 438
29 Alma Vale Road
Clifton
Bristol BS8 2HL
Tel: 0272 742796

TDI will exhibit the multi-user Sage IV and announce new software which will come bundled with the micro.

The UCSD P-System will be there on machines such as the Sirius and IBM PC and also on several new micros.

Texas Instruments Ltd Stand No 265
Manton Lane
Bedford
Tel: Bedford 67466

TI will show its home computer, the TI99/4A, with the wide range of software available. Programs are available to cater for the needs of the beginner right through to the expert. Accessories and peripherals will also be on display. TI will also show the CC40, the recently announced first member of a new family of portable computers.

Thame Systems Ltd Stand No 337
Thame Park Industrial Estate
Thame
Oxon OX9 3RS
Tel: 084 421 5471

On display will be Thame's full range of WP printers and the 3COM Ethernet network for the IBM PC.

There will be an opportunity to evaluate the Brother range of low cost daisywheel printers and to see the NEC Spinwriter range with the IBM PC Compatible 3550. The Toshiba dual mode dot matrix printer will also be shown.

Time Computer Products Stand No 436
17 Liverpool Street
London EC2M 7PD

This company supplies magnetic media and all computer related products.

TCP has just introduced a product which offers two unusual options. OEMs, trade and other dealers should benefit from the mini disk, as company name and choice of colour are the two options not offered elsewhere.

Timedata Ltd Stand No 200a
16 Hemmells
Laindon
Basildon
Essex SS15 6ED
Tel: 0628 418121

Timedata Ltd will show its speech and sound add-ons for the ZX81 and Spectrum.

Timescape Software Stand No 266
8a Digby Road
Sutton Coldfield
West Midlands

Timescape Software is a new company producing Spectrum games. A reward is offered to anyone who can find a game more action-packed than its Robotron game. And on the Saturday, Timescape's two-man band, The Time Bandits, will enthrall and entertain visitors.

Transam Components Ltd Stand No 328
59/61 Theobalds Road
London WC1R 8SF
Tel: 01 405 5240

Details unavailable at press time.

1983 PCW SHOW PREVIEW

Ulster Management Centre Stand No 302
Manor House
Rathlin Island
County Antrim
N Ireland
Tel: 02657 71220

As well as a range of management training materials, Ulster Management Centre will demonstrate a game generator for the BBC, Apple, IBM, Sirius and Spectrum. Also on show will be a veterinary practice program on the Sirius, special service systems and a welfare benefits program on the Epson HX-20 — £850 complete with the computer.

Vector International Stand No 435
Becketts Wharf
Lower Teddington Road
Hampton Wick
Kingston
Tel: 01 943 1259

Vector International will show three ranges of products:

Everyman, a business management tool;

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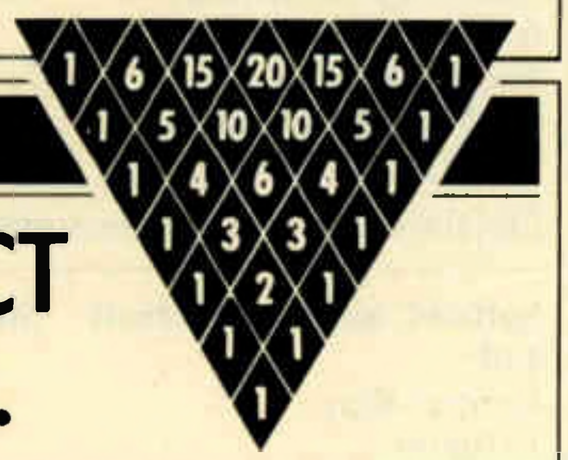
NUMBERS COUNT



ABUNDANT, DEFICIENT AND PERFECT NUMBERS... ALIQUOT SEQUENCES.

New readers start here. 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.

A proper divisor of an integer n is any positive integer divisor of n except n itself. f(n) denotes the sum of the proper divisors of n, and $f_k(n)$ denotes the sum of the kth powers of these divisors — eg, f(6) = 1+2+3=6, f(15) = 1+3+5=9.

The divisors of an integer n consist of the proper divisors of n, defined above, together with n itself. σ (n) denotes the sum of the divisors of n, and $\sigma_k(n)$ denotes the sum of the kth powers of these divisors. Thus σ (n) = f(n) + n, while $\sigma_k(n) = f_k(n) + n^k$.

n is Perfect if and only if σ (n) + 2n, *viz*, f(n) = n.

n is Abundant if and if only σ (n) > 2n.

nn is Deficient if and only if σ (n) < 2n.

eg, 6, 28, and 496 are perfect since:

1+2+3+6 = 2.6 = 12; 1+2+4+7+14+28 = 2.28 = 56;

1+2+4+8+16+31+62+124+248 = 2.248 = 496.

Since some numbers are known to be abundant and some deficient, it is natural to ask what happens when we iterate the function f(n) to produce an Aliquot Sequence $\{f^m(n)\}$ m = 1,2, . . . where by iteration we mean repeated application of the function, eg $f^3(15) = f(f(f(15))) = f(f(9)) = f(4)=3$.

Now E Catalan Bull, Soc Math France 16 (1887-88) pp128-129, conjectured that the iteration is either periodic or stops at the number 1.

There now exists a heuristic argument together with much experimental evidence to suggest that some sequences, perhaps almost all of those with n even, are of infinite length.

P Poulet has calculated that for n=936 we obtain the sequence 936, 1794, 2238, 2250, . . . 74, 40, 50, 43, 1 containing 189 terms, the greatest of which has 15 digits.

The smallest n for which the behaviour was in doubt was 138 but D H Lehmer eventually showed that, after reaching a maximum of $f^{117}(138) = 179931895322 = 2.61.929.1587569$, the sequence terminated at $f^{177}(138) = 1$.

The next value for which there continues to be real doubt is 276 $f^{469}(276) = 14938484659825484424390569599265141 2919855640$ reported to 3rd Conf Numerical Math Winnipeg 1973 by R K Guy, D H Lehmer, J L Selfridge and M C Wunderlich.

Problem

Submit a program, or suite of programs, to determine if a given integer is perfect, abundant or deficient . . . check that there are 23 odd abundant numbers less than 10,000 . . . use the same routine to iterate either the f(n) or σ (n) function and display the resulting sequences in the most useful manner to shed light upon the Catalan Conjecture.

All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order). A suitable prize will be awarded to the 'best' entry received.

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

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

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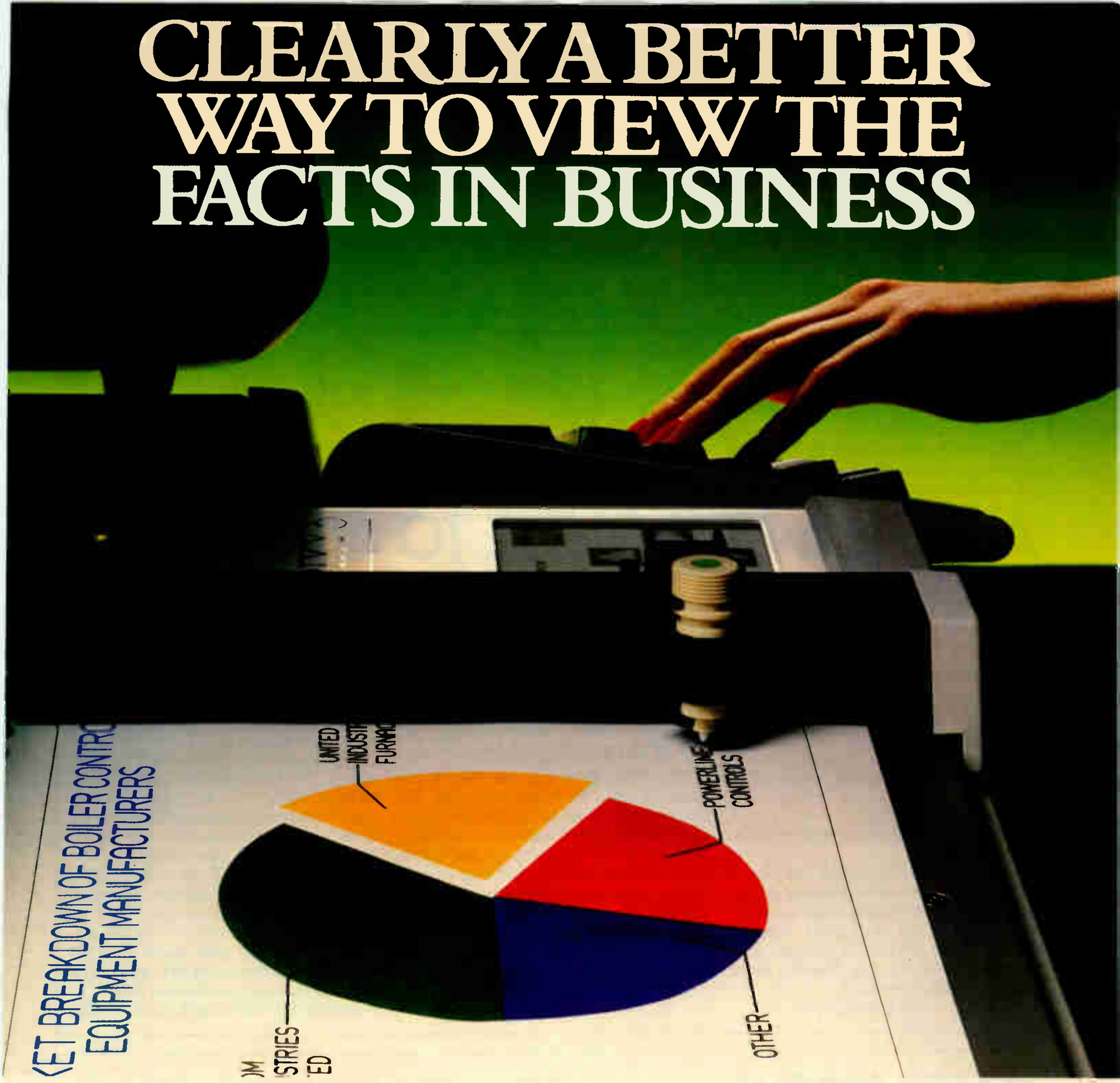

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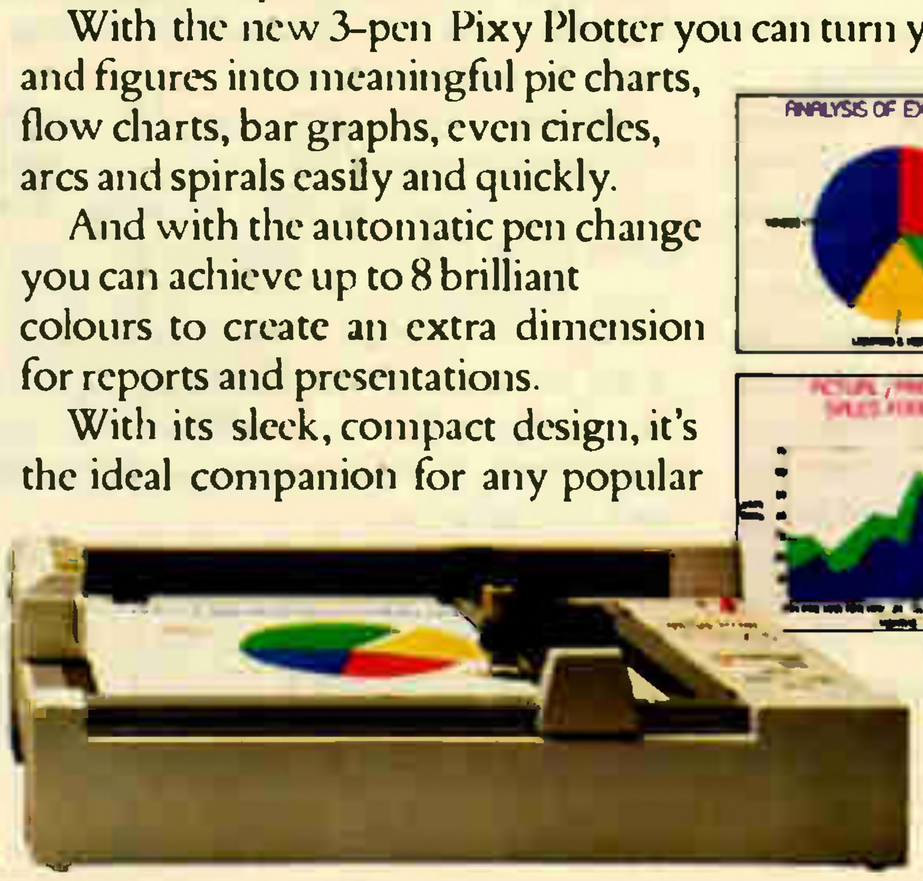

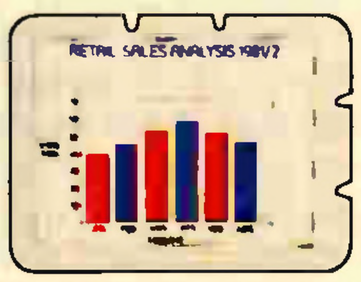



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INTER-GALACTIC MOVES

continued from page 199

position in which Black is under intolerable pressure. If now 30... Bh6-f4 31 g2-g3 e6xf5 32 g3xf4 Qa6-c6 33 Qb2-d2, and White wins a piece.)

30	...	e6xf5
31	Rd4xd5	Rd8xd5
32	Rd1xd5	Rf8-c8
33	Qb2-c2!	

(So that 33...Rc8xc2 is met by 34 Rd5-d8 mate.)

33	...	Qa6-e6

(Black might have tried 33...Rc8-f8, when 34 Qc2xf5 Qa6xa3 would prolong the struggle considerably.)

34	Nf3-d4	Qe6-e8
35	Rd5-c5	Rc8xc5
36	Qc2xc5	g7-g6
37	Qc5-d5	Qe8-c8
38	g2-g3	Qc8-c1+
39	Kg1-g2	Qc1-b2

(Pointless, but there was little that Black could do. If 39... Qc1-c8 40 e5-e6 f7xe6 41 Nd4xe6, and if 41... Qc8-c6 42 Qd5xc6 b7xc6 Ne6-d8, winning a pawn.)

40	e5-e6!	f7xe6
41	Qd5xe6+	Kg8-f8
42	Qe6-c8+	Kf8-e7
43	Qc8xb7+	Ke7-f6
44	Qb7-a6+	Kf6-f7
45	Qa6xa7+	Kf7-g8
46	Qa7-b8+	Bh6-f8
47	Nd4-e6	Qb2-f6
48	Qb8-c8	f5-f4
49	g3xf4	Qf6-f5
50	Qc8xf8+	Qf5xf8
51	Ne6xf8	Kg8xf8
52	a3-a4	

(and White won easily.) END

A BEGINNER'S GUIDE TO PROGRAM CONVERSION

continued from page 223

For example:

```
100 REM — Silly example
110 X=10
120 WHILE X>0
130 PRINT "The current value of X =";X;"."
140 X=X-1:WEND
150 REM – X is now zero and the WHILE test fails
```

In a WHILE-WEND loop, the loop is repeated while the test expression is true. A REPEAT-UNTIL loop works the other way around. All statements between REPEAT and UNTIL are executed until the test expression is true. Thus the above example would be written:

```
100 REM — Same silly example
110 X=10
120 REPEAT
130 PRINT "The current value of X =";X;"."
140 X=X-1:UNTIL X=0
150 REM – X is now zero and the REPEAT test is satisfied
```

Converting from one structure to the other is thus straightforward. But the majority of present-day Basics offer neither of the above. To create the same effect, we have to use a statement that causes purists to gasp in horror and head straight for the reassurance of their BBC micro: the GOTO.

Thus:

```
100 REM — Here we go again
110 X=10
120 PRINT "The current value of X =";X;"."
130 IF X>0 THEN X=X-1:GOTO120
140 REM – X is now zero and the test fails
```

While somewhat less elegant, the net result is the same. We can see that rewriting a WHILE-WEND or REPEAT-UNTIL structure is simply a matter of manually inserting the test (using IF-THEN) and pointer (GOTO).

**STRING$** is a statement which allows you to repeat a given sequence of characters. The format is STRING$(number of times to print string,string). If you wanted to print a line of asterisks across an 80-column screen, for example, you would state: STRING$(80,"*"). If your machine doesn't support this statement, then we fall back once again on the ever ready FOR-NEXT loop. Thus: FOR A=1 TO 80:PRINT"*";:NEXT, the string is simply duplicated, and the numeric argument placed in the FOR-NEXT loop.

TAB. This is supported by most machines, except that on the BBC micro the TAB function is performed by SPC while TAB prints in predetermined screen fields.

Next month: Graphics and sound END

MASTER PROFILES

continued from page 211

seems more healthy and personally satisfying than Bushnell's pathological compulsion to be doing something interesting.

Both men feel that governments should resist the urge to interfere in business activities. It only has the effect of slowing things down and this applies equally to development of new, or to the demise of existing, activities. They both feel that education needs a bit of a shake-up. Bushnell reckons that kids are being trained to become functionally useless in the twenty-first century while Sinclair feels that more emphasis should be placed on the art of living and a broader-based education for all covering both the arts and the sciences. Sinclair is particularly peeved that universities don't fulfil their potential. He describes university departments as being suspended in aspic. Each one pursues its own discipline and there is nowhere near enough intermingling between them. He has a dream of some future time when he can create a 'Paralab' containing multi-disciplinary people, people with deep and varied experiences, people who are keen to explore and develop ideas and pet theories for a few years with others of a similar outlook.

As well as these active people, Sinclair would like to have a group of wise people, savants, who would be there to listen, reflect and generally act as guides and sounding-boards. A well-stocked library would contain a wide and interesting selection of books, including some which would probably be regarded as somewhat eccentric by less open-minded people. His dreams for a Paralab reflect some of his frustrations with our 'system'. His preference for classically-educated employees in his Metalab suggests that they currently offer the best chances of success. The Paralab sounds just about the most exciting environment in which to work. I've no doubt that there will be few places available and that applicants will be vigorously screened. Imagine it: three years free of normal financial pressures, and the ability to pursue your own dreams and studies. If Sinclair is prepared to take that risk, and I'm sure he will, I think it could pay off handsomely.

Neither man seems to be terribly interested in money for its own sake, which is a refreshingly healthy attitude. They both regard it as a tool which must be put to work. Bushnell does admit, however, that it is a convenient way of keeping the score in his favourite game, business. They are each prepared to risk millions on their judgements of what products people will want in the future.

Bushnell talks about the day when you'll be able to jump into a machine in one of his Pizza Time Theatres and actually experience being anywhere in the world. Anywhere, that is, where he has installed

remote control robots. A 'player' in San Francisco could, through a satellite communication link, order a London-based robot out of its garage and control its progress around our capital. The player could actually experience walking round St Paul's Cathedral, getting lost in the Barbican or watching the changing of the guard. With a bit of holography it might even be possible for the booth to 'become' whatever part of London the robot happens to be in. Can you imagine that? Bushnell can and he's already admitted it.

Sinclair sees Britain becoming very strong in mind-based products. Expert systems can encode the knowledge of our best people on video-disks, say, and export them to any country which needs the expertise. Such systems would be great as personal doctors to take care of all the fairly simple jobs, freeing real doctors to do their jobs properly. Education could be packaged in the same way and we already know what can be done with computer programs. Video tapes, video disks, communications and computers are going to be central in our development and to our prosperity in the coming years. Like Bushnell, Sinclair sees robots as being important in the future, although his visions are not quite as bizarre as Bushnell's, who says things like: 'Robots will provide companionship and therapy for kids who can't make friends!' It may be true but it's an awful thought.

Oddly enough, their strongest dislikes are both to do with people whose ego gives them problems. Bushnell gets really mad when someone makes a mistake, knows it's a mistake but doesn't do anything about it because of loss of face, pride or whatever you want to call it. If this behaviour gets in the way of the bottom line then he completely freaks out. Sinclair, on the other hand, has a hearty dislike for people who present a facade of what they would like the world to think they are. He rather wickedly suggested that a lot of people in the City fell into this category. He loves openness and finds that he can relate to children well because most of them haven't yet learned to construct a facade. He is sad that his fame has meant a considerable loss of privacy.

And finally . . .

So there we have it. Each man deserves a full biography and I've no doubt that one day two people will become extremely wealthy simply by recording the lives of these two children of the twentieth century. In their different ways each is making a profound impact on our lives. Which is the most beneficial, only time will reveal. For the moment I'm proud that one of these visionaries is British.

END

SAGE 400

continued from page 232

enable the system to be used for multiple companies.

17. The printing of multiple labels will be enabled.
18. General improvements to the manual.

I had three lengthy sessions with Sage 400. One without the manual and two with. In my view either way one can expect little difficulty in following procedure if one understands basic book keeping.

Here are my conclusions:

1. There are no redundant key presses in Sage and it is executable efficiently. Delays can be a drag when printing, particularly if you have allocated a large number of accounts. However, you are not forced to print at any time, only when it is convenient to you.
2. 'Escapes' are provided from every routine, provided the cursor is at column 1.
3. There are some areas it cannot yet handle like stock control, order entry and invoicing and payroll but they are on the way.
4. At one point I was under the erroneous impression that production of daybooks (or journals) was not handled. The manual recommends using batch entry sheets and I began to think this was mandatory but this is not the case. Indeed I think the use of such things defeats the whole object of using a computer which to my mind should be the beast not the burden. Clearly, some minor cosmetic changes to the Menu could improve the whole package out of all proportion to the changes themselves.
5. It is a truly integrated suite. Many of the so-called integrated suites are often only partly integrated.
6. Without the changes listed above, I would have recommended this package to only the smallest business, but with them I have very few reservations in recommending this as undoubtedly the best value for money on the market today.
7. In my view it *does* do the job.

END

FUTURE FX 20

continued from page 203

far faster than most 8088s are run — the Sirius, for instance, clocks its processor at 5 MHz. Also, the FX20 uses special circuitry to refresh its dynamic RAMs; again using the Sirius as an example (because it uses the same version of Microsoft Basic), this has a significant effect on throughput as the Sirius uses its video circuitry to refresh the RAMs, thus taking over the system's internal bus and stopping the processor from doing its thing.

Don't worry if you don't understand these technicalities. What is important is that on the FX20, generally speaking, using an interpreted high level language like Basic will not involve as great a speed penalty as is the case on some other machines. And you can program in a high-level compiled language with the confidence that the decrease in software development time this brings about (as opposed to programming in assembler) will not cause a significant increase in program execution time. But I must stress that the chances are very high that many end users will notice no real difference.

Documentation

As is often the case when we test new machines, the documentation supplied was preliminary and needed much work to iron out inconsistencies (like using 'disk' and 'disc' interchangeably, sometimes within the same sentence) and omissions. However, it was written in a basically friendly and helpful style and included a brief tutorial on using SpellBinder. And it will be properly typeset, too.

Prices

FX20 with CP/M-86, utilities and SpellBinder	£1875
As above but with 5 Mbyte hard disk	£2800

Prices exclude VAT

Expansion

Lots of adds-ons are planned for the FX20, apart from RAM expansion. For a start, there'll be an IBM PC bus which will allow you to plug in IBM expansion boards, although some of these might be tricky to use from the software angle. Extra I/O boards are planned, along with a Z80 board and two levels of graphics capabilities, 640 × 250 medium resolution and an incredible 1280 × 500 high res, which will be something! On the comms side, an auto-dial modem and a telex interface are both in the pipeline, as are upgrade kits allowing you to move on to greater things higher up on the FX ladder.

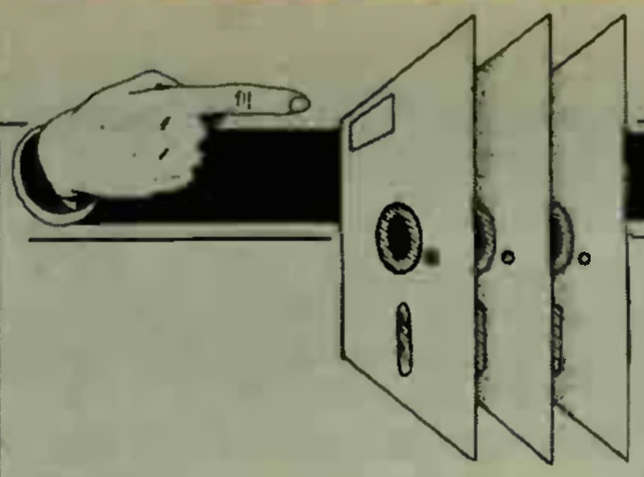
Conclusions

The Future Computers FX20 is a neat and powerful business micro. Although the case is rather large by today's standards — real estate costs money, even on the executive desk top — it is very robust and elegantly styled.

Although it may not always be apparent to the end user, the machine is capable of working much more quickly than similar computers and this combines with its ability to read IBM PC disks to make it a powerful and versatile business machine. There is now a large range of software available for both CP/M-86 and MS-DOS.

Its pricing and the built-in networking capability make the FX20 one of the most competitive micros around and — with the single reservation about doing its own thing, networkwise — Future Computers seems to be far more in tune with the micro world than many manufacturers now attacking this market.

END



PACKAGES

PCW's 'Packages' section is produced bi-monthly, alternating with our 'In Store' hardware guide. We have confined coverage to business packages which are available and supported at national level and which have been in use for at least six months in a minimum of five sites. Producers of packages which fall within these constraints should send for details or updates to: Tracy Dear, PCW, 62 Oxford Street, London W1.

The layout has been designed to allow you to discover which packages are available for the application you have in mind and to show you which packages are available for your computer if you already have a machine. In either case the code enables you to look up the supplier's name and telephone number in the table below.
All details published are the latest made available — some may have changed since this issue went to press.

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Tandy Model II	£165	M1
Credit control		
Apple II	£98	P2
CP/M	POR	G4
PET/CBM	£650	B4
Customer file		
CP/M	£900	G4
Famos	£1000	M2
Dairy mangement		
CP/M	£1500 +	C4
Database management retrieval		
ACT800	£225	H4
Apple II	£150	K2
Apple II	£60-140	S2
Apple II	£150	S5
Apple II	£75	P2
Apple II	£100	S4
Apple II	£100	C8
Apple II	£125	T2

Application/Machine	Price	Code
CP/M	£450	C4
CP/M	£100	G3
CP/M	£250	B3
CP/M	£295	G5
CP/M	£225-485	S9
CP/M	£155	X2
CP/M	£295	M4
Famos	£1500	M2
IBM	£295	M4
North Star Horizon	£250	B3
PET/CBM	£225	H4
PET/CBM	£50/150	C2
PET/CBM	£150	J1
PET/CBM	£150	G2
Superbrain	£300	S6
Tandy Model I	£25-90	M1
Tandy Model I	£60	S2
Tandy Model I	£150	J1
Tandy Model I	£32.50	M11
Tandy Model III	£270	A4
8000 Series	POR	C2
Debt collection		
CP/M	£150	G4
CP/M	£450	V2
Dental laboratory		
Apple II	£280	A6
Dental records		
Apple II	£1700	A6
CP/M	£500	G6
Department store order program		
Sorcerer	£2500	L2
Double glazing costing		
North Star Horizon	£750	W1
CP/M	£1500	V2
Earth parameter collection & Qualification		
CP/M	£95	M10
Grundy 8200	£95	M10
Eire payroll system		
CP/M	£650	M5
Engineering/computer-aided design		
Apple II	£300	S10
Estate agent		
Apple II	£850	S5
Apple II	£850	K1
Apple II	£175	P2
Apple II	£130	C8
Apple II	£750	S4
PET/CBM	£30	H3
CP/M	£700	B5
CP/M	£850	S9
Simpled Triton 3	£350	B3
MZ-80K	£195	W1
Superbrain	£600	S6
Superbrain	£600	C3
Equipment lease/rent/HP		
CP/M	£400	G1

Application/Machine	Price	Code
Expense analysis		
Philips P2000	£150	P4
Farm accounts		
CP/M	£750	C4
Financial & arable management		
CP/M	£2200	C4
File handling		
PET/CBM	£225	H4
PET/CBM	£645	D1
Financial modelling		
Act Sirius 1	£595	A1
Apple II	£450	P2
Apple II	£360	C8
CP/M	£400	G1
CP/M	£95	B5
CP/M	£425-535	A1
CP/M	£400	S11
CP/M	£400	V2
Cromemco	£95	B5
North Star Horizon	£95	B5
PET/CBM	£425-535	A1
PET/CBM	£250	D1
RAIR Black Box	POR	A3
Financial planning		
Act Sirius 1	£150	A1
Apple II	£250	S4
CP/M	£245	G4
CP/M	£90	X2
UCSD-P	£350	S4
Flare system design		
		S10
Fluid flow		
		S10
General ledger/NL		
Apple II	£300	S5
Apple II	£300	K2
Apple II	£455	P2
Apple II	£225	V1
Apple II	£295	C6
Apple II	£250P	S4
Apple II	£600	T2
Apple II	£490	L4
Apple II	£199	T5
CBN/8032	£350	W3
CP/M	£500	L3
CP/M	£375	L1
CP/M	£400	G1
CP/M	£400	M3
CP/M	£400	B5
CP/M	£275	S6
CP/M	£390	S7
CP/M	£250	B3
CP/M	£300	W1
CP/M	£425	S11
CP/M	£500	G6
CP/M	£400	M5
CP/M	£1000	B1
CP/M	£199	T5

PACKAGES

Application/Machine	Price	Code
CP/M	£950/1250	V2
CP/M	£400	M9
Cromemco	£400	B5
North Star Horizon	£250	B3
North Star Horizon	£400	M3
PCC 2000		
North Star Horion	£400	B5
PET/CBM	£200	C2
PET/CBM	£200	H3
PET/CBM	£199	T5
Philips P2000	£100	P4
Sharp PC3201	£450	P2
Superbrain	£400	M3
Superbrain	£400	S6
Tandy Model I	£90	M1
Tandy Model II	£200	M1
Tandy Model I	£225	M11
Tandy Model I	£225/325	T1
Tandy Model II	£425	T1
UCSD-P	£350	S4
Vector	£400	C5
8080 Z80	£357	L1
8080/Z80	£275	G3
General purchase transaction proc.		
CBM/8032	£495	S3
Greyhound race program		
Apple II	£750	M6
Health authority PPM		
Sorcerer	£2500	L2
Housing association package		
PET/CBM	POR	M7
Hotel billing		
Philips P2000	£500	P4
Hotel management		
CP/M	£750	H5
North Star Horizon	750	H5
RAIR Black Box	POR	A3
Incomplete records		
Act Sirius I	£1200	S1
Apple II	£250	S2
Apple II	POR	K1
Apple II	£425	P2
Apple II	£490	L4
CBM/8032	£150	W3
CP/M	£750	M3
CP/M	£250	B5
CP/M	£975	B3
CP/M	£750	W1
CP/M	£915	M5
CP/M	£155	C10
CP/M	£400	G4
Cromemco	£250	B5
North Star Horizon	£750	M3
North Star Horizon	£250	B5
North Star Horizon	£975	B3
Philips P2000	£150	P4
Superbrain	£750	M3
Superbrain	£1200	S1
Tandy Model I	£25-50	M1
Tandy Model I	£40	M11
Industrial cleaning package		
CP/M	£1000	B1
Industry Factory loading		
CP/M	£1000	X1
Industry work study		
DM5	£1000	X1
Inn Management		
Act Sirius I	£185	C7
Instrument logging		
Sorcerer	£500	L2
Insurance broker		
Act Sirius I	£450	C7
CP/M	POR	G4
Insurance renewals		
CBM/8032	£1200	S3
Integrated accts		
Act Sirius I	£795	O1
Apple II	£300	P2
Apple II	£855	V1
Apple II	£1500	T2
Apple II	£1470	L4
Apple II	£300	W2
Apple II	£199	T5
CBM/8032	£1500	P3
CP/M	£950	L1
CP/M	£750	C4
CP/M	£1100	G1
CP/M	£990	M3
CP/M	£690	B5
CP/M	£900	B5
CP/M	£950	B3
CP/M	£1200	S11
CP/M	£199	T5
CP/M	£3400	M9
Cromemco	£690	B5
Cromemco	£900	B5

Application/Machine	Price	Code
Famos	£2000	M2
MZ-80K	£150	P2
North Star Horizon	£950	B3
North Star Horizon	£690	B5
North Star Horizon	£900	B5
PET/CBM	£800	S3
PET/CBM	£199	T5
North Star Horizon	£990	M3
PET CBM	(£50)	C2
PET/CBM	£650	J1
PET/CBM	£650	G2
Philips P2000	£650	P4
Sirius	£1250	I4
Superbrain	£990	M3
Superbrain	£1200	S6
Superbrain	£1000	T3
Superbrain	£1200	S1
Tandy Model I	£300	M1
Tandy Model II	£600	M1
Tandy Model I	£75	J1
Tandy Model II	£795	O1
Tandy Model III	£550	A4
Vector	£1000	C5
Vector	£1250	I4
8000 Series	POR	C2
8080 Z80	£950	L1
8080/Z80	£995	G3
Investment portfolio		
Tandy Model I	£20	S2
Invoicing		
Act Sirius I	£95	C7
Act Sirius I	£265	O1
Act Sirius I	£195	A1
Apple II	£295	S2
Apple II	£300	P2
Apple II	£140	V1
Apple II	£1000	T2
Apple II	£199	T5
Challenger	£25	C7
CP/M	£325	L1
CP/M	£250	M3
CP/M	£250	S7
CP/M	£100	B5
CP/M	£100	B3
CP/M	£300	W1
CP/M	£300	B1
CP/M	£199	T5
CP/M	£400	G4
CP/M	POR	W4
CP/M	£400	M9
CP/M	£249	P1
CP/M	£280	U1
CP/M	£390	H1
Cromemco	£100	B5
IBM	£390	H1
North Star Horizon	£100	B3
North Star Horizon	£250	M3
North Star Horizon	£100	B5
PET/CBM	£350	A1
PET/CBM	POR	J1
PET/CBM	£199	T5
Philips P2000	£150	P4
Sorcerer	£290	L2
Superbrain	£250	M3
Superbrain	£150	S6
Tandy Model I	£90	M1
Tandy Model II	£200	M1
Tandy Model I	£25	M11
Tandy Model I	£75	T1
Tandy Model II	£125	T1
Tandy Model II	£265	O1
Tandy Model III	£280	A4
UCSD-p	£350	S4
8080/Z80	£325	L1
8080/Z80	£390	H1
Jewellers System		
CP/M	£1000	S7
CP/M	POR	G4
Job costing		
Act Sirius I	£350	C7
Act Sirius I	£265	O1
Apple II	£990	X1
Apple II	£199	T5
CBM/8032	£350	W3
CP/M	£350	M3
CP/M	£990	X1
CP/M	£395	G6
CP/M	£450	M5
CP/M	£300	B1
CP/M	£199	T5
BOS	£1500	T4
CP/M	£1500	V2
CP/M	£1000	X1
CP/M	£600	A2
CP/M	£495	C9
IBM	£495	C9
North Star Horizon	£350	M3
PET/CBM	£199	T5
Philips P2000	£400	P4
Sirius	£495	C9
Superbrain	£350	M3
Tandy Model II	£265	O1
UCSD-p	£350	S4
Job order control		
8080/Z80	£275	G3

Application/Machine	Price	Code
Legal precedents		
CP/M	£1150	C4
Leisure		
Apple II	£550	W5
Letter writer		
Apple II	£80	V1
Apple II	£99	T5
CP/M	£150	M3
CP/M	£99	T5
CP/M	POR	G4
North Star Horizon	£150	M3
Superbrain	£150	M3
Local government housing maint		
RAIR Black Box		
POR	A3	
Magazine subscriber		
CP/M	£950	S9
Mailing List		
Apple II	£50-150	S2
Apple II	£300	S5
Apple II	£300	K1
Apple II	£40	P2
Apple II	£100	S4
CP/M	£450	C4
CP/M	£250	G1
CP/M	£75	S9
CP/M	POR	G4
CP/M	£250	U1
CP/M	£149	M4
IBM	£149	M4
North Star Horizon	£195	W1
PET/CBM	£15	A1
PET/CBM	£35	H3
Sorcerer	£290	L2
Tandy Model I	£40	M1
Tandy Model II	£62-50	M1
Tandy Model I	£50-150	S2
Tandy Model I	£25/38/55	H1
Mail shot		
Act Sirius I	£95	A1
Apple II	£14	S2
Apple II	£40	P2
Apple II	£25	T2
Apple II	£99	T5
CBM/8032	£350	W3
Challenger	£25	C7
CP/M	£450	C4
CP/M	£90	M3
CP/M	£100	S7
CP/M	£50/150	G5
CP/M	£99	T5
MCZ Zilog	£250	I1
North Star Horizon	£90	M3
Superbrain	£90	M3
Tandy Model I	£75 +	G4
Tandy Model II	£75 +	G4
Tandy Model III	£160	A4
Membership accting		
Apple II	£75	P2
CP/M	POR	G4
MCZ Zilog	£250	I1
Motor Dealer		
Act Sirius I	£345	C7
CBM/8032	£950 +	P3
CP/M	POR	G4
Famos	£5000	M2
NEDO price adjustment		
Apple II	£200	S8
Nominal ledger Order entry/invoicing		
CP/M-86	£500	O2
Apple II	£99	T5
CBM/8023	£750	P3
CP/M	£350	G1
CP/M	£395	G6
CP/M	£300	M5
CP/M	£550	L1
CP/M	POR	B1
CP/M	£99	T5
CP/M	£400	M9
CP/M	£249	P1
IBM	£395	B2
8080/Z80	£550	L1
Order Processing		
AppleII	£99	T5
CP/M	£99	T5
CP/M	£500	G4
CP/M	£400	M9
Philips P2000	£200	P4
Sirius	£400	I4
Vector	£400	I4
Office admin		
Apple II	£100	S4
Pad to plotter systems		
Apple II	£250	P2
Apple II	£180	C8
Payroll		
Act Sirius I	£300 +	O1
Act Sirius I	£195	A1
Apple II	£200	S2
Apple II	POR	S5
Apple II	POR	K1

Application/Machine	Price	Code
Apple II	£200	P2
Apple II	£375	V1
Apple II	£375	C6
Apple II	£250P	S4
Apple II	£490	L4
Apple II	£199	T5
CBM/8032	£375	P3
CBM/8032	£350	W3
Challenger	£24	C7
CP/M	£450	L3
CP/M	£475	L1
CP/M	£450	C4
CP/M	£500	G1
CP/M	£390	M3
CP/M	£500	B5
CP/M	£350	B3
CP/M	£425	G11
CP/M	Lease	W1
CP/M	£495	G6
CP/M	£450	M5
CP/M	£300	B1
CP/M	£199	T5
CP/M	£395	G4
CP/M	POR	W4
CP/M	£600	M9
CP/M	£325	M12
CP/M-86	£500	O2
Famos	£1500	M2
North Star Horizon	£350	B3
North Star Horizon	£390	M3
North Star Horizon	Lease	W1
PET/CBM	£200/350	C5
PET/CBM	£400	I2
PET/CBM	£150	G2
PET/CBM	£150	J1
PET/CBM	£150	C2
PET/CBM	£10	H3
PET/CBM	£199	T5
Philips P2000	£300	P4
Scorcerer	£250	L2
Sirius	£600	I4
Superbrain	£390	M3
Superbrain	£400	S6
Superbrain	£250 +	T3
Tandy Model I	£200	M11
Tandy Model I	£218	T1
Tandy Model II	£375	T1
Tandy Model II	£300 +	O1
UCSD-p	£350	S4
8000 Series	£250	C2
8080/Z80	£475	L1
8080/Z80	£275	G3
PET/CBM	£150	G2
PET/CBM	£150	J1
PET/CBM	£150	C2
Sorcerer	£250	L2
Tandy Model I	£249	M1
TRS-80	£200	M11
TRS-80I	£218	K1
TRS-80I	£218	T1
TRS-80II	£375	T1
8000 Series	£250	C2
8080/Z80	£475	L1
8080/Z80	£275	G3
Victor	£600	I4
Perpetual Inventory		
CP/M	£150	B5
Cromemco	£150	B5
Personnel records		
Apple II	£98	P2
CP/M	£450	C4
MCZ Zilog	£400	I1
Petaid report generator		
PET/CBM	£250	S3
Petsoft programs		
PET/CBM	£160	J1
Pig management		
CP/M	£1250	C4
Pipeline pressure drops		
Apple II		S10
Pipeline sizing		
Apple II		S10
Point of sale		
CP/M	£400	M9
Postal advertising response packages		
Apple II	£350	S2
Price lister		
PET/CBM	£12	H3
Product Management		
Act Sirius I	£245	C7
Production analysis		
Apple II	£75	P2
Production control		
CBM/8032	£650 +	P3
CP/M	£2400	V2
PET/CBM	£650 +	P3
Prof appts groups		
8080/Z80	£275	G3
Prof appts individ		
8080/Z80	£220	G3

PACKAGES

Application/Machine	Price	Code
Prof client billing		
8080/Z80	£330	G3
Programming aids		
Apple II	£40	P2
Project mangagement		
Apple	£695	M13
CBM/8032	990	C11
IBM	1100	M13
IBM	1600	C11
Sirius	990	M13
Sirius	1600	C11
Victor	£990	M13
Property management		
CP/M	£750--15000	C4
CP/M	£400	M3
CP/M	£1000	B1
North Star Horizon	£400	M3
Superbrain	£400	M3
UCSD-p	£175	S4
Publishers System		
CP/M	£1850	S7
Purchase ledger		
Act Sirius 1	£395	A1
Apple II	£300	S5
Apple II	£300	K1
Apple II	£295	C6
Apple II	£300	P2
Apple II	£315	V1
Apple II	£250P	S4
Apple II	£300	T2
Apple II	£490	L4
Apple II	£199	T5
Challenger	£25	C7
CBM/8032	£350	W3
CP/M	£450	G1
CP/M	£500	L3
CP/M	£425	L1
CP/M	£400	M3
CP/M	£400	B5
CP/M	£395	S7
CP/M	250	B3
CP/M	£300	W1
CP/M	£425	S11
CP/M	£495	G6
CP/M	£200	M5
CP/M	£300	B1
CP/M	£199	T5
CP/M	£950--1250	V2
CP/M	POR	W4
CP/M	£400	M9
CP/M	£400	G4
CP/M	£450	U1
CP/M	£495	X2
CP/M-86	£500	O2
Cromemco	£400	B5
North Star Horizon	£250	B3
North Star Horizon	£400	M3
North Star Horizon	£400	B5
Sorcerer	£490	L2
Sirius	£325	I4
Superbrain	£400	M3
Superbrain	£300	S6
PET/CBM	£300	B4
PET/CBM	£200	C2
PET/CBM	POR	J1
PET/CBM	£350	H3
PET/CBM	£199	T5
Philips P2000	£200	P4
Sharp PC3201	£300	P2
Tandy Model I	£90	M1
Tandy Model II	£200	M1
Tandy Model I	£225	M11
Tandy Model I	£225	T1
Tandy Model II	£375	T1
UCSD-p	£350	S4
Vector	£400	C5
Victor	£325	I4
8000 Series	£250	C2
8080/Z80	£275	G3
8080/Z80	£425	L1
Quotation estimating		
Act Sirius 1	£125	C7
CP/M	POR	G4
Philips P2000	£400	P4
Recruitment Agency		
Act Sirius 1	£345	C7
Reinforcement bar schedule		
Apple II	£150	S8
Relief valve sizing		
Apple II		S10
Renewals ledger		
Philip P2000	£200	P4
Report generator		
CP/M	POR	G4
Requirements planning		
CP/M	£700	V2
Resource optimiser		
Apple II	£295	C10

