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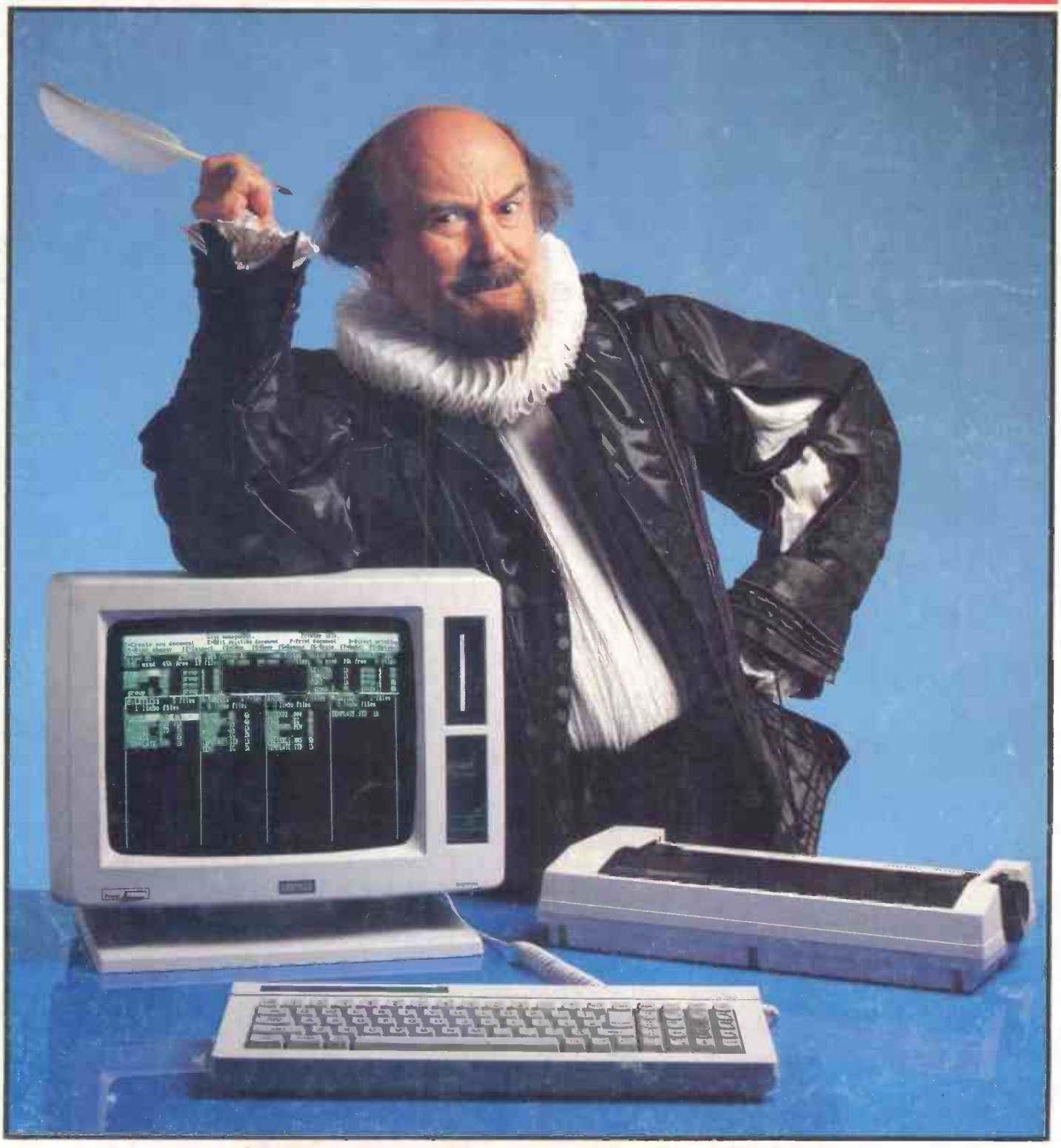

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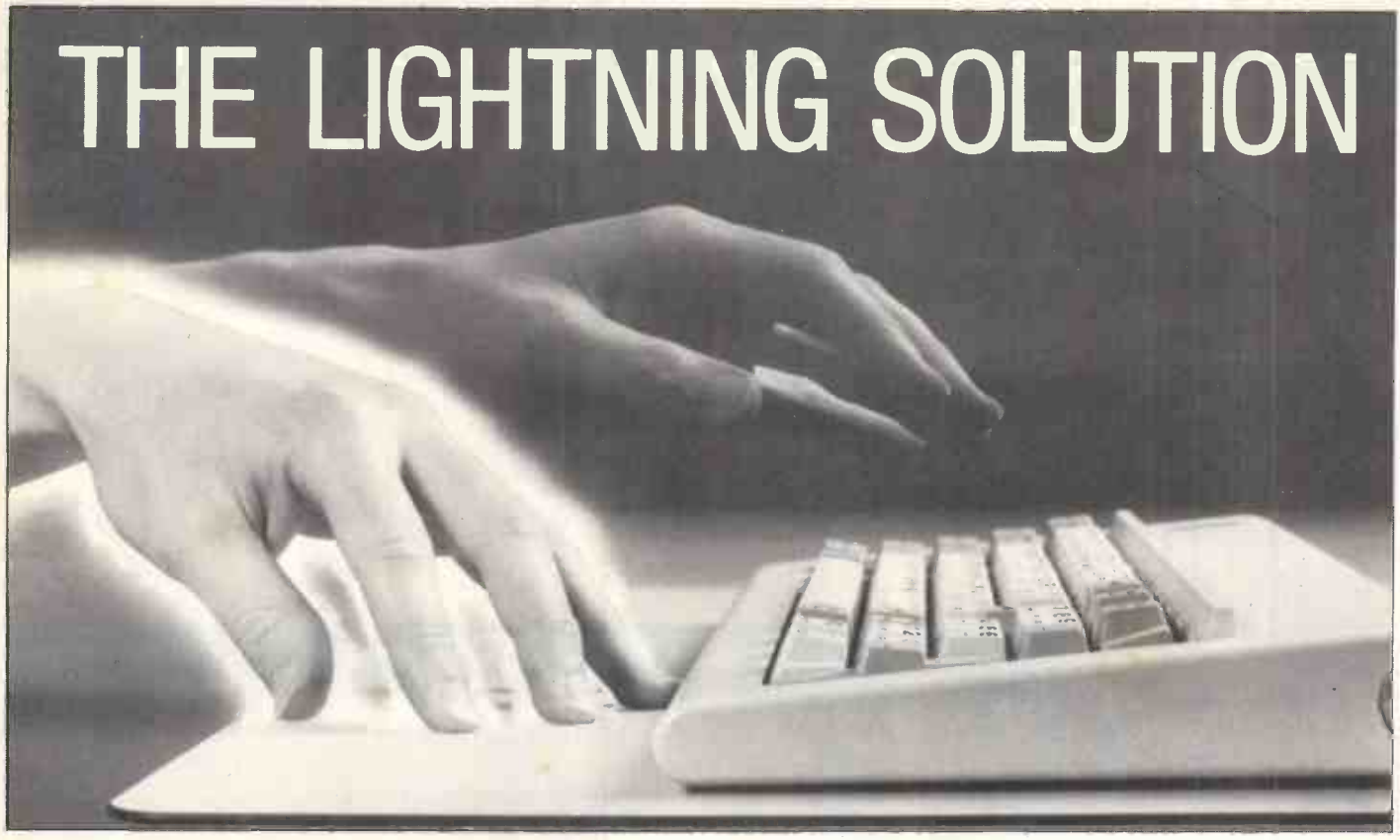