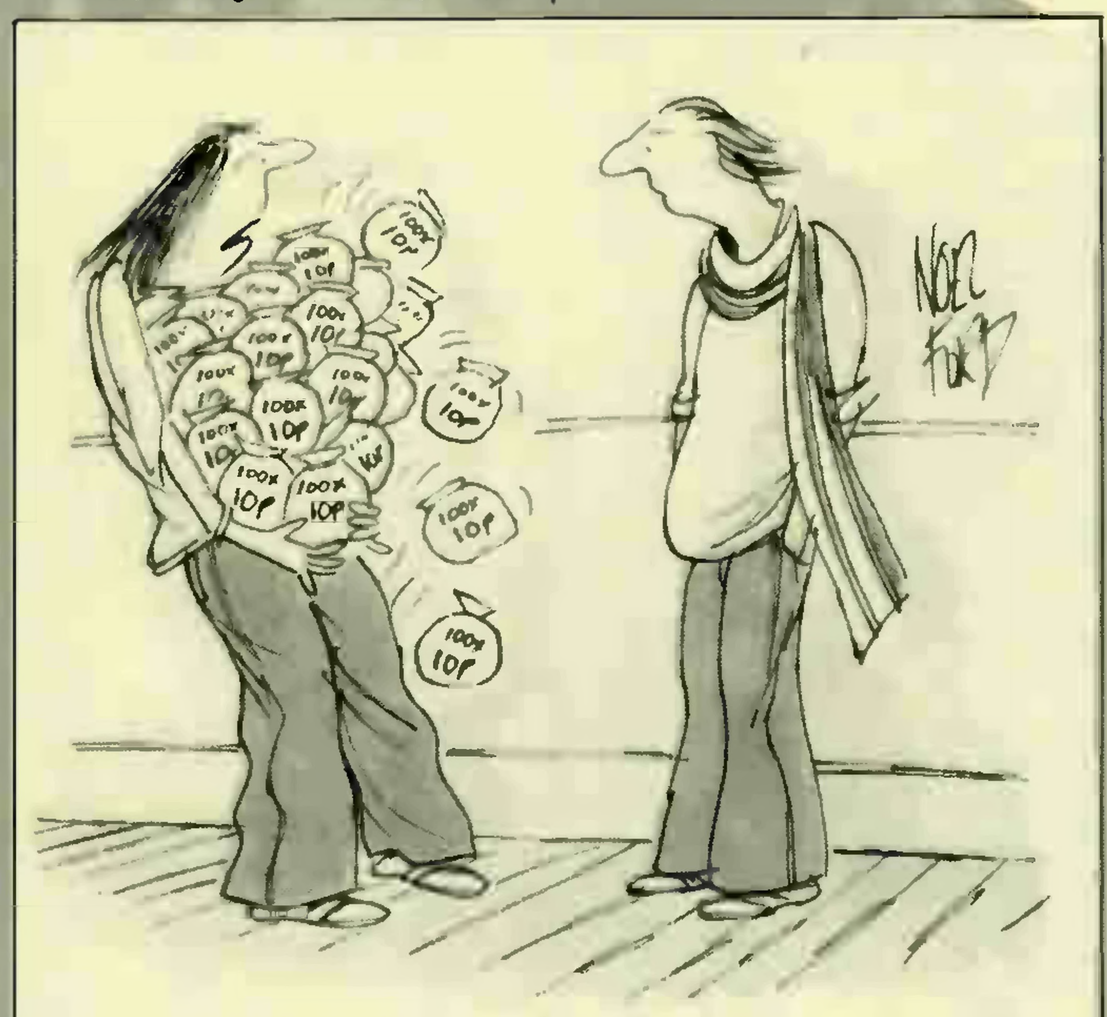
Application/Machine	Price	Code
Sales ledger		
Act Sirius 1	£395	A1
Apple II	£300	S5
Apple II	£300	K1
Apple II	£295	C6
Apple II	£300	P2
Apple II	£315	V1
Apple II	£250P	S4
Apple II	£600	T2
Apple II	£490	L4
Apple II	£199	T5
CBM/8032	£350	W3
Challenger	£25	C7
CP/M	£450	G1
CP/M	£500	L3
CP/M	£425	L1
CP/M	£400	M3
CP/M	£400	B5
CP/M	£365	S7
CP/M	£350	B3
CP/M	£300	W1
CP/M	£425	S11
CP/M	£495	T4
CP/M	£200	M5
CP/M	£300	B1
CP/M	£199	T5
CP/M	£400	G4
CP/M	£950--1250	V2
CP/M	POR	W4
CP/M	£400	M9
CP/M	£249	P1
CP/M	£390	H1
CP/M-86	£500	O2
Cromemco	£400	B5
IBM	£390	H1
North Star Horizon	£250	B3
North Star Horizon	£400	M3
North Star Horizon	£400	B5
PET/CBM	£300	B4
PET/CBM	£800	C1
PET/CBM	POR	J1
PET/CBM	£200	C2
PET/CBM	£350	C7
PET/CBM	£199	T5
Philips P2000	£200	P4
Sharp PC 3201	£300	P2
Sorcerer	£490	L2
Superbrain	£400	M3
Superbrain	£300	S6
Superbrain	£199	T5
Tandy Model I	£90	M1
Tandy Model II	£90	M1
Tandy Model I	£225	M11
Tandy Model I	£225	T1
Tandy Model II	£375	T1
UCSD-p	£350	S4
Vector	£400	C5
8000 Series	£250	C2
8080/Z80	£275	G3
8080/Z80	£425	L1
8080/Z80	£390	H1
Typing tutor		
CP/M	£50-125	A5
Utilities		
Apple II	£40	P2
Apple II	£20	C6
CP/M	£50	B5
ITT 2020	£20	C6
Utility set		
PET/CBM	£78	H3
Various engineering		
Tektronix		E1
Various thermal insulation industry systems		
BOS	£2000+	T4
Hewlett Packard		E1
VAT master		
PET/CBM	£25	H3
VAT register		
Tandy Model I	£15	M11
Video hire system		
Act Sirius 1	£125	C7
CP/M	£499	G4
CP/M	£795	L5
Tandy Model III	£460	A4
Video message		
Apple	£200	G3
Warehousing		
CBM/8032	POR	S1
CBM/8032	£375	P3
Word processing		
ACT 800	£375	H4
Act Sirius 1	£295-325	A1
Act Sirius 1	£295+	O1
Apple II	£60	S2
Apple II	£75	K1
Apple II	£75	S5
Apple II	£150-300	P2
Apple II	£75	J1
Apple II	£120	V1
Apple II	£180/95	S4
Apple II	£30	C8
Apple II	£500	T2

Application/Machine	Price	Code
Apple II	£99	T5
CP/M	£260	C4
CP/M	£400	G1
CP/M	£250	M3
CP/M	£250	S11
CP/M	£1000	B1
CP/M	£99	T5
CP/M	£420	V2
CP/M	£295	X2
CP/M	£350	M12
CP/M	£295	M4
Famos	£500	M2
IBM	£295	M14
IBM	£375	B2
North Star Horizon	£250	M3
PET/CBM	£375	H4
PET/CBM	£325	C5
PET/CBM	£75/150	C2
PET/CBM	£75/150	J1
PET/CBM	£75/150	G2
PET/CBM	£35	H3
PET/CBM	£249	P5
Philips P2000	£230	P4
Superbrain	£250	M3
Tandy Model I	£50/75	M1
Tandy Model II	£74-50	M1
Tandy Model I	£200	S2
Tandy Model I	£45/95	J1
Tandy Model I	£15	H1
Tandy Model II	£295+	O1
Vector	£400	C5
8000 Series	£250	C2
Work In Progress		
CP/M	£850	B5

MACHINES

Application/Machine	Price	Code
ACT 800		
Database management/	£225	H4
Word processing	£375	H4
Act Sirius 1		
Appointments planner	£115	C7
Building est	£325	C3
Building services	POR	H2
Financial modelling	£595	A1
Financial planning	£150	A1
Incomplete records	£1200	S1
Inn Management	£185	C7
Insurance Broker	£450	C7
Integrated Accts	£495	A1
Integrated Accts	£795	O1
Integrated Accts	£1250	I4
Invoicing	£95	C7
Invoicing	£265	O1
Invoicing	£195	A1
Job Costing	£350	C7
Job Costing	£265	O1
Job Costing	£495	C9
Mailing list	£95	A1
Motor Dealer	£345	C7
Order processing	£400	I4
Payroll	£300+	O1
Payroll	£195	A1
Payroll	£600	I4
Project Management	£245	C7
Project Management	£900	M13
Project Management	£1600	C11
Purchase ledger	£395	A1

Application/Machine	Price	Code
Purchase ledger	£325	I4
Quotation Estimating	£125	C7
Recruitment agency	£345	C7
Sales Ledger	£395	A1
Solicitors package	£1400	S1
Stock control/recording	£265	O1
Stock control/recording	£195	A1
Stock control/recording	£495	C9
Time/cost recording	£800	S1
Video hire system	£125	C7
Word processing	£295/325	A1
Word processing	£295+	O1
Apple II		
Appointments planner	£300	A6
Bill of materials	£199	T5
Budgeting	£125	T2
Building estimating	£570	S8
Building services	POR	H2
Building services	POR	I3
Cash flow	£80	V1
Cash flow	£75	P2
Cash flow	£100	C8
Construction cashflow	£75	S8
Construction expenditure	£250	S8
Construction financial control	£750	S8
Construction valuations	£500	S8
Database management/ information retrieval	£150	K1
Database management/ information retrieval	£60-140	S2
Database management/ information retrieval	£150	S5
Database management/ information retrieval	£98	P2
Database management/ information retrieval	£100	S4
Database management	£75	P2
Database management	£100	C8
Database management	£125	T2
Dental laboratory	£280	A6
Dental records	£1700	A6
Engineering/computer-aided design	£300	S10
Estate agent	£850	S5
Estate agent	£850	K1
Estate agent	£750	S4
Estate agent	£130	C8
Financial modelling	£360	C8
Financial planning	£250	S4
Flare system design		S10
Fluid flow		S10
General ledger/NL	£300	K1
General ledger/N/L	£450	P2
General ledger/NL	£300	S5
General ledger/NL	£225	V1
General ledger/NL	£295	C6
General ledger/NL	£250P	S4
General ledger/NL	£600	T2
General ledger/NL	£490	L4
General ledger/NL	£199	T5
Greyhound race program	£750	M6
Incomplete records	POR	K1
Incomplete records	£250	S2
Incomplete records	£450	P2
Incomplete records	£490	L4
Integrated accts	£885	V1
Integrated accts	£300	P2
Integrated accts	£1500	T2
Integrated accts	£300	W2



'It finally came through—my video game arcades syndrome research grant.'

PACKAGES

Application/Machine	Price	Code
Integrated accts	£1470	L4
Integrated accts	£199	T5
Invoicing	£295	S2
Invoicing	£300	P2
Invoicing	£140	V1
Invoicing	£300	P1
Invoicing	£1000	T2
Invoicing	£199	T5
Job costing	£450	S2
Job costing	£990	X1
Job costing	£199	T5
Leisure	£550	W5
Letter writer	£99	T5
Mailing list	£300	K1
Mailing list	£40	P2
Mailing list	£50-150	S2
Mailing list	£300	S5
Mailing list	£100	S4
Mailing List	£25	T2
Mail shot	£14	S2
Mail shot	£225	P2
Mail shot	£99	T5
NEDO price adjustment	£200	S8
Order entry/invoicing	£99	T5
Order Processing	£99	T5
Pad to plotter system	£250	P2
Pad to plotter system	£180	C8
Payroll	POR	S5
Payroll	POR	K1
Payroll	£200	S2
Payroll	£375	V1
Payroll	£200	P2
Payroll	£375	C6
Payroll	£250P	S4
Payroll	£400	T2
Payroll	£490	L4
Payroll	£199	T5
Personal records	£75	P2
Pipeline pressure drops		S10
Pipeline sizing		S10
Postal advertising response package	£350	S2
Production analysis	£75	P2
Programming aids	£40	P2
Project Management	£695	M13
Purchase ledger	£300	K1
Purchase ledger	£300	P2
Purchase ledger	£300	S5
Purchase ledger	£315	V1
Purchase ledger	£295	C6
Purchase ledger	£250P	S4
Purchase ledger	£300	T2
Purchase ledger	£490	L4
Purchase ledger	£199	T5
Reinforcement bar schedule	£150	S8
Relief valve sizing		S10
Resource optimiser	£295	C10
Sales ledger	£300	K1
Sales ledger	£300	S5
Sales ledger	£300	P2
Sales ledger	£315	V1
Sales ledger	£295	C6
Sales ledger	£250P	S4
Sales ledger	£600	T2
Sales ledger	£490	L4
Sales ledger	£199	T5
SL, PL stock control	£1000	T2
Solicitor's complete record accounting	£3000	S2
Statistics	£150	G3
Statistics	£100/195	P2
Statistics	£100-195	P2
Statistics	£140	C8
Stock control/recording	£150	G3
Stock control/recording	POR	K1
Stock control/recording	£300	P2
Stock control/recording	£80	S2
Stock control/recording	POR	S5
Stock control/recording	£285	V1
Stock control/recording	£500	S4
Stock control/recording	£490	L4
Stock control/recording	£199	T5
Storage tank costing/volumes		S10
Text file librarian	£125	S4
Time/cost recording	£450	S2
Utilities	£20	C6
Video message	£200	G3
Word processing	£75	K1
Word processing	£60	S2
Word processing	£300	P2
Word processing	£75	S5
Word processing	£120	V1
Word processing	£75	J1
Word processing	£180/95	S4
Word processing	£30	C8
Word processing	£500	T2
Word processing	£99	T5
BBC		
Bill of materials	£95	M10
CBM/8032		
Cheque writer	£90	P3
General ledger/NL	£350	W3
General purpose transaction proc.	£495	S3
Incomplete records	£150	W3
Insurance renewals	£1200	S3
Integrated accts	£1500	P3
Job costing	£350	W3
Mailing list	£350	W3
Motor trader	£950+	P3
Order entry/invoicing	£750	P3
Payroll	£375	P3
Payroll	£350	W3
Production control	£650+	P3
Project Management	£990+	C11
Purchase ledger	£350	W3
Sales ledger	£500	C11
Sales ledger	£350	W3
Solicitors package	£140	S1
Stock control/recording	£175	P3
Stock control/recording	£250	C11
Stock control/recording	£350	W3
Time/cost recording	£800	S1
Warehousing	£375	P3
Challenger		
Appointment Planner	£25	C7
Invoicing	£25	C7
Mail Shot	£25	C7
Payroll	£25	C7
Purchase Ledger	£25	C7
Sales Ledger	£25	C7
Stock Control	£25	C7
CP M		
Appointments planner	POR	G4
Arable recording & costing	£1500	C4
Architects package	£750	M6
Auction package	£700	M6
Bill of materials	£500	B5
Bill of materials	£199	T5
Bill of materials	£400	G4
Bill of materials	£850	V2
Bill of materials	£95	M10
Bill of materials	£390	H1
Bookmakers package	£1000	B1
Budgeting package	£95	B5
Builders est	£325	C9
Bursar Package	POR	M8
Cash flow	£250	L3
Cash flow	£95	B5
Cash register	£300	G6
Company secretary	£650	C4
Container accounting	£1250	M5
Contract costing	£2000	L3
Credit control	POR	G4
Customer file	£900	G4
Dairy management	£1500+	C4
Database	£350	B3
Database management/ information retrieval	£450	C4
Database management/ information retrieval	£100	G3
Database management/ information retrieval	£400	C3
Database management/ information retrieval	£600	G5
Database management/ information retrieval	£225-485	S9
Database management/ information retrieval	£450	V2
Database management/ information retrieval	£155	X2
Database management/ information retrieval	£295	M4
Debt collection	£550	G4
Dental records	£500	G6
Double glazing costing	£1500	V2
Earth parameter collection & quantification	£95	M10
Eire payroll system	£450	M5
Equipment lease/rent/ HP	£400	G1
Estate agent	£700	B5
Estate agent	£850	S9
Farm accounts	£750	C4
Financial & arable management	£220	
Financial modelling	£400	G1
Financial modelling	£95	B5
Financial modelling	£400	S11
Financial modelling	£400	V2
Financial planning	£245	G4
Financial planning	£90	X2
General ledger/NL	£500	L3
General ledger/NL	£400	G1
General ledger/NL	£375	L1
General ledger/NL	£200	B5
General ledger/NL	£275	S7
General ledger/NL	£400	M3
General ledger/NL	£350	B3
General ledger/NL	£300	W1
General ledger/NL	£425	S11
General ledger/NL	£395	G6
General ledger/NL	£300	M5
General ledger/NL	£1000	B1
General ledger/NL	£199	T5
General ledger/NL	£400	M9
General ledger/NL	£950--1250	V2
Hotel management	£525	M4
Hotel management	£750	H5
Incomplete Records	£250	B5
Incomplete Records	£750	M3
Incomplete Records	£975	B3
Incomplete Records	£750	W1
Incomplete Records	£995	M5
Incomplete Records	£155	C10
Incomplete Records	£400	G4
Industrial cleaner package	£1000	B1
Industry factory loading	£1000	X1
Industry work study	£990	X1
Insurance brokers	£995	W1
Insurance broker	POR	G4
Integrated accts	£750	C4
Integrated accts	£1100	G1
Integrated accts	£950	L1
Integrated accts	£690	B5
Integrated accts	£850	S7
Integrated accts	£990	M3
Integrated accts	£900	B5
Integrated accts	£1450	B3
Integrated accts	£1200	S11
Integrated accts	£199	T5
Integrated accts	£3400	M9
Invoicing	£325	L1
Invoicing	£150	S7
Invoicing	£250	M3
Invoicing	£100	B5
Invoicing	£200	B3
Invoicing	£300	W1
Inovicing	£300	B1
Invoicing	£199	T5
Invoicing	£400	M9
Invoicing	POR	W4
Invoicing	£400	G4
Jewellers System	£1000	S7
Jewellers System	POR	G4
Job costing	£990	X1
Job costing	£350	M3
Job costing	£395	T4
Job costing	£450	M5
Job costing	£300	B1
Job costing	£199	T5
Job costing	£1500	T5
Job costing	£1500	V2
Job costing	£600	A2
Job costing	£495	C13
Legal precedents	£1150	C4
Letter writer	£150	M3
Letter writer	£99	T5
Letter writer	POR	G4
Magazine subscriptions	£950	S9
Mailing list	£450	C4
Mailing list	£250	G1
Mailing list	£75	S7
Mailing list	£75	S9
Mailing list	POR	G4
Mailing list	£250	U1
Mailing list	£149	M4
Mail shot	£450	G4
Mail shot	£90	M3
Mail shot	£50/150	G5
Mail shot	£99	T5
Membership accounting	POR	G4
Motor dealer	POR	G4
Nominal ledger	£295	P1
Order entry/invoicing	£350	G1
Order entry/invoicing	£500	T4
Order entry/invoicing	£550	M5
Order entry/invoicing	£1000	B1
Order entry/invoicing	£99	T5
Order entry/invoicing	£400	M9
Order processing	£550	L1
Order processing	£99	T5
Order processing	£400	M9
Order processing	£500	G4
Payroll	£450	L3
Payroll	£450	C4
Payroll	£500	G1
Payroll	£475	L1
Payroll	£500	B5
Payroll	£390	M3
Payroll	£450	B3
Payroll	Lease	W1
Payroll	£425	S11
Payroll	£500	G6
Payroll	£450	M5
Payroll	£300	B1
Payroll	£199	T5
Payroll	£600	M9
Payroll	POR	W4
Payroll	£395	G4
Payroll	£325	M12
Perpetual Inventory	£150	B5
Personnel records	£450	C4
Pig management	£1250	C4
Point of sale	£400	M9
Production control	£2400	V2
Property management	£750-1250	C4
Property management	£400	M3
Property management	£1000	B1
Publishers system	£1850	S7
Purchase ledger	£500	L3
Purchase ledger	£450	G1
Purchase ledger	£425	L1
Purchase ledger	£200	B5
Purchase ledger	£275	S7
Purchase ledger	£400	M3
Purchase ledger	£350	B3
Purchase ledger	£300	W1
Purchase ledger	£425	S11
Purchase ledger	£500	G6
Purchase ledger	£200	M5
Purchase ledger	£300	B1
Purchase ledger	£400	M9
Purchase ledger	POR	W4
Purchase ledger	£400	G4
Purchase ledger	£950-1250	V2
Purchase ledger	£450	U1
Purchase ledger	£495	X2
Quotation estimating	POR	G4
Report generator	POR	G4
Requirements planning	£700	V2
Sales ledger	£500	L3
Sales ledger	£450	G1
Sales ledger	£425	L1
Sales ledger	£200	B5
Sales ledger	£275	S7
Sales ledger	£400	M3
Sales ledger	£350	B3
Sales ledger	£300	W1
Sales ledger	£425	S11
Sales ledger	£500	G6
Sales ledger	£300	M5
Sales ledger	£300	B1
Sales ledger	£199	T5
Sales ledger	£400	M9
Sales ledger	POR	W4
Sales ledger	£400	G4
Sales ledger	£950-1250	V2
Sales ledger	£249	P1
Sales ledger	£390	H1
Solicitors	£995	M5
Solicitors package	£2000	M12
S/L, P/L + stock control	£1000	L3
S/L, P/L + stock control	£900	B5
S/L, P/L + stock control	£1200	M9
S/L, P/L + stock control	£500	G4
Stock control/recording	£325	L1
Stock control/recording	£750-1500	C4
Stock control/recording	£350	G1
Stock control/recording	£500	B5
Stock control/recording	£900	M3
Stock control/recording	£300	B1
Stock control/recording	£500	G4
Stock control	£550	B3
Stock control	£300	W1
Stock control	£500	G6
Stock control	£450	M5
Stock control	£199	T5
Stock control	£400	M9
Stock control	£249	P1
Stock control	£350	U1
Stock control	£495	C9
Survey analysis	£645	M6
Surveying	£500	G6
Time/cost recording	£400	G1
Time/cost recording	£200	M3
Time/cost recording	POR	W4
Time/cost recording	POR	G4
Time/cost recording	£750	M6
Time ledger	£350	B3
Typing tutor	£50-125	A5
Utilities	£50	B5
Various thermal insullation industry systems	£2000+	T4
Video hire system	£499	G4
Video hire	£795	L5
Word processing	£400	G1
Word processing	£260	C4
Word processing	£250	M3
Word processing	£250	S11
Word processing	£1000	B1
Word processing	£99	T5
Word processing	£295	X2
Word processing	£350	M12
Word processing	£295	M4
Work in progress	£850	B5
Famos		
Customer file	£1000	M2
Data base	£1500	M2
Integrated accts	£2000	M2
Motor dealer	£5000	M2
Payroll	£1500	M2
Stock control	£1500	M2
Word processing	£500	M2
Grundy 8200		
Bill of materials	£95	M10
IBMPC		
Bill of Materials	£390	H1
Building est	£325	C9
Building services	POR	H6
Database management	£295	M4
Invoicing	£390	H1
Job costing	£495	C9
Mailing list	£149	M4
Nominal ledger	£395	B2
Project management	£1600+	C11
Project management	£1100	M13
Project management	£1100	C11
Sales ledger	£390	H1
Stock control	£395	B2
Stock control	£495	C9
Word processing	£295	M4
Word processing	£375	B4
MCZ Zilog		
Earth parameter collection & quantification	£95	M10
Mail shot	£250	I1
Membership accting	£250	I1
Personnel records	£400	I1
MZ-80K		
Estate agent	£195	W1
Integrated accounts	£150	P2
Stock control/recording	£150	P2
North Star Horizon		
Budgeting package	£95	B5
Building services	POR	I3
Cash flow	£95	B5
Database management/ information retrieval	£250	B3
Double glazing costing	£750	W1
Estate agent	£750	B5

PACKAGES

Application/Machine	Price	Code
Financial modelling	£95	B5
General ledger/NL	£250	B3
General ledger/NL	£400	M3
General ledger/NL	£400	B5
Hotel management	£750	H5
Incomplete records	£750	M3
Incomplete records	£250	B5
Incomplete records	£975	B3
Integrated accts	£950	B3
Integrated accts	£990	M3
Integrated accts	£690	B5
Integrated accts	£900	B5
Invoicing	£100	B3
Invoicing	£250	M3
Invoicing	£100	B5
Job costing	£350	M3
Letter writer	£150	M3
Mailing List	£195	W1
Mail shot	£90	M3
Payroll	£350	B3
Payroll	£390	M3
Payroll	Lease	W1
Property Management	£400	M3
Purchase ledger	£250	B3
Purchase ledger	£400	M3
Purchase ledger	£400	B5
Sales ledger	£250	B3
Sales ledger	£400	M3
Sales ledger	£400	B5
SL, PL + stock control	£900	B5
Stock control/recording	£450	B3
Stock control/recordng	£900	M3
Time/cost recording	£250	B3
Time/cost recording	£200	M3
Time/cost recording	£450	W1
Word processing	£250	M3
PET/CBM		
Assembler dev	£50	C2
Bill of materials	£199	T5
Bureau de change	£8	H3
Cash flow	£195	D1
Cheque writer	£90	P3
Credit control	£650	B4
Database management/ information retrieval	£50/150	C2
Database management/ information retrieval	£150	G2
Database management/ information retrieval	£150	J1
Database management/ information retrieval	POR	C1
Database management/ information retrieval	£225	H4
Database management/ information retrieval	£250	C3
File handling	£225	H4
File handling	£645	D1
Financial modelling	£250	D1
General ledger/NL	£200	C2
General ledger/NL	£1000	C1
General ledger/NL	£200	H3
General ledger/NL	£199	T5
Housing association package	POR	M7
Integrated accts	£(50)	C2
Integrated accts	£650	G2
Integrated accts	£650	J1
Integrated accts	£800	S3
Integrated accts	£199	T5
Invoicing	POR	J1
Invoicing	£400	C1
Invoicing	£199	T5
Job costing	£750	X1
Job costing	£199	T5
Mailing list	£35	H3
Payroll	£150	G2
Payroll	£150	J1
Payroll	£150	C2
Payroll	£50/195 195	I2
Payroll	POR	C1
Payroll	£200/350	C5
Payroll	£10	H3
Payroll	£199	T5
Petsoft programs	£160	J1
Petaid report generator	£250	S3
Prise lister	£12	H3
Production control	£650+	P3
Purchase ledger	£200	C2
Purchase ledger	POR	J1
Purchase ledger	£1000	C1
Purchase ledger	£300	B4
Purchase ledger	£350	H3
Purchase ledger	£199	T5
Sales ledger	POR	J1
Sales ledger	£200	J1
Sales ledger	£300	B4
Sales ledger	£800	C1
Sales ledger	£350	H3
Sales ledger	£199	T5
Solicitor's complete record accounting	£3000	S2
Stock control/recording	£150	C2
Stock control/recording	£150	G2
Stock control/recording	£150	J1
Stock control/recording	£195	I2
Stock control/recording	£15	A2
Stock control/recording	£300	B4
Stock control/recording	£35/25	H3
Stock control	£199	T5
Utility set	£78	H3
VAT master	£25	H3
Word processing	£75/150	J1
Word processing	£75/150	G2
Word processing	£75/150	C2
Word processing	£375	H4
Word processing	£325	C5
Word processing	£35	H3
Word processing	£249	P5
PET/Computhink		
Stock control/recording	£250	R1
Philips P200		
Analysis ledger	£100	P4
Expense Analysis	£150	P4
General ledger/NL	£100	P4
Hotel billing	£500	P4
Incomplete records	£150	P4
Integrated accts	£650	P4
Invoicing	£150	P4
Job costing	£400	P4
Order processing	£200	P4
Payroll	£300	P4
Purchase ledger	£200	P4
Quotation estimating	£400	P4
Renewals ledger	£200	P4
Sales ledger	£200	P4
S/L, P/L stock control		P4
Time/cost recording	£300	P4
Word processing	£230	P4
RAIR Black Box		
Financial modelling	POR	A3
Hotel management	POR	A3
Local government housing maint.	POR	A3
Sharp PC-3201		
General ledger	£450	P2
Sales ledger	£300	P2
Purchase ledger	£300	P2
Sorcerer		
Bookshop stock control	£1450	L2
Car showroom sales	£1900	L2
Department store order program	£2500	L2
Health authority PPM	£2500	L2
Instrument logging	£500	L2
Invoices	£290	L2
Mailing list	£290	L2
Payroll	£250	L2
Sales ledger	£490	L2
Solicitors package	£3500	L2
Stock control/recording	£390	L2
Tour operators package	£2900	L2
Superbrain		
Bill of materials	£450	T3
Database	£300	S6
Estate agent	£800	S6
General ledger	£400	M3
General ledger	£400	S6
Incomplete Records	£750	M3
Incomplete Records	£1200	S1
Integrated accts	£1200	S6
Integrated accts	£990	M3
Integrated accts	£1000	T3
Integrated accts	£1200	S1
Invoicing	£250	M3
Invoicing	£150	S6
Job costing	£350	M3
Letter writer	£150	M3
Mail shot	£90	M3
Payroll	£400	S6
Payroll	£390	M3
Payroll	£250+	T3
Property management	£400	M3
Purchase ledger	£300	S6
Purchase ledger	£400	M3
Sales ledger	£300	S6
Sales ledger	£400	M3
Solicitors package	£1400	S1
Stock control	£300	S6
Stock control	£900	M3
Stock control	£450	T3
Time/cost recording	£800	S1
Time recording	£200	M3
Word processing	£250	M3
Travel agency accts	£800	S6
S/L, P/L & stock control		
Apple II	£900	P2
Apple II	£1000	T2
CP/M	£1000	L3
CP/M	£900	B5
CP/M	£900	G4
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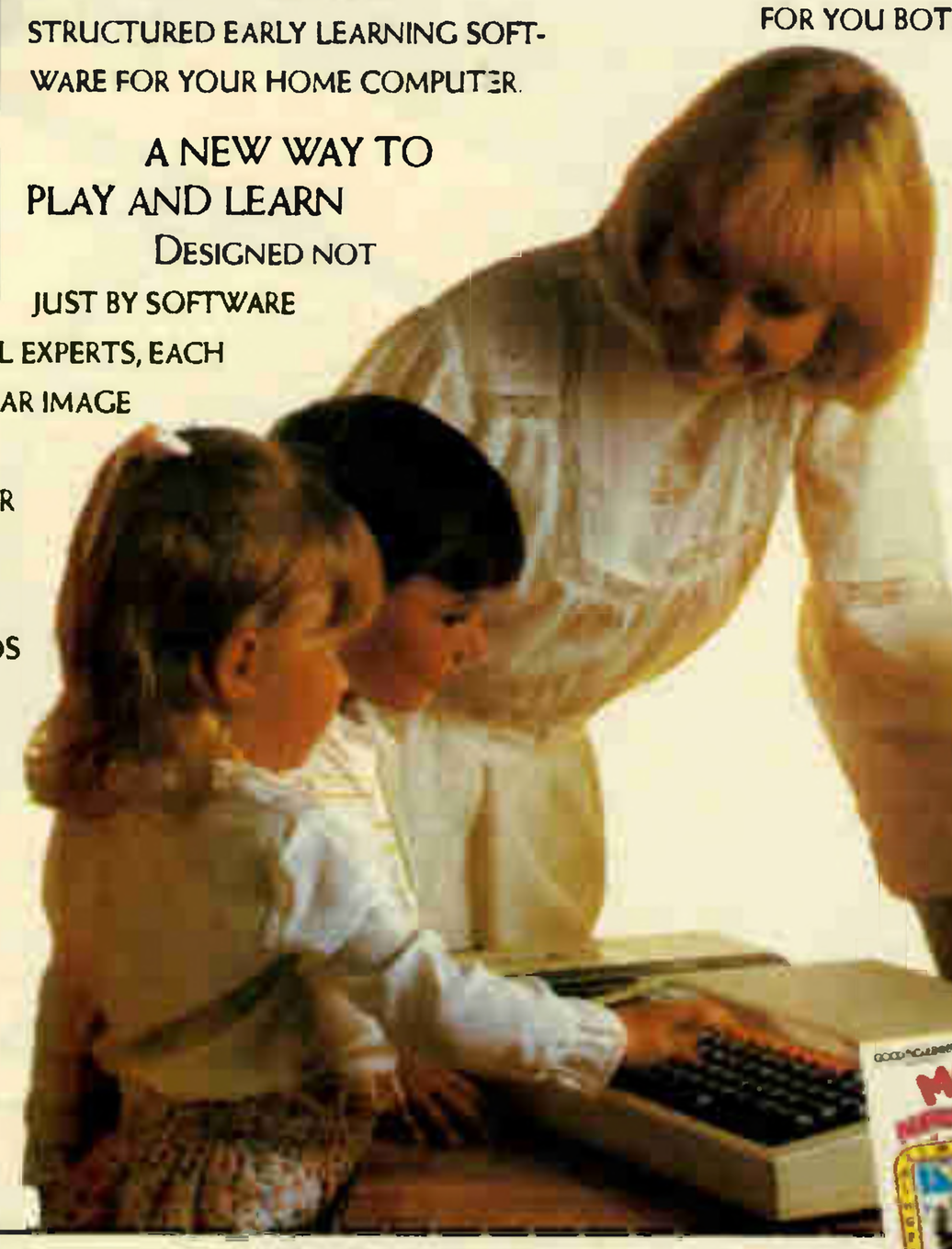

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● PET 2001 series 8k. New ROMS. integral cassette, about 50 games. excellent condition £250 ono. Tel: (021) 472 2371 after 5. Must collect Birmingham.

● Complete dark room for sale £200 ono. Exchange WHY interested printer for Atari 800 or any computer accessories. Tel: Basildon (0268) 825406 eve.

● Commodore dual disk drive wanted 3040 or 4040 model. Contact Atkins (094) 961 318 (near Nottingham).

● Sharp MZ-80K 48k. RAM and software, only one year old and in very good condition. £250 ono. Tel: David Huddersfield 510817. Urgent sale required.

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● APPLE II 48k with disk drive, disks. APPLE monitor III, centronics and colour cards, manuals and books. Very good condition. £750. Mr J Fox Orpington 30921 after 7pm.

● DRAGON 32 home computer system with centronics 779 printer, joysticks, temperature probe. All in perfect working order. Manuals, books, leads etc. Accept £250. No offers. Buyer collects. 01-204 4138 eve/weekends.

● TRS-80 expansion interface with 32k RAM £200. Acculab floppy tape drives 2 for £150 including Xbas and 25 wafers. Tel: Newport (0633) 881038 after 6.30pm.

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● Acorn ATOM 12k + 8k 6522 via printer socket. All leads, manuals etc. Tel: Tooting (677) 9213 after 4.30pm. £80 ono. (18 months old) and in superb condition!

● Sharp MZ-80K 84k VGC. Basic and extended Basic. About £40 of software, manual. Basic build up and software secrets books, dust cover, £350 ono. Tel: Trowbridge 61144 after 5pm.

● Sharp PC1500 with extra 8k RAM, 4 colour printer, pens, paper, cassette interface. All manuals. Perfect condition. Tel: Fahidy, Reigate (Surrey) 44046. £180 ovno.

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● TRS80 level II 48k printer VII with keyboard interface, monitor and TV modulator, software editor, complier, database, Scripsit, games, books etc, £350. 01-934 5962 or Fleet (02524) 4655 after 6.30pm.

● Wanted second-hand business software for APPLE and CP M like dBase II, Wordstar, Production, Planning, Payroll Project Planning and other utilities. Tel: 06-116688, write Peter Andersen, 41 Naesbyvej, 8270 Hoejbjerg, Denmark.

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● TRS-80 LI 16k. New green VDU

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● Acorn ATOM 12k RAM 8k ROM user manual, transformer, all leads, software (Space Invaders, Galaxian etc). Back issues of various computer magazines offers invited Tel: Nick (Horsham) 69400.

● Sharp MZ 80A Few months old. Must sell due to change of circumtances. £75 of tapes go with it, £350 ono. Tel: 01-574 8418 Eric eve only.

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● CBM PET 32k (3032), dual disk drive (3040), printer (4022), cassette deck, Visicalc, Kram. Rarely used, might split. Cost £2,000+. Accept £800 ono. Jones Sheffield (0742) 304982 or 661986 after 7pm.

● Disk drive single or dual wanted for BBC micro. + if possible interface. Also printer for above. Tel: (0392) 55697, 9 to 5. Truman, 23 Bridge Steet, Exeter.

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● Sharp MZ-80k 48k. Exc. condition. 1 year old, many games, eg Scramble, Pakman, Chess, 3 Basics and 4 Adventures. Many more games. Tel: Croydon (681) 7532 and ask for Mike.

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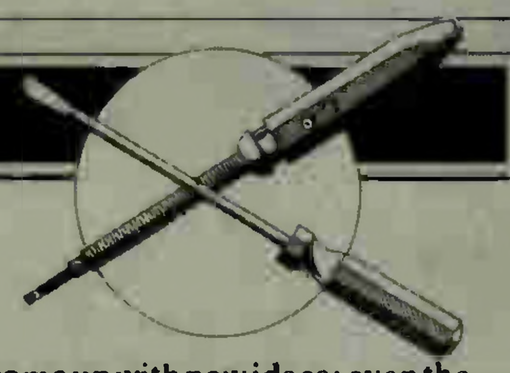


Rupert Steele gives his personal advice on running a computer club efficiently.

This month, I think it is time to make some general comments about the running of established computer clubs and user groups.

Often, the club grows far beyond the original aims of its founders, or they may find new calls on their time. This can then make the club grind to a halt.

Two approaches are available to help tackle this problem, one at the individual committee member level, and the other involving the chairman or committee as a whole.

The most important attribute that individual committee members and helpers should have is reliability. It does not help the chairman if he delegates a job to somebody, and then finds out several weeks later that it has not been done. The ideal committee member in a voluntary organisation will, when asked to perform a duty, say either that he will do it (and make sure he does do it) or else that he is overcommitted on this occasion, and cannot spare the time. If he does agree to do something, and later finds he cannot, it is essential that he either finds a substitute or (as a last resort) informs the chairman (or whoever is appropriate) immediately.

Secondly, the chairman or committee as a whole should keep a look out for overloaded individuals who are slowing up the organisation. It is essential to find reliable (but if necessary less able) committee members to take part of their duties.

High flyers should be allocated to jobs where their particular skills are used in the most efficient manner. Remember that these people are very valuable to a club's organisation, so ensure that the amount of administrative work you ask them to do is small enough to be a pleasure, rather than a pain.

Setting up this kind of arrangement requires considerable resources of tact and diplomacy, since those members who do find themselves on all the critical paths are often reluctant to give up part of their position of power within the club. They may be in a position to dictate the terms of any change in responsibilities: therefore their views must be taken seriously.

A further problem that may afflict you in reducing the workload of your key people is that there may be a great shortage of people in your club prepared to help bear the administrative burden. Strangely, members can always be found who will constitution-monger at your Annual General Meeting, but it is much harder to find good committee members. Incidentally, take a second look at those constitution-mongers — some of them can make first-class committee members.

People may be too shy to put themselves forward at committee meetings. The best way to get these people involved is to use whatever informal occasions the club runs (preferably 'socials') for the chairman or secretary to talk to members and gently pressure them into volunteering. Persuading old hands to help is even harder than persuading the less experienced or retired member. You should suggest the number of hours' work a week that the duty would entail. You may like to consider dividing all the functions of the club's officers into a number of separate jobs equal to the required committee size, and then insist that every committee member must take over one of these responsibilities. Clearly defined posts with well known demarcation lines will make it easier for those who are over-committed to assess the amount of work involved with helping the club.

Two further options are available to large clubs and national user groups. They are to employ secretarial help or to go 'full-time'. In either case, substantial quantities of money are required in order to finance the change.

Secretarial help is employed by organisations such as ALCC (the Association of London Computer Clubs). The advantage of this is that the skilled committee members are free to concentrate on administrative questions, rather than getting bogged down in clerical matters. The employment of a secretary also in no way affects the non-profit making nature of the organisation.

Some of the very largest user groups (such as BEEBUG) have gone full time. This means that the user group is rather like a company, which pays its manager a salary. This approach has been very successful in some cases (and indeed, some enterprising user group managers are now quite rich), and rather less so elsewhere. These groups are, of course, no longer associations of members collaborating for their mutual benefit, but companies selling a service.

Another problem that can afflict computer clubs is that of stagnation; quite simply, the club runs out of things to talk about, write about or do. This can come about through a poor committee; it is absolutely vital to have people involved in running the club who can give it some kind of impetus to come up with new ideas; even the best people tend to grow stale and run out of ideas, so it is essential to have some kind of turnover in the committee.

Also vital in the fight against stagnation are the 'keen' members of the club: those with some level of technical expertise. They provide a source of possible committee members. They may be persuaded to give talks or hold informal presentations and they will provide the drive that will stop the club degenerating into a drinking society.

Finally, beware the super-benefactor. Many clubs will be tempted to become absolutely dependent on one person for the provision (say) of premises. You may be offered free meetings in the offices of a club member, providing that the said member attends.

It is often only a matter of time before such an arrangement is withdrawn, or the member who has to attend finds other calls on his time. By all means accept such gifts, but ensure that alternative plans are made in case the scheme falls through (this will include some thoughts on financing any back-up scheme).

Well, those are some of the pitfalls that I have come across, and my ideas on their solution. I'd be interested to hear some feedback on this article, and would be pleased to pass on via this column any useful tips or experiences you may have.

* For informations about the ACC or the points mentioned in this article, contact: Rupert Steele, 17 Lawrie Park Crescent, London SE26 6HH. Tel: 01-778 6824.

NETWORK NEWS

Peter Tootill provides the latest information on foreign networking systems.

Just a couple of news items this month. The first is that TBBS London should now be on a new number and running 24 hours a day. Also Bettisfield remote CP/M system should be back on line by the time you read this. Up to date details of these systems can be obtained from Liverpool Mailbox, or most other Bulletin Boards.

I am hoping to publish a list of sources of terminal software, and I should be pleased to receive details of any packages that are available. I am especially keen to list software (and also communications orientated hardware add-ons such as RS-232 adaptors) for the popular budget-priced micros. All details will be gratefully received either via Liverpool Mailbox, or *PCW*.

I thought it might be interesting to say something about foreign systems this month. Bulletin boards first started in the USA and are very popular both there, and in Canada. In fact there must be at least a thousand operating in North America, perhaps considerably more!

To my knowledge there are very few in Europe outside England; Scandinavia has a few, there was one in Holland which hasn't been operating for sometime, and I have heard of one in Germany, but I haven't been able to track it down.

It is a very interesting experience to call a foreign system and to see what the messages are like, what sort of information is provided and so on. The only problem (apart from the cost of calls!) is with North American systems. Both the USA and Canada use Bell standard modems, normally Bell 103 (300 baud), although many are beginning to provide Bell 212a (1200 baud) also. These standards are incompatible with the CCITT standards normally used in Europe, including the UK. Thus you need a different modem to call the North American systems. Calls to European boards present no problems apart from the language difficulty!

The table below includes all the European systems that I know about (I'd be pleased to hear of more) and a more or less random selection of North American ones. A call to any of the 'HQ' systems will normally yield a list of phone numbers for other systems. Forum-80, Hull, also has a list of North American systems. Further, there is a publication called 'The Online Computer Telephone Directory', published by the Small Business System Group, 6 Carlisle Road, Westford, MA 01886, USA (tel 617-6923800) which gives information on the US and Canadian scene. More information on the Scandinavian systems, including some help with the language is available on CBBS-NE.

UK systems run by commercial organisations, which are free at least in part:

DISTEL. Tel: (01) 683 3311. Run by Display Electronics (new and surplus electronic and computer equipt, components, etc). The system provides information about stock lines, credit card sales, and some message facilities. 300 baud only at present. Cost: free.

REWTEL. Tel: (0277) 232 628. 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 annual subscription.

MAPTEL. Tel: (0702) 552 941. Run by Maplin (electronic components and microcomputers). Provides information on stock levels, credit card sales to existing customers only. 300 baud only. Cost: free.

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 £5.00 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:

The following are fully fledged 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 North East . . . System Operators: Trevor Smith & Malcolm Piper. Hours: Tel: (0207) 43555, 2.30pm-9am daily; tel: (0207) 32447, 7pm-midnight CCITT standards; midnight-8.30am Bell 103 (US) standards.

Mailbox-83, Stourport . . . Tel: (03843) 73873* **System Operator:** Jim Roden. Hours: Call Operator for times.

Forum-80 Hull . . . (Forum-80 HQ) Tel: (0482) 859169. **System Operator:** Fred Brown. International electronic mail, library for up/down loading software.
Forum-80 Users Group, Pet Users section shopping list system. Hours: 7 days a week midnight to 8am; Tues/Thurs 7-10pm; Sat/Sun 1-10pm; nights, midnight-8am, US (Bell 103) standards.

Forum-80 London . . . Tel: (01) 902 2546. **System Operator:** Victor Saleh. Electric mail, library for downloading. Hours: Tues/Fri/Sun 7-11pm.

CBBS London . . . Tel: (01) 339 2136. **System Operator:** Peter Goldman. Facilities: electronic mail, program downloading. Hours: Sun 5-10pm.

Forum-80 Milton . . . (TRS-80 Users Group 80-Nett) Tel: (0908) 613004. **System Operators:** Leon Heller and Brian Pain. Electronic mail, library, newsletter, TRS-80 information system. Hours: 7 days a week 7-10pm.

Mailbox-80 Liverpool . . . Tel: (051) 428 8924. **System Operator:** Peter Tootill. Electronic mail, downloading, TRS-80 information. Hours: 24 hours daily.

ACC . . . members bulletin board. Tel: (0908) 44262. **System Operator:** Peter Whittle.

TBBS, London . . . Tel: (01) 348 6518* **System Operator:** John Newgas. Hours: Mon-Fri 10pm-1am; weekends 2pm-1am

Rewtel . . . (Radio & Bulletin board). Tel: (0277) 232628. 24 hours service 7 days a week. Packed with useful and interesting information, etc. Subscription fee £10 p.a. Non-subscribers may have eight mins free. Hardware required: 300 baud full duplex. Standard page: 64 characters by 16 inches.

Bettisfield Remote CP/M . . . Tel: (094) 875 378. **Systems Operator:** Jim Eccleston. Hours: 1-4pm & 7-11pm daily. Restarts 8 September.

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

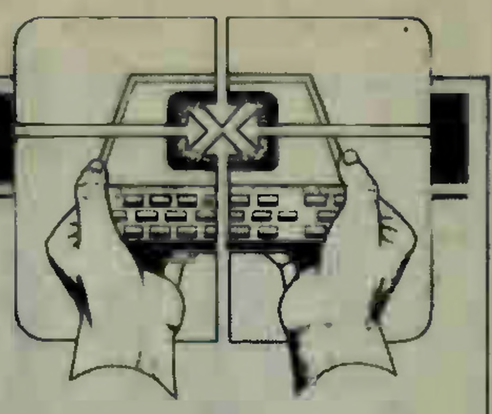
ELFA	ABC-MONITOR Sweden	010.468 7300706	Half duplex
ABC-Banken	Halmstadt, Sweden	010.463 5110771	
ABC-MONITOR	ABC Club of Sweden	010.468 801523	Passwords required
CBBS	Gothenburg, Sweden*	010.463 1292160	75/1200 baud
		010.463 1690754	300 baud

* 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 set '>' when you dial up, the system needs resetting and you type <I> C/R.

The above information is correct and current, to the best of my knowledge, but I would be pleased to receive corrections and updates, either via Liverpool Mailbox, or to 7 Stockville Road, Liverpool L18 3EJ.

* Ring back system — dial the number, let phone ring once and then ring back.

CTUK! CONTACTS



*For further information on Computer Town UK! see Prestel page *800803*

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54 Foregate Street
Worcester WR1 1DX

Ted Ellerton
25 Beachdale
Winchmore Hill
London N21

Bill Gibbings
2 Longholme Road
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Notts DN22 6TU

Peter J Kiff
2 Ranelagh Grove
St Peter's in Thanet
Broadstairs
Kent CT10 2TE

John Stephen Bone
2 Claremont Place
Gateshead
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Andrew Stoneman
135 Birchdale Avenue
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Imperial Drive
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Christopher Bates
Ashford Main Library
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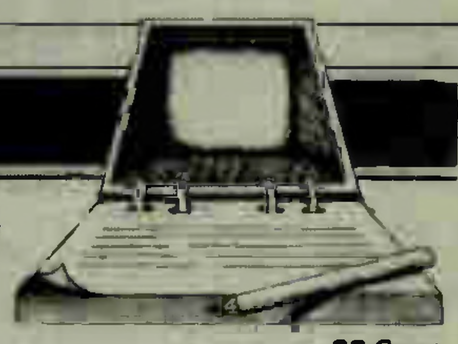
DIARY DATA



Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

Glasgow	(Central Hotel). Computer Open Day Exbn. Contact: Couchmead, 01-778 1102	22 Sept
Coventry	(Warwick University), Micros in Business. Contact: Operational Research Society. 021-643 0236	27-29 Sept
London	(Barbican), Personal Computer World Show. Contact; Montbuild Ltd, 01-486 1951	29 Sept-2 Oct
Birmingham	(NEC), Computer Trade Forum. Contact: Clapp & Poliak Europe Ltd, 01-747 3131	4-7 Oct
Birmingham	(Albany Hotel), Computer Open Day Exhibition. Contact: Couchmead Communications Ltd, 01-778 1102	6 Oct
Munich	Computer Systems International Trade Fair & Congress. Contact: ECL. 01-486 1951	17-21 Oct
Beds	(Challney Computer College), Chiltern Computer Fair. Contact: John Pinney, (0582) 56400	22 Oct
London	(Wembley Conf Centre), Computer Graphics European Conference & Exbn. Contact: Online, 01-868 4466	18-20 Oct
Birmingham	(NEC), International Business Show. Contact: Business Equipment Trade Association. 01-405 6233	18-26 Oct

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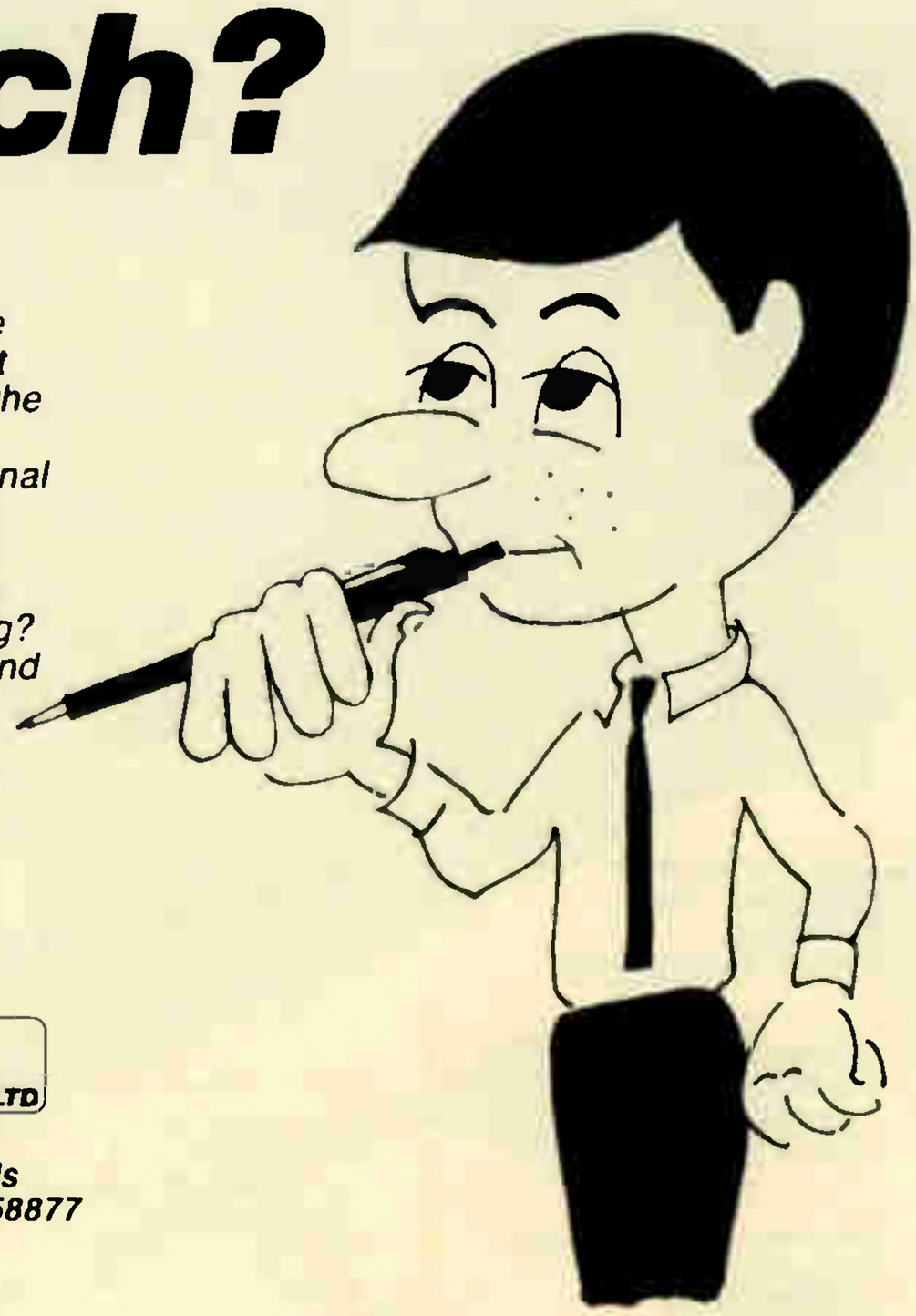

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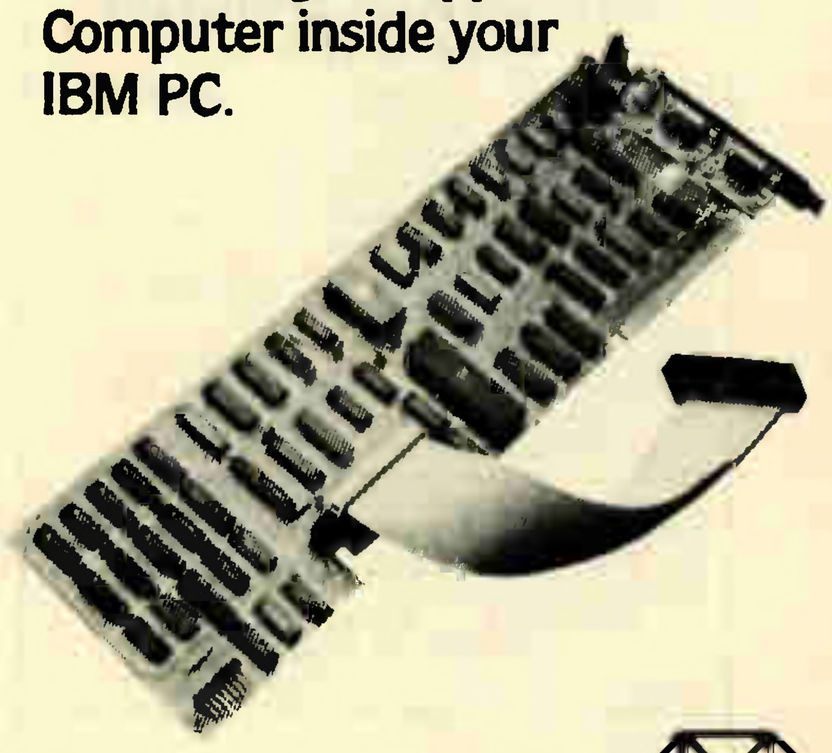

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(d) A suitable sae.

Please mark (a), (b) and (c) with your name, address, program title, machine (state minimum RAM where appropriate) and — if possible — a daytime phone number. All programs must, please, be fully debugged. Programs are paid for at the rate of £50 per page of published listing, plus a £100 bonus for the Program of the Month. Send contributions to: Surya, PCW Programs, 62 Oxford Street, London W1A 2HG.

I'll do my best to acknowledge receipt of programs as quickly as possible, but following this acknowledgement it will usually be some time before a decision can be made, so please be patient! Generally speaking, programs which are rejected for any reason are returned fairly quickly, so 'no news . . .'

You'll no doubt have noticed some strange-looking symbols alongside this month's Programs. Looking through some of the responses to the Reader Survey, it seems that most people are primarily interested in one class of program, be it games, utilities or whatever. With this is mind, we've decided to help you identify programs quickly using the following symbols:



Games
Scientific/mathematic
Business
Toolkit/utilities
Educational/Computer Aided Learning

Of course, not all programs will fit into one of these categories, so these have not been given a symbol.

MZ-80K Basic Modifier

by Scott Waterhouse

'Basic Modifier' allows you to modify up to 24 of the 84 keywords supported by Sharp Basic SP-5025.

The program presents you with a menu of the words which may be changed. You might, for example, want to change 'RUN' to 'GO'. After making the appropriate menu selection, you are prompted with the word in its existing format, requested to confirm your choice in response to an 'are you sure?' check and then enter the modified word. The modified word is entered a single character at a time, pressing CR after each character. The input routine in lines 146 to 153 inclusive could easily be changed to a GET routine so that the CR isn't necessary.

Note that the modified word must be the same length as the original though padding with spaces is acceptable.

Once you have made the desired changes, you can save your modified Basic to tape. If you do this, particularly if you intend to create several different modified Basics, I suggest the first thing you change is the Basic label '* SP-5025' so that you know which Basic you're loading! Otherwise, you'll be left wondering why you can't persuade your machine to perform elementary functions like RUNning and LISTing . . .

All necessary documentation is included in the program.

'Basic Modifier' works by simply POKEing the ASCII codes of each character of your modified word into the memory locations normally occupied by the original keyword. This can be achieved on machines like the Sharp since the high-level language in use is stored in RAM. I can see no reason why the principle couldn't be extended to allow any or all of the other sixty to be modified also.

If you get into a mess, with all your keywords changed to obscure things like 'LOOK' in place of LIST, 'ZAP' instead of NEW and so on, the only way of getting out of it is to reload Basic (the standard variety, that is), so do make a note of your modified syntax.

Offhand, I can't think of any practical application for the program. Well actually, I can think of one. You could have great fun at your local Sharp dealer's shop when nobody's looking. Not that I'm suggesting it, you understand. It is, anyway, quite fun just for the sheer hell of it, and you could write some interesting-looking programs in a modified Basic (only don't send them to me).

NB: The listing below contains a tiny bug. In line 116, the final figure should be changed from 5586 to 5585.

PROGRAMS

```
1 GOTO52
2 REM        A Basic Modifier
3 REM     by Scott Waterhouse (1983)
4 REM
5 PRINT"■■■■ Do you wish to :"
6 PRINT"■ (A) Exit the program."
7 PRINT"■ (B) Make a copy of new basic codes on   tape."
8 GETZ$:IFZ$=""THEN8
9 IFZ$="A"THENEND
10 IFZ$="B"THEN12
11 GOTO8
12 REM
13 POKE 4336,1
14 REM READ THE ENTERED TITLE
15 INPUT"What is your tape's name? ";A$
16 IF LEN(A$)>15THENPRINT"■TOO LONG":GOTO15
17 FORI=4337 TO 4353:POKEI,32:NEXT
18 J=4336+LEN(A$)
19 FOR I=4337 TO J
20 POKE I,ASC(MID$(A$,I-4336,1))
21 NEXT
22 POKE J+1,13
23 REM READ LENGTH OF PROGRAM
24 READ L
25 GOSUB 44
26 POKE 4354,J
27 POKE 4355,I
28 REM READ PROGRAM START ADRESS
29 READ L
30 GOSUB 44
31 POKE 4356,J
32 POKE 4357,I
33 REM READ PROGRAM EXECUTE ADRESS
34 READ L
35 GOSUB 44
36 POKE 4358,J
37 POKE 4359,I
38 PRINT"■■■■■POSITION TAPE TO RECORD PROGRAM
39 PRINT"■■■(ANY KEY TO CONTINUE)■■■■"
40 GET Z$:IF Z$="" THEN 40
41 USR(33)
42 USR(36)
43 END
44 I=INT(L/256)
45 J=L-I*256
46 RETURN
47 DATA 12900, 4608,4608
48 INPUT"■■ EXIT PROGRAM ? ";GG$
49 IFGG$="Y"THENEND
50 IFGG$="N"THENRUN
51 GOTO48
52 PRINT"■■    SP-5025 MODIFICATION PROGRAM"
53 PRINT"    ──────────────────────────"
54 PRINT"■■This program will enable new screen"
55 PRINT"messages or keywords to be created"
56 PRINT"in SP-5025 Basic."
57 PRINT"■For example 'READY' can be changed to   'OK' etc."
58 PRINT"■It is important to note that if you "
59 PRINT"change a word such as 'LIST' then the"
60 PRINT"program will not list unless you use"
61 PRINT"the modified word. "
62 PRINT"■■■■■■■■■■HIT 'CR' TO CONTINUE "
63 GETF$:IF F$="" THEN 63
64 IF ASC(F$)=102 THEN 66
65 GOTO63
66 PRINT"■  When changing a word, only ONE letter"
67 PRINT"■ at a time may be changed. Also, the "
68 PRINT"■ new word has to be exactly the same"
69 PRINT"■ length as the word being modified. If "
70 PRINT"■ this is not possible then the word must";
71 PRINT"■ be padded with spaces to the correct "
72 PRINT"■ length. EG :-"
73 PRINT"■ BREAK may be changed to:"
74 PRINT"■ STOP  but the last letter has to be"
75 PRINT"■ padded with a space to make it five "
76 PRINT"■ letters long."
77 PRINT"■■  HIT ANY KEY TO START PROGRAM"
78 GETA$:IFA$=""THEN78
79 PRINT"■SP-5025 MODIFICATION PROGRAM"
80 PRINT"■No.    Keyword          No.   Keyword"
81 PRINT"──────────────────────────────────────"
82 PRINT
83 PRINT" 1)    * SP-5025        13)   PEEK"
84 PRINT" 2)    READY            14)   RUN"
85 PRINT" 3)    BREAK            15)   NEW"
86 PRINT" 4)    ERROR            16)   SAVE"
87 PRINT" 5)    SYNTAX           17)   POKE"
88 PRINT" 6)    IN               18)   LIST"
89 PRINT" 7)    MEMORY           19)   PRINT"
90 PRINT" 8)    DATA             20)   LOAD"
91 PRINT" 9)    MISMATCH         21)   VERIFY"
92 PRINT"10)    BYTES            22)   BYE"
93 PRINT"11)    FILE             23)   MUSIC"
94 PRINT"12)    OVERLAY          24)   TEMPO"
95 PRINT"──────────────────────────────────────"
96 PRINT"       25) EXIT PROGRAM OPTION       "
97 PRINT"──────────────────────────────────────"
98 PRINT
99 INPUT"enter no.and press 'CR' ";N
100 FORQ=0TO24:READW$,M1,M2
101 IFQ=NTHENM$=W$:X=M1:Y=M2
102 NEXTQ
103 RESTORE
104 DATA* SHARP BASIC SP-5025,4835,4855
105 DATA"READY",4857,4861
106 DATA"BREAK",4909,4913
107 DATA"ERROR",4864,4868
108 DATA"SYNTAX",4874,4879
109 DATA"IN",4871,4872
110 DATA"MEMORY",4881,4886
111 DATA"DATA",4888,4891
112 DATA"MISMATCH",4893,4900
```


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PROGRAMS

```
113 DATA"BYTES",4903,4907
114 DATA"FILE",4938,4941
115 DATA"OVERLAY",4943,4949
116 DATA"PEEK",5582,5586
117 DATA"RUN",5347,5349
118 DATA"NEW",5350,5352
119 DATA"SAVE",5402,5405
120 DATA"POKE",5412,5415
121 DATA"LIST",5343,5346
122 DATA"PRINT",5353,5357
123 DATA"LOAD",5398,5401
124 DATA"VERIFY",5406,5411
125 DATA"BYE",5469,5471
126 DATA"MUSIC",5440,5444
127 DATA"TEMPO",5445,5449
128 IFN=25 THEN 2
129 IFN>25THEN79
130 REM****MODIFICATION ROUTINE****
131 PRINT"E"
132 PRINT"  You have chosen to modify the word!-  "
133 PRINT M$
134 PRINT CHR$(13)
135 PRINT" Are you sure that you really want to do this?"
136 PRINT"  Y/N":USR(62)
137 GET A$:IF A$="" THEN 137
138 IF ASC(A$)=78 THEN 79
139 IF ASC(A$)=89 THEN 141
140 GOTO137
141 PRINT"E"
142 PRINT"The keyword to be modified is:-  "
143 PRINT M$
144 PRINT"  Enter new letters one at a time. Press  'CR' after each letter."
145 PRINT" To insert a space use '→' (shift Z)"
146 FORI=XTOY
147 E=32
148 PRINT" ENTER LETTER NOW "
149 INPUT L$
150 IF ASC(L$)=198 THEN 162
151 M=ASC(L$):IF(N>12)*(I=Y)THENM=M+128
152 POKE I,M
153 NEXT I
154 PRINT"  MODIFICATION IS COMPLETE"
155 USR(62):USR(62)
156 PRINT"  Press 'M' to return to menu "
157 USR(62)
158 GET K$:IF K$=""THEN 158
159 IF K$="M"THEN79
160 IF ASC(K$)<>88 THEN END
161 GOTO158
162 POKE I,E:GOTO153
163 PRINT CHR$(13)
164 PRINT"  ————————————————————————————————————————"
165 GOTO 156
```

Program of the Month
Lynx Star Trek

by B Coupe



I must admit, my initial reaction on opening the envelope and catching sight of the dreaded words 'star trek' was 'oh no! Not another one . . .'. The fact that it was one of those rarest of treasures — a Lynx program — did little to add to my enthusiasm, but actually playing the game did — so here it is. It requires a 48k Lynx.

'Star Trek' is a game which began life in a mainframe in the 1960s and has been handed down to every machine developed ever since. The average version is an adaptation of an adaptation of . . . well, you get the idea. The net result of this constant adapting is that the game has gradually been watered down to a mere chip off the old IBM (sorry about that). 'Lynx Star Trek' may not quite restore the power of the original, but it was written from scratch rather than simply changing as few lines as necessary to get it to run on the Lynx. Consequently, the display does actually make use of the Lynx's graphics capability.

Seasoned Starship captains should find the game self-explanatory, but for those uninitiated in the ways of Klingon hunting, a brief outline follows.

You are captain of the Starship Enterprise. Your present location is in a distant galaxy comprising 244 quadrants in a 9×9×3 matrix. Within this quadrant lurk 20 Klingon warships which, given half a chance, will turn you and your ship into finely-powdered radioactive dust. Your job, being a kind of chief emigration officer to the human race, is to suss out five class M planets fit for human habitation. You must firstly locate suitable planets and then orbit each one in order to allow your on-board computer to collect all the relevant data. You are also required to engage in 'meaningful negotiations' with the Klingons over ownership of said planets by redistributing the component molecules of their bodies over a wide area.

Movement between quadrants is via

your warp drives. On selecting the warp drive, you will need to enter your destination quadrant as a three-figure coordinate followed by your speed. The faster you travel, the less time you take (brilliant, eh?) and the more energy you consume.

To help you decide your destination, the long-range scan facility will give you information on the surrounding 26 quadrants. This information will normally take the form KwBxSyPz where w is the number of Klingons in the quadrant, X the number of bases, Y stars and Z planets. If, however, any of the quadrants contain anything your ship-board computer thinks you should know about (pulsars, black holes and so on), this data will be displayed instead.

Once you have arrived in a particular quadrant, it is advisable to request a short-range scan. This gives you a detailed look at the position of the Enterprise and anything else hanging out in the quadrant. To move within an individual quadrant, use your impulse drive, entering a direction and a speed. The direction codes are:

```
    1
  8   2
7   +   3
  6   4
    5
```

If your current quadrant contains a Klingon battleship, it is quite likely to take a neighbourly pot-shot at you. Being fired upon drains energy and may result in damage to your ship. Damage can be lessened by placing the ship on yellow or red alert, but this is expensive in terms of energy. If damage does occur, you may attempt repair using the repair facility: this will consume 5% of your energy.

During a Klingon attack, some menu options will be temporarily suspended. Any option selected immediately prior to an attack will automatically resume as soon as the attack is over.

You may, of course, shoot back at the Klingon using either your torpedoes or phasor. You have only three torpedoes, so they must be used sparingly. The direction of fire is as for the impulse drive. The phasor doesn't require a direction, simply the amount of energy you want to expend. Once you have entered this amount, press 'F' to fire.

Initially, you have 3,000 units of energy and three torpedoes. Sooner or later you will run short on one or the other. To refuel the ship, you must locate one of the Starbases (a sort of intergalactic filling-station) and dock alongside. To dock with a starbase, simply move your ship to the position of the base using your impulse drive.

To orbit a planet, you will need firstly to ascertain that it is a Class M (rather than F) planet. To do this, simply move into the appropriate quadrant and request the video option — this will enable your computer to identify the contents of the quadrant.

This option is also useful if you forget which character is which in the middle of a game. Having done this, the procedure to orbit is the same as docking with a starbase.

If you need any help locating Starbases, Klingons, planets or unexplored areas, press 'C' to invoke a computer scan.

All options are presented in a menu which remains on the screen throughout the game. The game ends either when you run out of energy or when you have succeeded in your mission of discovery and carnage.

Important: The program will just fit into a 48k Lynx with all comments omitted. Since the program occupies all but 10 bytes of the available memory, entering even a single REM statement will result in an 'out of memory' error.

In lines 100 and 110, any code less than 0A should be typed as a single digit — that is, omitting leading zeros.

Lynx owners may now boldly go where thousands of other micronuts have gone before . . .

```
100 DIM A(243),C(9),D(9),E(6),F(6),P(27),V$(24),T$(20),W$(5),G(6),V$(3)(5)
110 REM SET UP VARIOUS STRINGS, OPTIONS ETC.
120 FOR I=1 TO 243
130   LET A(I)=RND(8)+1:Q$=CHR$(RND(8)+48):T$=T$+Q$
140   IF I<9 THEN LET D(I)=3
150 NEXT I
160 FOR I=1 TO 6
170   READ A,B,C,D,E,F,G,U$(I)
180   LET V$(I)=CHR$(A)+CHR$(B)+CHR$(C),E(I)=G
190   IF D=0 THEN GOTO 300
200   FOR S=1 TO D+RND(E)
210     LET X=RND(243)+1
220     IF A(X)<9 THEN LET A(X)=0
230     LET A(X)=A(X)+F
240   NEXT S
250 NEXT I
260 LET A(0)=4,D=X,A(D)=A(D)+0.5,A$=CHR$(144)
```


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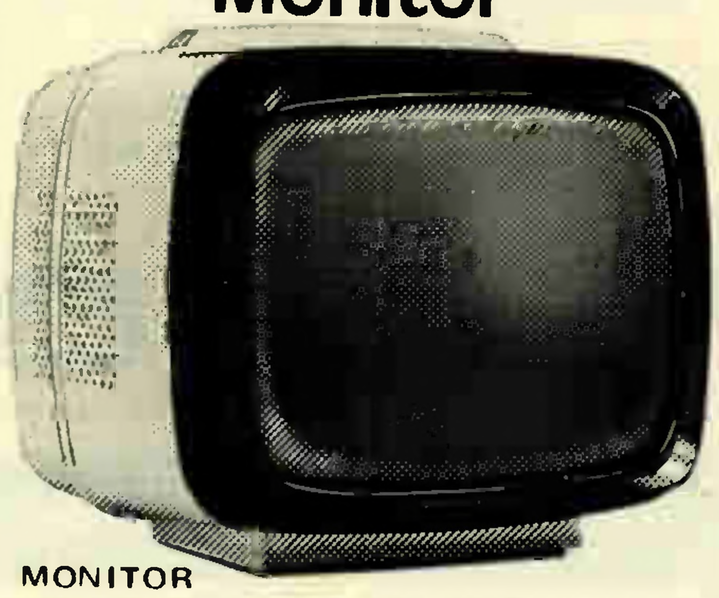

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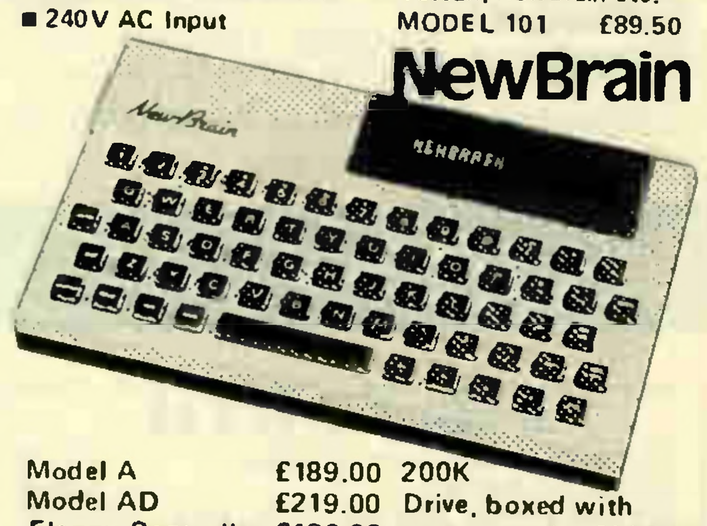

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	DSDD Soft/Hard Sec	19.93	19.41	18.93
	SSQD Soft/Hard Sec	21.62	21.06	20.53
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PROGRAMS

```
320 GOSUB 790
329 REM SET UP DISPLAY
330 CLS
340 INK WHITE
350 PRINT @ 3,10:"QUADRANT  "Y:","I;","W: @ 66,10;"STARDATE  2200.00": @ 27,30;T
$; @ 27,170;T$;
360 FOR L=30 TO 170 STEP 10
370   PRINT @ 24,L:Q$: @ 117,L:Q$:
380 NEXT L
390 FOR L=1 TO 12
400   READ Z$,N$,O
410   LET M=0,U=170
420   IF L>6 THEN LET M=42,U=110
430   PRINT  @ M,U+L*10,Q$Z$A$N$A$"   "Q$:
440 NEXT L
450 GOSUB 2460
460 GOSUB 3740
470 INK GREEN
480 PRINT @ 38,210;Q$Q$;
490 GOSUB 940
500 GOSUB 1070
509 REM MAIN ROUTINE FOR CHOOSING SYSTEM
510 LET K$=GET$
520 DPOKE &620D,&6608 REM REINIALISE STACK
530 RESTORE 680
540 FOR O=1 TO 12
550   READ Z$,N$,L
560   IF Z$=K$ OR Z$=UPC$(K$) THEN GOTO 590
570 NEXT O
580 GOTO 510
590 IF (O)3 AND O(7) OR O=12 THEN GOTO 630
600 IF O)6 THEN LET O=O-3
610 GOSUB 2720 REM TO FIRING SUBROUTINE
620 IF D(O)()3 THEN GOTO 510 REM IF SYSTEM NOT WORKING THEN GOTO MAIN ROUTINE
630 INK BLACK
640 PAPER WHITE
650 GOSUB L REM OR GOTO SYSTEM SUBROUTINE
660 GOTO 510
670 DATA 32,129,130,20,1.20,1, CLASS F STAR,141,142,143,5,1,500,3000,CLASS M PLA
NET,141,142,143,12,20,100,0,CLASS G PLANET,138,139,140,30,30,2000,0,    STARBASE,
134,135,137,8,1,10.3,KLINGON WARSHIP,131,132,133,0,0,0,2200,N
680 DATA V,VIDEO   ,2630,C,COMPUTER,1540,P,PHASERS ,3270,A,ALERT   ,850,  ,PLANET
S ,780,R,REPAIRS ,940,W,WARP DRIVE         ,1940,T,PHOTON TORPEDOES   ,3190
690 DATA L,LONG RANGE SENSORS ,1060,S,SHORT RANGE SENSORS,2340,I,IMPULSE ENGINES
   ,3420,  ,KLINGONS          ,780
700 DATA -8,-7,1,9,8.7,-1,-9
710 DATA BL. HOLE, O STAR, PULSAR, NOISE,UNKNOWN,UNKNOWN,  VOID,  VOID
719 REM CLEAR DISPLAY AREA
720 LET F=40
730 INK BLACK
740 FOR M=F TO 160 STEP 10
750   PRINT @ 27,M:T$;
760 NEXT M
770 PAPER BLACK
780 RETURN
789 REM OBTAINS CO-ORDINATES OF A(?) - Q=CURRENT QUADRANT
790 LET I=Q DIV 27.1,H=I-1,J=I+1,Y=(Q-I*27) DIV 3.1,X=Y-1,Z=Y+1,W=((Q-1)-I*27) M
OD 3+1
800 IF H=-1 THEN LET H=8
810 IF J=9 THEN LET J=0
820 IF X=-1 THEN LET X=8
830 IF Z=9 THEN LET Z=0
840 RETURN
849 REM ALERT
850 PRINT @ 9,210:"G,Y OR R";
860 IF INP(&0380)=239 THEN LET E(1)=1,A(0)=4
870 ELSE IF INP(&0480)=253 THEN LET E(1)=2,A(0)=6
880 ELSE IF INP(&0380)=253 THEN LET E(1)=3,A(0)=2
890 ELSE GOTO 860
900 PRINT @ 9,210;CHR$(18)N$"   "; @ 33,210;A$;
910 INK A(0)
920 PRINT Q$Q$;
930 RETURN
939 REM REPAIRS
940 PAPER BLACK
950 INK WHITE
960 FOR T=1 TO 8
970   LET C$="OO",B=36,C=170
980   IF T)3 THEN LET B=111,C=140
990   IF RAND(2) THEN LET D(T)=D(T)+1
1000   IF D(T))2 THEN LET D(T)=3,C$="OK"
1010   IF D(T)=2 THEN LET C$="AR"
1020   PRINT @ B,C+T*10:C$;
1030 NEXT T
1040 IF Z$="R" THEN LET E(2)=E(2)*0.95
1050 GOTO 3740
1059 REM L.R. SENSORS
1060 GOSUB 720
1070 INK MAGENTA
1080 GOSUB 790
1090 PRINT @ 30,40:Q$"   "H:"    "Q$"   "I;"    "Q$"   "J;"    "Q$": @ 27,70:X;
@ 27,110;Y; @ 27,150;Z; @ 27,50;T$; @ 27,90;T$; @ 27,130;T$;
1100 FOR L=60 TO 140 STEP 40
1110   PRINT @ 111,L;Q$:X-1: @ 111,L+10;Q$:W; @ 111,L+20;Q$:W+1;
1120 NEXT L
1130 LET F=H,B=3
1140 GOSUB 1180
1150 LET F=I
1160 GOSUB 1180
1170 LET F=J
1179 REM L.R. PRINT TO SCREEN
1180 LET C(1)=X*3+F*27+W-1,B=B+27,N=50
1190 IF C(1) MOD 27=0 THEN LET C(1)=C(1)+27
1200 FOR L=2 TO 9
1210   LET C(L)=C(L-1)+1
1220   IF C(L) MOD 27=1 THEN LET C(L)=C(L)-27
1230 NEXT L
1240 FOR D=1 TO 9
1250   LET A=A(C(D)),N=N+10
1260   GOSUB 1320
1270   PRINT @ B,N;Q$C$;
1280   IF D MOD 3=0 THEN LET N=N+10
1290 NEXT D
1300 RETURN
1309 REM DETERMINES CONTENTS OF QUADRANT
1310 LET A=A(Q)
1320 FOR M=1 TO 5
1330   LET G(M)=0
```

PROGRAMS

```
1340 NEXT M
1350 IF A)9 THEN GOTO 1410
1360 RESTORE 710
1370 FOR U=1 TO A
1380   READ C$
1390 NEXT U
1400 RETURN
1410 LET M=2000,T=1
1420 GOSUB 3810
1430 LET M=500,T=2
1440 GOSUB 3810
1450 LET M=100,T=3
1460 GOSUB 3810
1470 LET M=20,T=5
1480 GOSUB 3810
1490 LET M=10,T=4
1500 GOSUB 3810
1510 IF G(4))1 THEN LET G(4)=1
1520 LET C$="K"+CHR$(48+G(5))+"B"+CHR$(48+G(4))+"S"+CHR$(48+G(1))+"P"+CHR$(48+G(
2)+G(3))
1530 RETURN
1539 REM COMPUTER
1540 GOSUB 720
1550 INK GREEN
1560 PRINT @ 48,40:"SCAN TO LOCATE"; @ 33,70;"1. KLINGONS"; @ 33,100;"2. UNEXPLO
RED AREAS"; @ 33,130;"3. PLANETS"; @ 33,160;"4. STARBASES";
1570 GOSUB 3780
1580 IF O(1 OR O)4 THEN GOTO 1570
1590 GOSUB 1890
1600 SWAP D,O
1610 PRINT @ 45,50;
1620 GOTO 1590+O*40
1630 PRINT"    KLINGONS";
1640 LET O=5,S=5
1650 GOTO 1770
1660 REM
1670 PRINT"UNEXPLORED AREAS";
1680 FOR O=1 TO 243
1690 IF A(O)=INT(A(O)) THEN GOSUB 1840
1700 GOTO 1910
1710 PRINT"    PLANETS";
1720 GOTO 1770
1730 REM
1740 REM
1750 PRINT"   STARBASES";
1760 LET S=4
1770 FOR O=1 TO 243
1780   GOSUB 1310
1790   IF G(O)=0 AND S(S)=0 THEN GOTO 1810
1800   GOSUB 1840
1810 NEXT O
1820 SWAP D,O
1830 RETURN
1839 REM PRINTS COMPUTER INFORMATION TO DISPLAY
1840 GOSUB 790
1850 PRINT @ X,L;Y;" ";W;
1860 LET L=L+10
1870 IF L=170 THEN LET L=70,X=X+24
1880 IF K(123 THEN RETURN
1890 LET F=60,S=2
1900 GOSUB 730
1910 INK GREEN
1920 LET K=27,L=70
1930 RETURN
1939 REM WARP DRIVE - ENERGY DECREASES, TIME INCREASES, SETS UP NEW S.R. ARRAY
1940 PRINT @ 51,180;"QUADRANT ";
1950 GOSUB 3780
1960 PRINT @ 81,180;C;",";
1970 LET G=O*3,P=ABS(G-Y)
1980 IF P)4 THEN LET P=9-P
1990 GOSUB 3780
2000 PRINT;",";
2010 LET S=G+O*27,M=ABS(O-X)
2020 IF M)4 THEN LET M=9-M
2030 GOSUB 3780
2040 IF O)4 THEN GOTO 2030
2050 PRINT O;
2060 LET S=G+O,P=INT(SQR(M*M+P*P))
2070 IF G=0 OR 46 MOD 27=0 AND O=0) THEN LET G=G+27
2080 ELSE IF G=244 OR (G MOD 27=1 AND O=4) THEN LET G=G-27
2090 LET T=100,D=8
2100 GOSUB 3880
2110 LET P=S,E(6)=E(6)+(10-D)*E(7),E(7)=E(7)-P*O+E(1)
2120 IF A(O)=INT(A(O)) THEN LET A(O)=A(O)+0.5
2130 GOSUB 790
2140 PRINT @ 27,10;V-1;"1";"A"; @ 36,10;E(6);
2150 GOSUB 3740
2160 GOSUB 2460
2169 REM END
2170 IF E(6)(2500 AND INT(A(O))()1 AND INT(A(O))()2 THEN GOTO 2340
2180 INK CYAN
2190 CLS
2200 IF E(6)(2500 THEN GOTO 2230
2210 PRINT"OUT OF TIME."
2220 GOTO 2270
2230 GOSUB 1310
2240 IF E(2))0 THEN PRINT"AFTER FLYING INTO A "C$
2250 ELSE PRINT"AFTER EXPENDING ITS ENERGY"
2260 PRINT"THE ENTERPRISE WAS LOST TO SPACE ON     STARDATE "E(6)
2270 PRINT
2280 PRINT"RATING "E(4)*3+E(3)*8;"%"
2290 PRINT
2300 PRINT"PLAY AGAIN?"
2310 IF INP(&0480)=253 THEN RUN
2320 IF INP(&0480)()239 THEN GOTO 2310
2330 END
2339 REM S.R. SENSORS
2340 GOSUB 720
2350 IF D(7)()3 THEN GOTO 510
2360 LET R=0
2370 INK YELLOW
2380 FOR X=55 TO 155 STEP 20
2390   FOR H=73 TO 213 STEP 20
2400     IF Q(R)=0 THEN DOT H,X
2410     ELSE PRINT @ (H-9)/2,X-5;V$(Q(R));
2420     LET R=R+1
2430   NEXT H
2440 NEXT X
2450 RETURN
```


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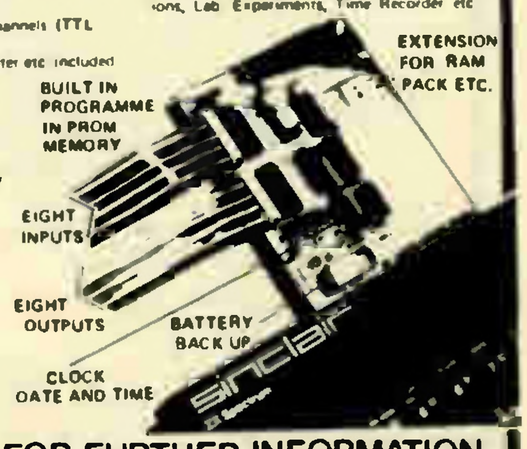

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PROGRAMS

```
2459 REM SETS UP S.R. ARRAY
2460 GOSUB 1310
2470 FOR R=0 TO 47
2480   LET G(R)=0
2490 NEXT R
2500 FOR R=1 TO 5
2510   IF G(R)=0 THEN GOTO 2570
2520   FOR H=1 TO G(R)
2530     LET K=RAND(48)
2540     IF  Q(K)<>0 THEN GOTO 2530
2550     LET Q(K)=R
2560   NEXT H
2570 NEXT R
2580 LET K=RAND(48)
2590 IF Q(K)<>0 THEN GOTO 2580
2600 LE  Q(K)=6.E=K
2610 IN  YELLOW
2620 RETURN
2629 REM VIDEO
2630 FOR U=0 TO 47
2640   IF Q(U)=0 OR Q(U)=6 THEN GOTO 2700
2650   GOSUB 720
2660   LET V=INT(U/8).H=U-V*8
2670   INK YELLOW
2680   PRINT @ 66,100:V$(Q(U)); @ 45,130;"OBJECT AT "H;","V;" IS A"; @ 51,140;U$
(Q(U));
2690   PAUSE 15000
2700 NEXT U
2710 GOTO 2340
2719 REM FIRING SUBROUTINE  - IF KLINGON IN QUADRANT, DOES IT FIRE? IF SO, WHAT
    DAMAGE TO ENTERPRISE?
2720 IF RND)1/(E(1)+1)+0.2 THEN GOSUB 940
2730 GOSUB 1310
2740 IF G(5)=0 OR RND(0.5 THEN RETURN
2750 LET R$=V$(5),S$=V$(6),D$="=".Y$="="
2760 GOSUB 2810
2770 FOR T=1 TO 9-E(1)*2
2780   IF RND(0.5 THEN LET D(RAND(8)+1)=1
2790 NEXT T
2800 GOTO 940
2809 REM PERFORMS ALL KLINGON-ENTERPRISE/ENTERPRISE-KLINGON FIRING ACTIONS
2810 GOSUB 720
2820 INK YELLOW
2830 PRINT @ 66,100:R$;
2840 FOR T=60 TO 27 STEP -1
2850   PRINT @ T,100:D$;
2860 NEXT T
2870 INK BLACK
2880 PRINT @ 27,100:T$;
2890 INK YELLOW
2900 PRINT @ 66,100:S$;
2910 FOR T=27 TO 60
2920   PRINT @ T,100:Y$;
2930 NEXT T
2940 INK BLACK
2950 IF R$=V$(6) AND (T$="T" OR RND(0.6) AND NOT S$="" THEN GOTO 3000
2960 IF NOT R$=V$(6) THEN LET E(2)=E(2)-RAND(E(2)/(E(1)+1))/3
2970 PRINT @ 27,100:T$;
2980 GOSUB 3740
2990 GOTO 2350
2999 REM ENTERPRISE DESTROYS SOMETHING
3000 PRINT @ 66,100:D$
3010 FOR T=1 TO 200
3020   DOT (220+RND(8),100+RND(10)
3030 NEXT T
3040 INK YELLOW
3050 IF S$="" THEN GOTO 2350
3060 IF NOT(T$="T" OR T$="K") THEN GOTO 3090
3070 LET D=6
3075 LET L=0
3080 IF Q(U)=5 THEN GOTO 3090
3085 GOTO 3075
3090 IF Q(U)<>5 THEN GOTO 3150
3100 LET E(1)=E(1)+1.5*(T$="K").E(2)=E(2)-50*(T$="K")
3110 IF E(1)<0.5 THEN LET E(1)=0.5
3120 PRINT @ 151,230:E(1);
3130 GOSUB 3700
3140 INK BLACK
3150 GOTO 2970
3159 REM IF NOT KLINGON THEN END
3160 CLS
3170 PRINT"YOU FACE COURT'S MARTIAL FOR DESTROYING A"U$(Q(U))
3180 GOTO 2270
3189 REM.TORPEDOES
3190 IF E(5)=0 THEN RETURN
3200 LET T=190
3210 GOSUB 3840
3220 GOSUB 3910
3230 LET E(5)=E(5)-1
3240 LET R$=V$(6),R$="* "+Y$+" *"
3250 GOSUB 3930
3260 GOTO 3810
3270 REM ENDGAME
3280 GOSUB 1310
3290 LET R$=V$(5),R$="",D$="",Y$="=",G$=""
3300 IF E(5)<0 THEN LET G$="
3310 PRINT @ 9,200;          "; @ 9,200;
3320 LET K=RND(8
3330 IF K=10 THEN GOTO 3370
3340 IF K=9 OR K=8 THEN GOTO 3320
3350 PRINT K;
3360 LET G$=G$+CHR$(K)
3370 GOTO 3320
3380 PRINT @ 9,200;G$+R$(6)+G$;
3390 GOTO 3810
3400 INK BLACK
3410 PAPER WHITE
3419 REM IMPULSE ENGINES : IF DOCKED THEN REPLENISH ENERGY AND TORPEDOES : IF
     ORBIT THEN CLASS M PLANET RECEIVES AND CLASS O PLANET
3420 LET T=220,D=7
3430 GOSUB 3840
3440 GOSUB 3930
3450 GOSUB 3880
3460 LET E(2)=E(2)-D*E(1)/2
3470 IF D)5 AND S$="" THEN GOTO 3400
3480 IF D)5 OR (D=5 AND Q(U)/2()INT(Q(U)/2)) THEN GOTO 3670
3490 IF D=5 AND (Q(U)=2 OR Q(U)=4) THEN GOTO 3521
```


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PROGRAMS

```
3500 LET Q(E)=0,E=E+P*Q,Q(E)=6
3510 GOTO 2340
3520 LET Q(E)=0,E=E+(Q-1)*P,Q(E)=6
3530 GOSUB 720
3540 INK YELLOW
3550 PRINT @ 63,100;
3560 IF Q(U)=2 THEN GOTO 3620
3570 PRINT"DOCKED";
3580 LET E(2)=3000,E(5)=3
3590 GOSUB 3740
3600 PAUSE 10000
3610 GOTO 2340
3620 PRINT"ORBIT";
3630 LET E(3)=E(3)+1,Q(E+P)=3,A(P)=A(P)-400
3640 GOSUB 3740
3650 PRINT @ 39,220;E(3);
3660 GOTO 3600
3670 CLS
3680 LET C$=U$(Q(U))
3690 GOTO 2240
3699 REM IS MISSION ACCOMPLISHED?
3700 IF E(4)<>20 OR E(3)<>5 THEN RETURN
3710 CLS
3720 PRINT"MISSION COMPLETE"
3730 GOTO 2270
3739 REM PRINT ENERGY
3740 INK WHITE
3750 PRINT @ 0,30;"ENERGY"; @ 3,100;INT(E(I));"
3760 IF E(I)<=0 THEN GOTO 2180
3770 RETURN
3779 REM INKEY
3780 LET Q=GET-48
3790 IF Q<0 OR Q>8 THEN GOTO 3780
3800 RETURN
3809 REM USED IN DETERMINING CONTENTS OF Q
3810 IF A<M THEN RETURN
3820 LET G(T)=G(T)+1,A=A-M
3830 GOTO 3810
3839 REM DIRECTION : FOR IMPULSE ENGINES AND TORPEDOES
                1
          8           2
        7               3
          6           4
                5
3840 PRINT @ 51,T;"DIRECTION (1-8)      ";
3850 GOSUB 3780
3860 IF Q=0 THEN GOTO 3850
3870 RETURN
3879 REM SPEED : USED FOR WARP DRIVE AND IMPULSE ENGINES
3880 PRINT @ 51,T;"SPEED (1-"D;")          ";
3890 GOSUB 3780
3900 IF Q>D THEN GOTO 3890
3910 PRINT @ 51,T;CHR$(18)N$;
3920 RETURN
3929 REM USED FOR TORPEDOES AND IMPULSE ENGINES TO CHECK IF ANYTHING IN THAT
     DIRECTION
3930 RESTORE 700
3940 FOR L=1 TO Q
3950    READ  P
3960 NEXT U
3970 LET F=0,U=E,S$=""
3980 IF (U<8 AND (Q<3 OR Q=8)) OR (U>39 AND Q>3 AND Q<7) OR (U/7=INT(U/7) AND Q>
1 AND Q<5) OR (U/8=INT(U/8) AND Q>5) THEN RETURN
3990 LET U=U+P,F=F+1
4000 IF Q(U)=0 THEN GOTO 3980
4010 LET S$=V$(Q(U))
4020 RETURN
```

BBC Listing Analysis

by Nicholas Phizackerley

'Analysis' is a debugging aid for the BBC A or B.

The program analyses the program currently in RAM producing a table containing:

a) all REM statements;
b) functions and procedures together with the line calling them and the arguments passed;
c) ENDs, STOPs, ENPROCs and =s (= is the function terminator).

The program is useful in giving a reasonable idea of the structure of a program, quickly indicating key lines.

To save the program on cassette, type 'SPOOL"ANALYSIS"' after typing in the listing. To analyse a program, load your program into memory. 'Analysis' is then loaded by '*TAPE 3' (not necessary if recorded at the usual 1200 baud) followed by 'EXEC"ANALYSIS"' and then 'PROCANAL'.

The program to be analysed must be reasonably structured — no jumping in and out of procedures and functions like a demented kangaroo.