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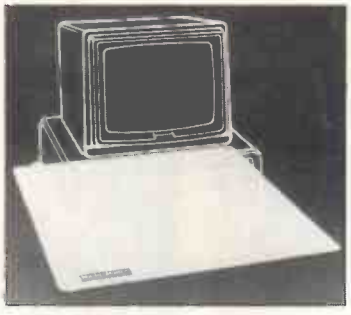

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CONTENTS

Vol 8 No 10 October 1985

Cover story begins page 132
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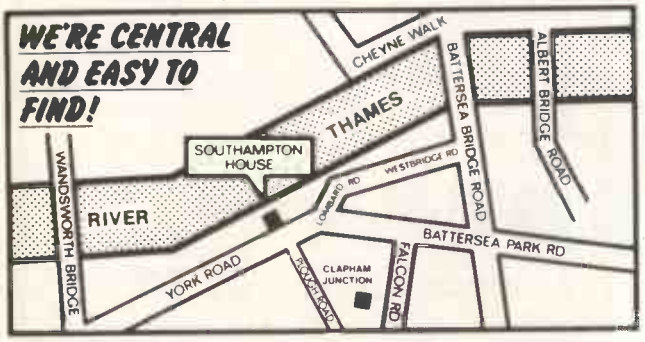

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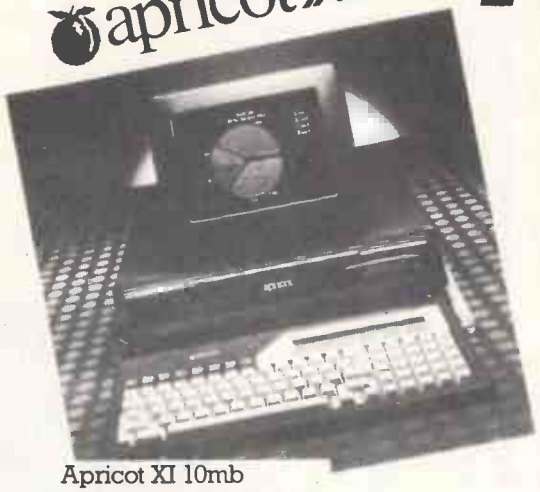

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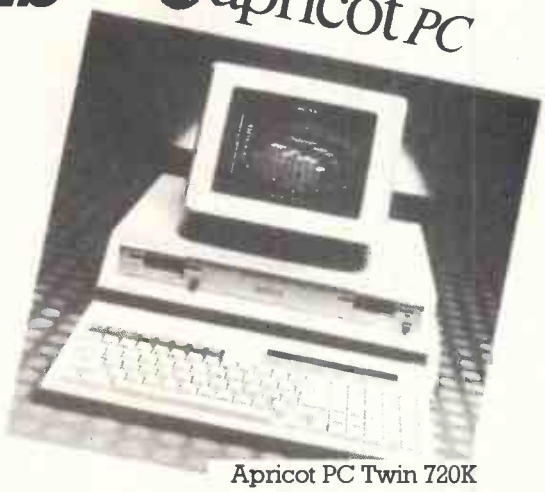

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The ORIGINAL FREE OF CHARGE dial up data base. Buy, browse or place YOUR OWN AD for goods or services to sell. 1000's of stock items, spares and one off bargains. Updated daily.
ON LINE NOW. CCITT, 8 bit word, no parity.
For 300 baud modems call 01-679 1888
For 1200-75 baud modems call 01-679 6183

PRINTER / TERMINAL SCOOP

A MASSIVE purchase of these attractive stand alone terminal units enables a SUPER BARGAIN offer. Made by the US GENERAL ELECTRIC CORPORATION the GE MODEL 30 features a standard QWERTY 80 key electronic keyboard coupled to a quality built matrix printer with variable 3" to 9.5" forms tractor. The printer is capable of continuous duty printing, with up to 120 characters per line. Standard RS232 interface accepts ASCII data at 110, 150 or 300 baud. Ideal for Terminals, Data loggers, local label printing, or just as a printer!! Sold TESTED with data ONLY £95.00. Also available with TWIN MAGTAPE CASSETTE unit for data capture, data preparation etc £150.00 Carriage £10.00.

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8" DRIVE PSU for 2 drive units £45.00

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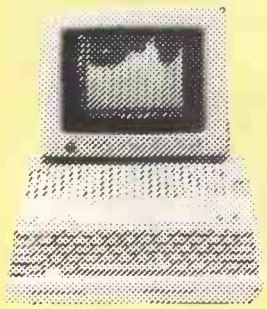

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DISKETTES

FREE!

With every ten-pack of diskette s, now comes the NEW FLIP'N'FILE 10, value 4.48 inc VAT.