With REM statements omitted, 'Analysis' occupies less than 1k.

```
30000 REMN.P.PHIZACKERLEY APRIL 82
30001 END:REM SO USER PROGRAM HALTS
30002 DEFPROCANALYSIS:LOCALA%,B%,C%
30003 CLS:O$=CHR$13+CHR$151+CHR$153+STRING$(36,CHR$172)+CHR$13+CHR$10+CHR$10+CHR$9+CHR$9:PRINT'
"    FUNCTION AND PROCEDURE HIRARCHY"'';CHR$13;"  RUN":FORC%=PAGE TO TOP
30004 B%=?C%:IF B%=&0D THEN N%=256*(C%?1)+C%?2:C%=C%+3:O%=TRUE:NEXT:ENDPROC:REM DEAL WITH NEW LI
NE
30005 O%=B%=58OR((B%=61ORB%=32)ANDO%):IF B%=&DD:VDU13,10:PRINTO$;STR$(N%);" ";FNNAME(-1,C%+1);CH
R$10:NEXT:ENDPROC:REM FINDS 'DEF' STATEMENTS
30006 IF&F4=B%PRINTN%;:L%=14:VDU129:REPEAT:A%=?C%:L%=L%+1:CALL&B53A:C%=C%+1-(&F4=A%AND32=C%?1):V
DU-9*(&F4=A%)-130*(0=L%MOD40):UNTILA%=13:C%=C%-2:PRINT:NEXT:ENDPROC:REMFINDS 'REM' STATEMENTS
30007 IF B%=&F2 OR B%=&A4 THEN PRINTN%;" ";FNNAME(0,C%):REM FINDS FN/PROC CALLS
30008 IF&FA=B%OR&E0=B%OR&E1=B%OR(61=B%ANDO%)A%=B%:PRINTN%;:VDU130::CALL &B53A:CALL&FFE7:REM STOP
 END = ENDPROC
```


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```
30009 NEXT:ENDPROC
30010 DEFFNNAME(L%,Q%):LOCALR$:A%=?Q%:CALL&B53A:R$="":REPEAT:Q%=Q%+1:R$=R$+CHR$?Q%:UNTILQ<INSTR(
": +$=/,;'!$(?"+CHR$13,CHR$?Q%):C%=Q%-1:REM RETURNS NAME OF FN/PROC
30011 IF40=?Q%THENR$=R$+FNPARENTHESIES(Q%)+" "
30012 =LEFT$(R$,LEN(R$)-1)+LEFT$(CHR$130+"=",-2*(L%AND61=C%?1))
30013 DEFFNPARENTHESIES(Q%):LOCAL P$:REM LISTS ARGUMENTS
30014  P$="":REPEAT:Q%=Q%+1:P$=P$+CHR$?Q%:IF 40=?Q% P$=P$+FNPARENTHESIES(Q%):Q%=C%:UNTILFALSE
30015 IF &A4=?Q% THEN P$=LEFT$(P$,LEN(P$)-1)+"FN"
30016 IF &F2=?Q% THEN P$=LEFT$(P$,LEN(P$)-1)+"PROC"
30017 UNTIL41=?Q%:C%=Q%:=P$
30018 DEFPROCANAL:LOCALQ$,Q%:VDU22,7,14:PROCANALYSIS:VDU15,13,10:PRINTQ$:ENDPROC:REM ENTRY FN
```

BBC Voltmeter

by Peter Taylor

'Voltmeter' uses one of the BBC B's built-in analogue-to-digital converters (usually referred to as ADCs) to simulate a moving-coil voltmeter. Its most obvious application is in a physics class demonstration, a large monitor enabling the whole class to see the display.

Although the input to the micro must be a varying voltage in the range 0 to 1.8 volts, there is no reason why other parameters (temperature, weight, pressure — almost anything you care to name) couldn't be measured provided that a suitable interface unit is constructed.

Almost any energy form measurable can be converted to a varying voltage fairly easily and cheaply. If you take a £300 chemical balance, for example, you'll find about £30 worth of mechanics and the rest of the cost made up by the electronics. Since you already have the electronics (in the form of your BBC micro), why pay £270 more than you need to?

The input voltage should be fed into CH0 (marked as pin 15). For testing purposes, a 10k potentiometer should be connected between VREF (pin 11) and Analogue Ground (pin 5).

WARNING: Your interfacing circuitry must protect the computer from excess voltages. Voltages outside the stated range (0 to 1.8 volts) will seriously, and possibly fatally, damage your machine. Neither *PCW* nor the author can be held responsible for any damage resulting from the use of this program. A diagram of the analogue port can be found on page 499 of the BBC manual.

```
  10 REM***** M E T E R  *******
  20 REM**** Peter Taylor ******
  30 REM****** May 1983 ********
  40 REM++++ large-face meter simulator ++++
  50 MODE1
  60 PX=596:PY=253:V=300:ANGLE=1.4:REM++++ dummy values for PROCPointer ++++
  70 VDU 28,0,31,39,31:REM++++ define text window ++++
  80 PROCbox
  90 PROCscale
 100 PROCbezel
 110 PROCPointer
 120 REM
 130 REM**************************************
 140 REM:++++ draw meter outiline ++++
 150 DEFPROCbox
 160 MOVE 0,50
 170 DRAW 1279,50
 180 DRAW 1279,973
 190 DRAW 0,973
 200 DRAW 0,50
 210 ENDPROC
 220 REM
 230 REM**************************************
 240 REM++++ scale and calibration ++++
 250 DEFPROCscale
 260 MOVE92,699:REM++++ zero end Position ++++
 270 FOR X = 92 TO 640 STEP 4:REM++++ left end to centre ++++
 280   DRAWX,(50+ INT(SQR(850^2-(640-X)^2)))
 290   NEXT X
 300 FOR X = 644 TO 1188 STEP 4:REM++++ centre to FSD ++++
 310   DRAW X, (50+INT(SQR(850^2-(X-640)^2)))
 320   NEXT X
 330 REM++++ calibrate scale ++++
 340 INPUT"Enter FSD (2 - 19):  "FSD
 350 IF FSD>19 OR FSD<2 GOTO 340:REM++++ check for limits ++++
 360 VDU 5:REM++++ Print text at Graphic cursor ++++
 370 FOR S = 0 TO FSD STEP 1
 380   ANGLE = 1.4*S/FSD+0.869:REM++++ calc Posn. each numeral ++++
 390   MOVE(ABS(-640+(850*COS(ANGLE)))),(100+850*SIN(ANGLE))
 400   PRINTS:REM++++ Print numeral at calculated Position ++++
 410   NEXT S
 420 VDU 4:REM++++ text at text cursor ++++
 430 ENDPROC
 440 REM
 450 REM**************************************
 460 REM++++ shade-in bezel (2 triangles) ++++
 470 DEFPROCbezel
 480 GCOL0,2:REM++++ yellow- less bright in b/w ++++
 490 MOVE 0,50
 500 MOVE 0,250
 510 PLOT85,1279,250
 520 MOVE 1279,50
 530 PLOT 85,0,50
 540 REM++++ Print legend on bezel ++++
 550 INPUT"ENTER LEGEND:  "U$
 560 VDU5
 570 GCOL0,0:REM++++ back to white ++++
 580 MOVE(640-(16*LEN(U$))),175:REM++++ centre legend ++++
 590 PRINTU$
 600 VDU4
 610 GCOL0,3
 620 ENDPROC
 630 REM
 640 REM**************************************
 650 REM++++ digitisaton and Plotting ++++
```

```
660 DEFPROCPointer
670 OPX=PX:OPY=PY:OV%=V%:OA=ANGLE:REM++++ store old values for comparison +++
680 VDU 23,1,0;0;0;0; :REM++++ cursor off ++++
690 *FX16,1
700 V%=ADVAL(1)/328:REM++++ digitise ++++
710 ANGLE=(1.403*V%/200)+0.869:REM++++ Pointer angle ++++
720 LET PY =820* SIN(ANGLE):REM++++ scale end of Pointer ++++
730 LET PX =820* COS(ANGLE)
740 LETPY=PY+50
750 LETPX=ABS(-640+PX)
760 MOVE(640-(250/TAN(ANGLE))),253:REM++++ Position of pointer at bezel edge
770 DRAW PX,PY
780 IF OV%=V% THEN GOTO 670:REM++++ test for change of Pointer Position ++++
790 MOVE(640-(250/TAN(OA))),253
800 PLOT7,OPX,OPY:REM++++ erase old Pointer ++++
810 GOTO 670
820 ENDPROC
```



BBC Map Quiz

by Alan Wagstaff

'Map Quiz' is a geographical multiple-choice quiz program for the model A or B BBC.

A map of Britain is displayed on the screen. A flashing dot appears together with a list of four towns; the user is then required to select the town thought to be nearest to this point. The correct answer is indicated after an incorrect response. A score of correct responses is displayed at the end of the game.

This is arguably more useful to a trainee coach driver or travelling salesman than in a classroom but kids do seem to enjoy this type of program if it is offered as a game rather than a test.

Data statements are included for 47 towns, though others may be added by redimensioning T$ and resetting T% in line 30, altering the value of the loop in line 40 and adding further data. Data statements take the form DATA TOWN, X-coordinate, Y-coordinate, ASCII code of character to be plotted. The character plotted at position X,Y allows a 'fine adjustment' of the position.

The map, incidentally, contains no global variables so could easily be incorporated into any program in need of a map of Britain. The local variables passed to the procedure in line 70 select green land surrounded by blue sea. Changing the values of B% and F% (set in line 20) will change these colours, allowing you to turn Britain red/blue or whatever according to your political persuasions.

Listing courtesy of 'The Computer Shop', Darlington.

```
LIST
  10*FX229,1
  15REM For OS 0.1 line 10 should read ?&226=&FF
  20MODE7:!&FE00=&10200A:B%=132:F%=146:V%=0:S%=0
  30DIMT$(46),C$(3),T%(46,3)
  40FORG%=0TO46:READT$(G%):FORH%=0TO2:READT%(G%,H%):NEXT,
  50PROCTITLE
  60REPEAT
  70PROCMAP(B%,F%):PROCSET:PROCSORT:PROCQUIZ:IFI%=R%PROCRIGHT ELSE PROCWRONG
  80V%=V%+1:PRINTTAB(0,23)CHR$129;CHR$157;CHR$135;S%;" right out of ";V%;". Get
 ready...";
  90NOW=TIME:REPEATUNTILTIME-NOW)500:CLS
 100UNTILO
 110END
 120DEFPROCMAP(B%,F%)
 130VDUB%,157,32,32,32,F%,104,255,125,124,255,13,10
 140VDUB%,157,32,32,32,F%,124,255,255,63,33,13,10
 150VDUB%,157,32,F%,124,116,255,255,63,97,120,116,112,112,13,10
 160VDUB%,157,32,32,F%,255,255,255,255,255,255,255,255,255,13,10
 170VDUB%,157,32,32,F%,122,255,255,255,255,255,255,255,37,13,10
 180VDUB%,157,32,F%,42,39,120,255,255,255,255,47,33,13,10
 190VDUB%,157,32,32,32,F%,255,255,255,255,63,96,13,10
 200VDUB%,157,32,32,F%,95,55,122,255,255,255,255,255,52,13,10
 210VDUB%,157,32,32,F%,34,32,98,255,255,255,255,255,255,52,13,10
 220VDUB%,157,32,32,32,F%,95,255,255,63,47,255,255,255,125,13,10
 230VDUB%,157,32,32,32,F%,34,96,33,32,126,255,255,255,255,124,112,13,10
 240VDUB%,157,32,32,32,32,32,32,32,F%,42,255,255,255,255,255,255,52,13,10
 250VDUB%,157,32,32,32,32,32,32,32,32,F%,122,255,255,255,255,255,125,48,13,10
 260VDUB%,157,32,32,32,32,32,32,32,32,F%,111,255,255,255,255,255,116,49,13,10
 270VDUB%,157,32,32,32,32,F%,120,124,255,255,126,255,255,255,255,255,255,63,13,
10
 280VDUB%,157,32,32,32,32,F%,96,107,255,255,255,255,255,255,255,255,255,124,126
,255,125,13,10
 290VDUB%,157,32,32,32,32,32,F%,255,255,255,255,255,255,255,255,255,255,255,255
,255,255,53,13,10
 300VDUB%,157,32,32,F%,120,124,126,255,255,255,255,255,255,255,255,255,255,255,
255,255,47,33,13,10
 310VDUB%,157,32,32,F%,34,39,96,47,255,63,103,255,255,255,255,255,255,255,47,39
,13,10
 320VDUB%,157,32,32,32,32,F%,95,112,112,95,255,255,255,255,255,255,255,255,255,
125,124,13,10
 330VDUB%,157,32,32,32,F%,95,126,255,255,255,255,255,255,255,63,255,255,255,63,
39,33,13,10
 340VDUB%,157,32,32,F%,120,255,63,255,55,33,34,96,96,13,10
 350VDUB%,157,F%,40,46,39,32,32,34,13,10
 360ENDPROC
 370DEFPROCSET
 380FORG%=0TO46:T%(G%,3)=0:NEXT
 390FORG%=0TO3:C$(G%)="":NEXT
 400ENDPROC
 410DEFPROCSORT
 420Z%=RND(47)-1:T%(Z%,3)=1:X%=T%(Z%,0)-1:Y%=T%(Z%,1):N%=T%(Z%,2)
 430R%=RND(4):C$(R%-1)=T$(Z%)
 440FORC%=0TO3:IFC%=R%-1 GOTO460
 450Z%=RND(47)-1:IFT%(Z%,3)=0C$(C%)=T$(Z%):T%(Z%,3)=1:ELSE450
 460NEXT:ENDPROC
 470DEFPROCQUIZ
 480FORG%=0TO3:PRINTTAB(16,G%*2+1);CHR$147;CHR$157;CHR$129;G%+1;"  ";C$(G%);:NE
XT
```


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PROGRAMS

```
  490K%=FNK:M%=?K%
  500REPEAT:?K%=M%:FORG%=1TO1000:NEXT
  510SOUND1,-5,RND(200),1
  520?K%=N%:FORG%=1TO1000:NEXT
  530I%=INKEY(0)-48:*FX15,0
  540UNTILI%)0ANDI%(5
  550ENDPROC
  560DEFPROCRIGHT
  570PRINTTAB(16,10)CHR$149;CHR$157;CHR$132;"You are ";:FORG%=1TO4000:NEXT:FORG%
=1TO10:SOUND1,-15,12*G%,1:NEXT:PRINT;"CORRECT":S%=S%+1
  580ENDPROC
  590DEFPROCWRONG
  600PRINTTAB(16,10)CHR$149;CHR$157;CHR$132;"You are ";:FORG%=1TO4000:NEXT:FORG%
=-15TO0:SOUND0,G%,5,1:NEXT:PRINT;"WRONG"
  610PRINTTAB(36,R%*2-1)CHR$136;"**"
  620FORG%=1TO2000:NEXT
  630ENDPROC
  640DATA INVERNESS,9,3,126,ABERDEEN,14,3,111,FORT WILLIAM,8,4,123,PERTH,10,5,11
9,GLASGOW,8,6,63,EDINBURGH,11,7,125,NEWCASTLE,15,9,123,STRANRAER,7,9,63,CARLISLE
,12,10,126,MIDDLESBRO,16,10,123,KENDAL,12,11,119,YORK,16,12,125,LEEDS,15,12,111
  650DATA PRESTON,12,13,126,HULL,18,12,111,LIVERPOOL,12,13,63,MANCHESTER,13,14,1
25,SHEFFIELD,15,14,125,HOLYHEAD,8,14,40,LINCOLN,17,14,63,STOKE,13,15,123,NOTTING
HAM,16,15,123,SHREWSBURY,13,15,111,NORWICH,21,15,63,BIRMINGHAM,14,16,125
  660DATA ABERYSTWYTH,9,16,123,NORTHAMPTON,17,16,123,CAMBRIDGE,19,16,63,HEREFORD
,13,17,126,COLCHESTER,22,17,123,OXFORD,16,17,111,CARDIFF,11,18,111,CARMARTHEN,8,
18,126,LONDON,19,18,111,BRISTOL,13,18,123,GUILDFORD,17,19,125
  670DATA MAIDSTONE,20,19,125,DOVER,22,19,63,BARNSTAPLE,8,19,63,SALISBURY,14,19,
111,TAUNTON,11,20,126,SOUTHAMPTON,15,20,63,BRIGHTON,19,20,111,EXETER,10,21,126,D
ORCHESTER,12,21,125,PLYMOUTH,9,21,111,PENZANCE,4,22,119
  680DEFPROCTITLE
  690FORO%=1TO2:PRINTTAB(0,5+G%)CHR$131;CHR$157;CHR$132;CHR$141;TAB(16)"MAP QUIZ
";:NEXT
  700PRINT''CHR$148;CHR$157;CHR$135;" You will see a map of Britain."'';VDU148,1
57,135:PRINT"Press the number for the town you"'';VDU148,157,135:PRINT"think is
nearest to the flashing dot."
  710PRINTTAB(0,23);:VDU129,157,135:PRINT;"Press any key to start.....";C%=GET:C
LS:ENDPROC
  720DEFFNK=HIMEM+X%+Y%*40
```

Pet Wave Simulation

by Robert Oakeshott

'Wave Simulation' is a simple program to demonstrate the principle of superimposition for the addition of two travelling waves. Although the resolution is very low, it is adequate for demonstration purpose in an 'O' level physics class.

It is possible to control the speed of the display by pressing 'f' (faster) to increase the speed and 's' (slower) to decrease it. As the program stands, it is not possible to freeze the display. It should be possible to allow a much slower movement, however, by editing line 350 to allow a higher value of k ('. . . and k<1000 . . .', for example).

Instructions are given within the program.

```
10 rem standing wave simulation
20 rem robert oakeshott 1982
30 poke 59468,14:rem lower case
40 poke 53,15:clr:rem redefine top of memory - poke 135,15 for old rom
50 lk=151:rem location to find key pressed - lk=515 for old rom
60 gosub 580:rem instructions
70 for i=7936 to 8192:poke i,0:next:rem clear table of wave positions...
80 rem set up table of scaled sin wave
90 for i=0 to 7
100 sn=sin((↑/8)*i)
110 s2=12*sn
120 s3=int(s2+.5)
130 poke 8080+i,s3
140 poke 8088+i,(-s3) and 255
150 next
160 rem enter machine code
170 for i=4096 to 9999
180 read a$
190 if a$<>"#" then poke i,val("&"+a$):next
200 rem enter lower half of pointers to screen lines
210 for i=0 to 24
220 read a:poke 8096+i,a
230 next
240 rem enter upper half of pointers to screen lines
250 for i=0 to 24
260 read a
270 poke 8144+i,a
280 next
290 print tab(10);"[REV]Press space to start[OFF]"
300 wait 59410,4,4:rem wait for space key
310 k=102:rem delay constant
320 sys 4096:rem move wave on
330 for j=1 to k:next:rem delay
340 get c$
350 if c$="s" and k<200 then k=k+20:poke lk,255:rem slow down & repeat
360 if c$="f" and k>31 then k=k-20:poke lk,255:rem speed up and repeat
370 goto 320
380 rem data for machine code
390 data 162,0,189,1,31,157,0,31,232,224,39,208,245,173,143,31,41,15
400 data 170,189,144,31,141,39,31,232,142,143,31,56,169,0,237,1,31,141
410 data 48,31,162,38,189,48,31,157,49,31,24,125,1,31,157,96,31,202,16
420 data 240,162,0,169,32,157,0,128,157,0,129,157,0,130,157,0,131,202
430 data 208,241,169,192,160,39,153,224,129,136,208,250,162,24,189,160
440 data 31,133,0,189,208,31,133,1,169,103,145,0,202,16,239,234,234,234
450 data 234,169,0,141,47,31,169,42,141,95,31,169,0,141,94,31,160,39
460 data 185,0,31,32,188,16,136,208,247,169,255,141,47,31,169,0,141,95
470 data 31,169,128,141,94,31,160,39,185,48,31,32,188,16,136,208,247
480 data 160,39,185,95,31,24,105,24,74,170,189,160,31,133,0,189,208,31
490 data 133,1,169,102,145,0,136,208,231,96,72,42,104,105,24,74,170,169
500 data 232,224,12,208,1,96,48,2,169,202,141,230,16,189,160,31,133,0
510 data 189,208,31,133,1,177,0,45,47,31,13,95,31,77,94,31,202,145,0
520 data 224,12,208,228,96,170,170,170,170
530 data "#"
540 rem data for start of screen locations
```

```
550 data 0,40,80,120,160,200,240,24,64,104,144,184,224.8,48,88,128,168,208,248
560 data 32,72,112,152,192,128,128,128,128,128.128,128,129,129,129,129,129,129
570 data 130,130,130,130,130,130,130,131.131,131.131,131
580 rem instructions
590 print "■";tab(13);"Standing Waves"
600 print     tab(13);"──────────────"
610 print "■This program demonstrates the formation"
620 print "■of a standing wave, when an incident"
630 print "■wave inteferes with its reflection."
640 print "■The incident wave is shown by '*'.the"
650 print "■reflected wave is shown by reverse"
660 print "■field, and their sum by '■'."
670 print"■■The program may be speeded up by"
680 print "■pressing the ■ F ■ key, and slowed down"
690 print "■with the ■ S ■ key."
700 return
read .
```

Apple II Aplist

by G Keen

'Aplist' is a utility for an Apple II and requires the Microsoft TASC compiler. The listing below assumes an Epson MX-80 F/T III printer, but is simple to modify for any use with other printers.

The program takes a Basic program and produces a neat, paged hardcopy listing. The listing below was produced using 'Aplist'. The processed listing gives you (1) neatly-paged listings, (2) Basic keywords in lower-case, (3) REM statements enlarged (makes it easier to read listings) and (4) optional 'space-recognition'. Space recognition, if selected, prints underline characters in place of spaces within strings and data statements. This is useful where the number of spaces in a string is important.

When 'Aplist' requests first and last parameters, it is referring to the lowest and highest line numbers of the program to be listed.

After entering the program (and saving it as a precaution), it must be compiled using the TASC compiler. When running the compiler, select decimal 24576 as the runtime location and choose the default object code file. This places 'Aplist' above hires page 2, safely out of harm's way.

The easiest way to run the program is to set up an EXEC file containing:-

"BLOAD RUNTIME,A24576"
"BRUN LLIST.OBJ"

The program can then be run by EXEC APLIST.

It is also possible to run the program from Basic by renumbering it '60000,1', merging it onto the end of the program to be listed and the simply RUN 60000.

If you want to modify 'Aplist' for use with printers other than the Epson, the control codes used are:-

CHR$ (15)	— selects 16 characters per inch.
POKE 1657,132	— selects 132 characters per line
CHR$ (12)	— page skip on
CHR$ (14)	— selects double print width
CHR$ (23)	— toggles between upper/lower case
CHR$ (27); "—"; CHR$ (1)	— automatic underlining on
CHR$ (27); "—"; CHR$ (0)	— automatic underlining off

In line 220, the number 62 refers to page length (no of lines). The number 122 in line 270 refers to the maximum print width; this will have to be adjusted to suit your printer and should be set to (maximum print width — 5).

'Aplist' works by scanning your program line by line until it finds a line greater than or equal to your first parameter. It then checks the memory location currently being examined. If this check reveals a keyword, then printer is switched to lower-case, the word is printed and the printer is switched back to upper-case. If the check reveals a REM statement, the printer is switched to enlarged print and the rest of the line is printed before switching back to normal sized print. If the character being examined is a space and the space-recognition option is on, then the space is underlined (underlining a space sounds a little unlikely, but the Apple will happily oblige). It then repeats this operation until it reaches your upper parameter.

Credit for the original idea and basis of the program is apparently due to 'Oggi'.

```
10   dim A$(110):J = 0:A = 0:L = 1: for C = 1 to 107: read A$(C): next
90   text : home : print "PROGRAM LISTING UTILITY  (C) G.KEEN 1983                LLIST.": print : print
100  print "PRESS  1....TO LOAD YOUR PROGRAM": print "       2....TO LIST YOUR PROGRAM": print "       3....TO EXIT THE UT
     ILITY": print "       ";: get B$: if B$ < "1" or B$ > "3" then 90
101  if B$ = "3" then  new
110  if B$ = "1" then  home : print "LOAD PROGRAM, THEN TYPE '&' TO RE-RUN  LLIST": end
115  home : print "ENTER :-": print : print "PROGRAM NAME : ";: input N$: print : print "PARAMETERS (FIRST,LAST) : ";: input F,
     L: print : print "DATE FOR LISTING : ";: input DT$
117  print : print "SPACE RECOGNITION (Y/N) : ";: get B$: if B$ = "Y" then N = 1
120  if  len (DT$) > 8 then DT$ =  left$ (DT$,8)
130  print
150  print  chr$ (4)"PR#1": print  chr$ (15): poke 1657,132: gosub 340:A = 2049
160  E =  peek (A) +  peek (A + 1) * 256:N = 1
170  if E = 0 then  print  chr$ (4)"PR#0": goto 90
180  N = 0
182  A1 =  peek (A + 3)
184  A1 = A1 * 256
186  A1 = A1 +  peek (A + 2)
190  A = A + 4: if A1 > L then  print  chr$ (4)"PR#0": goto 90
200  if A1 < F then A = E: goto 160
```


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PROGRAMS

```
210   J = J + 1:D = 7
220   if K > 62 then  print  chr$ (12): gosub 340
230   print A1; spc ( 8 -  len ( str$ (A1))));
240   B =  peek (A: if B = 0 then A = A + 1: print :D = D + 1: goto 160
250   if B > 127 and M = 0 then  print " ";
260   D = D + 1 + (M = 1)
270   M = 0: if D > 122 then  print : print  tab ( 7)::D = D: A = A + 1: if M = 1 then  print  chr$ (14);
280   if B = 170 then D = 1:M = 1
290   A = A + 1
295   if B = 32 and M = 1 then  print  chr$ (95):: goto 240
300   if B > 128 then  print  chr$ (B-128):: goto 240
310   B = B - 127: print  chr$ (32);A$(B); chr$ (28);" ";D = D + len (A$(B))
320   if D = 1 then  print  chr$ (14)::D = 0
330   goto 240
340   print "APPLE PROGRAM LISTING": spc ( 95);"PAGE : ";L: print  chr$ (27);"-"; chr$ (1);N$; spc ( 87 -  len (N$));"
                  DATE : ";D$; spc ( 8 -  len (D$)); chr$ (27);"-"; chr$ (0)
345   L = L + 1:P = 4: print : return
350   data END,FOR,NEXT,DATA,INPUT,DEF,DIM,READ,GR,TEXT,PRE,INE,CALL,PLOT,HLIN,VLIN,HGR2,HGR,HCOLOR =,HPLOT,DRAW,XDRAW,HT
      AB,HOME,ROT =,SCALE =,SHLOAD,TRACE,NOTRACE,NORMAL,INVERSE,FLASH,COLOR =,POP,VTAB,HIMEM:,LOMEM:,ONERR,RESUME,RECALL,ST
      ORE
360   data SPEED =,LET,GOTO,RUN,IF,RESTORE,&,GOSUB,RETURN,REM,STOP,ON,WAIT,LOAD,SAVE,DEF,POKE,PRINT,CONT,LIST,CLEAR,GET,A
      DD,NEW,TAB (,TO,FN,SPC (,THEN,AT,NOT,STEP,+,-,*,/,^,AND,OR,>,=,<,SGN,INT,ABS,USR,FRE,SCRN (,PDL,POS
370   data SQR,RND,LOG,EXP,COS,SIN,TAN,ATN,PEEK,LEN,STR$,VAL,ASC,CHR$,LEFT$,RIGHT$,MID$
```

And, below, the first three lines of the listing with the space-recognition employed:-

```
10   dim A$(11):d = 0:p = 0:L = 1: for C = 1 to 107: read A$(C): next
20   cls : home : print "PROGRAM LISTING UTILITY  (C) E.GREEN 1982                LLIST.": print : print
30   print "PRESS  1....TO LOAD YOUR PROGRAM": print "      2....TO LIST YOUR PROGRAM": print "      3....TO EXIT THE UT
     ILITY": print "      ": get Q$: if Q$ < "1" or Q$ > "3" then 90
```

BBC Varchange

by David Grant

'Varchange' is a very useful utility for the BBC A or B. The utility allows selected variable names within a Basic program to be changed. Since the utility works by acting directly on the memory locations of variables and not by a textual substitution, it can act precisely and unambiguously. It is possible to change the variable A$, for example, without affecting A, A1, AA$, A%, etc. Another interesting consequence is that legal variables such as A can be changed to illegal variables such as PRINT. Statements such as PRINT PRINT will not confuse the BBC since it can distinguish between the tokenised command and the assigned variable.

You can type in and save the listing as it stands whatever your BBC system. When it comes to running the utility, however, you need to observe the following. Econet users, set page% to &1B00. For a model B, let PAGE=&6000, model A let PAGE=&3000. If you have a disk system, change line 40 to set page% to &1900.

Among the uses of the utility are: changing a frequently used number to a variable; changing long variables to short to save on memory; changing ordinary variables into array variables; changing numeric to string; converting ordinary numeric variables to integer; renaming procedures . . . possibilities abound.

After loading the program should you wish to change and set the values of page% and PAGE as detailed above, load 'Varchange' from tape. Type OLD and then RUN. The program will first of all ask how many variables are to be changed and then request the old name followed by the new name. To change a number to a variable, enter the number as if it were a variable. Once you have done this, 'Varchange' will begin changing the variables telling you what it is doing and which line it is working on. This fact means that you could also use the utility to locate all occurrences of a particular variable simply by changing it to itself and noting the line numbers.

When 'Varchange' has finished, it will print 'done'. Set PAGE to page% then LIST the program. Don't forget to save the new version!

To change array variables, eg, A(20,10) to B(20,10), enter the variable name plus left-hand bracket thus: A(and B(respectively. To change procedure names, enter the names without PROC. To change PROCzap to PROCping, for instance, enter zap as the old variable and ping as the new.

It is also possible to change DATA statements using this utility provided that quotes have not been used.

```
10 REM Variable change program
20 REM  written by D.A.Grant
30
40 DIM O$(9),N$(9):@%=8:page%=&E00:top%=page%
50 REPEATtop%=top%+top%?3:UNTILtop%?1=&FF:top%=top%+2
60 INPUT"No of variables"NO%
70 FORI%=1TONO%:PRINT''"Var. No ";I%"=";:INPUTLINE,O$(I%-1)"Change to",N$(I%-1):NEXT
80 FORI%=0TONO%-1:O$=O$(I%):N$=N$(I%)
90 PRINT''"Changing "O$" To "N$
100 OL%=LEN(O$):NL%=LEN(N$)
110 IFRIGHT$(O$,1)="("THEN NA%=FALSE ELSE NA%=TRUE
120 SH%=NL%-OL%
130 FO%=page%
140 REPEAT
160 L%=256*FO%?1+FO%?2
170 LL%=FO%?3
180 IFINSTR($(FO%+4),O$)=0 THEN 400
```

PROGRAMS

```
190 DZ%=FALSE:CN%=TRUE
200 XX%=P0%+4
210 REPEAT
220 CH%=?XX%:C$=CHR$CH%
230 IFCH%=&22THENQ%=NOTQ%
240 IFQ%THEN380
250 IFCH%>&7D OR CH%<&30 OR CH%=&5E OR (CH%<&40 AND CH%>&39) THEN CN%=TRUE:GOTO380
260 IFCH%=&20THEN380
270 IFNOTCN%THEN380
280 CN%=FALSE
290 IFINSTR(U$,C$)<1THEN380
300 C1%=OL%?XX%
310 IFNOT(C1%<&24 OR C1%=&27 OR (C1%>&28 AND C1%<&30) OR (C1%=&39 AND C1%<&40) OR C1%=&5E OR C1%>&7D) AND NA% THEN380
320 IFLL%+SH%>255THENPRINT"Line Too Long Error":"Lines changed upto ";LX%:VDU7:END ELSE LL%=LL%+SH%:P0%?3=LL%
330 PRINTL%;
340 IFSH%<0THENS1%=XX%+OL%:SZ%=topZ%:ST%=4 ELSES1%=topZ%:SZ%=XX%+OL%:ST%=-4
350 IFSH%<>0THENC3%='S2%:FORX1%=S1%TOS2%STEPST%:SH%!X1%=!X1%:NEXT:SH%'SZ%=C3%
360 C1%=NL%'XX%:$XX%=N1%:NL%'XX%=C1%
370 topZ%=topZ%+SH%
380 XX%=XX%+1
390 UNTILXX%>P0%+LL%-1
400 P0%=P0%+LL%
410 UNTIL P0%=topZ%
420 NEXT:PRINTCHR$17 "xxDONExx"
```



BBC Epson Colour Screendump

by Peter Clark

In the April issue we published 'Beebdump', a screendump program for a BBC and Epson printer. This program is similar but has one added feature: it can represent colour displays through a 'grey scale'.

The assembly language program produces a machine code routine that will copy any graphics screen onto an Epson MX80 Mk.III or FX80 printer. Different colours are represented by varying shades of grey achieved by varying the density of dots fired on the printer.

'Screendump' must be loaded and run before loading your own program. This will locate 1/2k of machine code at memory location 'screendump'. The code may be relocated if desired, but the author makes the following recommendations:

a) The safest thing to do is to reset the value of page to PAGE+512 and then save the code at the old value of PAGE. This is achieved by adding line '25 PAGE=PAGE+512'. This location is the safest since there is no danger of overlapping the operating system workspace.

b) Disk users may locate the code at &A00, the area normally employed by the user-defined function keys. This would mean that these keys cannot be used, of course, but it has the advantage of allowing the routine to be treated as an OS command. '*SDUMP' will now perform the screendump.

Although you could load and run the assembler program each time you wanted to use it, this would take quite a long time. A faster way of doing it is to save the actual machine code generated by the assembler. The author has provided an easy way of doing this. On running the assembler, the program asks you if you want to save it. If you do, simply enter 'y'. The machine code can then be loaded by '*LOAD"S-DUMP"'.

For cassette users, the screendump is executed by the statement 'CALL &start'. where start is the hex value defined above. Probably the easiest way to call the routine is to add the following lines to your program:

```
1 ON ERROR GOTO 2
2 IF ERR=17 THEN CALL &start: END:ELSE REPORT:END
```

Pressing the escape key will now execute a screendump.

```
LIST
  10 REM EPSON SCREENDUMP
  20 REM BY P.A. CLARK
  30 screendump=PAGE-512
  40 REM **** IMPORTANT *****
  50 REM Disc users must execute 'PAGE=PAGE+512' before running, or
  60 REM alternatively change line 30 to read: screendump=&A00 if user defined
  70 REM keys are not being used. Cassette users may either leave line 30 as
  80 REM it is, in which case user defined characters cannot be used, or
  90 REM execute 'PAGE=PAGE+512' before running the program.
 100 :
 110 DIM CL 30
 120 ST$=CHR$3+CHR$26+CHR$7+CHR$5+CHR$18+CHR$3+CHR$7+CHR$25+CHR$4+CHR$200+CHR$0
+CHR$0+CHR$3+"PRESS"+CHR$13+CHR$10+"P for positive"+CHR$13+CHR$10+"N for negativ
e"+CHR$4+CHR$2
 130 xlo=&70:xhi=&71:ylo=&72:yhi=&73:colour=&74:xstep=&75:counter=&76:ytoplo=&7
7:ytophi=&78
 140 buffersz=&79:numcol=&7A:lenlo=&7B:lenhi=&7C:counterval=&7D:invert=&7E:buff
er=&7E:REM This program uses zero page locations &70 to &84
 150 osbyte=&FFF4:osword=&FFF1:oswrch=&FFEE
 160 FOR PASS=0 TO 2 STEP 2:REM make this 0 to 3 STEP 3 until debugged.
 170 P%=screendump:[OPT PASS
 180 LDA #960 MOD 256:STA lenlo:LDA #960 DIV 256:STA lenhi:LDA #4:STA counterva
l
 190 LDA #&87:JSR osbyte \read mode number
 200 CPY #0:BNE t0 \ branch if not mode 0:LDA #640 MOD 256:STA lenlo:LDA #640 D
IV 256:STA lenhi:LDA #8:STA counterval:LDX #2:LDY #1:LDA #1:BNE readpallette
 210 .t0 CPY #1:BNE t1 \ branch if not mode 1:LDX #4:LDY #3:LDA #3:BNE readpall
ette:.t1 CPY #2:BNE t2 \ branch if not mode 2:LDX #8:LDY #15:LDA #6:BNE readpall
ette
 220 .t2 CPY #4:BNE t3 \ branch if not mode 4:LDX #4:LDY #1:LDA #3:BNE readpall
ette:.t3 CPY #5:BNE return \ return if not mode 5:LDX #8:LDY #3:LDA #6:BNE readp
allette:.return RTS \return if non graphics
 230 .readpallette STA buffersz:STX xstep:STY numcol:STY xlo:CPY #1:BNE nextcol
```


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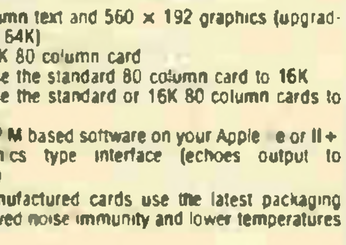

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PROGRAMS

```
 \ set actual colours to 0 & 7 for mode 0:LDA #0:STA pallette:LDA #7:STA pallett
e+1:BNE start
  240 .nextcol LDX #xlo:LDY #0:LDA #&B:JSR osword \read actual colour of colour
xlo:LDA xlo+1:LDY xlo:STA pallette,Y:DEC xlo:BPL nextcol \Delete this line (apar
t from .nextcol) for 0.1 OS
  250 .start LDA #1024 DIV 256:STA yhi:LDA #1024 MOD 256:STA ylo \ store top of
screen
  260 JSR message:LDA #0:STA invert:.testkeys LDA #129:LDX #200:LDY#255:JSR osby
te:TXA:BMI defaults:LDA #129:LDX #170:LDY#255:JSR osbyte:TXA:BPL testkeys:LDA #&
FF:STA invert:.defaults JSR message
  270 LDA #27:JSR printer:LDA #51:JSR printer:LDA #23:JSR printer \ set line spa
cing
  280 .newline LDA ylo:STA ytoplo:LDA yhi:STA ytophi:LDA #0:STA xlo:STA xhi \ be
gin next line to printer
  290 LDA #13:JSR printer \ If printer does not auto linefeed add here :LDA #10:
JSR printer using colons rather than semicolons.
  300 LDA #27:JSR printer:LDA #ASC("L"):JSR printer:LDA lenlo:JSR printer:LDA le
nhi:JSR printer \set up bit image mode
  310 .newbyte LDA ytoplo:STA ylo:LDA ytophi:STA yhi:LDA counterval:STA counter
\ start new printer byte
  320 .decy LDA ylo:SEC:CLD:SBC #4:STA ylo:BCS readpixel:DEC yhi \ next pixel do
wn
  330 .readpixel LDX #xlo:LDY #0:LDA #9:JSR osword \ read logical colour:JSR loa
dcolour \ get actual colour:LDA tablelo,Y \ get dot pattern:JSR pushbuffers \ sh
ift into buffer
  340 LDA counterval:CMP #8:BEQ deccounter \ jump if mode 0
  350 JSR loadcolour \ get actual colour again:LDA tablehi,Y \get other half of
dot pattern:JSR pushbuffers \ shift into buffer
  360 .deccounter DEC counter:BNE decy \ next pixel:LDX buffersz
  370 .opbyte LDA buffer,X:JSR printer:DEX:BNE opbyte \ send buffer to printer
  380 LDA xlo:CLC:CLD:ADC xstep:STA xlo:BCC cmpxtop:INC xhi \next x
  390 .cmpxtop CMP #1280 MOD 256:BNE newbyte:LDA xhi:CMP #1280 DIV 256:BNE newby
te \test for end of line
  400 LDA ylo:CMP #0:BNE jumpnewline:LDA yhi: CMP #0:BEQ finish \test for bottom
 of screen
  410 .jumpnewline JMP newline:.finish LDA #13:JSR printer:LDA #10:JSR printer:L
DA #27:JSR printer:LDA #50:JSR printer \output cr-lf and reset line spacing
  420 LDA #3:JSR oswrch \ turn printer off:LDA #15:LDX #1:JSR osbyte
  430 RTS \return to basic
  440 .printer PHA:LDA #1:JSR oswrch:PLA:JSR oswrch:RTS \send accumulator to pri
nter only
  450 .loadcolour:LDX colour:LDA pallette,X:LDY invert:BPL noinvert:EOR #&FF:.no
invert AND #7:TAY:RTS \ put actual colour of logical colour into Y
  460 .pushbuffers LDX buffersz:.pushbyte ROR A:ROL buffer,X:DEX:BNE pushbyte:RT
S \shift A into buffer.
  470 .locmessage:]
  480 FORI%=0 TO LEN(ST$)-1:P%?I%=ASC(MID$(ST$,LEN(ST$)-I%,1)):NEXT:P%=P%+LEN(ST
$)+1:?(P%-1)=LEN(ST$)-1
  490 [OPT PASS:.message LDX message-1:.toscreen LDA locmessage,X:JSR oswrch:DEX
:BPL toscreen:RTS
  500 ]:tablelo=P%+1:tablehi=P%+9:pallette=P%+17:NEXT PASS:REM for 0.1 OS substi
tute pallette=&38A for pallette=P%+17
  510 FORI%=0 TO 7:READ J%:tablelo?I%=J%:READ J%:tablehi?I%=J%:NEXT
  520 REM DATA 63,63,21,42,19,26,1,8,47,61,23,58,9,18,0,0:REM ALT. DOT PATTERN
  530 DATA 63,63,21,42,9,18,2,16,47,61,58,23,16,5,0,0
  540 PRINT"EPSON SCREENDUMP NOW LOADED AT ";~screendump
  550 INPUT" DO YOU WANT TO SAVE IT",A$
  560 IF INSTR("YESyesNOno",A$)=0 THEN 540
  570 $CL="SAVE"+CHR$32+"SDUMP"+CHR$32+STR$~(screendump)+CHR$32+STR$~(P%+34)
  580 IF INSTR("YESyes",A$)<>0 THEN X%=CL MOD 256:Y%=CL DIV 256:CALL &FFF7
  590 END
```

BBC Towers of Hanoi

by Alexander Holt

'Towers of Hanoi' describes graphically the solution to the famous puzzle of the same name. In its present form, using mode 2 graphics, it requires a model B. Since the code itself occupies less than 2k, however, the program could be modified to run on a model A using a lower-resolution graphics mode.

To those unfamiliar with the puzzle, it consists of three poles and a set of graduated disks with holes in the centre. When you start, the disks are placed on the left-hand pole according to diameter: largest at the bottom and smallest at the top. The problem is to transfer the disks in such a way that they end up in the same order on the right-hand pole. There are only three rules.

1. Only one disk may be moved at a time.
2. Disks may only be placed on one of the three poles.
3. At no time may one disk be placed on top of a smaller one.

The program is considerably more efficient than the standard Microsoft solution, due to its use of recursively-defined procedures. As you can see in the listing, PROChanoi calls itself twice and PROCmove once. PROCmove calls PROCdisk which in turn calls PROCfill. All in all, much shorter and neater coding than that allowed under most Basics.

Line 1160 causes the program to wait for a key press after each move; this line may, of course, be deleted if desired.

```
1000 REM Towers of Hanoi
1010 REM ---------------
1020 REM Alexander G. B. Holt
1030 REM Thanks to Mark D. Ryan
1040
1050 MODE 7
1060 REPEAT INPUT "Number of discs (1-24) : " n%
1070 UNTIL n%>0 AND n%<25
1080 MODE 2
1090 PROCinit
1100 PROCinitgraf
1110 PROChanoi(n%,0,2,1)
1120 END
1130
1140 DEF PROChanoi(num%,from%,to%,via%) IF num%=0 ENDPROC
1150 PROChanoi(num%-1,from%,via%,to%)
```

```
1160 A=GET
1170 PROCmove(num%,from%,to%)
1180 pin%(from%)=pin%(from%)-1: pin%(to%)=pin%(to%)+1
1190 PROChanoi(num%-1,via%,to%,from%)
1200 ENDPROC
1210
1220 DEF PROCmove(disc%,from%,to%)
1230 PROCdisc(from%,pin%(from%)-1,disc%,0)
1240 PROCdisc(to%,pin%(to%).disc%,disc%MOD6+1)
1250 ENDPROC
1260
1270 DEF PROCdisc(pin%.height%.size%,colour%)
1280 LOCAL 1%.x%.y%
1290 GCOL 1.colour%+128
1300 IF colour%=0 THEN GCOL 2,8+128
1310 l%=416-(n%-size%)*diam%
1320 x%=216+pin%*424-l%DIV2: y%=100+height%*sep%
1330 PROCfill(x%,y%+4.x%+l%-8.y%+sep%-8)
1340 ENDPROC
1350
1360 DEF PROCfill(x1%,y1%,x2%,y2%)
1370 VDU grafwindow%.x1%;y1%;x2%;y2%;
1380 CLG
1390 ENDPROC
1410 DEF PROCinit
1420 LOCAL logical%.actual%
1430 reldraw%=1
1440 relate%=19
1450 grafwindow%=24
1460 FOR logical%=0 TO 15                    : REM set logical-actual pairs
1470 READ actual%                            : REM so that discs retain
1480 VDU relate%,logical%,actual%,0,0,0      : REM their actual colour
1490 NEXT                                    : REM when drawn over pins
1500 DATA 0,1,2,3,4,5,6,7,7,1,2,3,4,5,6,7
1510 DIM pin%(2)                             : REM holds number on each pin
1520 pin%(0)=n%                              : REM all discs start on pin 0
1530 sep%=4*INT(200/n%)                      : REM disc separation
1540 IF sep%>100 THEN sep%=100
1550 diam%=16*INT(25/n%)                     : REM disc width facto
1560 ENDPROC
1570
1580 DEF PROCinitgraf
1590 LOCAL disc%
1600 GCOL 0.8                                : REM draw base and pins
1610 MOVE 0.92: DRAW 0,42: DRAW 1272,42
1620 DRAW 1272,92: DRAW 1072,92
1630 PROCpin: DRAW 648,92: PROCpin
1640 DRAW 224,92: PROCpin: DRAW 0,92
1650 FOR disc%=1 TO n%                       : REM draw initial posit
1660 PROCdisc(0.n%-disc%.disc%.disc%MOD6+1)
1670 NEXT
1680 ENDPROC
1690
1700 DEF PROCpin
1710 PLOT reldraw%,0,820: PLOT reldraw%.-24,0
1720 PLOT reldraw%,0,-820
1730 ENDPROC
```



Calendars

by Kevin R Smith

Although written on a Nascom 2, 'Calendars' is written entirely in Microsoft Basic and so should run on almost any micro with the absolute minimum of adaption. The only things to look out for are PRINT CHR$(17) in line 200 to perform a backspace (this is CHR$(8) on most machines) and the TAB statement which should be changed to SPC for the BBC micro.

The program calculates and prints the calendar of any month of any year between (wait for it) 25000 BC to 20000 AD and, yes, it does take into account the calendar reform of 1752. Try the calendar of September 1752 when the Julian calendar was abandoned in favour of the Gregorian.

To enter a date BC, prefix the date with a minus sign; to end the program, enter a zero for either the month or year. When entering a date, type month (1-12), year (−25000-20000). Attempting to follow the calculation involved is worse than Rubic's Revenge, but it does work for all the dates we tried. Arithmetic was never my strong point, so I'll leave you bright sparks out there to figure it out.

Our referee did manage to catch it out, incidentally. It doesn't work for 46BC when, Gary Rowland assures me, the year was 445 days long. I'll take his word for it, trusting soul that I am.

```
1 REM  CALENDARS by Kevin Smith
10 CLS:CLEAR1000:PRINTTAB(17);"CALENDARS":PRINT
15 DIMM$(12):FOR I=1 TO 12:READ M$(I):NEXT
20 DATAJanuary,February,March,April,May,June
21 DATAJuly,August,September,October,November
22 DATADecember
30 PRINT" A program to print a calendar of any month"
40 PRINT" of any year between 25000 BC and 20000 AD."
50 PRINT" Enter a negative number for years BC, or"
60 PRINT" two zeroes to end the program.":PRINT
100 INPUT" Enter month and year required";M,Y
110 IF M<0 OR M>12 OR Y<-25000 OR Y>20000THEN100
115 IF M=0 OR Y=0 THEN END
120 I=Y:A$="AD":IF Y<0 THEN A$="BC":I=-I:Y=Y+1
130 CLS:PRINTTAB(9);"Month of ";M$(M);I;A$
```


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PROGRAMS

```
150 GOSUB1000:I=J:PRINT
160 PRINTTAB(11);"S  M  T  W  T  F  S"
170 M=M+1:IF M>12 THEN M=1:Y=Y+1
180 GOSUB1000:N=J-I:J=I-INT(I/7)*7+1
185 IF J=7 THEN J=0
186 J=J*3+10:K=1
187 IF Y<>1752 OR M<>10 THEN190
188 PRINTTAB(J);" 1  2";:K=14:J=22:N=30
190 FOR I=K TO N:PRINTTAB(J);
200 IF I>9 THEN PRINTCHR$(17);
210 PRINTI;
220 J=J+3:IF J>30 THEN PRINT:J=10
230 NEXT:PRINT:PRINT:GOTO100
1000 K=Y+4712:J=INT(K/4)+365*K
1010 N=30.6*M-32.3
1020 IF M>2 THEN1040
1030 N=N+2.3:IF K-INT(K/4)*4=0 THEN J=J-1
1040 J=J+INT(N+1)
1050 IF J<=2361221 THEN RETURN
1060 K=Y-300
1070 IF M<3 THEN K=K-1
1080 N=INT(K/100)
1090 J=J-INT(.75*N)-1:RETURN
Ok
```

BBC Monitor

by Peter Whiting

'Monitor' will run on both BBC machines. The program is a simple but useful utility enabling the user to examine and modify the contents of specified RAM addresses. Hexadecimal notation is used throughout.

On running the program, a simple full-stop is used as a prompt. To examine a block of memory, enter M low-address.high-address. The monitor will now display the contents of the memory locations between the two addresses. Since 'Monitor' displays addresses in blocks of eight bytes, the command M 1900.1901 would display locations 1900 to 1907 inclusive.

To change the contents of a memory location, enter C low-address.high-address. The monitor will step through each location, displaying the current content. If you want to change the content, simply enter the desired byte and the monitor will place it in the appropriate location. Attempting to write to ROM produces a question mark.

Pressing the escape key stops the current operation, while X returns you to Basic.

```
 10 REM BBC MONITOR
 20 MODE 6
 30 COM$="XMC"
 40 ON ERROR GOTO 60
 50 @%=0
 60 PRINT
 70 VDU 15
 80 INPUT "."A$
 90 IF A$="" THEN A$=" "
100 C$=LEFT$(A$,1)
110 L=1
120 REPEAT
130   L=L+1
140   UNTIL MID$(A$,L,1)<>" "
150 A$=MID$(A$,L)
160 X=0:X=INSTR(A$,"."):IF X=0 THEN X=INSTR(A$," ")
170 IF X=0 THEN 240
180 B$=MID$(A$,X+1)
190 A$=LEFT$(A$,X-1)
200 A$="&"+A$:B$="&"+B$
210 A=EVAL(A$):B=EVAL(B$)
220 IF B>65535 OR A>65535 OR A<0 OR B<0 THEN 60
230 IF B<A THEN PRINT '"Second address too small":GOTO 60
240 C=INSTR(COM$,C$)
250 IF C=0 THEN 60
260 ON C GOTO 280,300,470
270 REM *** X:EXIT MONITOR ***
280 PRINT:END
290 REM *** M:EXAMINE MEMORY ***
300 IF X=0 THEN 60
310 VDU 14
320 PRINT
330 FOR J=A TO B STEP 8
340   IF J<4096 THEN PRINT "0";
350   IF J<256 THEN PRINT "0";
```

```
360    IF J<16 THEN PRINT "0";
370    PRINT ~J;
380    FOR K=0 TO 7
390      PRINT TAB(7+3*K);
400      X=?(J+K)
410      IF X<16 THEN PRINT "0";
420      PRINT ~X;
430      NEXT K
440    PRINT:NEXT J
450 GOTO 60
460 REM *** C:CHANGE MEMORY ***
470 A=EVAL("&"+A$)
480 IF A>65535 THEN 60
490 PRINT
500 IF A<4096 THEN PRINT "0";
510 IF A<256 THEN PRINT "0";
520 IF A<16 THEN PRINT "0";
530 PRINT ~A"  ";
540 IF ?A<16 THEN PRINT "0";
550 PRINT ~(?A);
560 INPUT "  "D$
570 D=EVAL("&"+D$)
580 ?A=D
590 IF ?A<>D THEN PRINT TAB(13,VPOS-1)"?"
600 A=A+1:IF A=&10000 THEN A=0
610 GOTO 500
```

Oric 1 Disassembler

by the Tangerine Users' Group

Acting as a simple disassembler, this program demonstrates the DEEK command of the Oric instruction set. It allows the user to investigate the workings of the Basic interpreter and system monitor.

A double-precision (that is, 16-bit) number is returned by the DEEK instruction, unlike the PEEK command which returns a single byte (8 bits). Lines 20 and 30 set the start and end address in decimal of the ROM or RAM to be disassembled. The variables 'A' and 'B' should be set to the required addresses.

```
10 CLS:              REM clear screen
20 A=49152           REM start address
30 B=49252           REM end address
40 FOR I=A TO        REM step thru in
B STEP 2:            double bytes
50 PRINT             REM output
HEX$(I)" =           current values
"HEX$(DEEK
(I)) 60 GET A$       REM wait
70 NEXT I            REM next address
80 END
```

Atom Filer

by C J Hollyman

'Filer' facilitates the creation of named cassette data files on the unexpanded atom.

On running the program, enter 1 to read a file and 2 to write. The filename, prompted by 'F?', must then be entered. This must consist of four characters.

When writing a file, enter each data item followed by the RETURN key. Enter 'E' as the end-of-file marker. All data is stored in string form.

Being written for the unexpanded machine, the program is necessarily fairly crude (the input prompts particularly), but it does work and I'm sure most Atom programmers will find it very useful.

If you have an expanded machine, then the value of D in lines 10 and 20 should be changed to # 29BD and # 2991 respectively. Note that the program is not error-trapped in order to save memory.

Incidentally, if you get a 'SUM ERROR 6' report when reading a file (indicating corrupt data), it is still possible to read the file by entering 'G.e'.

```
) LIST
  10IN."R/W 1/2"C;IFC=1D=#82BD
  20IFC=2D=#8291
  30IN."F"$D;D?4=34
```

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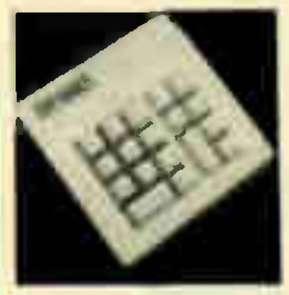

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PROGRAMS

```
 40dA=#8300;IFC=1G.a
200b)N.$A;IF$A="E"G.c
205A=A+1+LENA;IFA)#83E0G.c
210G.b
220c+$AVE"FILE" 8300 8400
225IF$A="E"E.
230G.d
300a+LOAD"FILE"
305e?.$A';A=A+LENA+1;IF$A="E"E.
310IFA)#83E0G.d
320G.e
```

Atomforth Decompiler

by Adrian Taylor

'Atomforth Decompiler' is the Forth equivalent of a Basic disassembler. It occupies just under 1¼k of dictionary space and is defined as DECOMPILE.

Used in the form DECOMPILE DEFINED-WORD, the routine gives a partial decompilation of any colon-defined Forth word. Information on each decompiled word is given in four columns:-

Column 1: serial number of code (decimal)
2: hex address of code (unsigned hex)
3: hex code (unsigned hex)
4: source code and interpretative information (numbers given in signed decimal)

As a general guide, everything in column 4 and not enclosed in round brackets can be reproduced exactly to reconstitute a word. Items enclosed in round brackets require further interpretation. Of these, LIT — together with the system-word equivalent, CLIT — can be ignored as they are automatically compiled whenever a literal value is encountered.

With the Atomforth editor present in the default position of HEX 8C00, the decompiler slightly overfills the dictionary. To avoid corrupting the screen, therefore, you should save the final screen before compilation and testing. Alternatively more experienced users may care to reset DP and FENCE in order to make use of the graphics memory.

While the program is running, ESC interrupts the display. Following ESC, RETURN terminates the run: any other key-press resumes the run. Holding down the ESC key allows single-stepping.

```
BASE @                          ( save number base across application )
FORTH DEFINITIONS HEX
: CHECK                                                  ( FORTH word )
   [COMPILE] ' DUP CFA DUP @
    DUP 2D87  =  B ?ERROR                                  ( variable )
    DUP 2D6B  =  C ?ERROR                                  ( constant )
    DUP 2DA0  =  D ?ERROR                                ( user variable )
    DUP 317A  =  E ?ERROR          ( vocabulary/<BUILDS...DOES> )
   2DUP  2 -  =  A ?ERROR                                  ( m/c primitive )
         2D2F XOR 9 ?ERROR                               ( other non-colon )
   DROP
;                                                          ( leave pfa )

  0 VARIABLE NCODE    0 VARIABLE BOFS
  0 VARIABLE +OFS     0 VARIABLE FLAG
  4 CONSTANT FIELD    2 CONSTANT RIGHT

: OFLAG   0 FLAG ! ;
: TAB   RIGHT SPACES ;
: DSIG   DECIMAL FIELD .R HEX TAB ;
: UNSIG   0 FIELD D.R TAB ;
: NPRINT   NCODE @ 1+ DUP CR DSIG NCODE ! ;
: LPRINT
   NPRINT
   OVER 2+ DUP UNSIG
   @ DUP UNSIG
   DECIMAL . HEX
```

PROGRAMS

```
    2 +OFS +!
    OFLAG
;

: ID1                                          ( literal )
    DUP 2828 = IF
      ." ( LIT )"
      LPRINT
    THEN
;

: QUOTE
    2E EMIT 22 EMIT 20 EMIT
    COUNT TYPE
    22 EMIT
;

: ID2                                          ( string )
    DUP 31E4 = IF
      OVER 2+ DUP QUOTE
      C@ 1+ +OFS +!
      OFLAG
    THEN
;

: ID3                                          ( DO )
    DUP 2910 = IF
      ." DO"
      OFLAG
    THEN
;

: ID4                                          ( LOOP/+LOOP )
    DUP 28BA = IF
      ." LOOP" 2 +OFS +! OFLAG
    ELSE DUP 28E0 = IF
        ." +LOOP" 2 +OFS +! OFLAG
      THEN
    THEN
;

: ID5                                          ( BRANCH/0BRANCH )
    DUP 288D = IF
      ." ( BRANCH" LPRINT ." )"
    ELSE DUP 28A2 = IF
        ." ( 0BRANCH" LPRINT ." )"
      THEN
    THEN
;

: ID6                                          ( one-byte literal )
    DUP 285B = IF
      ." ( CLIT )"
      NPRINT
      OVER 2+ DUP UNSIG
      C@ DUP
      FIELD .R TAB
      DECIMAL . HEX
      1 +OFS +!
      OFLAG
    THEN
;

: IDE                                          ( COMPILE )
    DUP 30D3 = IF
      ." COMPILE" DROP
      NPRINT
```


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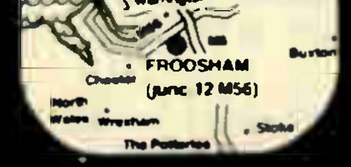

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PROGRAMS

```
    2+ DUP DUP UNSIG
    @ DUP UNSIG
    2 +OFS +!
    1 FLAG !
  THEN
                                        ( leave updated stack )
CREATE VALID   2A9 , 6320 , A528 , 3892 , 3E9 , 9285 , 2B0 ,
93C6 , 8E86 , A2 , 92B1 , 3910 , 92C6 , 92A5 , FFC9 , 2D0 ,
93C6 , E0E8 , F020 , B12A , 1092 , 29ED , 861F , C594 , 9094 ,
911E , A490 , B194 , 2992 , 917F , 8890 , F7D0 , 8EA6 , CACA ,
92A5 , 95 , 93A5 , 195 , 1A9 , 214C , A62B , 988E , F8F0 ,
SMUDGE

: NFA=  DROP NFA OVER = ;

: PRINT
   DUP DUP
   C@ 40 AND IF
     ." [COMPILE] "
   THEN
   2B4B = FLAG @ XOR 3 = IF
     ." ; " DROP
   ELSE ID.
   THEN
;

: [D]  DUP @ ." [ " DECIMAL . HEX ." , ]" ;

: IDF                                          ( FORTH name )
   FLAG @ IF
     HERE VALID IF
       HERE LATEST [ 2955 , ] IF
         NFA= IF
           PRINT
         ELSE DROP [D] THEN
       ELSE DROP [D] THEN
     ELSE [D] THEN
   ELSE DROP THEN
;                                    ( leave pfa\pfa+BOFS )

: LAST?
   2B50 = DUP IF
     FLAG @ AND 1 XOR
   THEN
;

: DECOMFILE
   BASE @ CURRENT @            ( save number base and CURRENT )
   CHECK                     ( eliminate non-colon definition )
   DEFINITIONS                          ( set CURRENT = CONTEXT )
   0 NCODE ! 0 BOFS !                    ( zero NCODE and BOFS )
   BEGIN                                          ( start cycle )
     0 +OFS ! 2 FLAG !                ( zero +OFS, default FLAG )
     NPRINT                          ( print column 1, decimal )
     DUP                                      ( save copy of pfa )
     BOFS @ + DUP DUP UNSIG                   ( print column 2, hex )
     @ DUP UNSIG                              ( print column 3, hex )
     ID1 ID2 ID3 ID4 ID5 ID6          ( identify special cases )
     NOOP NOOP                        ( space for further ID's )
     IDE IDF           ( complete identification in column 4 )
     +OFS @ 2+ BOFS +!                          ( update BOFS )
     @ LAST?                           ( check for terminal ;S )
     ?ESC DUP IF                     ( pause if ESC pressed ... )
       DROP KEY D =                  ( ... and check for RETURN )
```

```
    THEN OR                              ( OR flags )
  UNTIL                                  ( terminate if true )
  DROP                                   ( drop pfa )
  CURRENT ! BASE !                       ( restore CURRENT and BASE )

BASE !                                   ( restore BASE across application )
```



Texas Breakout

by Des Farrell

'Breakout' is a version of the well-known arcade game for the TI-99/4A, a machine rarely spotted in these pages. Unfortunately, we didn't have a machine to test it on and the author's instructions were none too clear, so these notes are based mainly on reading the listing and making educated guesses.

The game is pretty-well standard. You have a bat at the bottom of the screen and a wall at the top. The idea is to use the bat to bounce a ball against the wall; as the ball strikes a brick, the brick will be removed from the wall. The bat is controlled using keys 's' and 'k' for left and right respectively. You have five balls per game and will be awarded a bonus wall if you score 100 points. You are scored on the number of bricks you destroy; one point for bricks on the bottom level, two points for the next and five for the top.

A new ball is set in motion by pressing any key. When the game ends, press 'Y' to play again or 'N' to end.

```
  120  CALL CLEAR
  130  RESTORE
  140  CALL SCREEN(16)
  150  PS=2
  160  IF PS=18 THEN 240
  170  PS=PS+2
  180  READ A$
  190  GOSUB 1700
  200  GOTO 160
  210  DATA "THE OBJECT OF THE
GAME IS","TO KNOCK DOWN THE
PIECES","OF THE WALL USING F
IVE"
  220  DATA "PROJECTILES.THE BA
T IS","CONTROLED USING THE K
EYS"
  230  DATA "FOR <=S AND K=> .PR
ESS","ANY KEY TO START THE "
,"PROJECTILES.GOOD LUCK"
  240  FOR D=1 TO 1000
  250  NEXT D
  260  CALL CLEAR
  270 CALL COLOR(2,2,15)
  280  CALL COLOR(11,7,15)
  290  CALL COLOR(12,5,15)
  300  CALL COLOR(13,13,15)
  310  CALL CHAR(112,"COCOCOCOC
OCOCOCO")
  320  CALL CHAR)113,"030303030
3030303")
  330  CALL CHAR(114,"OOOOOOOOO
OFFFFFF")
  340  CALL CHAR(115,"OOOOOOOOO
OCOCOCO")
  350  CALL CHAR(116,""OOOOOOOOO
0030303")
  360  CALL CHAR(120,"FEFEFEFEF
EFEFE")
  370  CALL CHAR(128,"FEFEFEFEF
E")
  380 MAN=5
  390  SC=0
  400  Z=0
  410  BT=14
  420  CALL SCREEN(15)
  430  CALL HCHAR(1,9,114,15)
  440  CALL HCHAR(1,8,116)
  450  CALL HCHAR(1,24,115)
  460  CALL VCHAR(2,8,113,22)
```


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PROGRAMS

```
470  CALL VCHAR(2,24,112,22)
480  PS=8
490  A$="SCORE"
500  W=24
510  GOSUB 1750
520  GOSUB 1500
530  A$="MAN =5"
540  W=2
550  GOSUB 1750
560  CALL HCHAR(10,26,48)
570  REM BUILD WALL
580  FOR I=4 TO 6
590  CALL HCHAR(I,9,120,15)
600  NEXT I
610  RANDOMIZE
620  A=INT(RND*15)+8
630  B=7
640  BD=1
650  IF A>19 THEN 660 ELSE 68
0
660  AD=-1
670  GOTO 690
680  AD=1
690  CALL KEY(0,K,S)
700  IF S=0 THEN 690
710  GOTO 1000
720  CALL KEY(0,KY,ST)
730  IF KY=83 THEN 860
740  IF KY=75 THEN 860
750  A=A+AD
760  B=B+BD
770  IF A<9 THEN 1040
780  IF A>23 THEN 1040
790  IF B<2 THEN 1100
800  IF B>23 THEN 1140
810  CALL GCHAR(B,A,G)
820  IF G=120 THEN 1310
830  CALL HCHAR(B,A,46)
840  CALL HCHAR(B,A,32)
850  GOTO 720
860  CALL HCHAR(24,BT 32)
870  CALL HCHAR(24,BT+1,32)
880  CALL HCHAR(24,BT+2,32)
890  IF KY=83 THEN 900 ELSE 9
20
900  BT=BT 1
910  GOTO 930
920  BT=BT+1
930  IF BT<6 THEN 940 ELSE 97
0
940  BT=6
950  CALL SOUND(30,-1,0)
960  GOTO 1000
970  IF BT>23 THEN 980 ELSE 1
000
980  BT=23
990  CALL SOUND(30,-1,0)
1000  CALL HCHAR(24,BT,128)
1010  CALL HCHAR(24,BT+1,128)
1020  CALL HCHAR(24,BT+2,128)
1030  GOTO 750
1040  REM HIT SIDE WALLS
1050  AD=-AD
1060  CALL SOUND(30,380,0)
1070  IF B<2 THEN 1100
1080  IF B>23 THEN 1140
1090  GOTO 750
1100  REM HIT TOP
1110  BD=-BD
1120  CALL SOUND(30,380 0)
1130  GOTO 750
1140  REM HIT BAT
1150  BD=-1
1160  CALL SOUND(30,380,0)
1170  IF A=BT THEN 1250
1180  IF A=BT+1 THEN 1270
1190  IF A=BT+2 THEN 1290
1200  MAN=MAN-1
```

PROGRAMS