DISKING Professional

Prices exc VAT and quantities relate to **Ten-Packs**

5¼"	1	2-4	5-9	10-19	20+
D1D S/S 48 tpi	15.90	13.90	13.40	12.90	12.40
D2D D/S 48 tpi	17.90	15.90	15.40	14.90	14.40
D1Q S/S 96 tpi	17.90	15.90	15.40	14.90	14.40
D2Q D/S 96 tpi	22.90	20.90	19.90	19.40	18.90

DISKING COLOURED Disks

Prices exc VAT and quantities relate to **Ten-Packs**

5¼"	1	2-4	5-9	10-19	20+
1D S/S 48 tpi	20.90	18.90	17.90	16.90	15.90
2D D/S 48 tpi	23.90	21.90	20.90	19.90	18.90
1DD S/S 96 tpi	23.90	21.90	20.90	19.90	18.90
2DD D/S 96 tpi	28.90	26.90	25.90	24.90	23.90

To order the colour of your choice, just precede the type number with the appropriate letter, (R) RED, (O) ORANGE, (Y) YELLOW, (G) GREEN, (B) BLUE.

DISKING BULK DISKETTES

10-40 disks gets you a **FREE Flip 'n File. 10** with every ten-pack, **OR** Buying 50 disks entitles you to a **FREE Budget 50 storage box.**
All Disking bulk diskettes are supplied with user & write protect labels.

Prices exc VAT and quantities relate to **Ten-Packs**

5¼"	10-40	50+
UL1D S/S 48tpi	10.00	8.58
UL2D D/S 48 tpi	12.00	10.58
UL1DD S/S 96 tpi	12.00	10.58
UL2DD D/S 96 tpi	14.00	12.58

Prices exc VAT and quantities relate to **Ten-Packs**

Unlabelled 3" Microdisks	1	2-4	5-9	10-19	20+
UL 350 S/S	34.90	32.90	31.90	30.90	29.90
UL 360 D/S	44.90	42.90	41.90	40.90	39.90

MEMOREX

Prices exclude VAT and quantities relate to **Ten-Packs**

5¼" Diskettes	1	2-4	5-9	10-19	20+
3481 S/S 48 tpi	20.90	18.90	17.90	16.90	15.90
3491 D/S 48 tpi	23.90	21.90	20.90	19.90	18.90
3504 S/S 96 tpi	24.90	22.90	21.90	20.90	19.90
3501 D/S 96 tpi	28.90	26.90	25.90	24.90	23.90
High Density (IBM PC AT)					
5¼.009 Diskettes	1	2-4	5-9	10-19	20+
5500 1.6 MB	48.90	44.90	43.90	42.90	41.90
3½" Diskettes	1	2-4	5-9	10-19	20+
6100 S/S	29.90	28.90	27.90	26.90	25.90
6120 D/S	44.90	43.90	42.90	41.90	40.90

Datalife

Prices exc VAT and quantities relate to **Ten-Packs**

5¼"	1	2-4	5-9	10-19	20+
525 S/S 48 tpi	20.90	18.90	17.90	16.90	15.90
550 D/S 48tpi	23.90	21.90	20.90	19.90	18.90
577 S/S 96 tpi	23.90	21.90	20.90	19.90	18.90
557 D/S 96 tpi	28.90	26.90	25.90	24.90	23.90
High Density (IBM PC AT)					
5¼" Diskettes	1	2-4	5-9	10-19	20+
MOHD 1.6 MB	46.90	44.90	43.90	42.90	41.90
3½" Microdisks	1	2-4	5-9	10-19	20+
MF 350 S/S	34.90	33.90	32.90	31.90	30.90
MF 360 D/S	44.90	43.90	42.90	41.90	40.90

Verex

Prices exc VAT and quantities relate to **Ten-Packs**

5¼" Diskettes	1	2-4	5-9	10-19	20+
150 S/S S/D	14.90	12.90	12.40	11.90	11.40
200 S/S D/D	15.90	13.90	13.40	12.90	12.40
250 D/S D/D	20.90	28.90	17.90	17.40	16.90

8" Diskettes — Call for prices

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Prices and quantities relate to Ten-Packs

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MD2-D D/S 48	29.90	27.90	26.90	25.90	24.90
MD1-DD S/S 96	29.90	27.90	26.90	25.90	24.90
MD2-DD D/S 96	34.90	32.90	31.90	30.90	29.90
3½" Microdisks	1	2-4	5-9	10-19	20+
MF1-DD S/S	40.90	38.90	37.90	36.90	35.90
MF2-DD D/S	53.90	51.90	50.90	49.90	48.90
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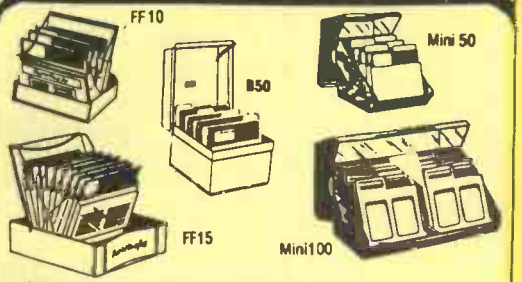
CF2 D/S	39.90	38.90	37.90	36.90	35.90

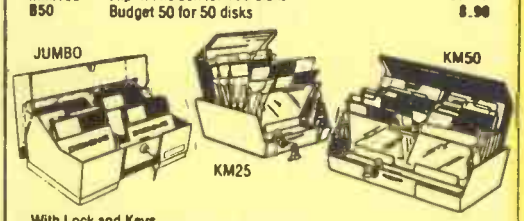
** FREE Memorex VDU Cleaning Kit per pack
8" Diskettes — Call for prices

STORAGE & ACCESSORIES



5¼" DISKETTE STORAGE (Buy two get one free)
Without Locks

Part No.	Description	Price exc VAT
FF110	Flip 'n File 10 for 10 disks	3.90
FF15	Flip 'n File 15 for 15 disks	5.90
Mini 50	Flip 'n File box for 50 disks	16.90
Mini100	Flip 'n File box for 100 disks	32.90
B50	Budget 50 for 50 disks	8.90



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KM25	Flip 'n File lockable for 25 disks	25.90
KM50	Flip 'n File lockable for 50 disks	36.90
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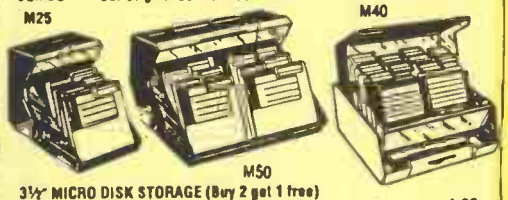

3½" MICRO DISK STORAGE (Buy 2 get 1 free)