```
1210  CALL SOUND(30,-1,0)
1220  CALL HCHAR(8,7,MAN+48)
1230  IF MAN=0 THEN 1800
1240  GOTO 620
1250  AD=-1
1260  GOTO 750
1270  AD=0
1280  GOTO 750
1290  AD=1
1300  GOTO 750
1310REM HIT WALL
1320  BD=-BD
1330  CALL SOUND(30,380,0)
1340  IF B=6 THEN 1370
1350  IF B=5 THEN 1400
1360  IF B=4 THEN 1440
1370  SC=SC+1
1380  GOSUB 1500
1390  GOTO 830
1400  SC=SC+2
1410  GOSUB 1500
1420  AD=-AD
1430  GOTO 830
1440  SC=SC+5
1450  IF BD=1 THEN 1460 ELSE
1470
1460  AD=-AD
1470  REM GOTO SCORE
1480  GOSUB 1500
1490  GOTO 830
1500  REM SCORE
1510  IF SC =100 THEN 1580 EL
SE 1520
1520  X=INT(SC/10)
1530  Y=SC-(X*10)
1540  CALL HCHAR(10,27,X+48)
1550  CALL HCHAR(10,28,Y+48)
1560  RETURN
1570  PS=8
1580  A$="BONUS"
1590  W=13
1600  GOSUB 1750
1610  FOR I=200 to 400 STEP 1
0
1620  CALL SOUND(30,1,0)
1630  NEXT  I
1640  CALL HCHAR(8,12,32,7)
1650  Z=Z+1
1660  CALL HCHAR(10,26,Z+48)
1670  SC=SC-(Z*100)
1680  GOSUB 1520
1690  GOTO 580
1700  FOR I=2 TO 8
1710  CALL COLOR(I,5,16)
1720  NEXT I
1730  W=3
1740  REM ASC FIND
1750  FOR I=1 TO LEN(A$)
1760  Q=ASC(SEG$(A$,I,1))
1770  CALL HCHAR(PS,I+W,Q)
1780  NEXT I
1790  RETURN
1800  CALL CLEAR
1810  CALL SCREEN(16)
1820  A$="          GAME OVER
"
1830  PS=8
1840  GOSUB 1750
1850  A$="DO YOU WANT TO PLAY AGAIN?"
1860  PS=23
1870  GOSUB 1750
1880  CALL KEY(0,KE,S)
1890  IF S=0 THEN 1880
1900  CALL HCHAR(23,30,KE)
1910  IF KE=89 THEN 100 ELSE
1920
1920 END
```


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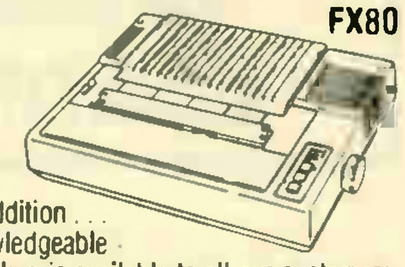

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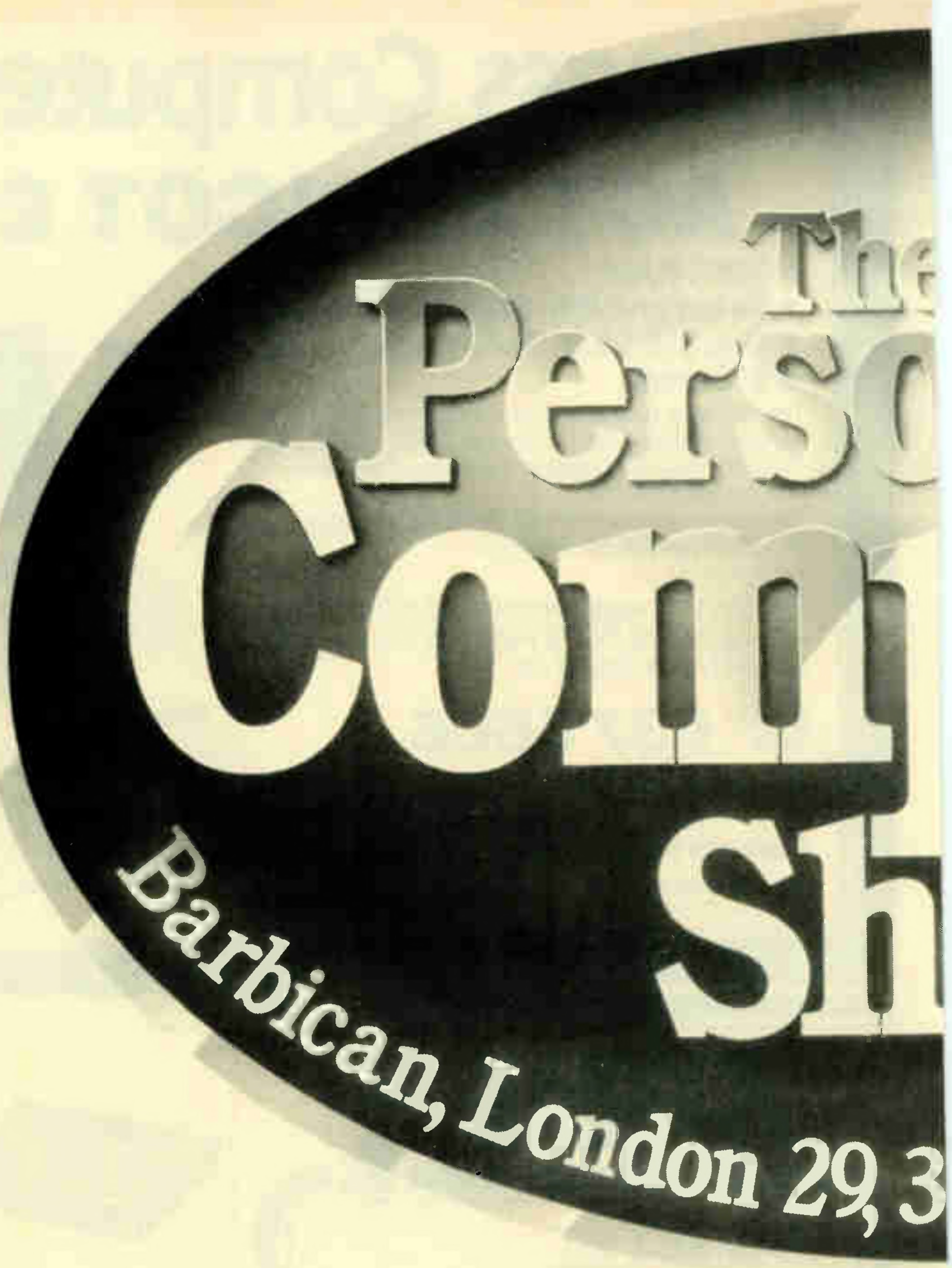

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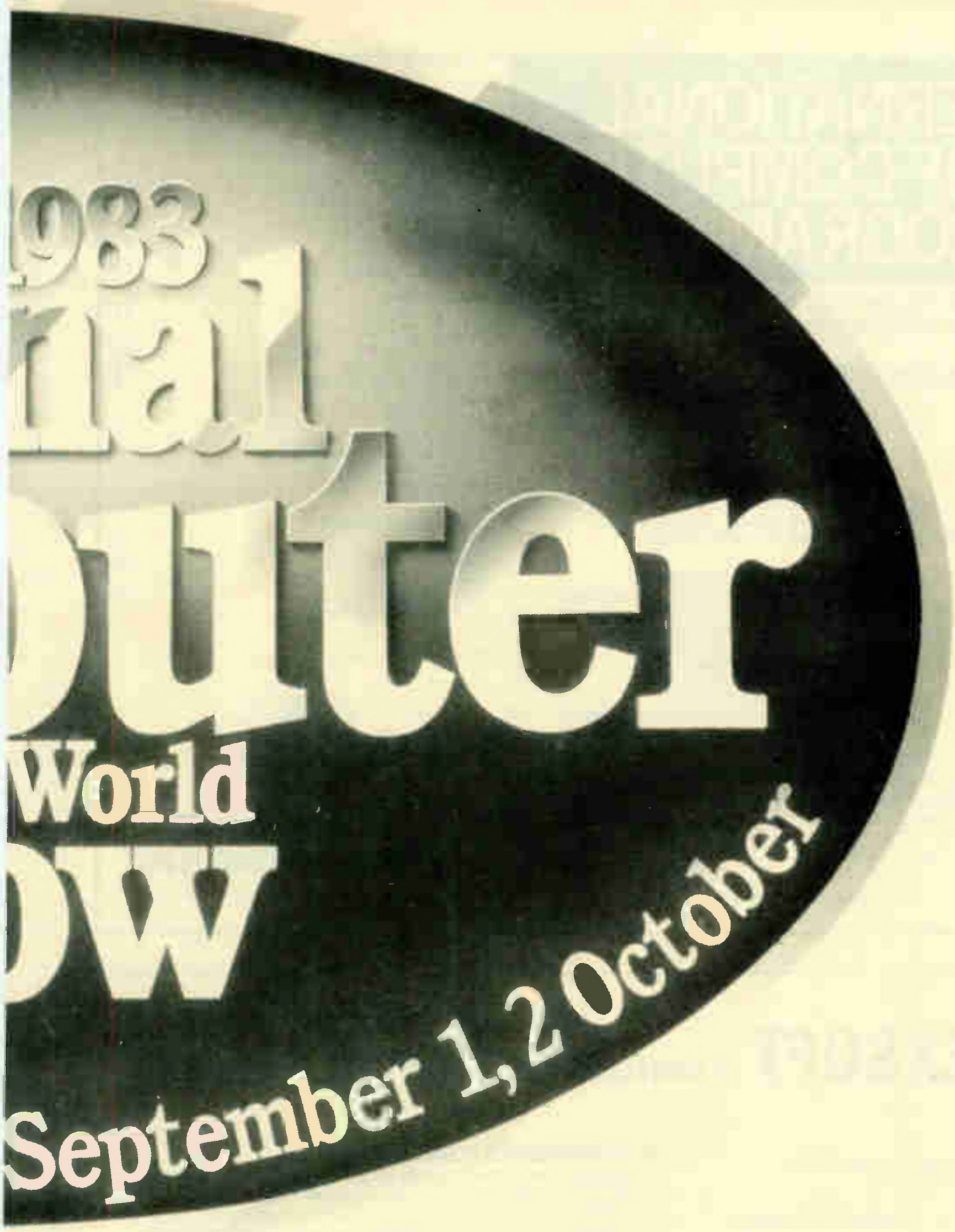

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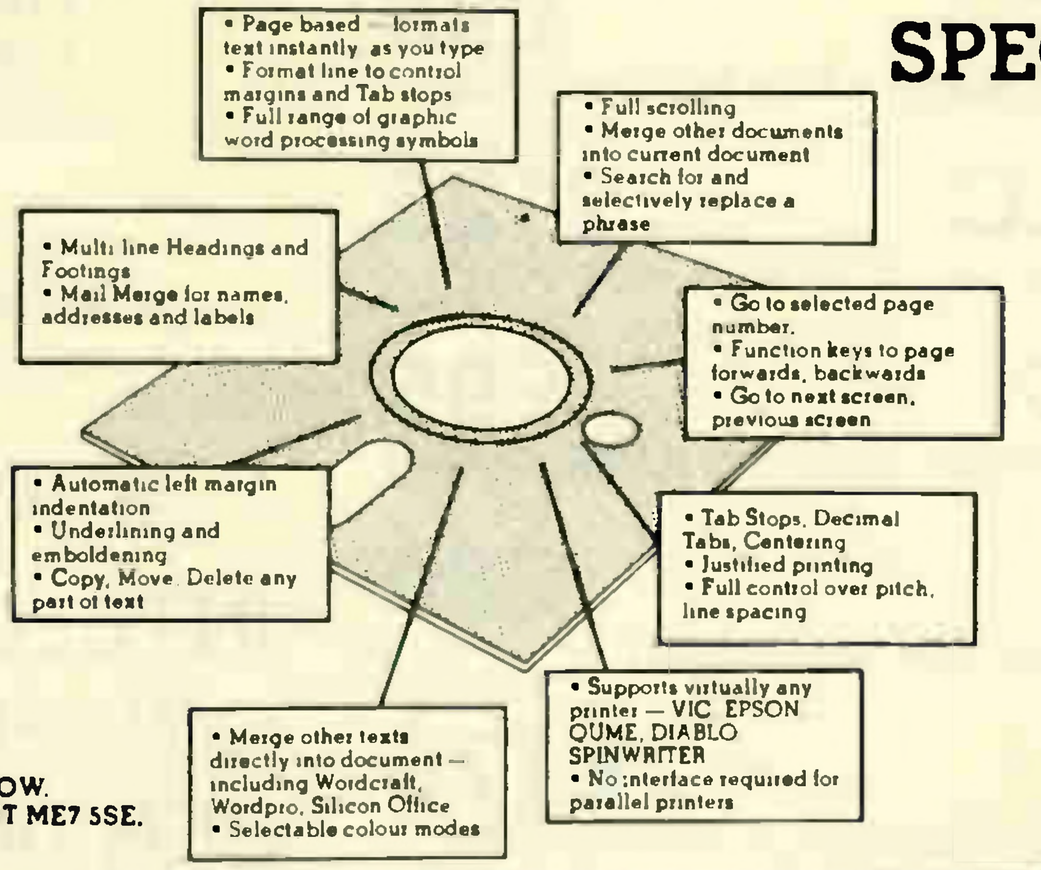

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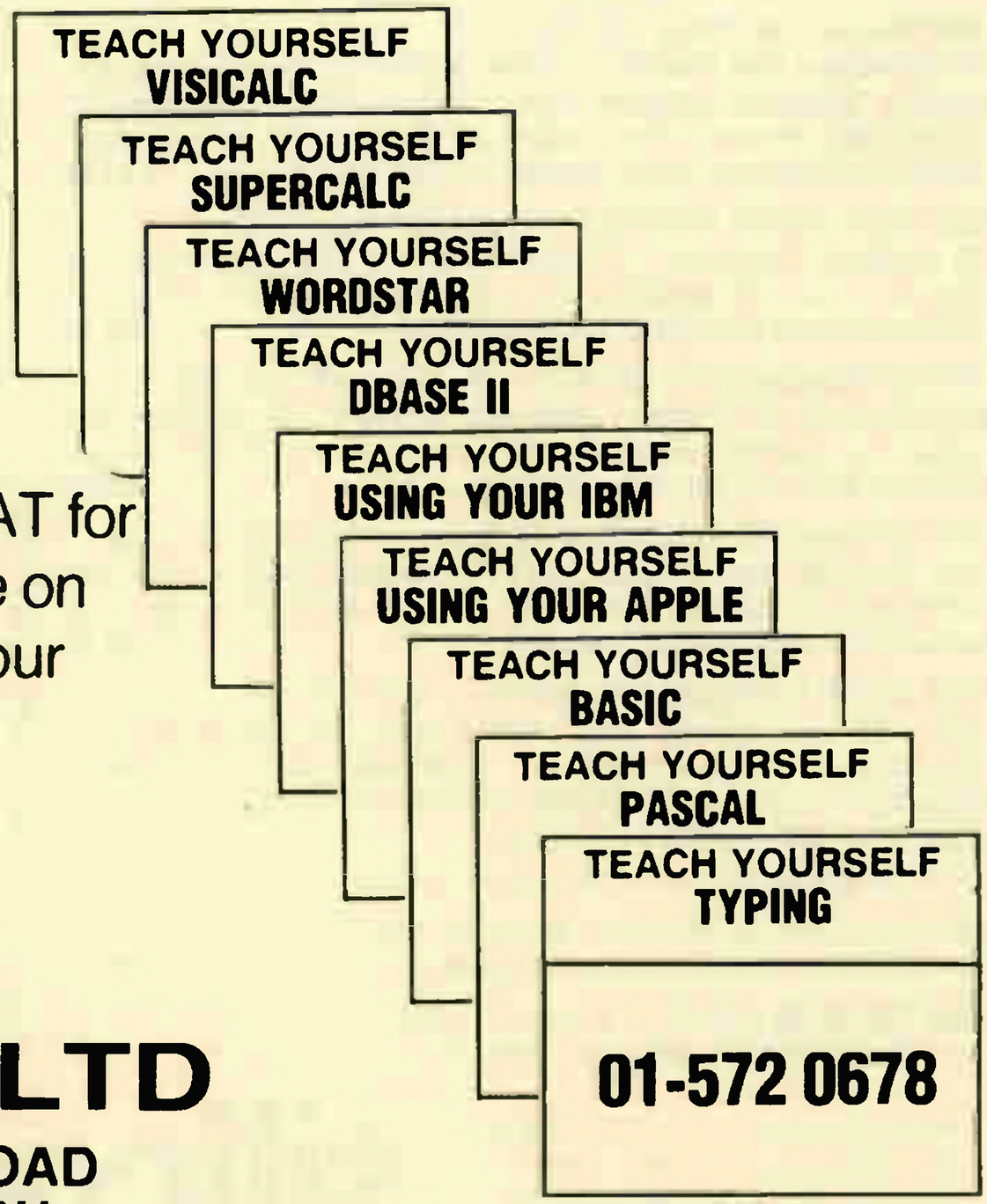

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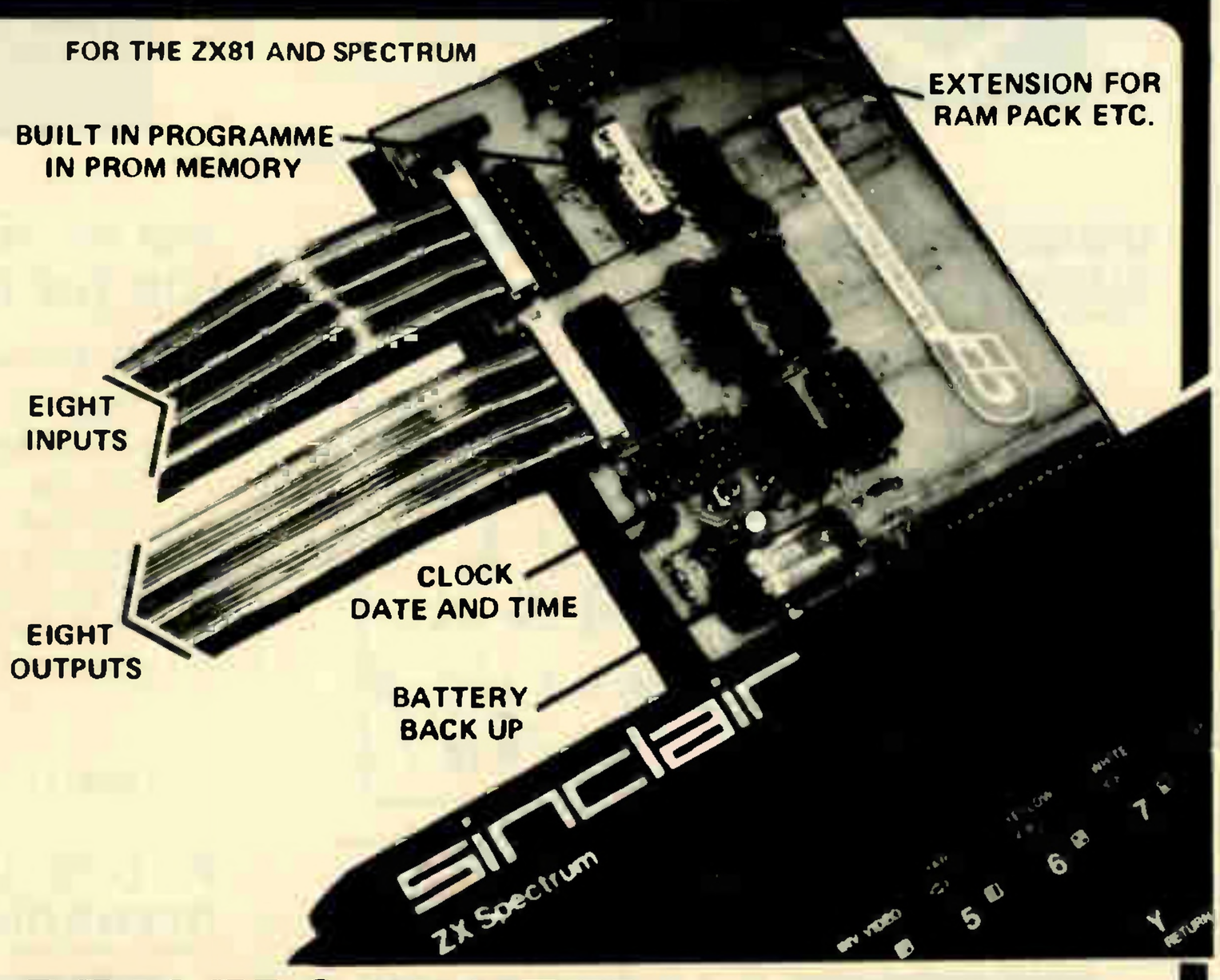

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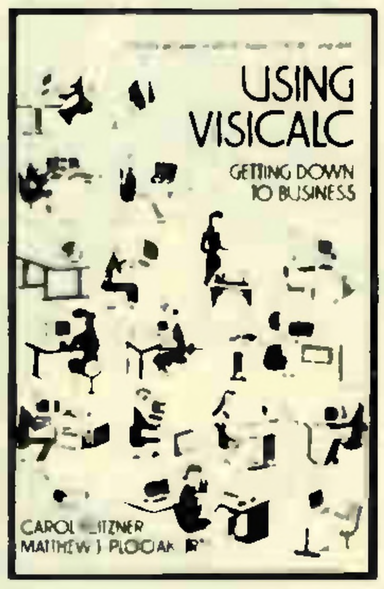

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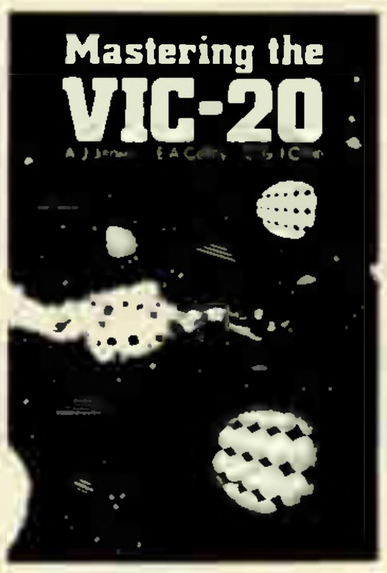

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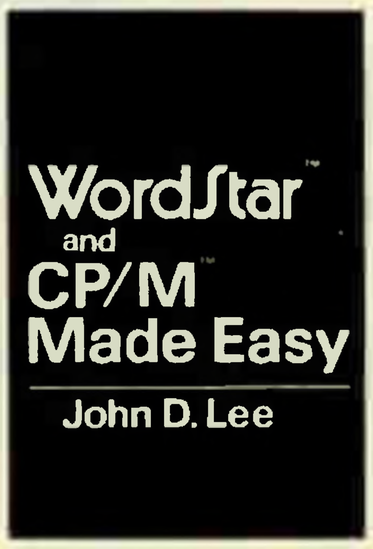

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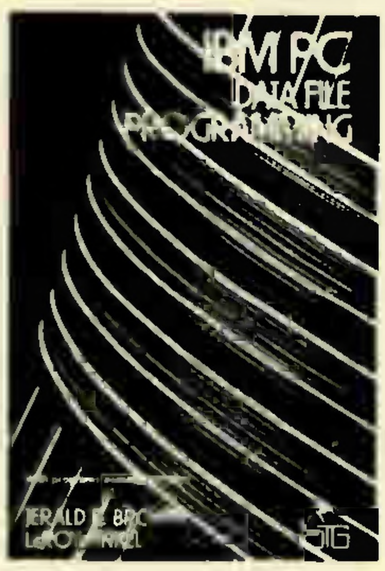

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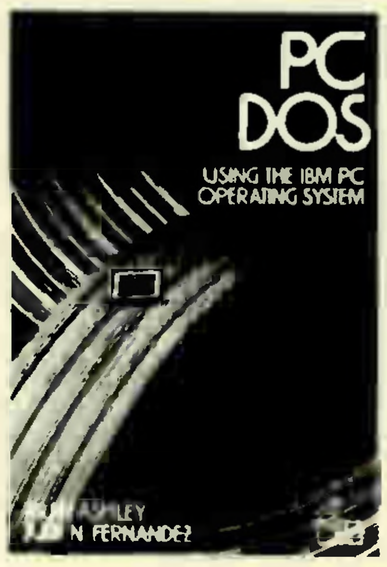

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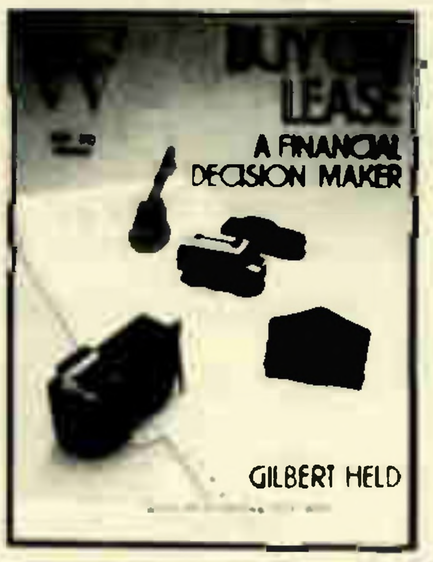

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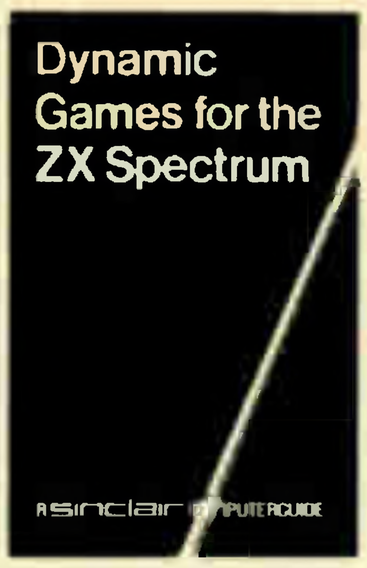

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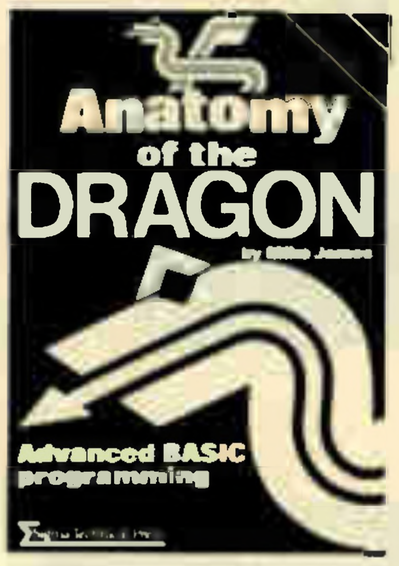

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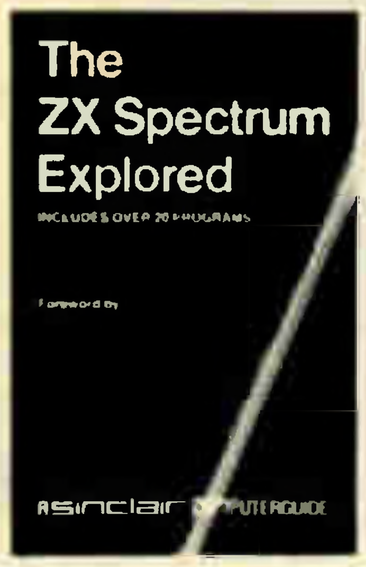

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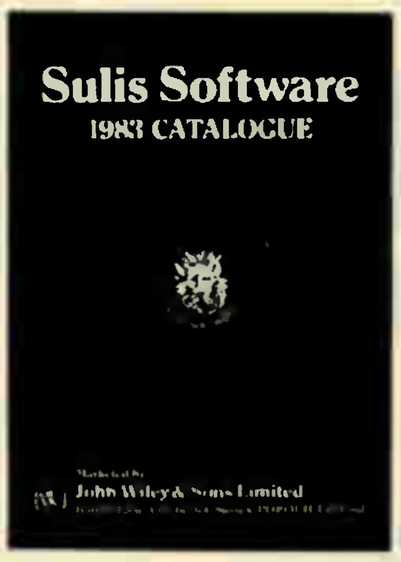

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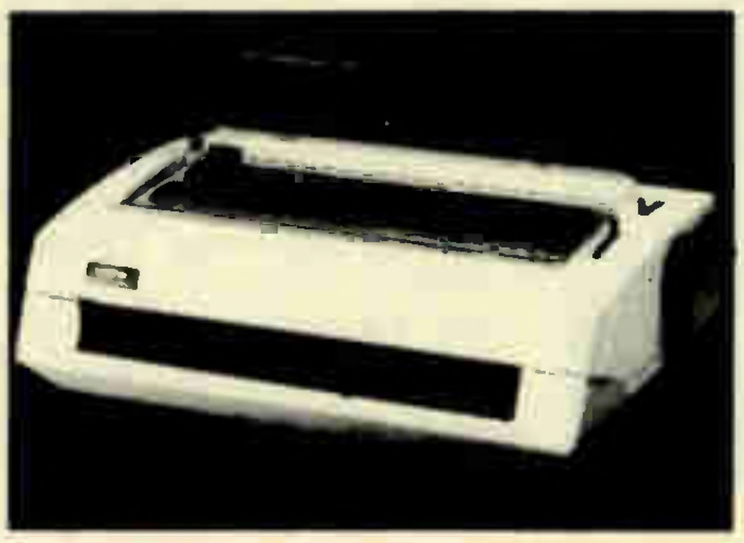

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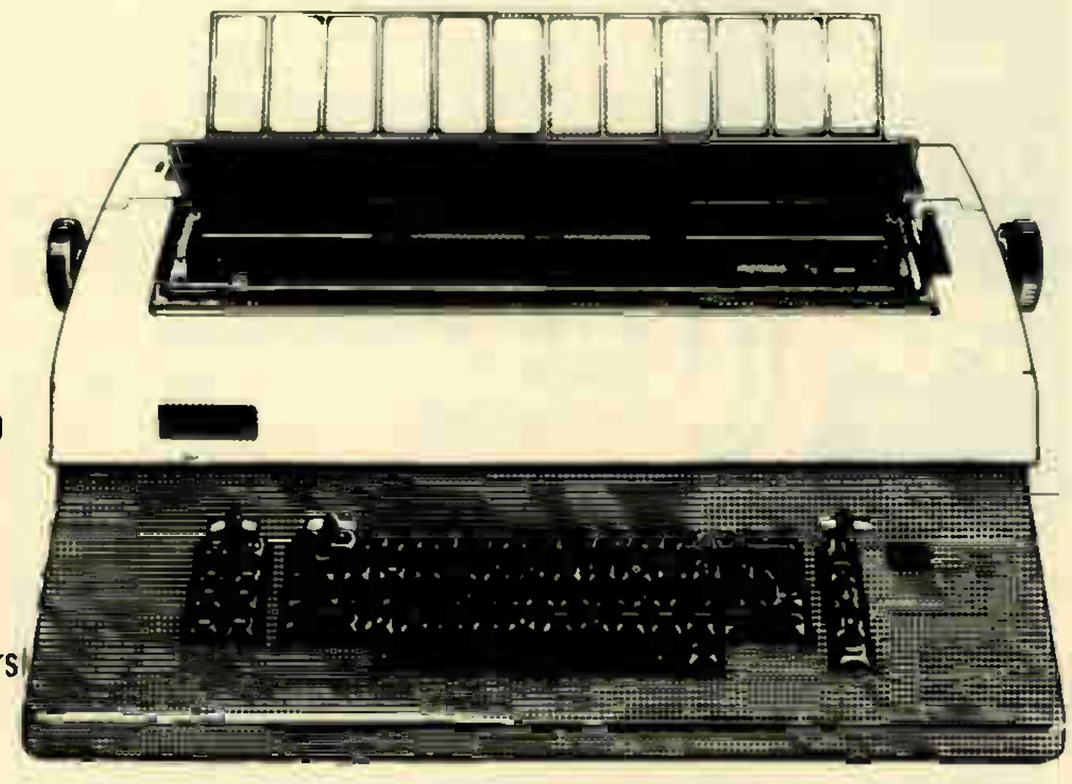

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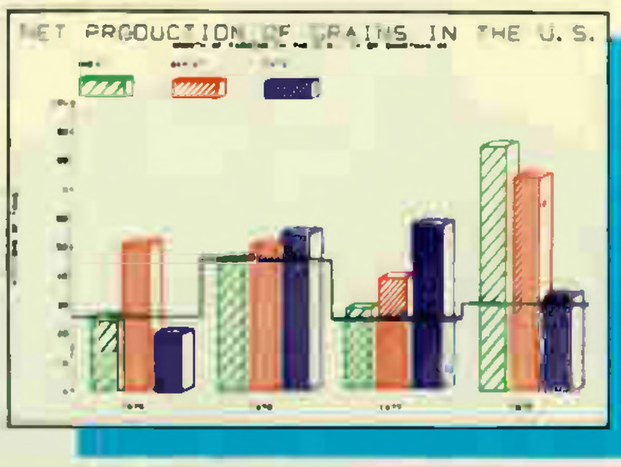

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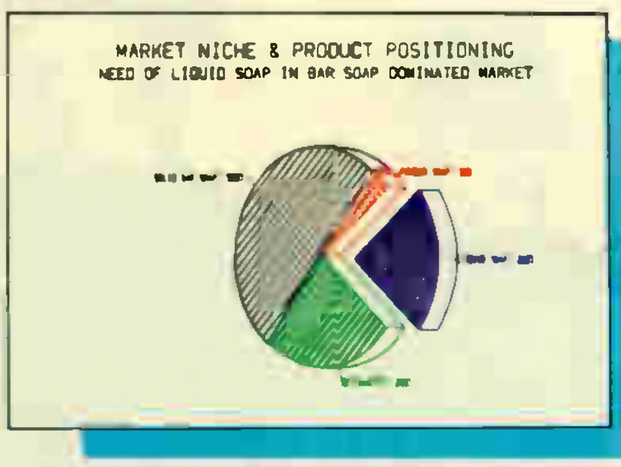

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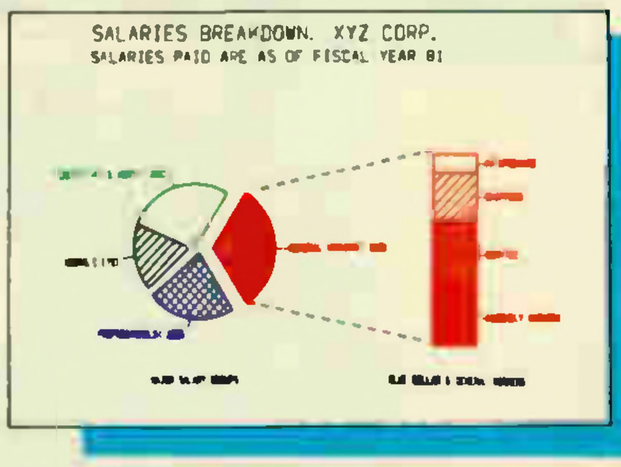

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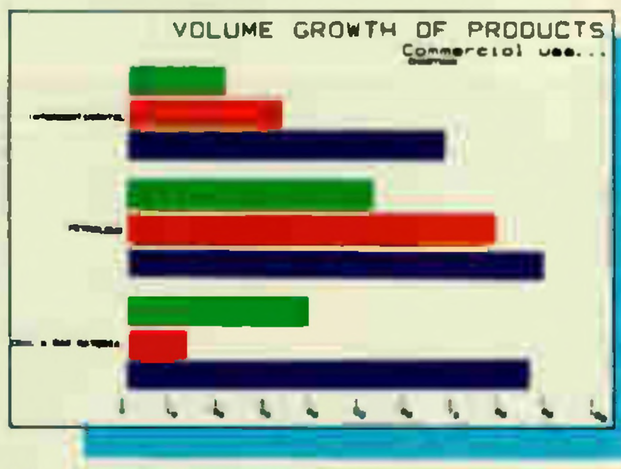

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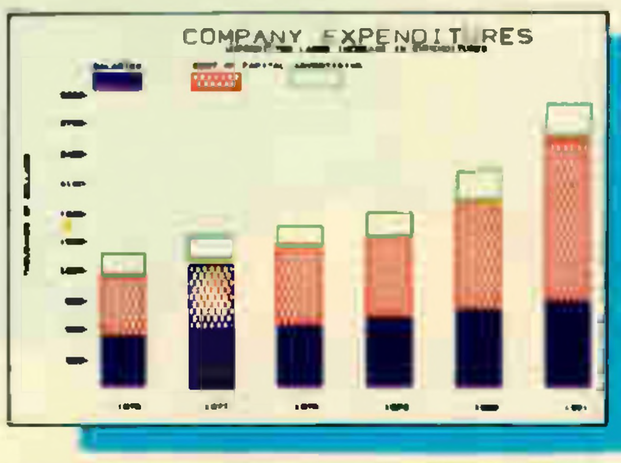

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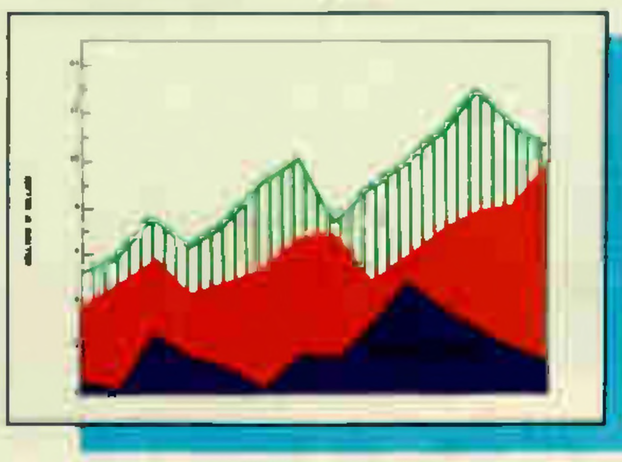

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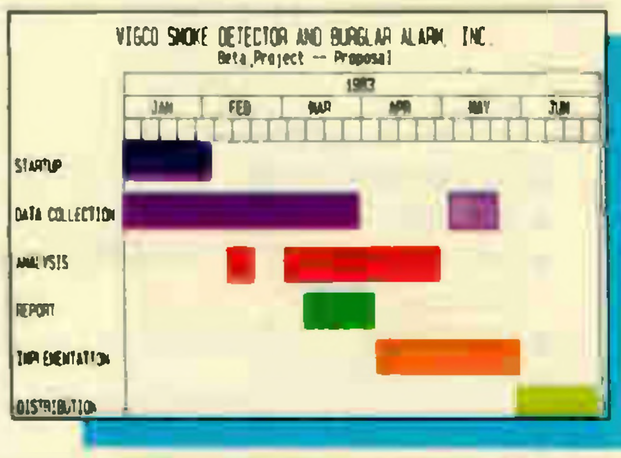

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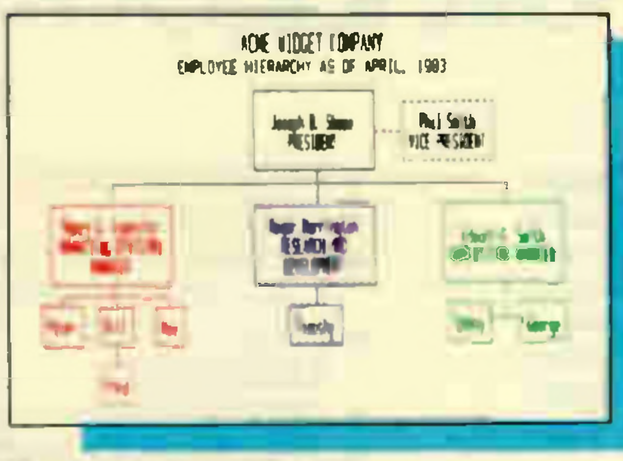

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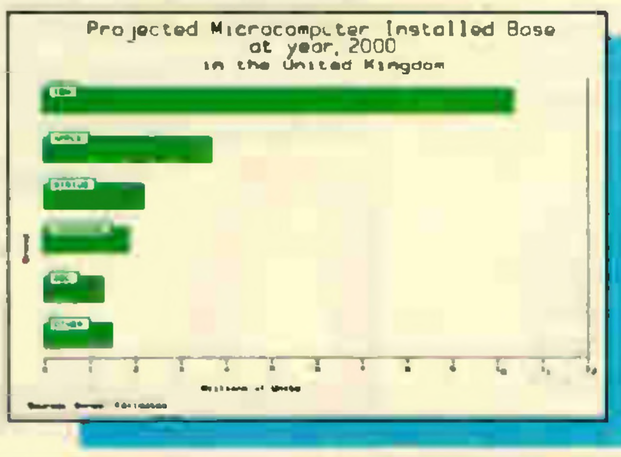

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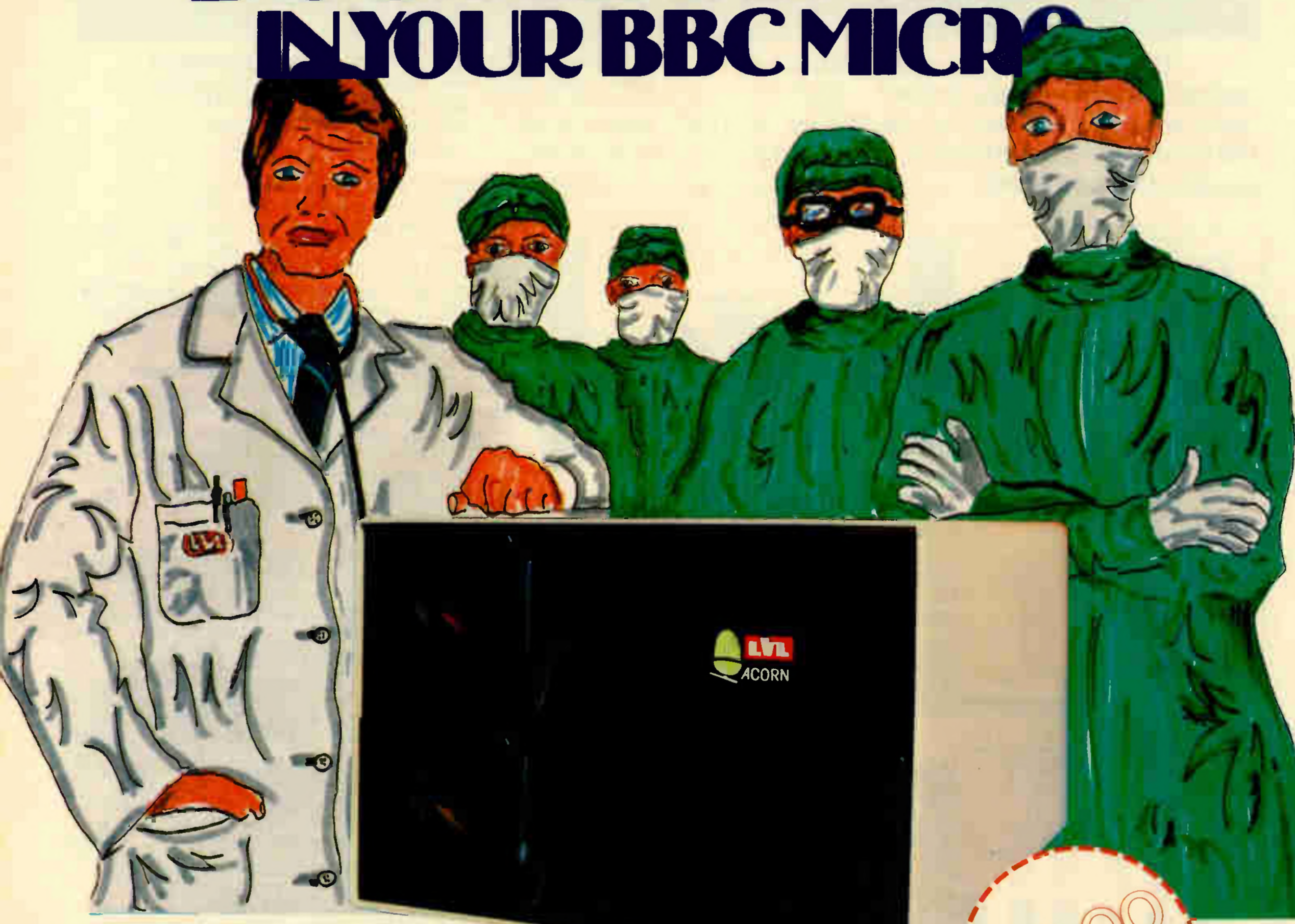

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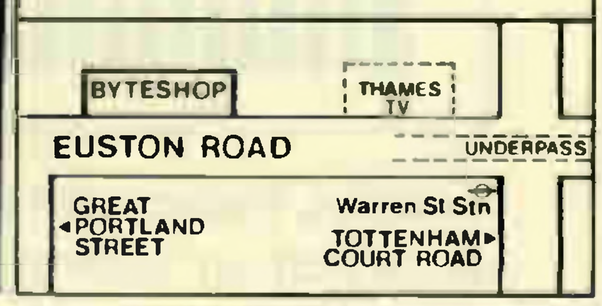

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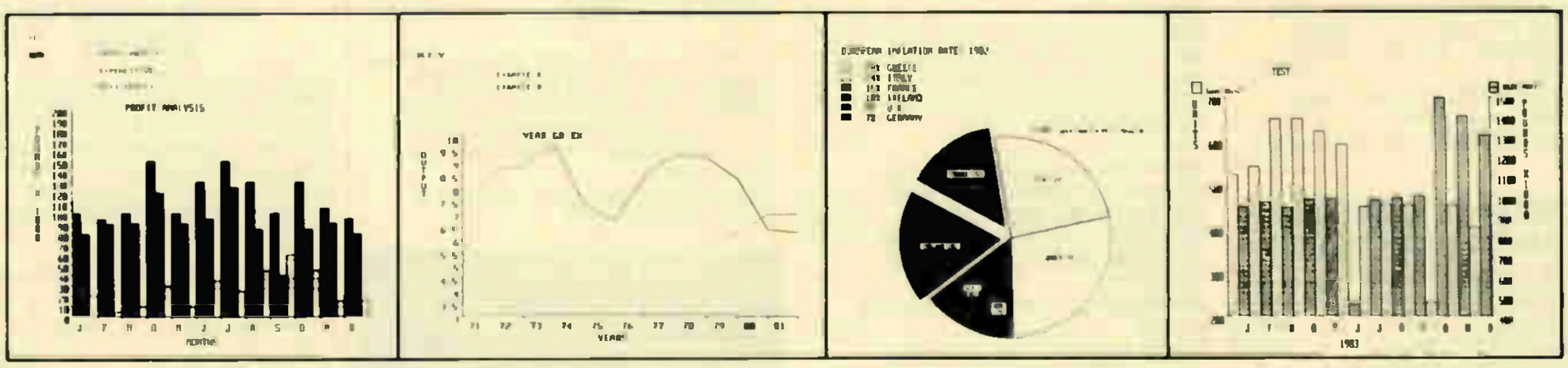

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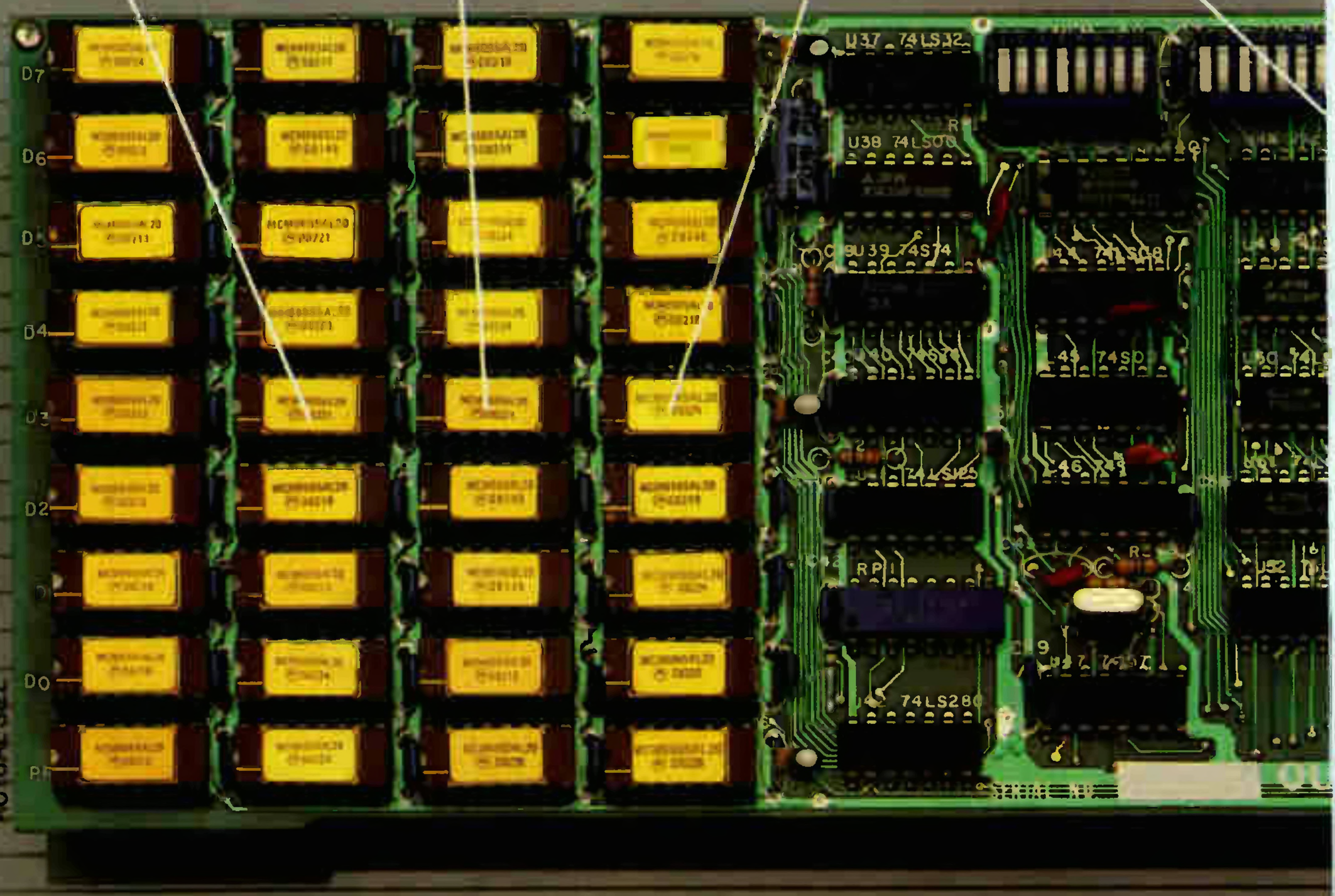

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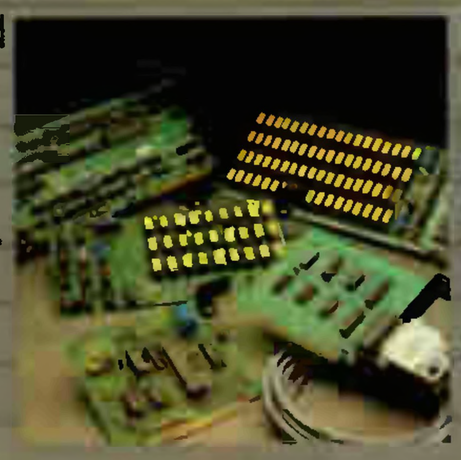

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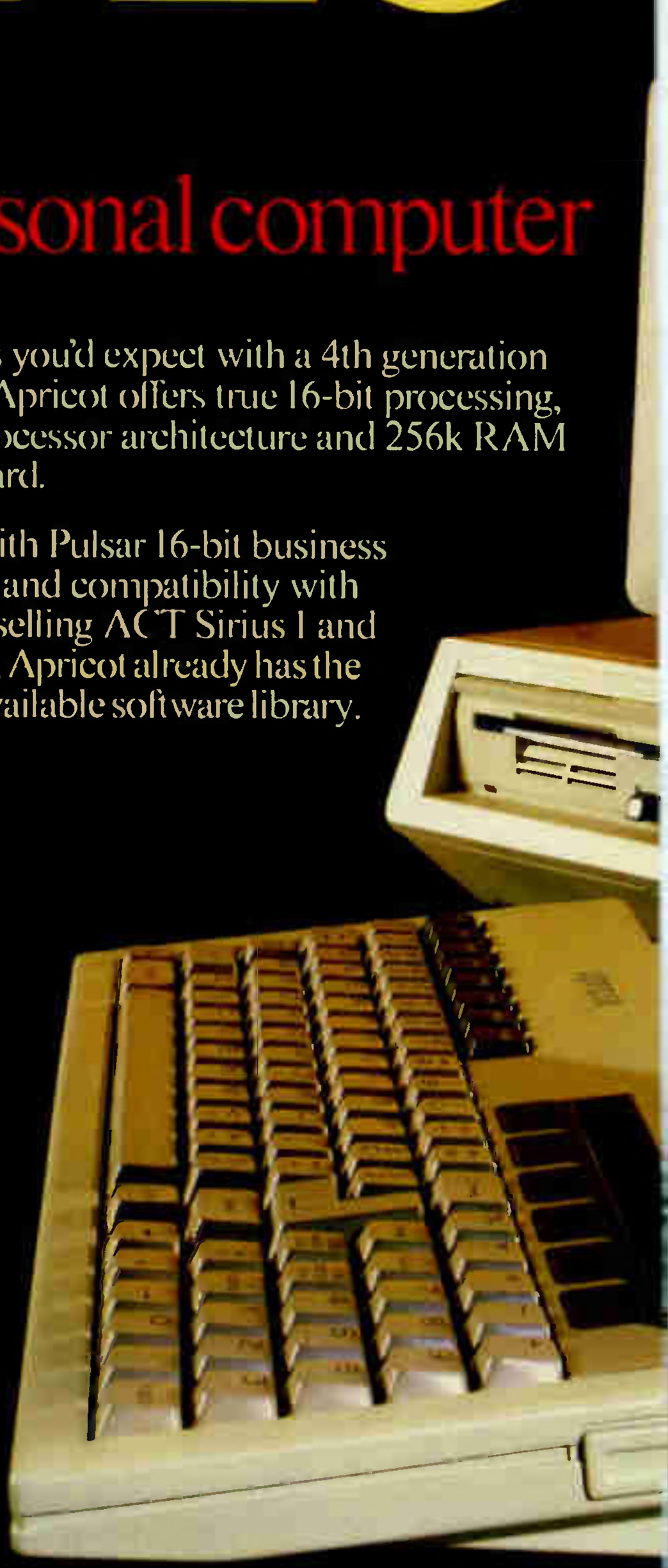

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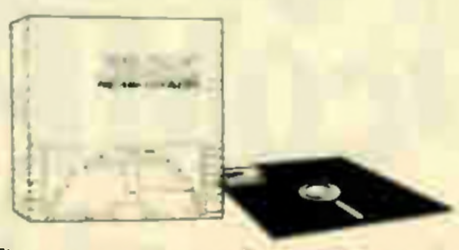

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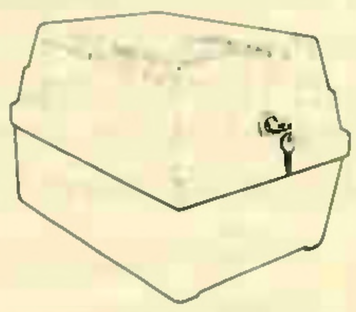

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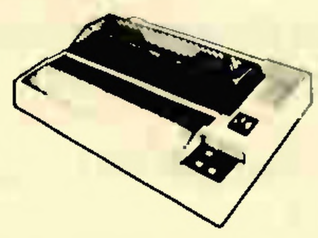

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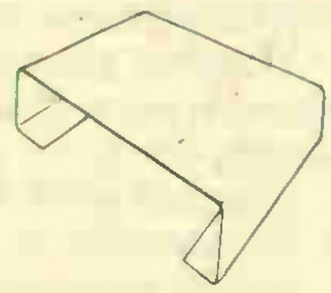

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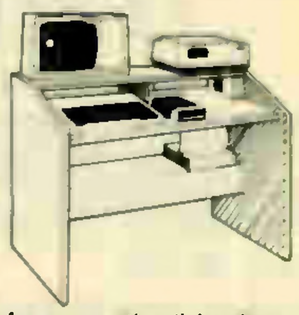

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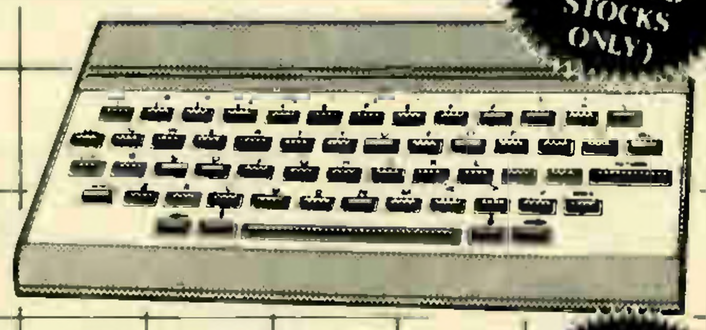

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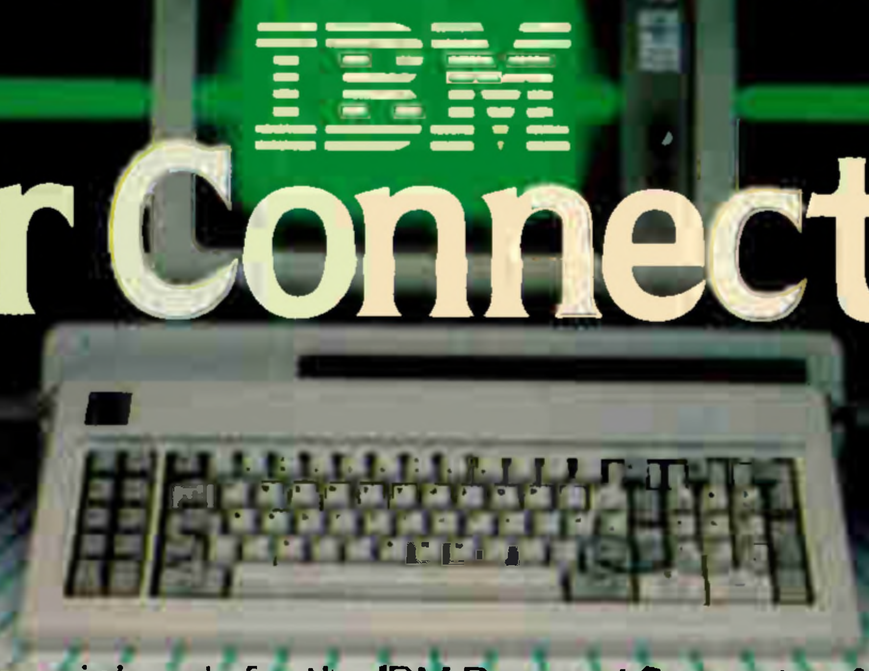

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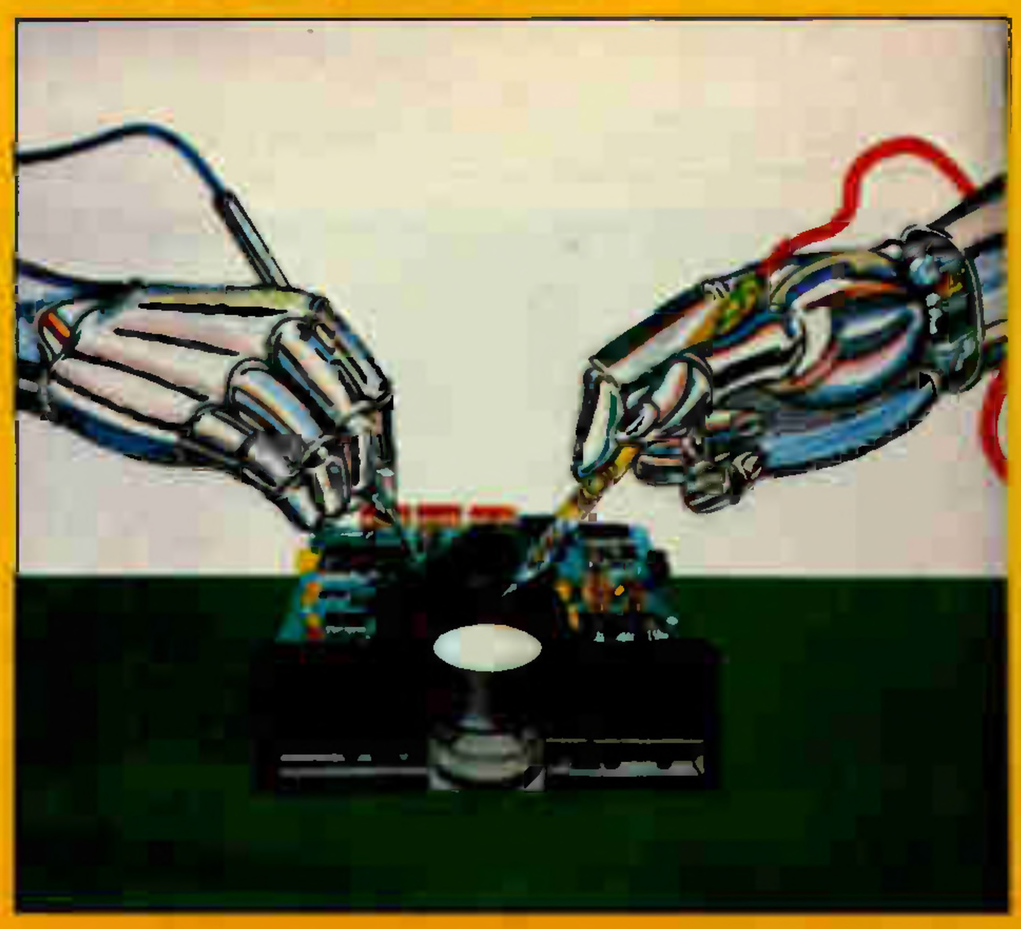
Disk Doctor was not designed for use with double sided or hard disks.



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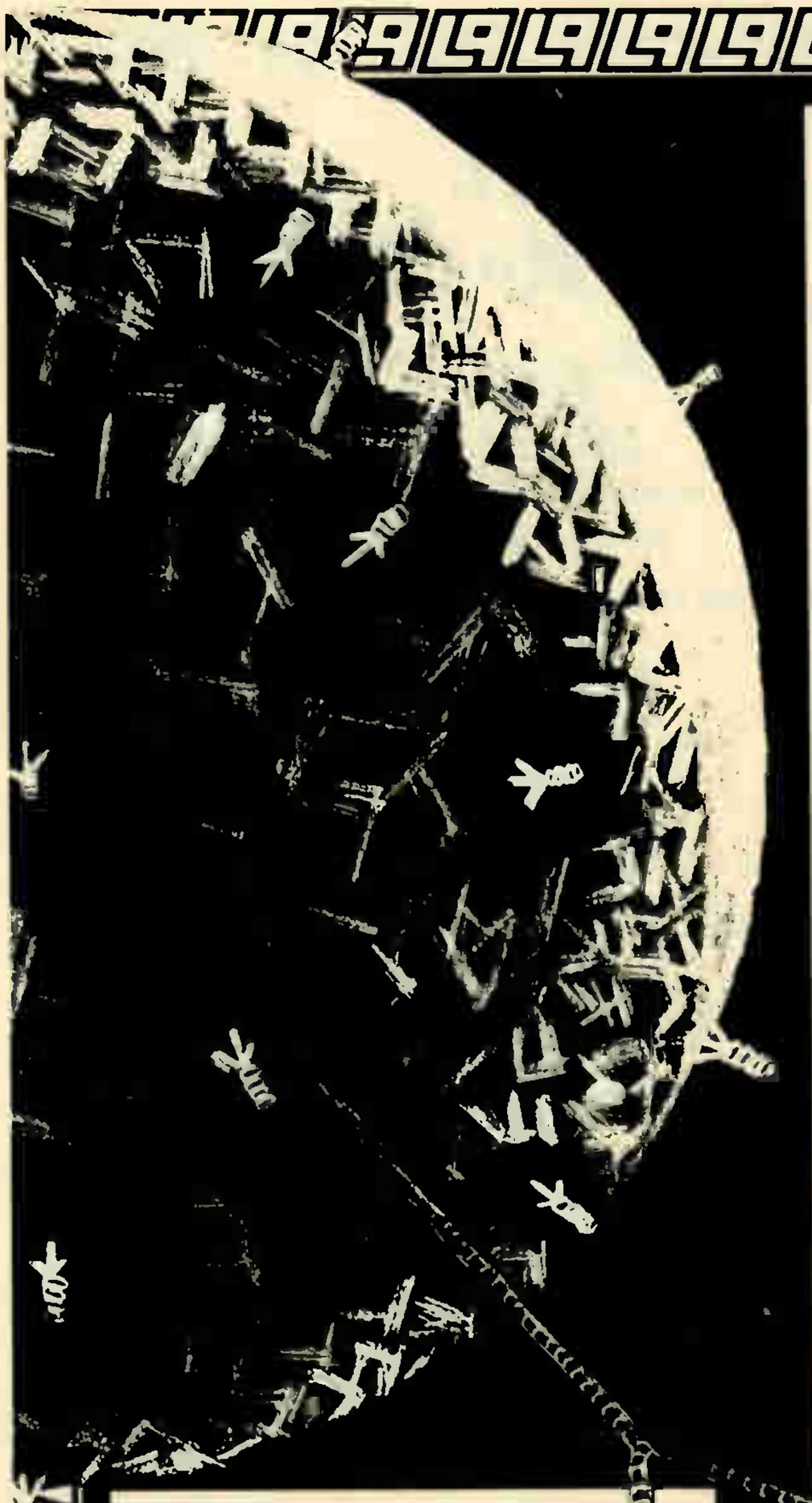

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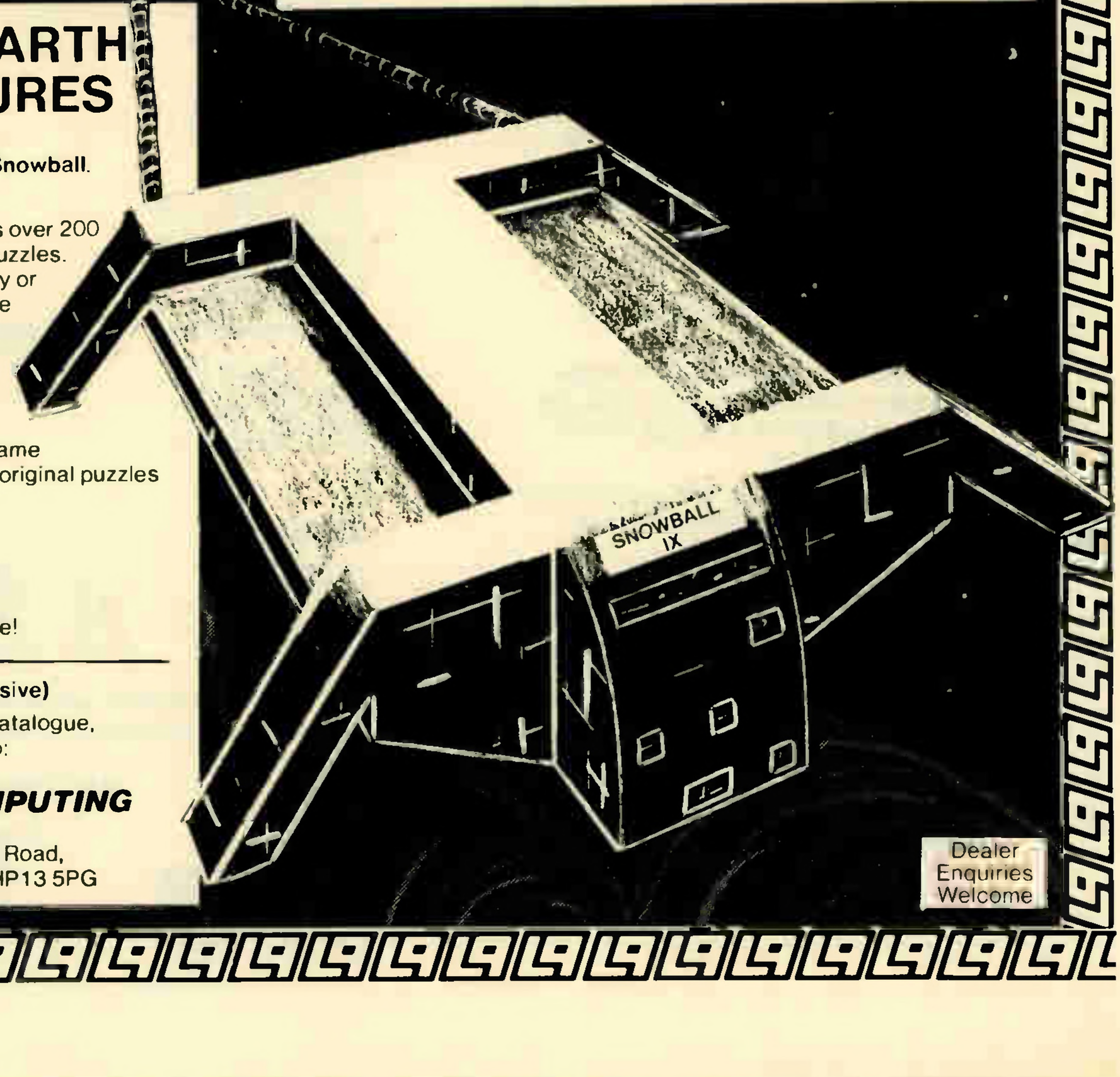

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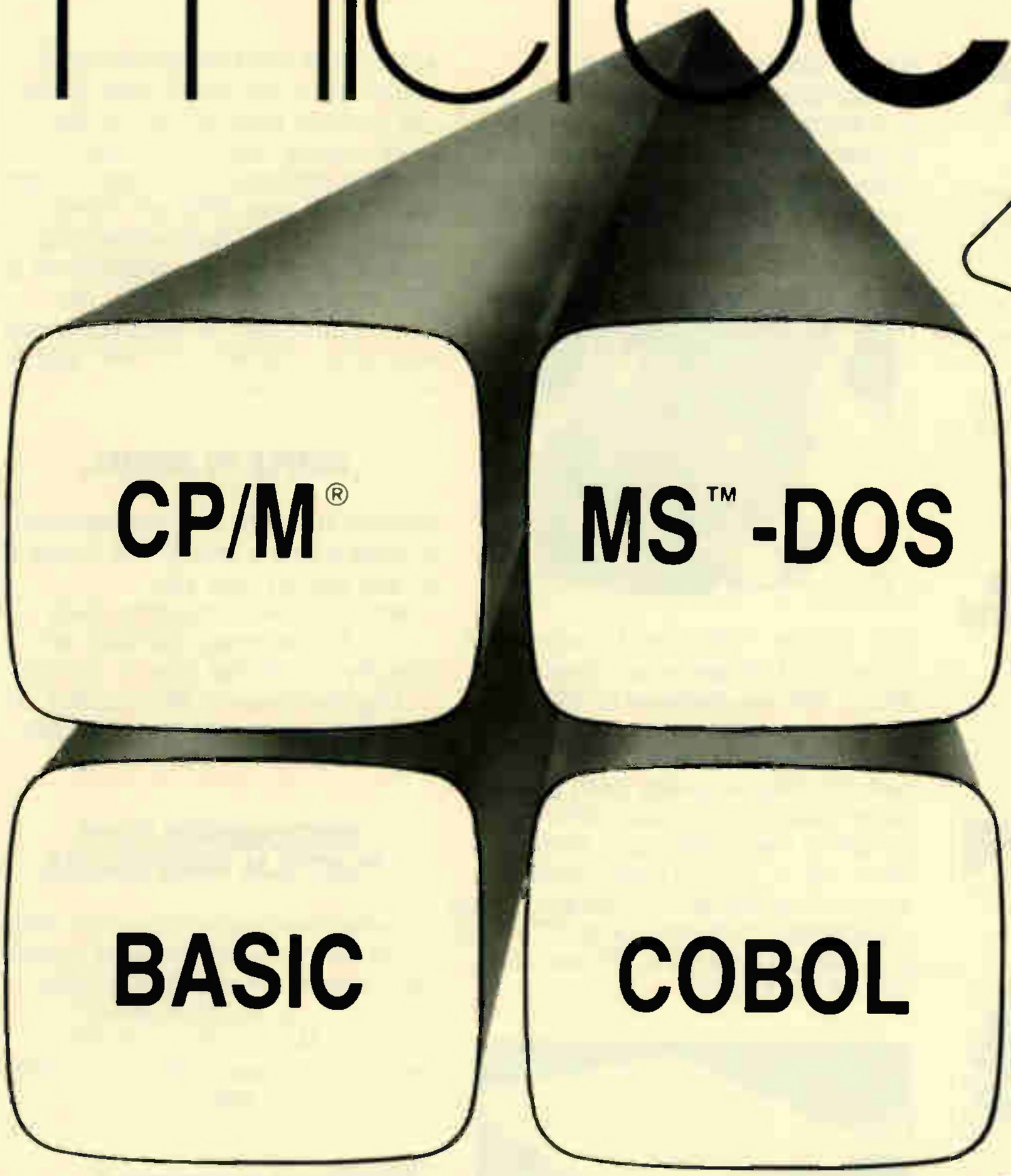

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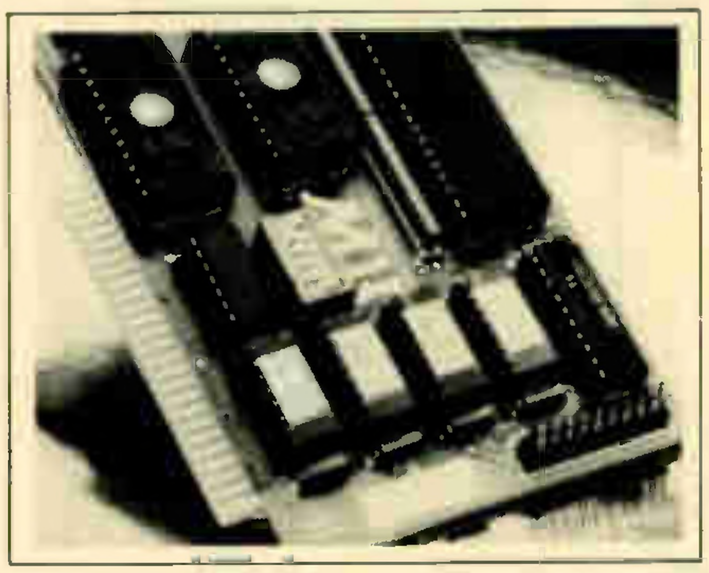

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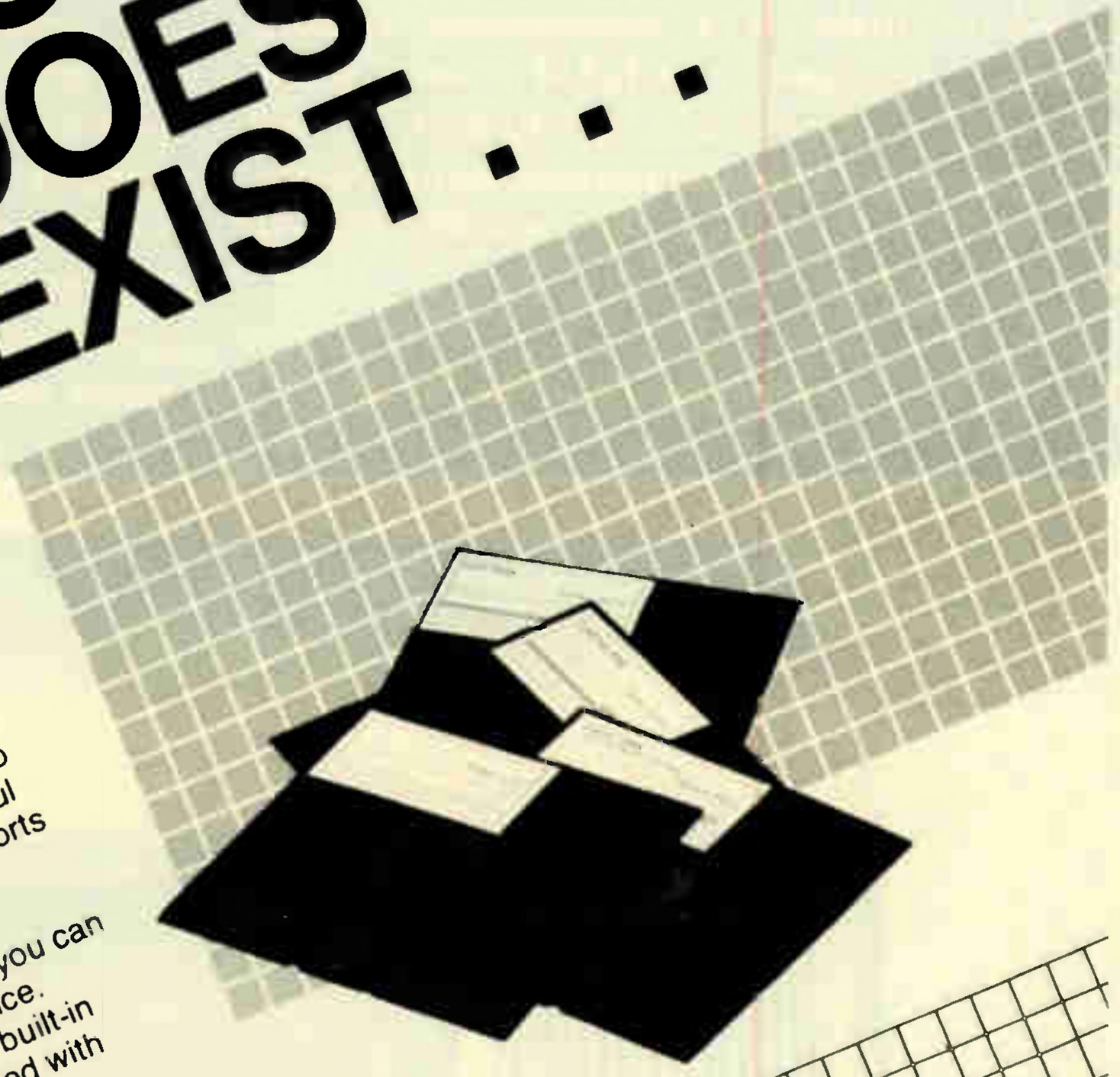

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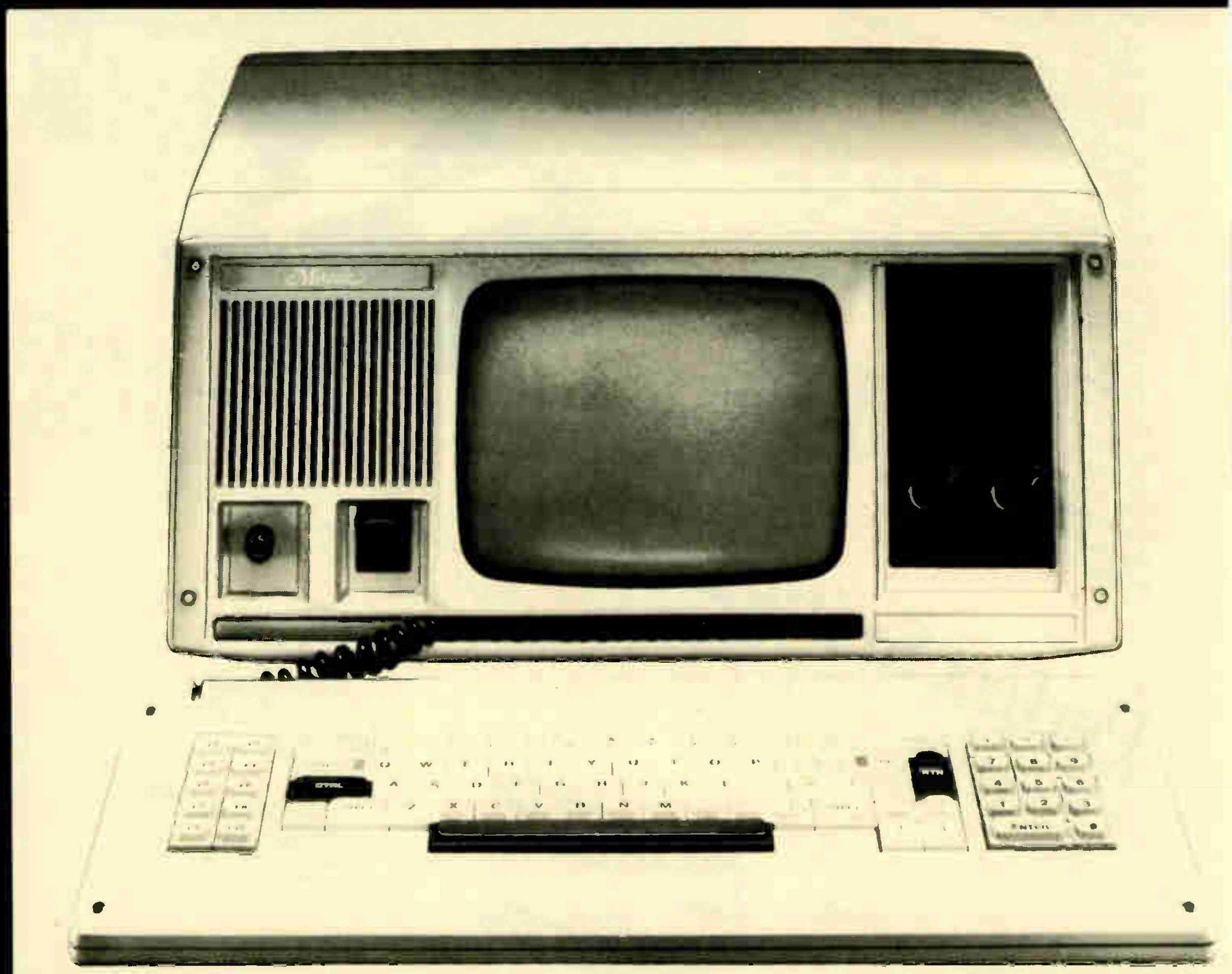

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Miracle Specifications

Microprocessors
- CPU Z80A
- Speed 4MHz
- Z80A DMA (Direct Memory Addressing)
- Z80A SIO
- Z80A PIO
- Z80A CTC (Counter Timer Chip)
- 5 Expansion slots available
- SASI Industry standard Winchester hard-disk interface (optional extra)

Memory
- RAM 128K (Cache utilises 64K)
- EPROM 4K
- 60K TPA
- 192K RAM board (optional extra)

Storage
- 2 Intelligent 5¼" Floppy disk drives, 500 Kb (unformatted), 400Kb (formatted) each, single side quad-density.

Ports
- Parallel: Centronics type
- Serial: Two RS232C
  RS422 (optional extra)

Screen
- 10" Green phosphor, 80 x 25 display, Brightness control and inverse video

Keyboard
- Slimline and fully detachable
- 86 keys (107 legends) full QWERTY
- Separate numeric pad
- Separate (10) programmable keys
- Coiled lead for easy and neat storage

Dimensions
- Height 220mm (8.7")
- Width 500mm (19.7")
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- Custom designed plastic casing

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With the TULIP system® I Compudata has provided one of the most powerful and fastest microcomputers in the world. This is due to the application of an 8086 micro-processor and an 8087 arithmetic co-processor.

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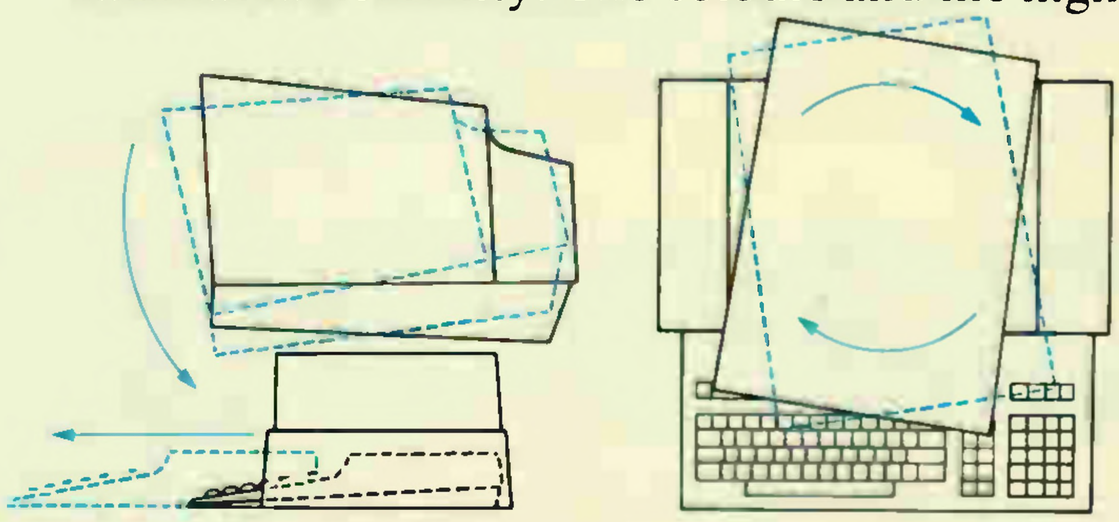

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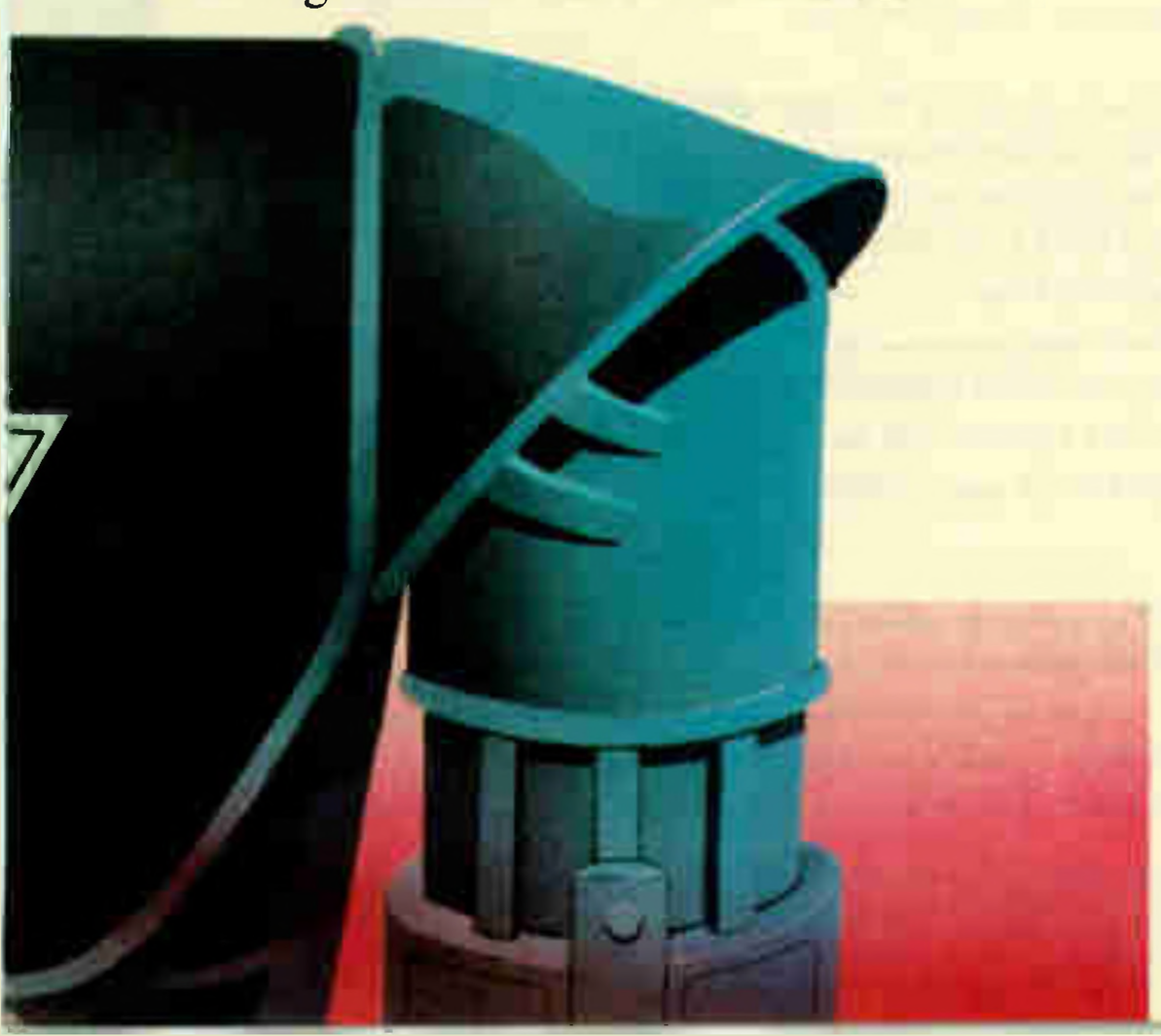



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Profile of the Fourth Generation: TULIP system® I

Specifications	
Computer.	
Processor	8086, 8087 (opt)
Clock	8 Mhz
RAM	128-896 Kb
Serial I/o	RS 232
Parallel I/o	Centronics comp.
Interfaces	Hard-disk, tape, lightpen
Fl. disk controller	8 inch + 5¼ inch
Bufferd Keyboard	104 keys

Storage.	
Floppy disk	dual 5¼ inch; 1.5 Mb
Hard disk – fixed	5 MB, 10 Mb
– removable	5 Mb
Display.	
Formats	80 x 25, 64 x 31, 40 x 25
Low res. graphics	100 x 160
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Colour	8
Internat. char. sets	8 – softw. selectable

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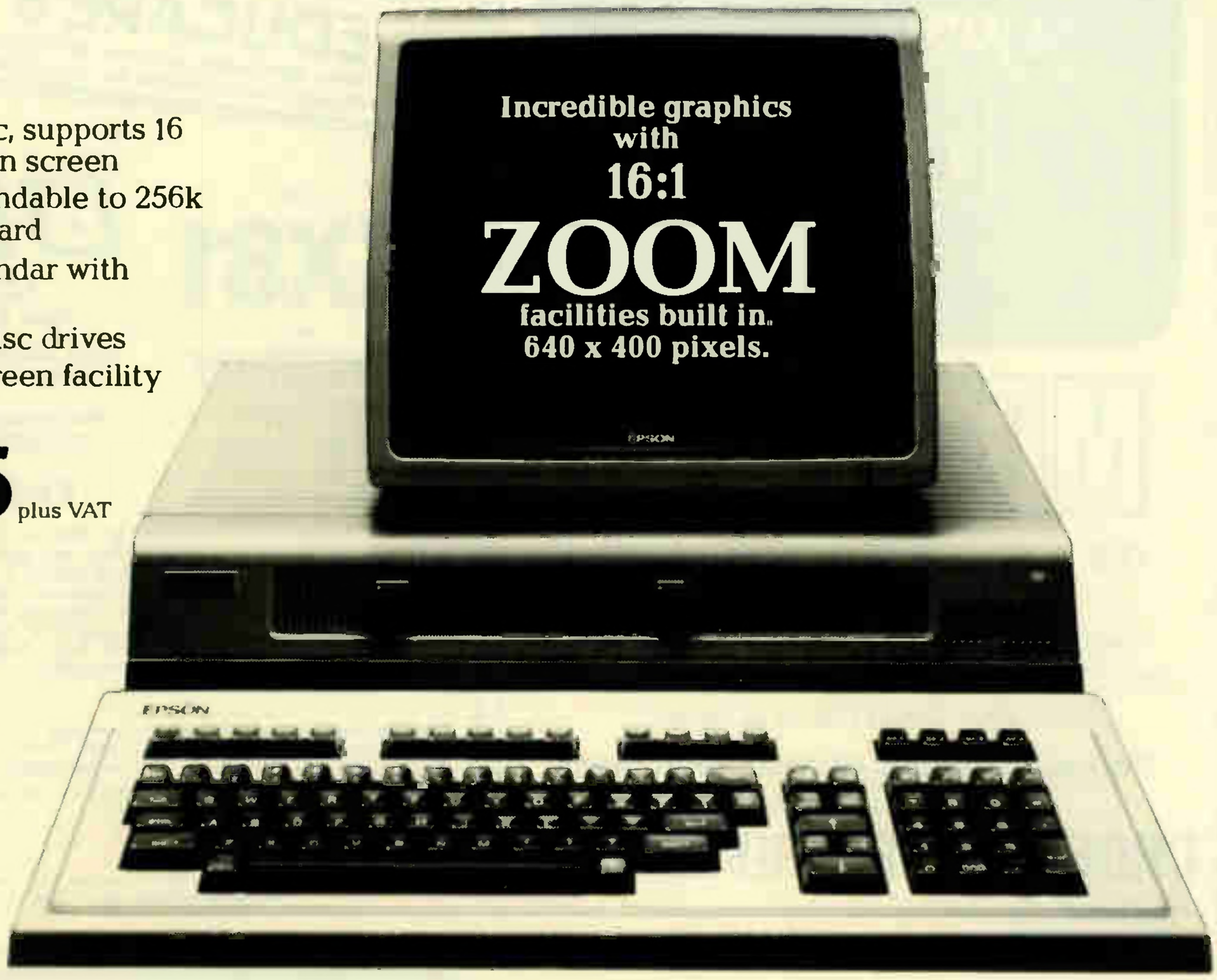

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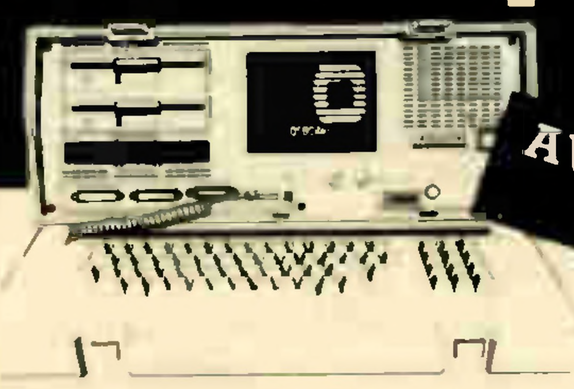

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The unbeatable TI Home Computer. It's all the computers your family will ever need.

Buying a home computer is something you have to get right first time. It's too late when you've got one to find it won't take plug-in software. Or can't be programmed without an expensive accessory.

The TI Home Computer is a real computer system

The TI Home Computer has got the memory power you might expect from more expensive computers, built in. At its heart is a powerful TMS 9900 16-BIT Microprocessor. Most other home computers have only an 8-BIT. And you can expand the memory from 16K of RAM up to 52K.

The total memory capacity is 114K Bytes.

A wide range of software for everyone

Another feature that makes the TI system so powerful, yet so easy to use is Solid State Software.™ These plug-in cartridges cover everything from space games like Parsec™ to teaching maths, managing home finances and composing music. And the range is getting wider all the time.

It even has what professionals look for in a home computer

CPU: TMS 9900 16-BIT, plus 256-byte Scratchpad RAM.
Memory: Total 114K bytes; 26K bytes ROM internal; up to 36K ROM cartridges external; 16K built-in RAM expandable to 52K bytes.
Keyboard: 48 Key QWERTY, alpha lock, function key auto repeat.
Sound: 5 octaves, 3 simultaneous tones, noise tone.
Colour: 16 foreground and background. High resolution.
Interfaces: Cassette, TV, 2 joysticks, main peripheral port.

™ trademark of Texas Instruments.

More than one programming language

The standard programming language, TI BASIC, is built into your TI Home Computer so you can begin programming right away. But there's an expanded range of optional languages like Extended BASIC, TI Logo, USCD-Pascal, TI FORTH and Assembler.

With these you can fully expand your programming skills.

A wide range of peripherals

Most computers lose a lot of memory when you add peripherals. The TI Home Computer is different. Every peripheral comes with its own built-in programs to keep the loss of memory to a minimum.

The convenient Peripheral Expansion System houses up to eight peripherals. Additional hardware cards simply plug in. You can even add a complete Floppy Disk Memory System.

The peripherals include memory expansion, RS232 Interface, P-Code card and more. There's also a sophisticated matrix printer and Solid State Speech™ synthesizer – which you can use with your own TI BASIC programs.

A lot more for no more

The TI Home Computer gives you so much more without costing more. At today's price it's exceptional value. Take your family round to try one. If you never try it you'll never know what you're missing.

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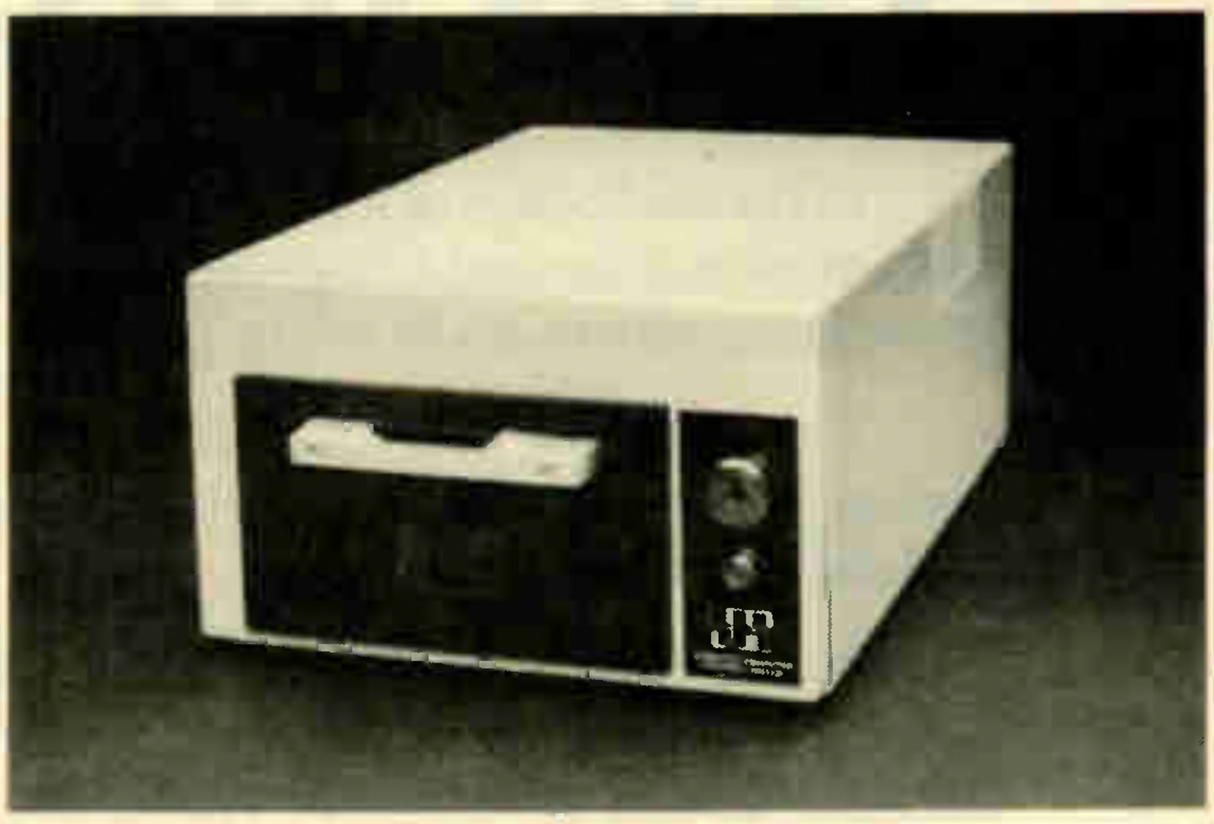

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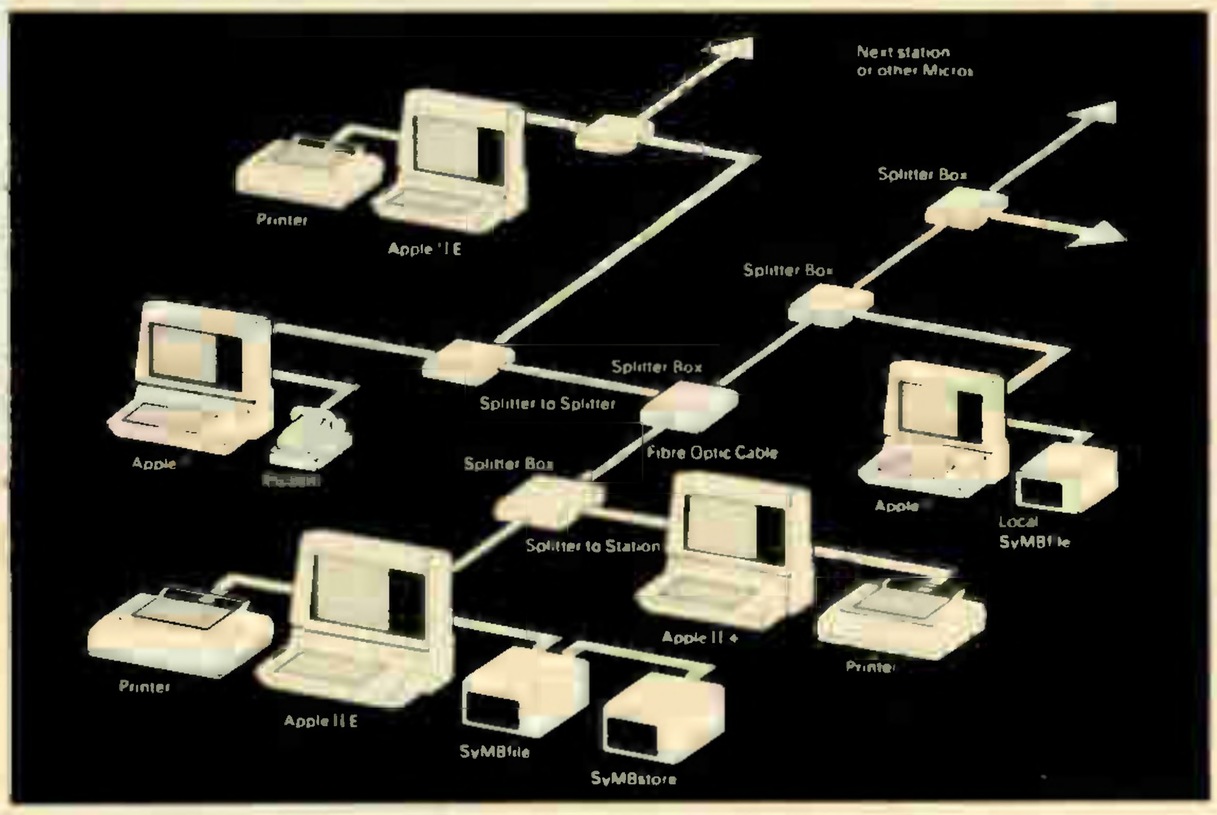
SYMBSTORE is the perfect complement to SYMBFILE giving a high speed, totally reliable back up system. SYMBSTORE will copy the entire contents of a SYMBFILE to a C60 type digital cassette. SYMBSTORE'S unique multiple buffer verification ensures the perfect transfer of data. Software to individually back up volumes and files under present operating systems will soon be available on request.



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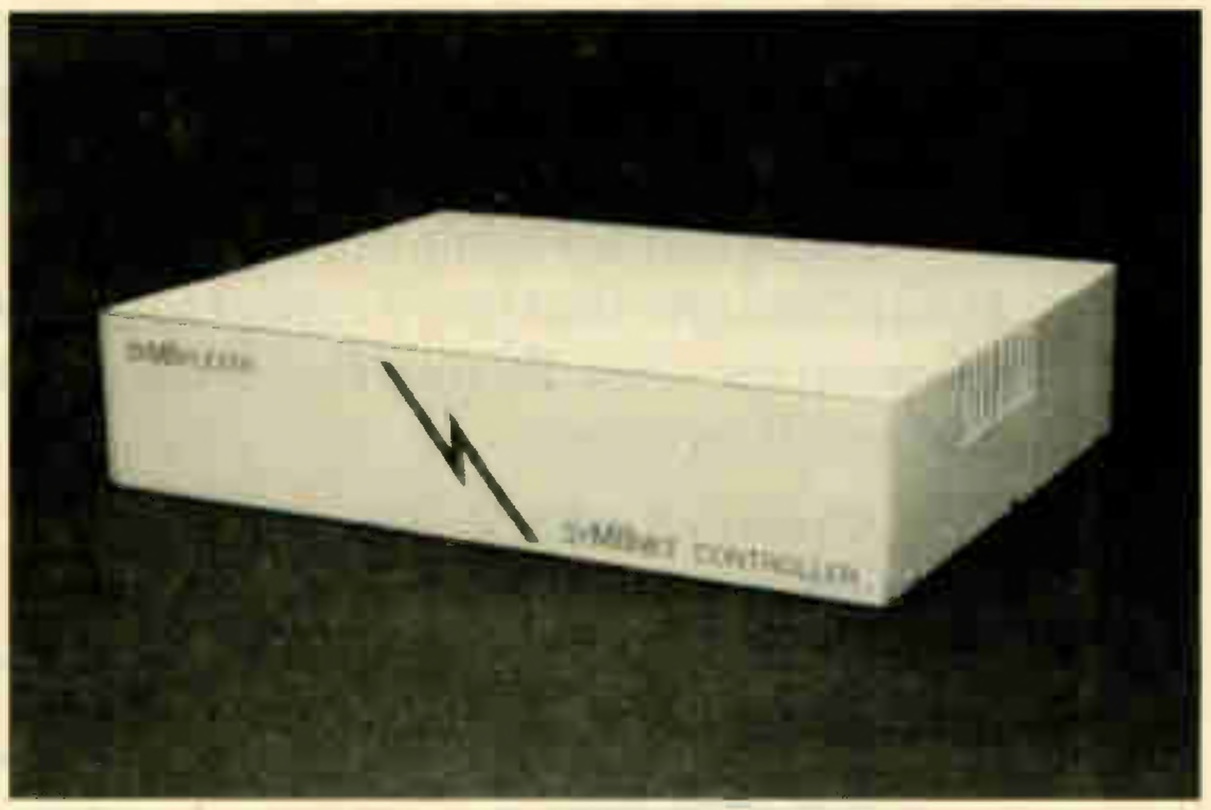
SYMBNET is a "tree and branch" network system using fibre optic cable to allow several microcomputers to share a common SYMBFILE. SYMBNET is the fastest long range local area network for microcomputers, and can cover a range of 7-9 Kilometres. Fibre optics means that SYMBNET is more cost effective: it uses a high intensity semi-conductor laser to transmit data and cables can be laid along the shortest route, whereas other networking systems use flat ribbon or coaxial cable which are sensitive to electrical noise from fluorescent lights, photocopiers, etc. SYMBNET is compatible with DOS, Pascal, SOS, and CP/M running on any microcomputer supported by the SYMBFILE in concurrent operation.



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Why all other spread

In the early days of micros, the first spreadsheets appeared, using complicated cell co-ordinate references to define plans.

This made the most of limited computing power but plans were tricky to write, and difficult to read later.

Today's micros are much more sophisticated but all the spreadsheets are more or less the same as they always were. All that is, except PlannerCalc and MasterPlanner. Described in a recent university report as ". . . the best spreadsheet package currently on the Market," PlannerCalc and MasterPlanner are true business aids.

Dyed in the wool calc freaks won't like them but businessmen will.

NEW USERS START HERE

PlannerCalc at £85.00* is now accepted as the first choice for people new to financial planning.

Designed for 8-bit micros, it boasts the kind of features that you'd expect to pay twice as much for. (Buy PlannerCalc's nearest rival and you'll have to.)

Unlike all other 'calc' products it allows you to enter calculations in a language you understand. Plain English.

For example:

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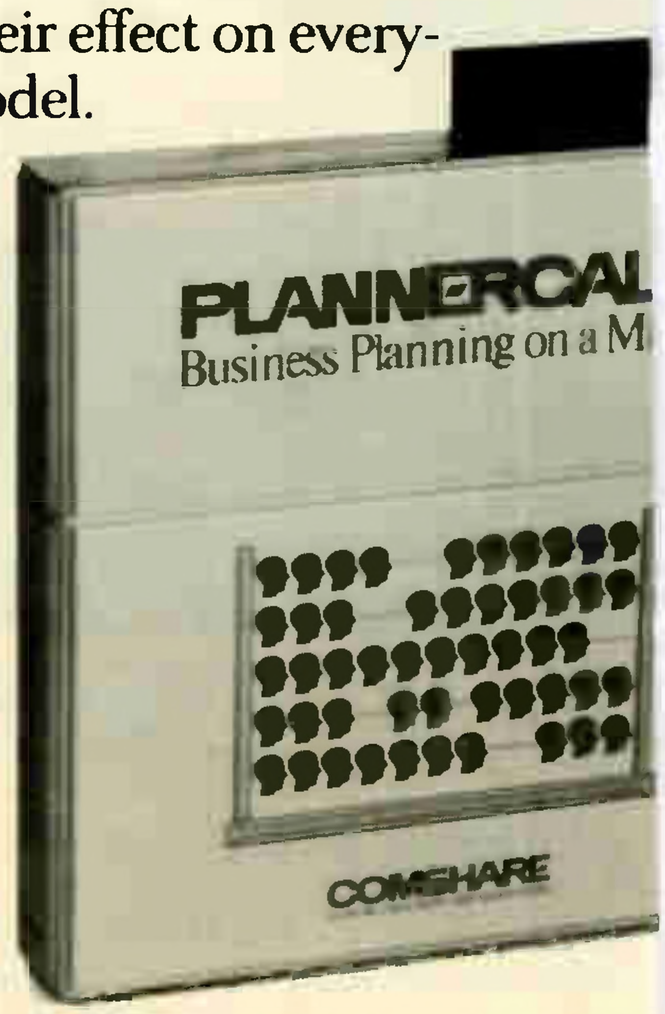
LINE 2 EXPENSES=GROW 70 BY 15% FOR 4
LINE 3 NET=SALES−EXPENSES
LINE 4 CSALES=CUM SALES
COLUMN 5 YEAR=SUM OF COL 1 THRU COL 4

So it's much easier to use.

It uses the popular "spreadsheet" approach with a window that can be rolled in all directions.

Which means you can enter new figures and rules and immediately see their effect on everything else in the model.



It comes with the best manual on the market and it's suitable for most micros with a ™CP/M 2.2 operating system, 64K of memory, giving at least 900 cells, minimum screen width of 80 characters and 2 floppy disc drives.

MUCH MORE POWER, NOT MUCH MORE MONEY

MasterPlanner is the most powerful spreadsheet system currently available with its increased matrix size, 2000-3000 cells on most 64K micros. (But at £245* it certainly isn't the most expensive.)

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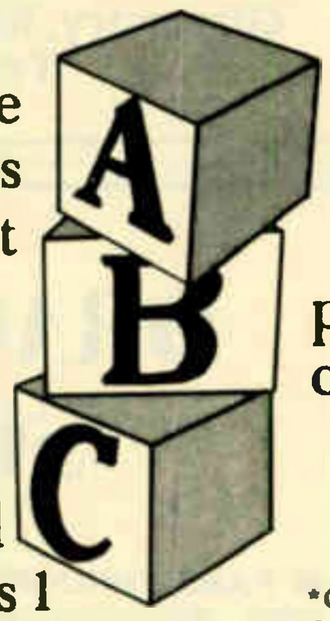
plan. Data transfer to word processing and other systems lets you incorporate figures in reports and output to a data base. It also has extensive formatting facilities which means you can produce reports that wouldn't look out of place in the board room.

It can store up to 25 standard reports to run when you need them. It's got full WHAT IF? analysis and direct editing of both spreadsheet and logic display.

JUST AS EASY TO USE

All this increased power doesn't mean you'll need a degree in advanced computing to understand MasterPlanner.



It works on exactly the same system as PlannerCalc and models written on PlannerCalc run without modification on MasterPlanner.

16 BIT VERSION

A new version of MasterPlanner has been specifically designed for the 16 bit micros like the Sirius 1 under ™CP/M-86 or the IBM personal using either CP/M-86 or ™MS DOS 1.1. With a vast matrix size of over 7000 cells on 128K and even more with larger memory, you'll at last be able to make the most of your micro.

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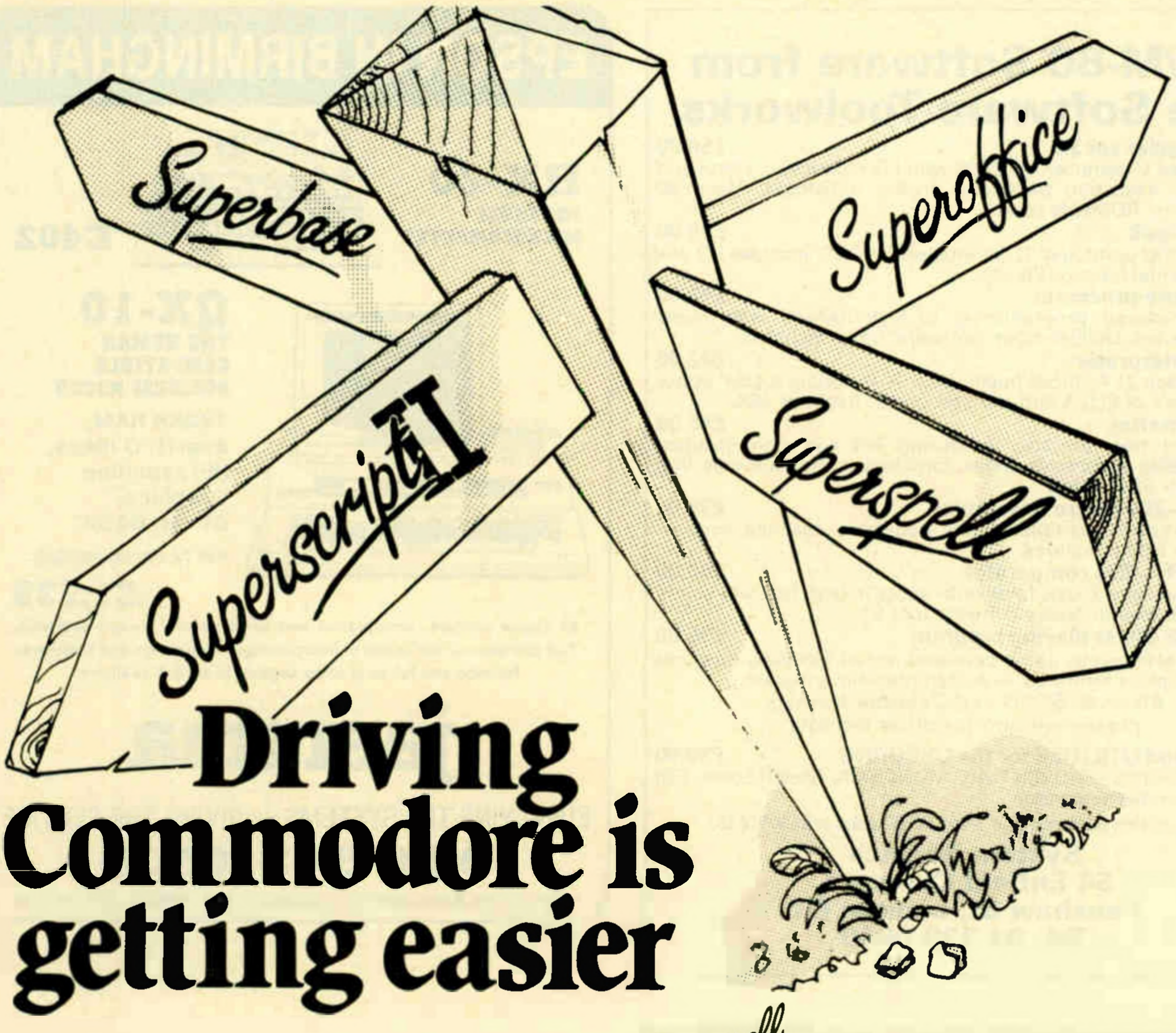

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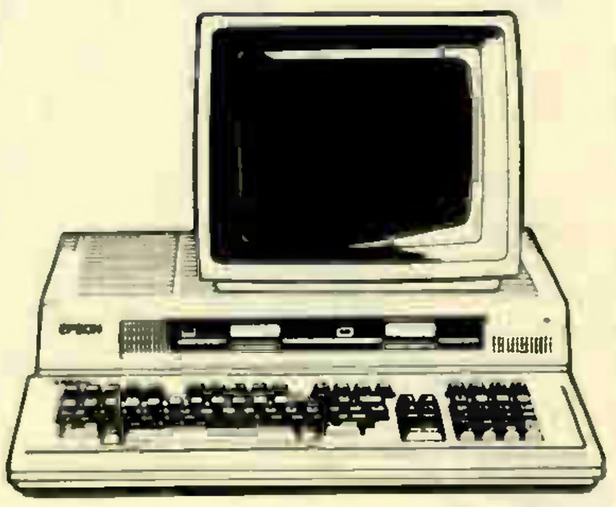

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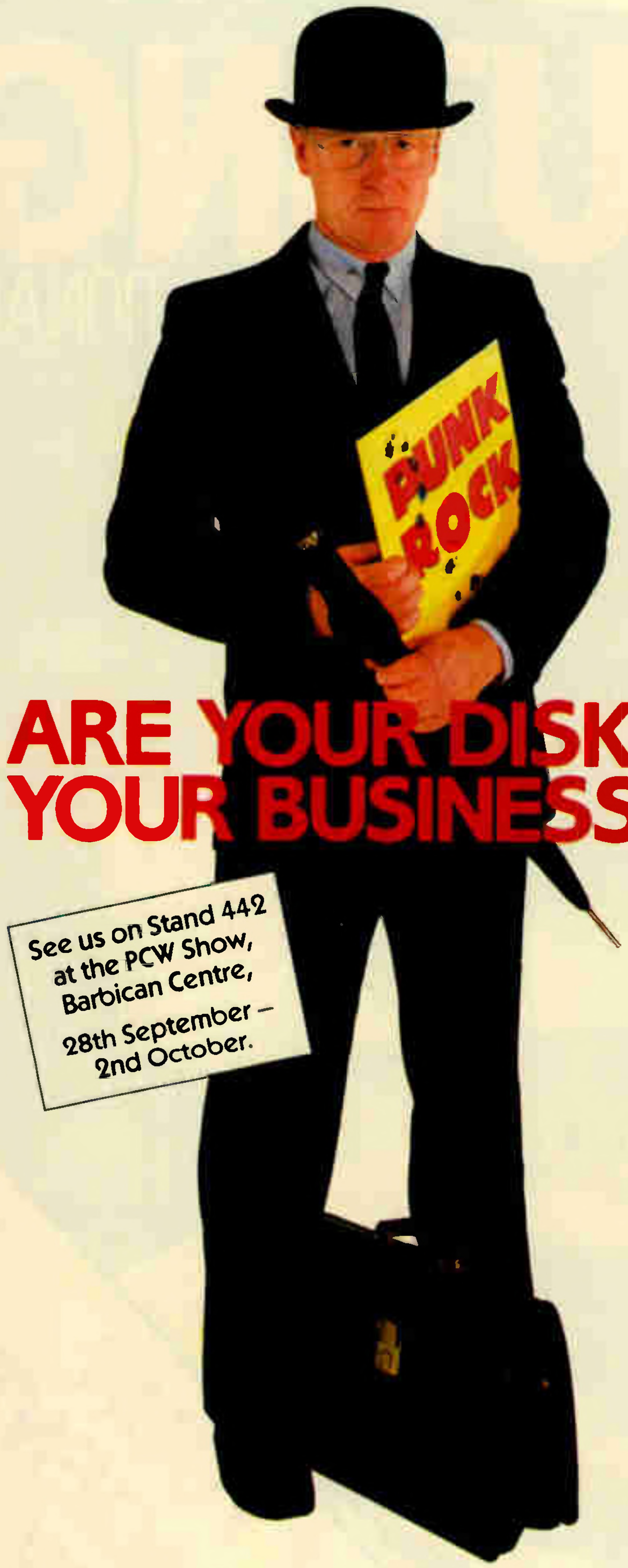

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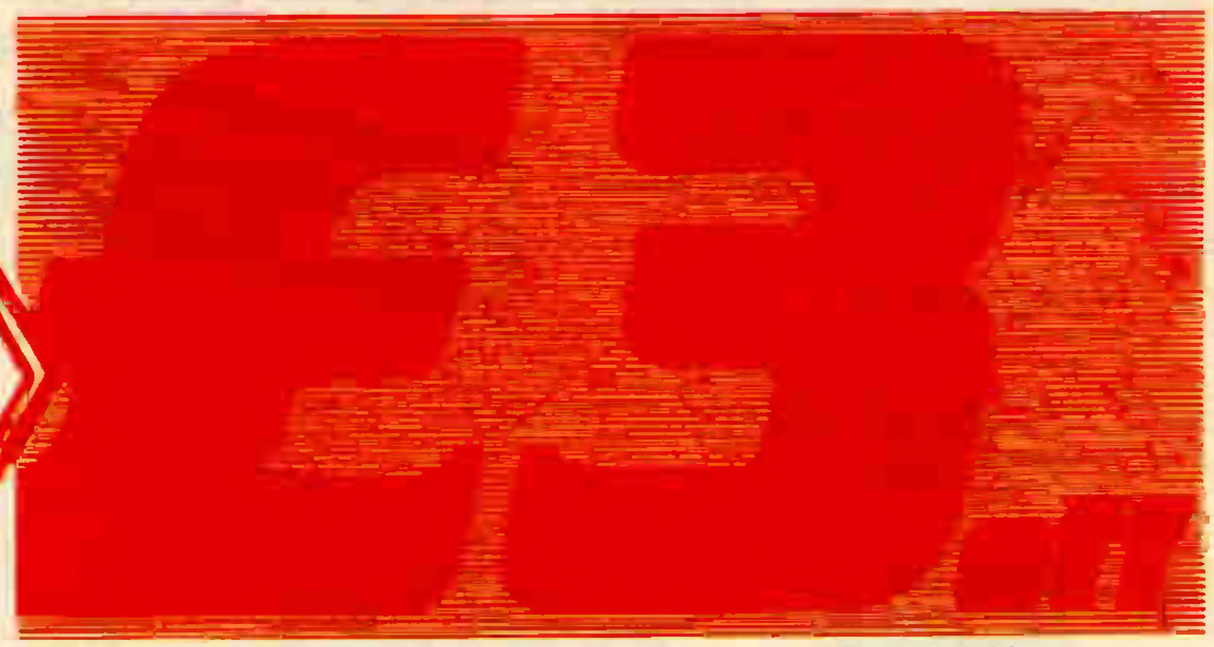

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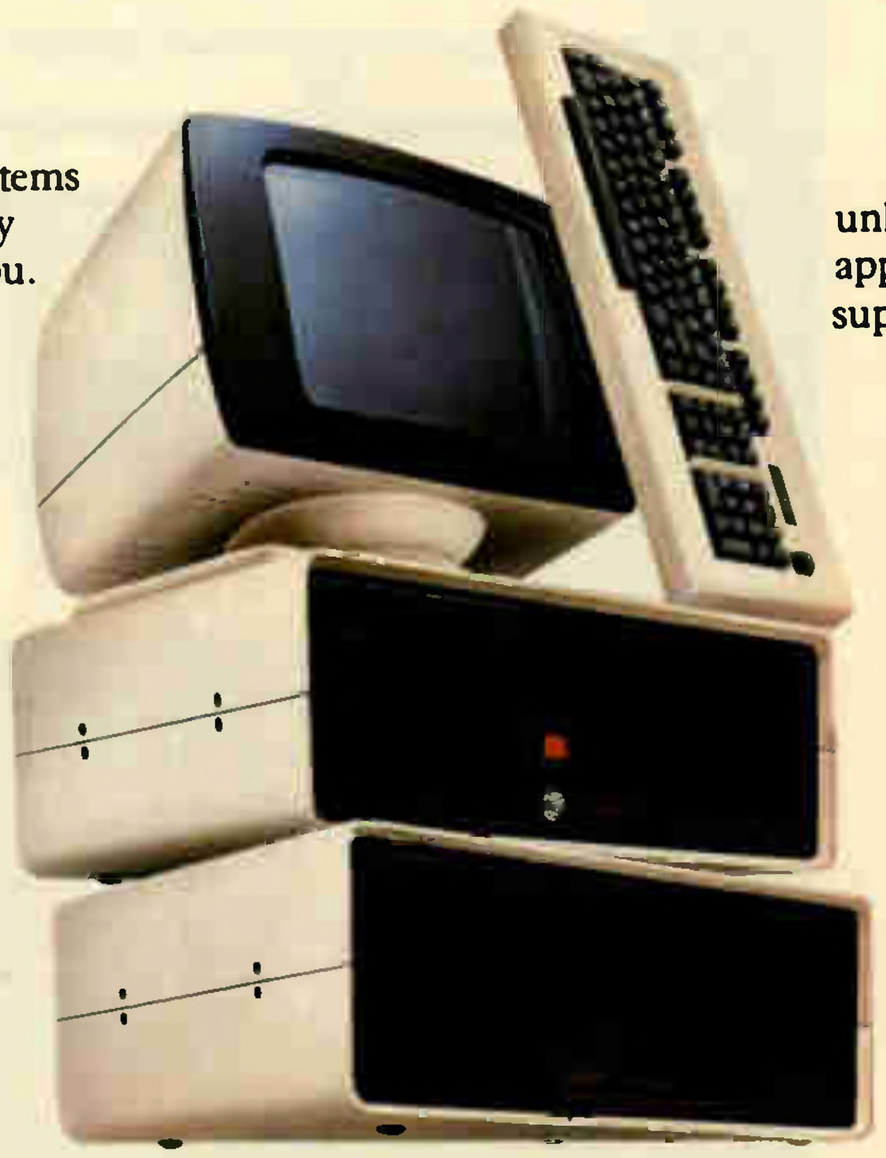

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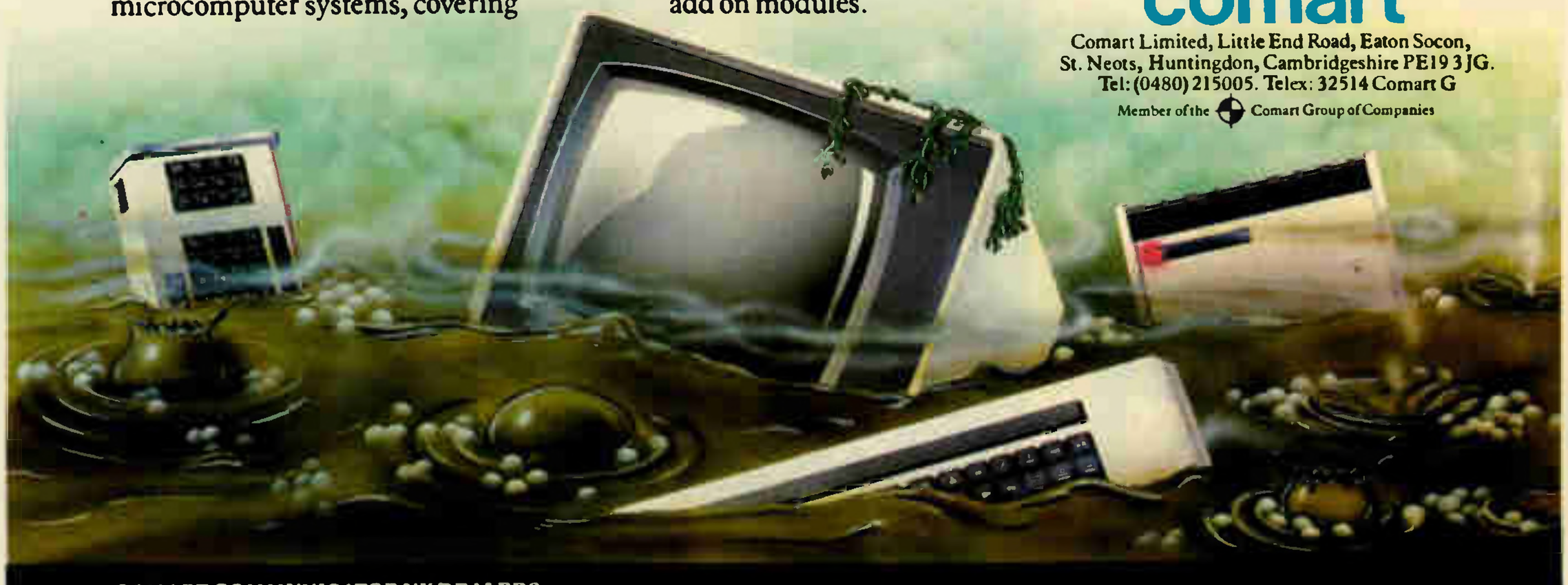