M10	Flip 'n File Box for 10 microdisks	4.90
M25	Flip 'n File box for 25 microdisks	10.90
M50	Flip 'n File box for 50 microdisks	19.90
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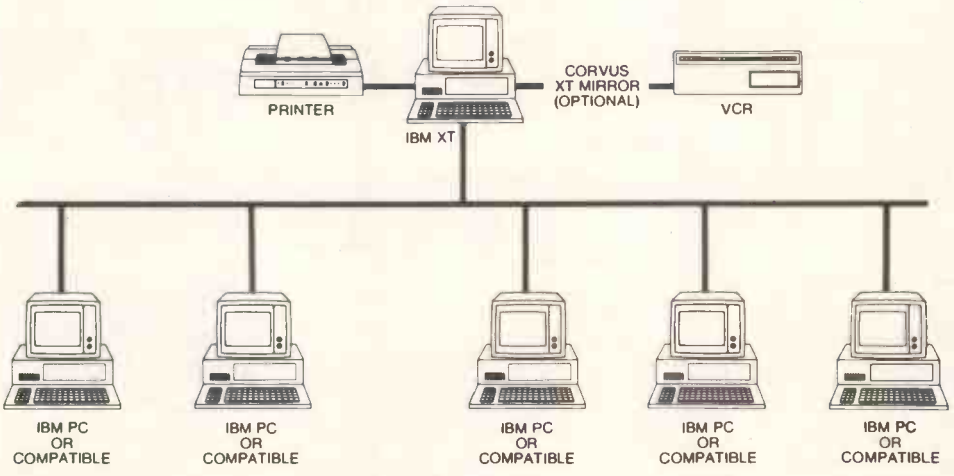
The Working Network

For IBM PC users: Omninet with Omnishare software



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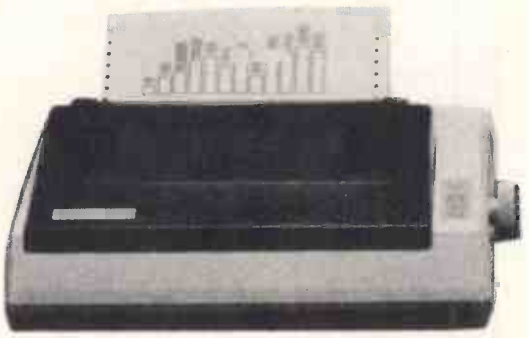

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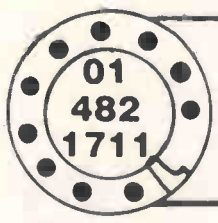

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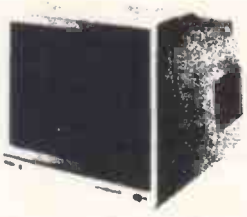

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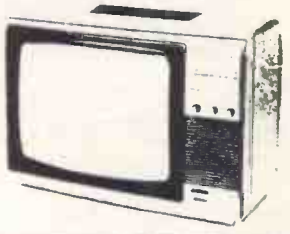

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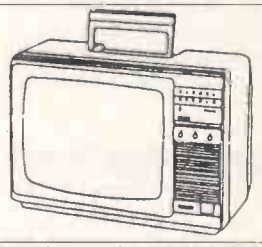

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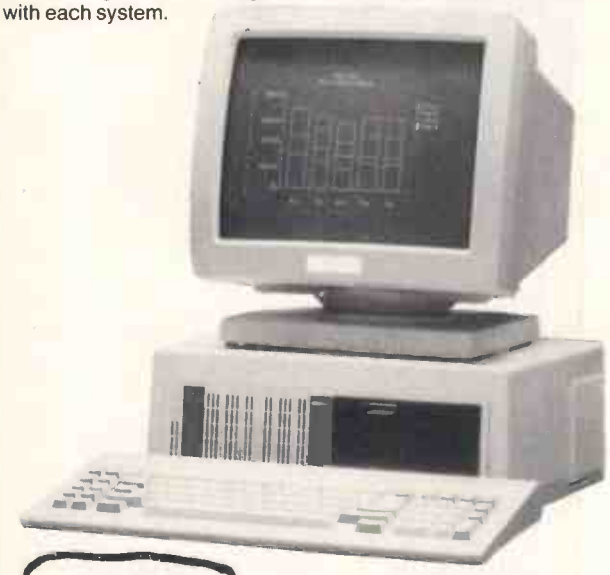

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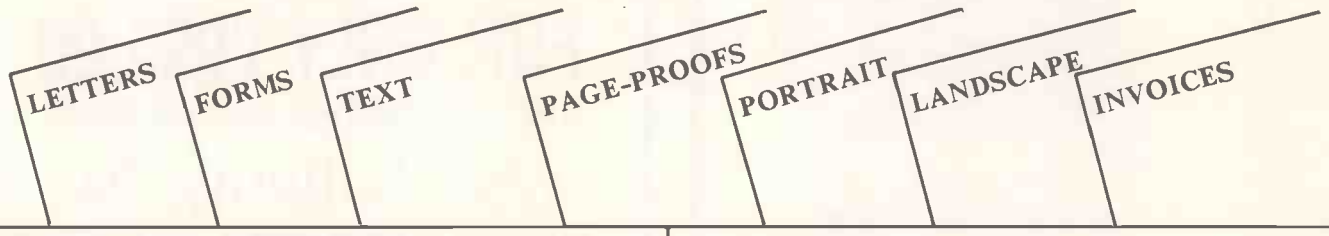

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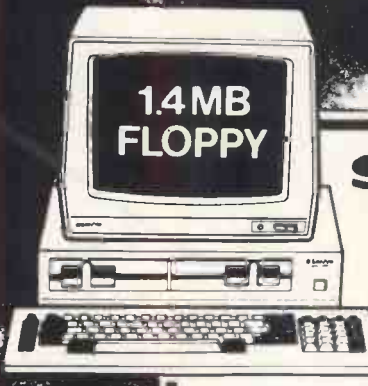

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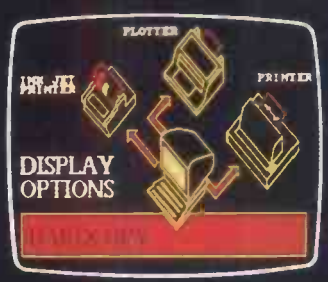

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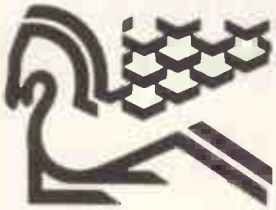

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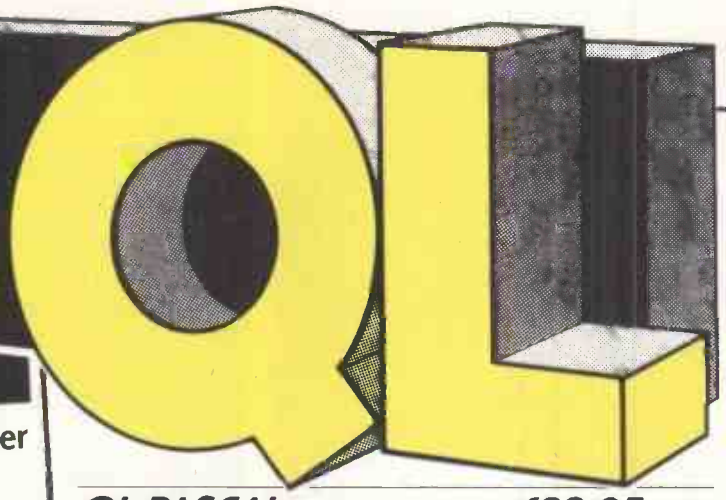

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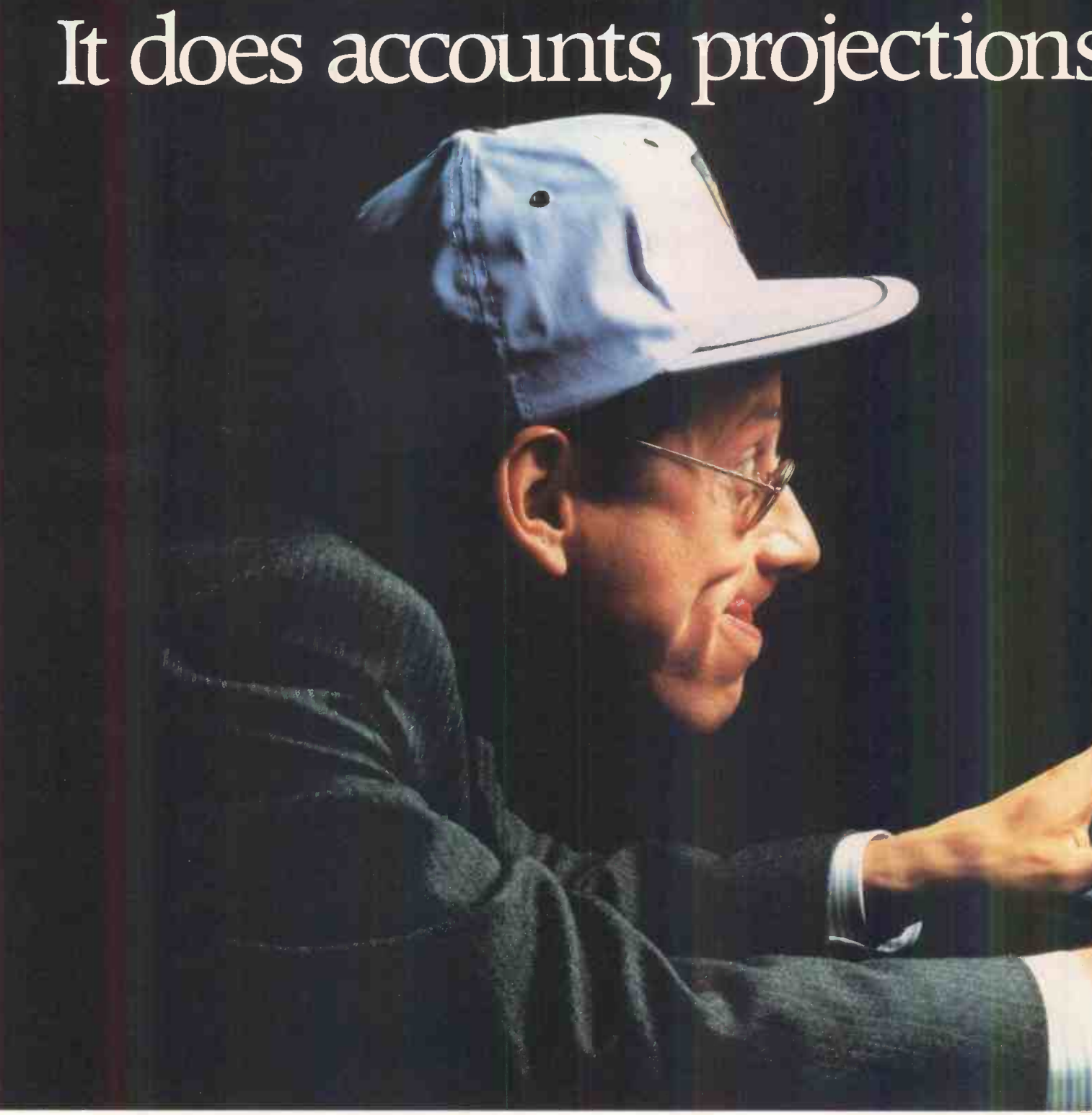
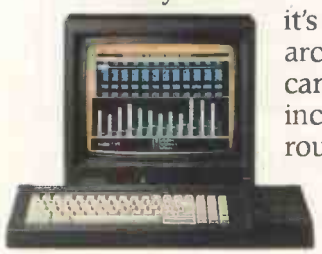


No wonder people are racing out to buy Amstrad's new CPC 6128 computer.

Not only does it answer all your business needs, it's also compatible with nearly 200 arcade and adventure games. So it can either speed you through your income tax returns or whizz you round a simulated Silverstone.



On the business side we start you off with a free disc which introduces you to the Amstrad CPC 6128's impressive range of capabilities, and the best ways to exploit them.

You'll discover how its massive 128k memory can open the door to over 8,000 CP/M* applications.

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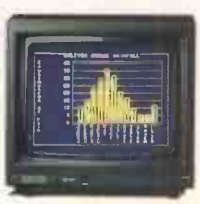

There's a series of business contro programs which form a complete invoice stock control and statement system.

In other words it's easy to choose the software you need to take the big problems out of your small business.

But even if you don't own a business there are plenty of good reasons for owning an Amstrad CPC 6128.

It makes short work of the problems we all face. Like keeping track of rates, mortgage and H.P. payments.