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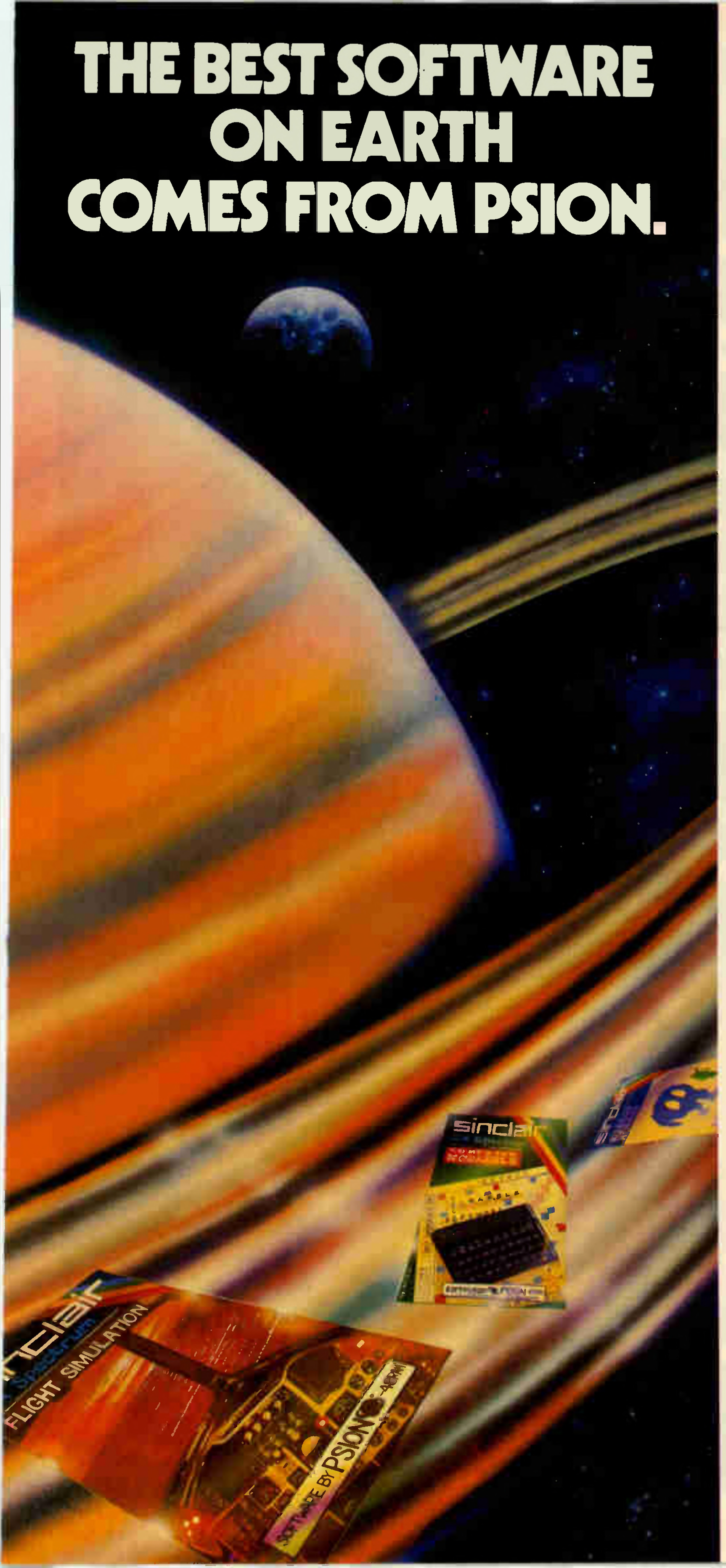

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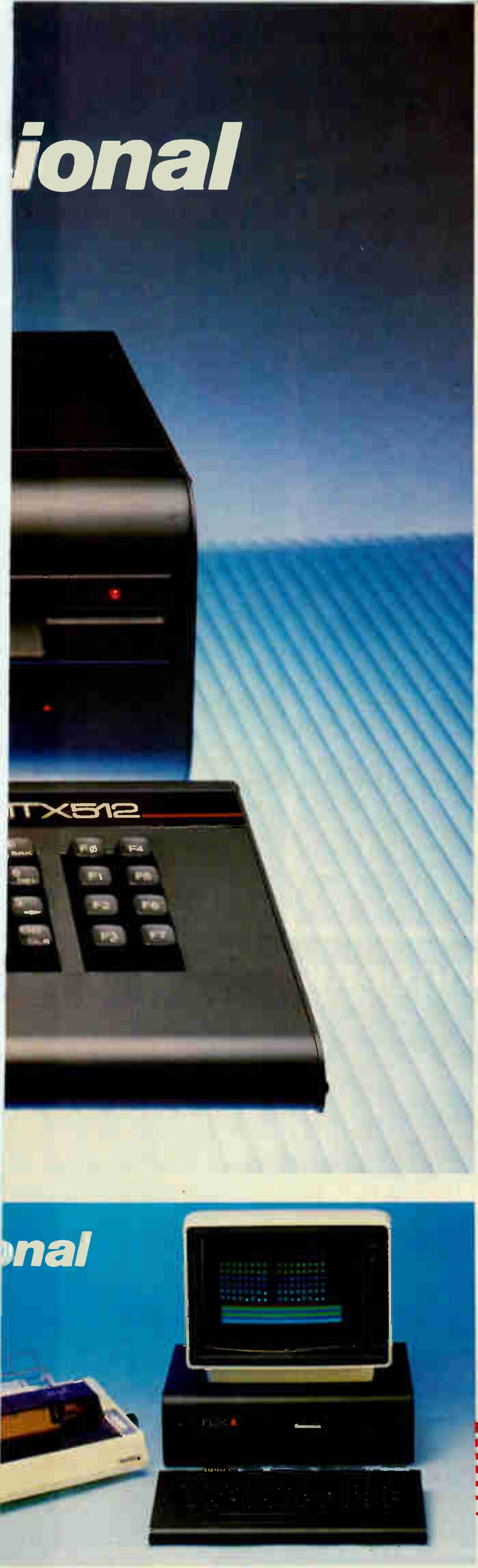

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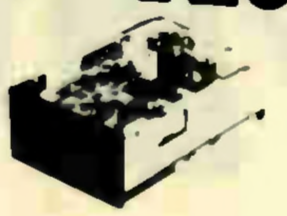

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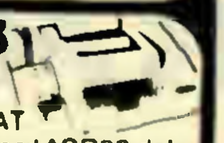

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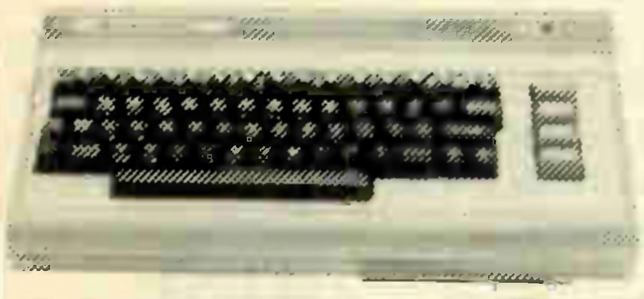

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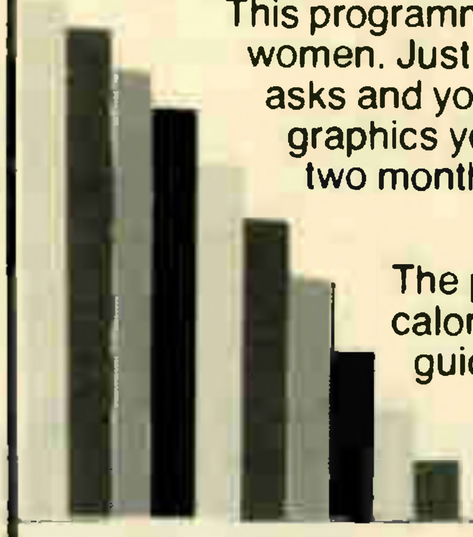

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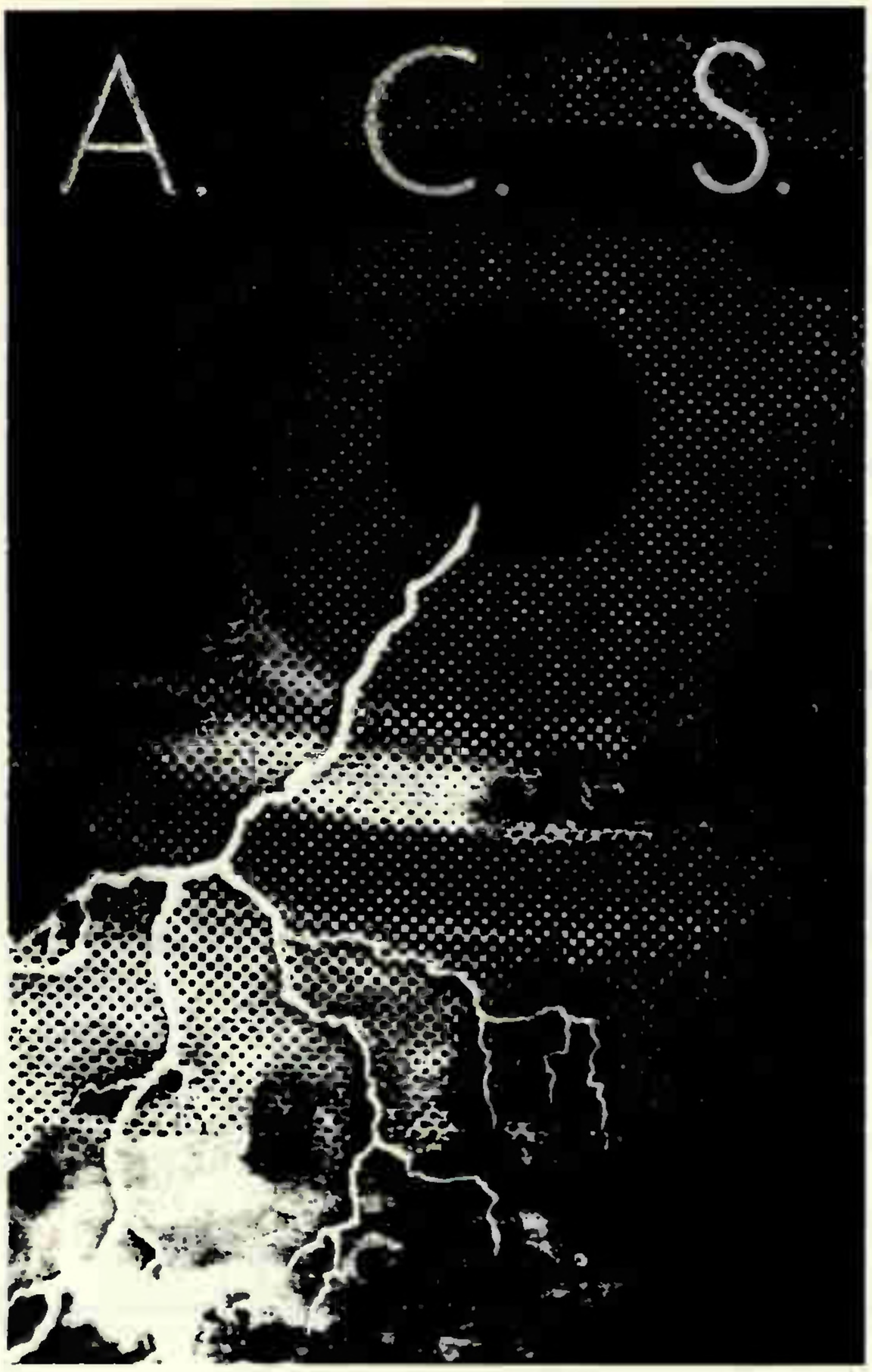

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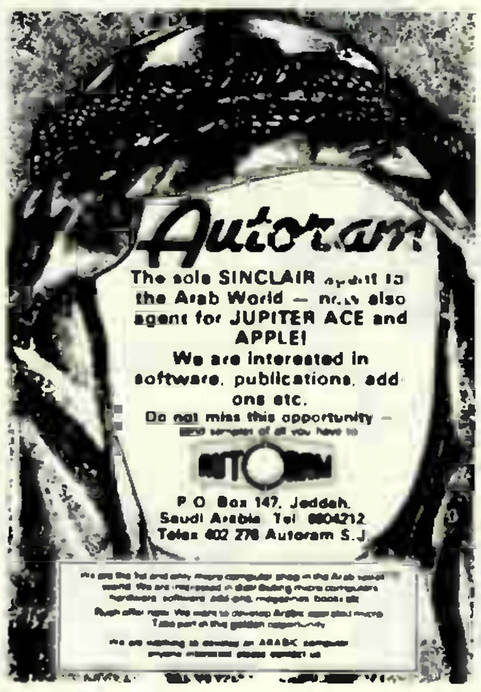

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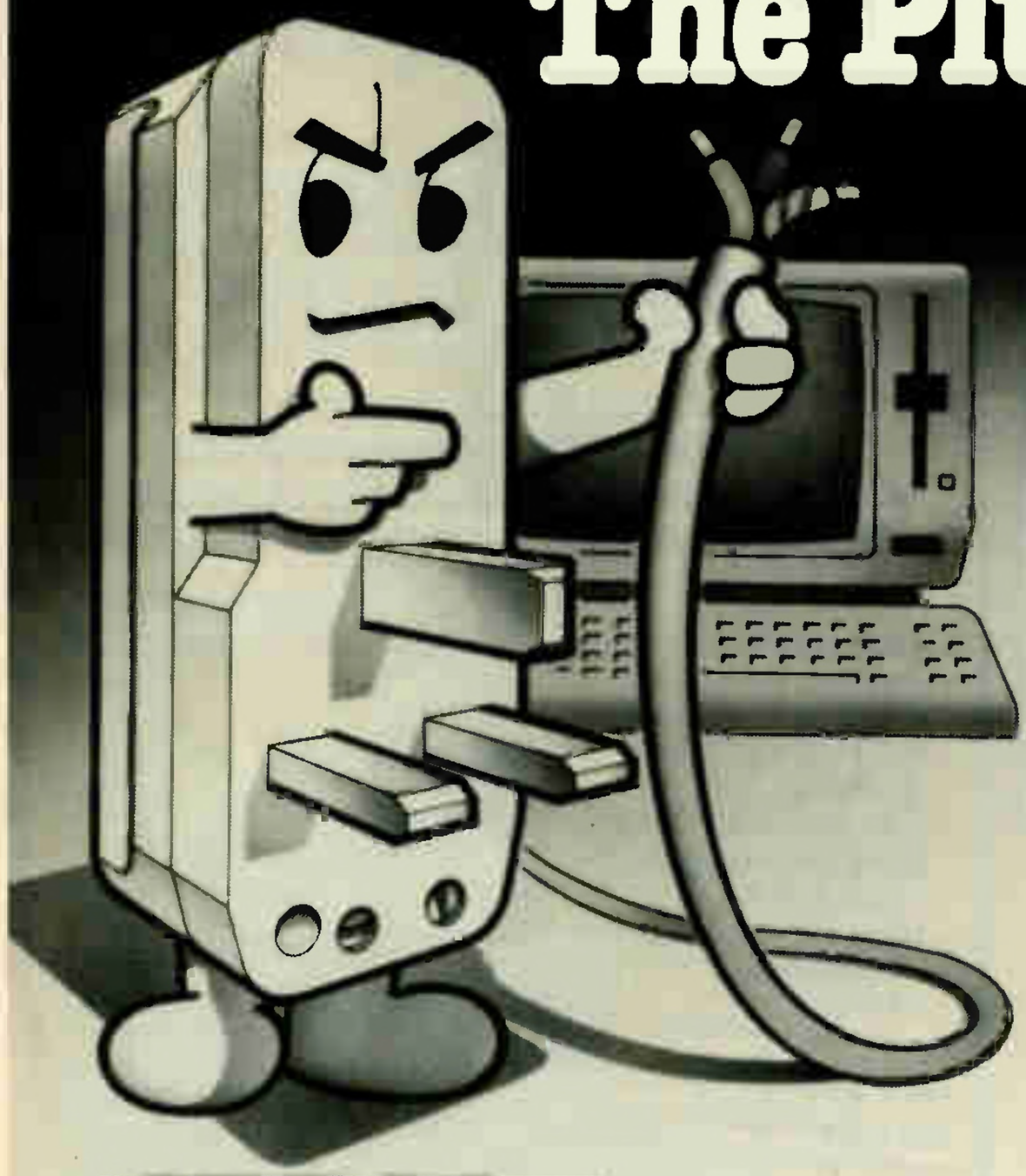

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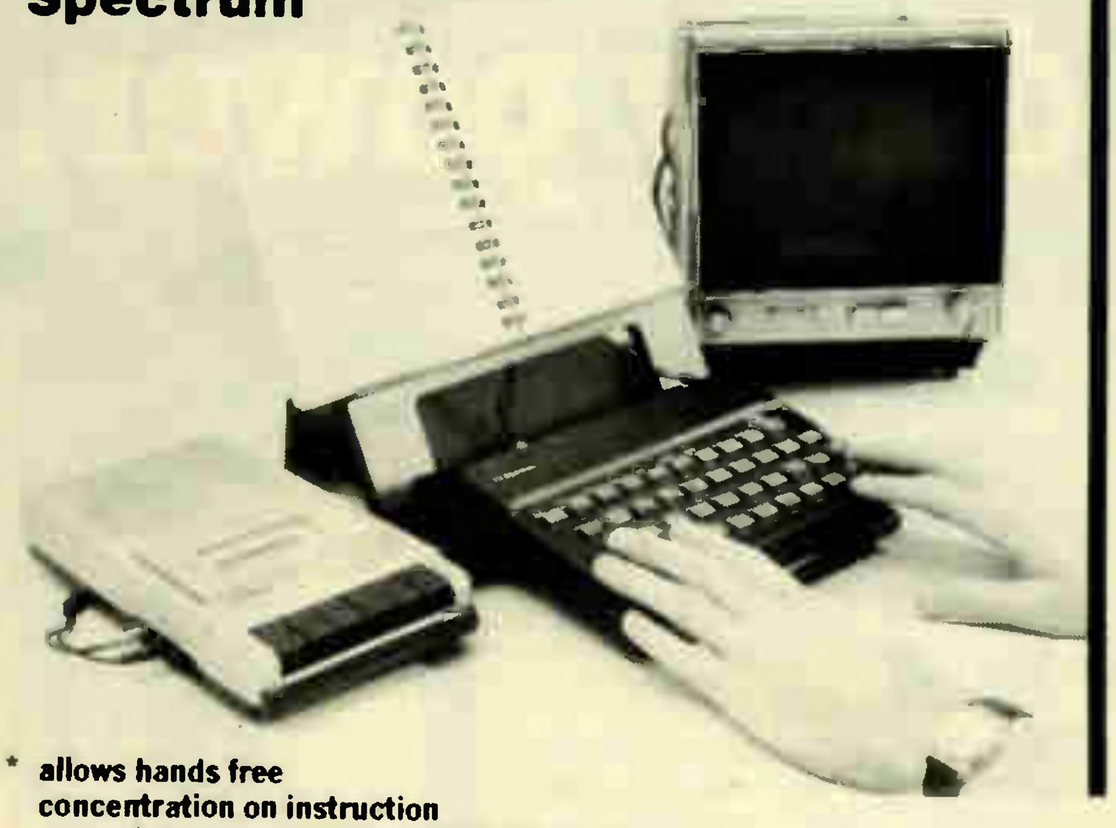

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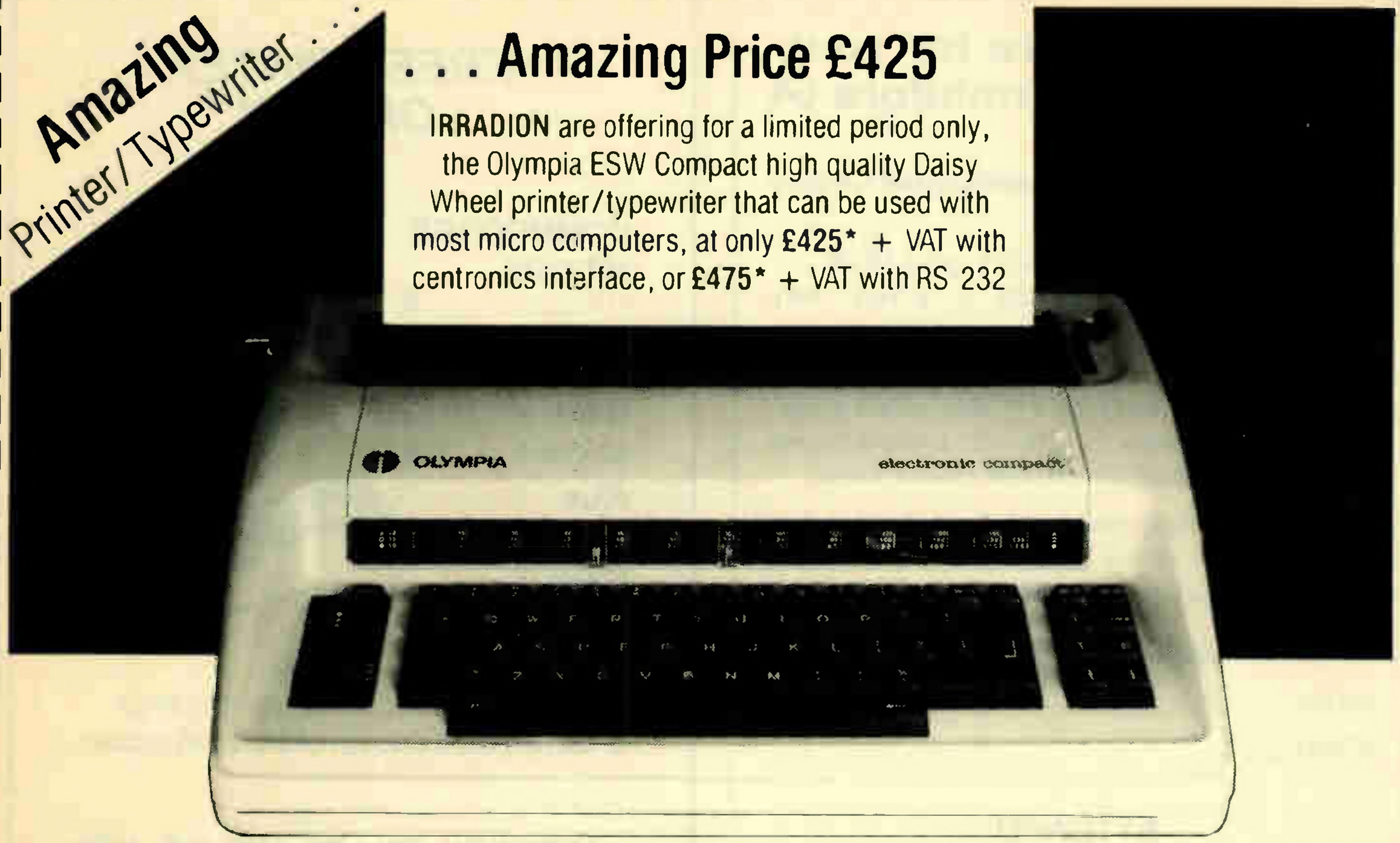

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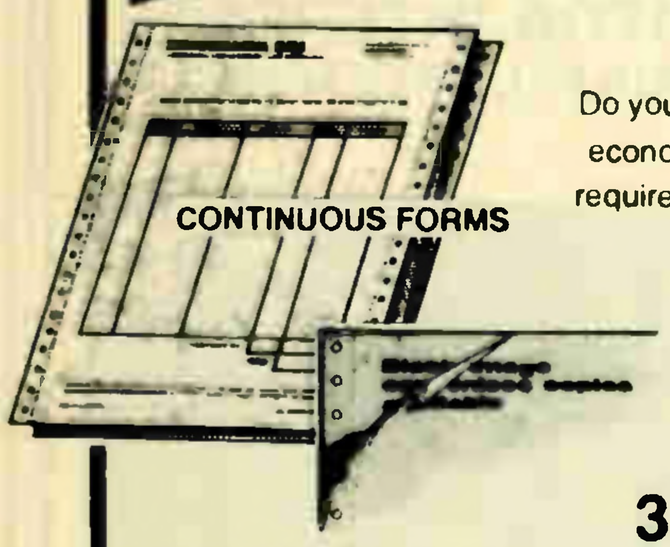

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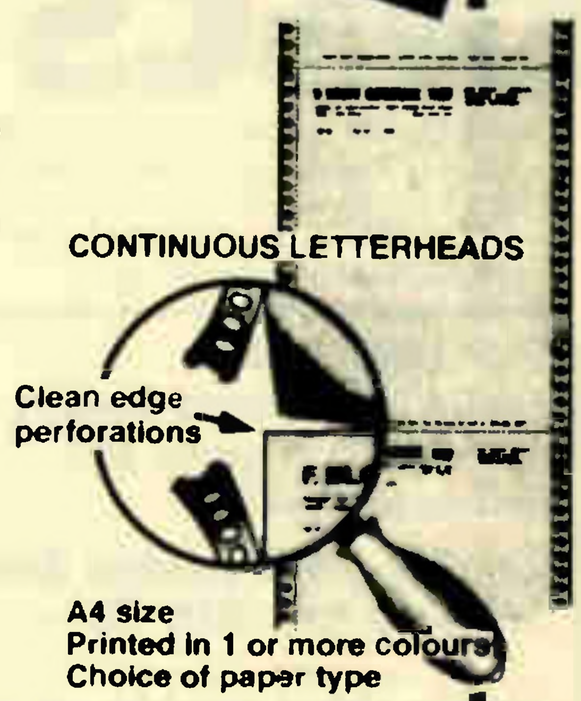

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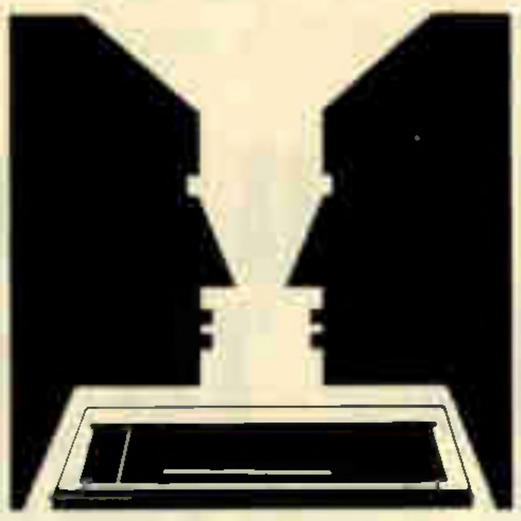

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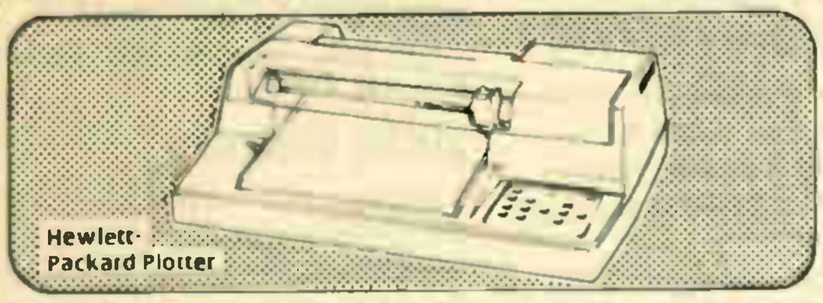



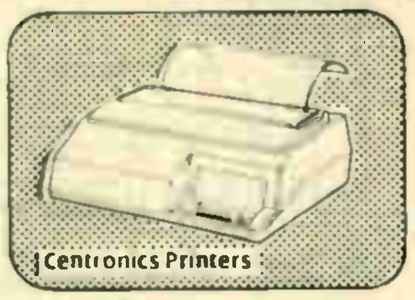

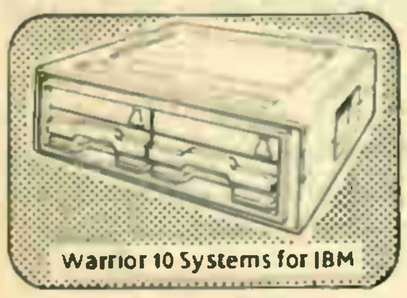









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Much of our software may now carry the Sharp logo and be obtainable through their dealers. The programs in question include:

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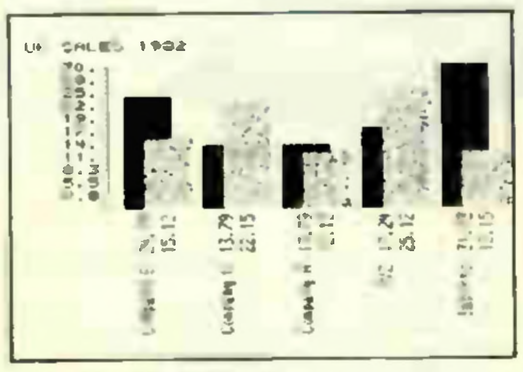

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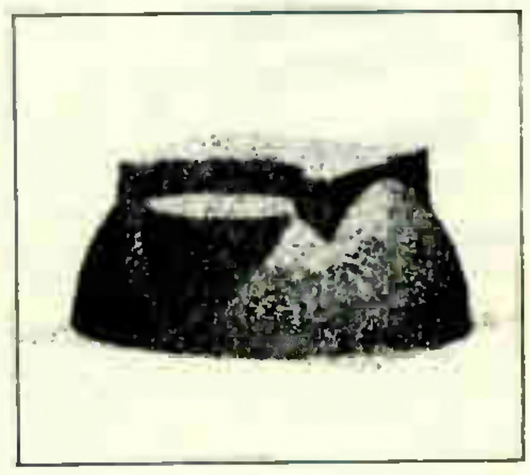

C-GRAF/M12L 12" monochrome long persistence — ideal for Polygon £198
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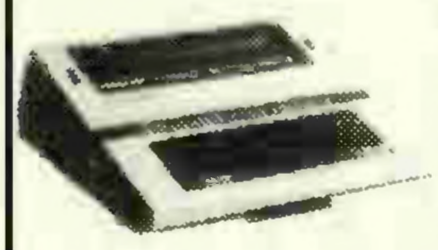

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Advertisers Index courtesy of Ant and Bee Ltd.

CHIP CHAT

CHIP CHAT CHIP CHAT CHIP CHAT CHIP CHAT CHIP CHAT

ACT's done it again! Secret information has reached industry spies on two new ACT computers, to be launched soon after the Apricot goes on sale. The first is the Cherry. the world's smallest micro. It's the size of a pocket calculator, says our informer, and yet it comes with 3 megabytes of RAM as standard and two 0.5 in micro winchesters with a capacity of 10 megabytes each. The second dramatic development in ACT systems technology is the Watermelon, a vast mainframe complex four times the size of a Cray 1 . . . Soak testing: the first London computer marathon was undoubtedly set to be an action-packed affair. full of all the fun you'd expect of a race. Perhaps unscrupulous manufacturers gave their computers amphetamines to keep them going at top whack through the contest. Seriously, folks, the Marathon has been set up as an annual reliability test for 16-bit micros during which they are left running continuously for seven days. Seven days will probably make no difference to any computer worth its salt — part of a *PCW* Benchtest involves the barbaric practice of 'soak testing' — forcing a computer to run on for a couple of days. Perhaps the adjudicators (certain other journalists) should be made to watch over these machines for seven years of continuous running; that'd be a more realistic test . . . Prize for initiative this time, instead of *PCW*'s usual slag off of Public Relations types: Data Track Technology, a disk drive manufacturer. introduced us to its new and, gladly. all-British. range of disk drives. The company sent *PCW* its ad on a jigsaw in a little bag with a label saying 'the 12-bit drive for microsystems'. Yes folks, you've guessed it. there were 12 pieces to the jigsaw. So if we'd been a bit thick, we'd still have had no trouble in putting it together. The prize for initiative. as well as a mention in Chip Chat, is the appearance in print of the company's address. More info on all-British, cheaper. less-power-using disk drives from Data Track Technology. Unit 3. Elliott Road, West Howe Industrial Estate, Bournemouth BH11 8JZ. But don't expect to get a jigsaw — that's only for privileged members of the press . . . Submarines are not the sort of thing which appear every month in *PCW*, but readers might like to hear this little story. A new submarine in the Australian navy will be equipped with a group of computers forming an information and reminder service. The job of one computer will be to do no more than to monitor the temperature of the fat in the fish fryer . . . Here's a nice little story. Barry Muncaster, the managing director of Oric Products, recently arrived at a garage in a great hurry, slapped down his Gold American Express card and drove off again — in a brand new, £46,500 Ferrari! (Wonder if he bought one for his henchman Paul Johnson?) A Ferrari, according to American Express. is about the most expensive item a credit card could buy. Oddly enough, this rushed purchase actually saved Muncaster some cash. A few days later the price of the Ferrari Boxer sports car was upped to £48,000. You could call this stretching your facilities. As a parting shot on this little tale, readers still in possession of a June *PCW* might like to look at a letter from one Mr Kent (see Communications) . . . Haven't you always wanted to have a computer which could be crushed by a four-ton fork-lift truck and still go on working? Buy a Husky then. An airline recently contacted UK Husky manufacturer DVW Micro-electronics to let the company know that a Husky had been damaged in transit. It had been 'squashed; flattened out like butter'. DVW's Production Manager, Derek Ramsdale, says the damage is 'completely consistent with a solid-tyre fork-lift truck. Deep gouges in the underside of the aluminium casing suggest that it was dragged along beneath the truck before being rolled over.' The airline, of course, denies all knowledge of how this indignity was done. We wonder what these airlines manage to do to peoples' suitcases — and to the people! The Husky, incidentally, does still work and survived the incident with all data intact. Says Andy Faulkner, DVW's Technical Director, 'can you imagine what a plastic cased model would look like?' . . . Disturbing news reaches us from Hong Kong, where Matthew Wauchup was exiled by ACT to sell Sirii to the last of the colonials. Wauchup's latest escapade is to advertise the Sirius lavishly. at first sight a good move. Except that the ads are said to feature his own photograph rather more prominently than the product. allegedly with a caption describing him as a 'white-hot technocrat'. ACT's lawyers are now working on an agreement with the People's Republic to get the Hong Kong lease revoked as soon as possible. rather than wait until 1997 for the Red Tide to overwhelm the hapless Wauchup . . .

END

BLUDNERS



The second half of the BBC 'Quadsolve' listing (August Programs) suffered another attack of the gremlins, with the right-hand side of two lines disappearing off the edge of the page. The missing characters are as follows.

At the end of line 820, '... TAB(25);" equation"' and at the end of line 1290, '...n: C%=C%/n:ENDPROC'

Surya adds: I had this wonderful idealistic vision that the Basic Converter Chart would be totally bug free. This vision was not to come true. In the Spectrum row, there are two errors: the first is a typesetting error, the second a b***s-up on my part. The entry for CLEAR (3rd column) should of course be CLEAR and not CHR$(exp), and the note in the second column should be deleted. The Spectrum does support the standard ASCII character set. It is only the ZX81 which does not.

END

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San Francisco, California

East

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