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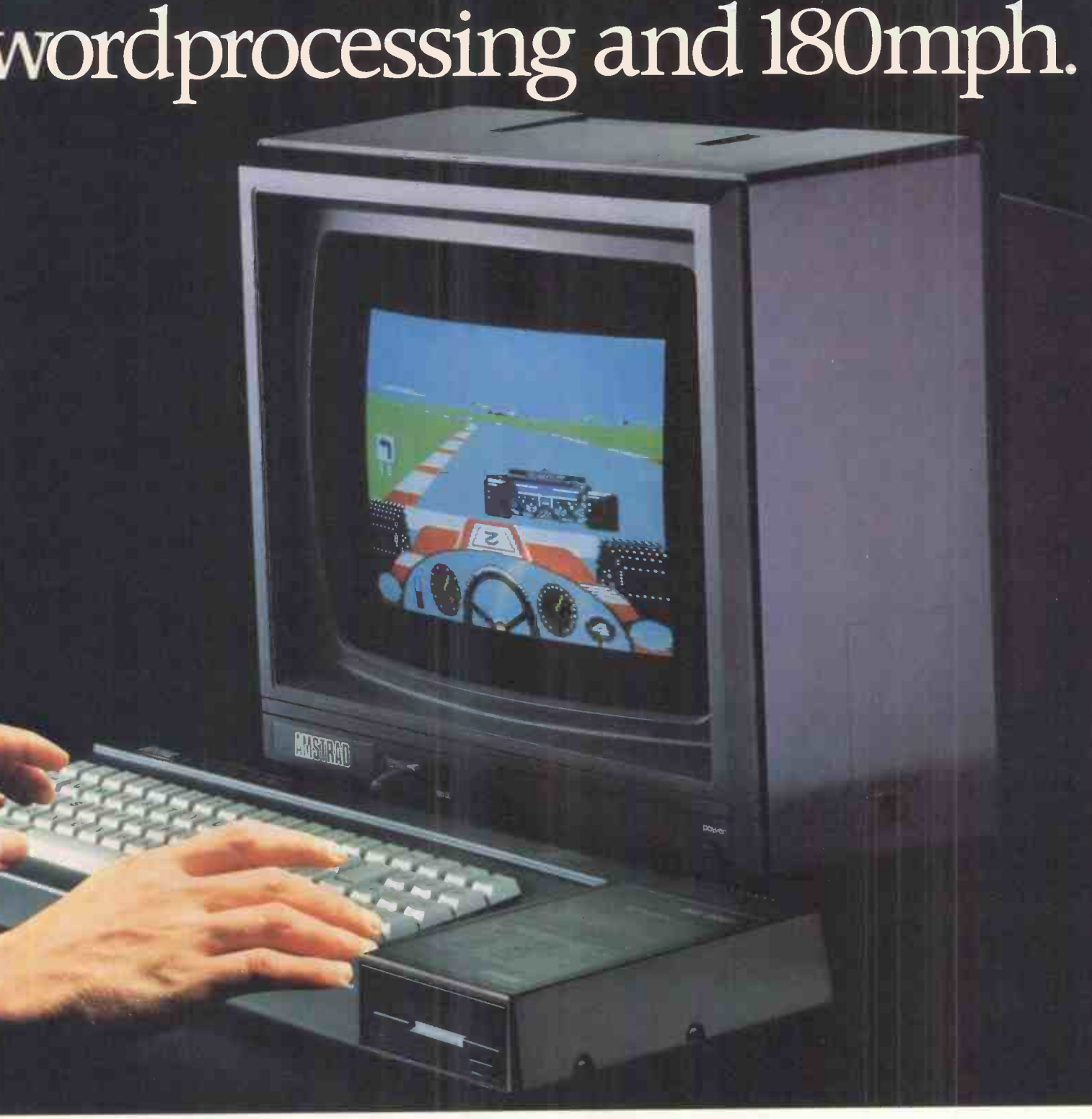

as Amstrad's are only as good as the hardware they're loaded into.

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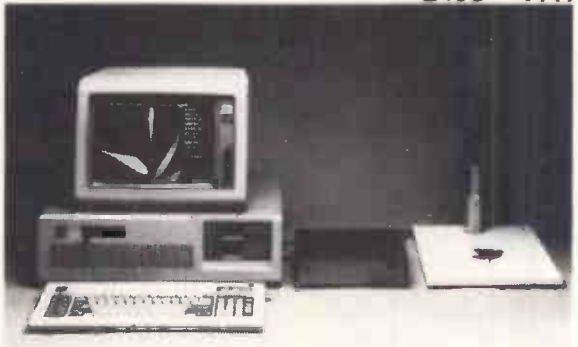

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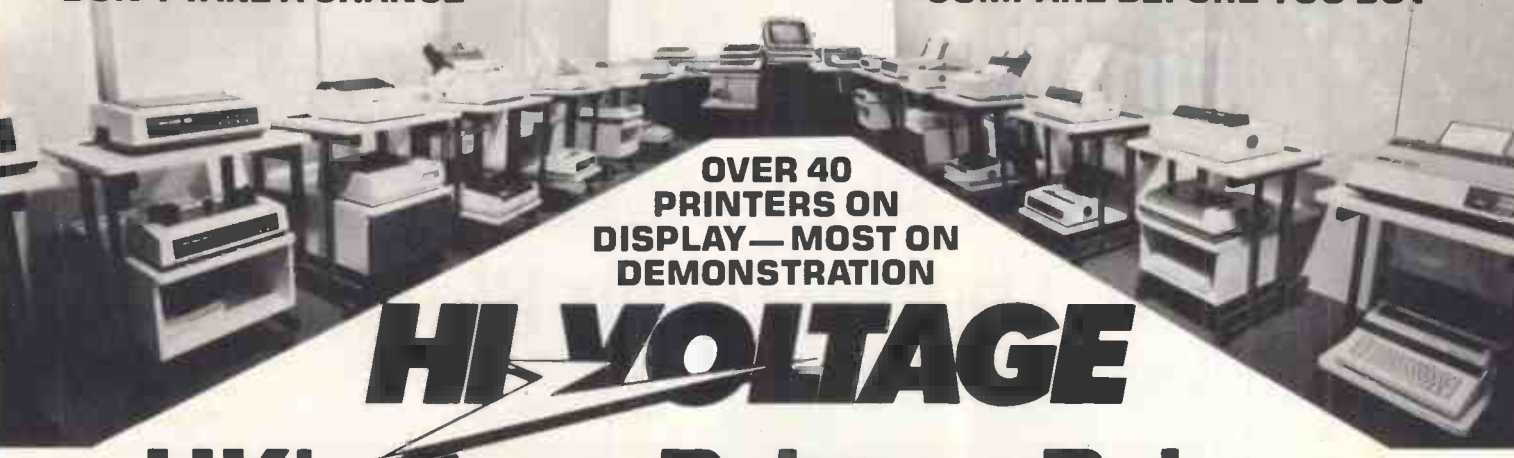

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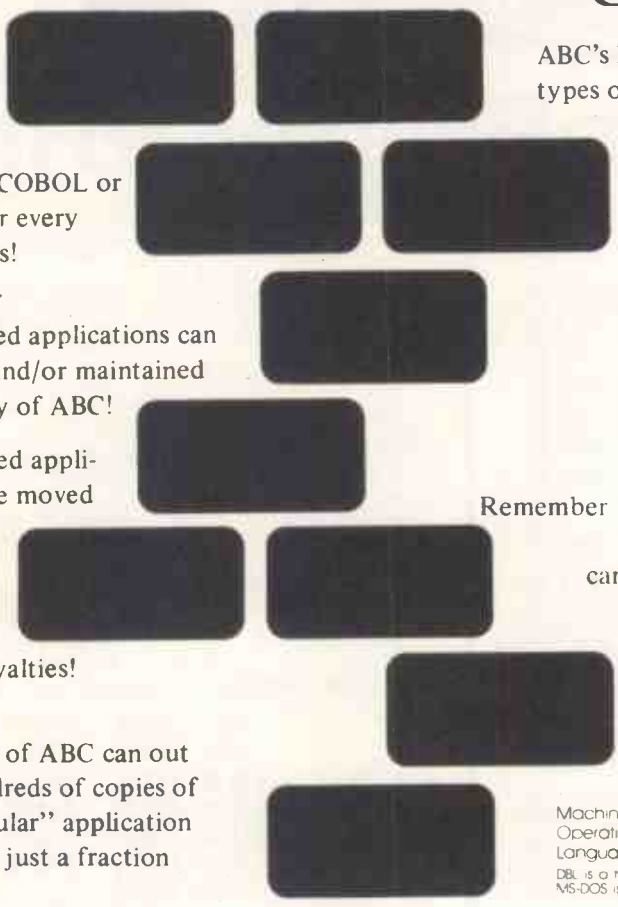

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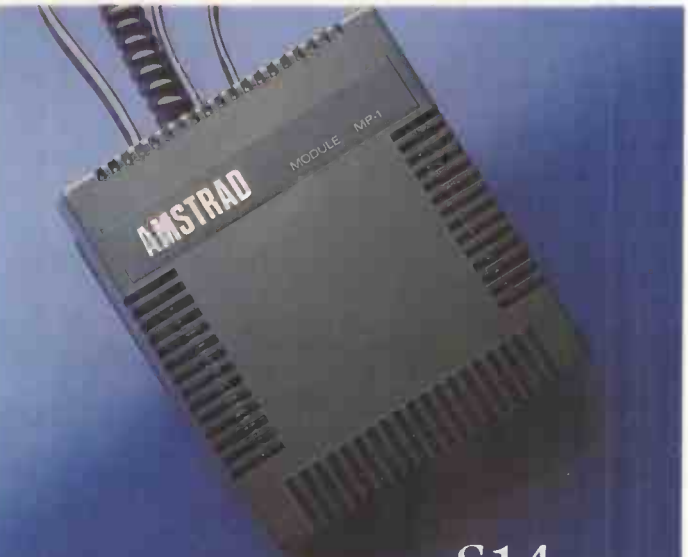

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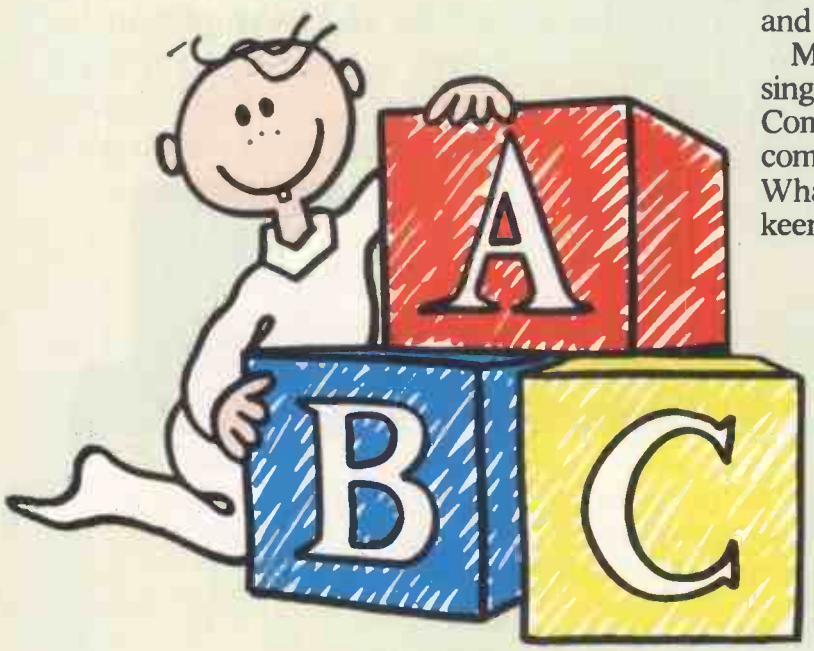

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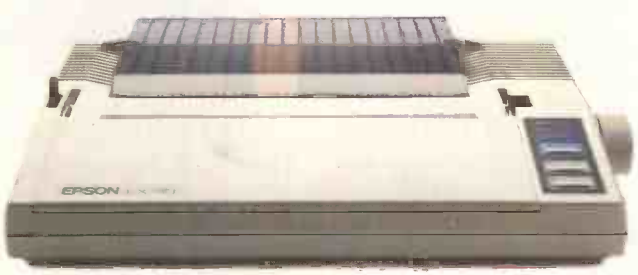

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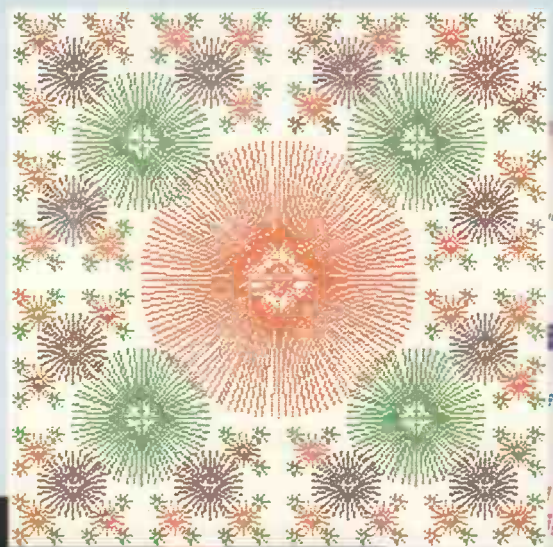

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ATARI ST

520ST

POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazingly high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 18 key numeric keypad), MIDI interface, GEM and a 500K 3½ inch disk drive, all for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizeable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below: 1) TOS -Tramiel Operating System based on CPM 68K. 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment. 3) DR GEM Paint for creating graphics masterpieces. 4) DR GEM Write for word processing. 5) Logo learning language to enable you to write your own programs easily using turtle graphics. 6) DR Personal Basic a powerful user friendly version of the Basic programming language. 7) BOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned. Atari will soon be releasing a 1000K (1MB) 3½ inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disk (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

Silica Shop Price: £651.30 + £97.70 VAT = £749.00 This price includes:

- ★512K RAM
- ★B/W MONITOR
- ★MOUSE
- ★500K 3.5" DISK DRIVE
- ★GEM
- ★KEYBOARD (95 KEYS)

£749

ATARI 520ST SPECIFICATION

MEMORY
512K RAM (524 288 bytes)
16K ROM expandable to 320K
Port for addnl 128K plug-in ROM cartridges
200K TOS operating system

GRAPHICS
Individually addressable 32K bit-mapped screen with 3 screen graphics modes:
320x200 pixels in 16 colours (low resolution)
640x200 pixels in 4 colours (med resolution)
640x400 pixels in monochrome (high res)
16 shades of grey in low res mode
512 colours available in low/medium res
8 levels of each in red, green and blue

ARCHITECTURE
4 custom designed chips:
GLUE Chip - MMU Memory Mngmnt Unit
DMA Controller - Graphics Processing Unit
16/32 bit Motorola 68000 processor at 8MHz
eight 32 bit data registers
eight 32 bit address registers
16 bit data bus/24 bit address bus
7 levels of interrupts/56 instructions
14 addressing modes/5 data types

DATA STORAGE
High speed hard disk interface
Direct memory access 1.33 Megbytes per second
CD (Compact Disc) interface
Built in cartridge access
Dedicated floppy disk controller

DISK DRIVE
500K (unformatted) s/sided 3½" floppy d/drive
349K (formatted) storage capacity

SOUND AND MUSIC
Sound Generator
Frequency control from 30Hz to above audible
3 voices (channels) in wave shaping sound in addition to a noise generator
Separate frequency and volume controls
Dynamic envelope controls
ADSR (Attack, Decay, Sustain, Release)
Noise generator
MIDI interface for external music synthesizers

KEYBOARD
Separate keyboard microprocessor
Standard QWERTY typewriter styling
Ergonomic angle and height
95 keys including 10 function keys
Numeric keypad — 18 keys including ENTER
One touch cursor control keypad

MONITOR
12" screen - high res monochrome monitor
640x400 monochrome resolution

Note: Some of the above specifications are pre-release and may therefore be subject to change

VIDEO PORTS
Display - Low Resolution - 40 columns
Med/High Res - 40/80 plus cols
Medium res RGB (Red/Green/Blue) output
High resolution monochrome (Black & White)

COMMUNICATIONS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
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MIDI interface for external music synthesizers

GEM WIMP ENVIRONMENT
WIMP - Window Icon Mouse Pop-down menus
Two button mouse controller
Icons/Pull down menus/Windows
GEM VDI - Virtual Device Interface
GEM AES - Application Environment Services
GEM BBT - Bit Block Transfer
Real time clock & calendar

SOFTWARE
GEM environment
with user friendly Macintosh style operation
TOS - Tramiel Operating System
Atari's own system based on CP/M 68K with hierarchical directory & file structure plus a host of MS DOS & UNIX command structures
BOS - Business Operating System
to run any standard BOS business programs
GEM desktop
with GEM PAINT graphics mgmt system and GEM WRITE word processor
Personal BASIC and DR Logo
originally written by Digital Research (DR) very much like those on other machines except for the extensive use of pull down menus, mouse control and windows

VARIOUS
Dimensions: 470mmx240mmx80mm
Replaceable external power supplies
Expansion: 3½" floppy disk drives 500K/1,000K (two drives can be connected)
3½" 15Mb hard disk
CD (compact laser disc)
Dot matrix & d/wheel prntrs (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

LANGUAGES
BASIC & LOGO supplied
Many others will soon be available, including: Assembler, BCPL, C, Cobol, Compiled Basic Lisp, Modular-2 and Pascal

MACINTOSH v F1e v 520ST

"Imagine a Fat Mac - the 512K Apple Macintosh - but with a bigger screen, a far bigger keyboard with numeric keypad, cursor and function keys, and colour. That gives you some idea of what the Atari 520ST is like, except for two important things. First the Atari seems faster. Second the Atari system is about one third of the price."
June 1985 - Jack Schofield - PRACTICAL COMPUTING

FEATURES OF MAIN SYSTEM	APPLE MACINTOSH	APRICOT F1e	ATARI 520ST
Price includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (LxDxH)	330x147x50	450x167x28	470x240x80
Keyboard size ins (LxDxH)	13x5¾x2	17½x6½x1	18½x9½x2½
3½" D/Drive (Unformatted)	500K	500K	500K
3½" D/Drive (Formatted)	398K	315K	349K
WIMP (Window, Icon, Mouse,)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232 Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	59	92	95
Numeric Keypad	NO	YES (16 Keys)	YES (18 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	10
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	16	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse included	Single Button	NO - extra £95	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Joystick Ports	NO	NO	YES (two)
MIDI Synthesiser Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES

System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive			
Price of basic system (exc VAT)	£2595+VAT	£595+VAT	£652+VAT
+ Mouse	Included	£95+VAT	Included
+ Monochrome Monitor	Included	£200+VAT	Included
+ Expansion to 512K RAM	Included	£285+VAT	Included
Price of complete system (exc VAT)	£2595+VAT	£1185+VAT	£652+VAT
PRICE rounded down including VAT	**£2,984**	**£1,382**	**£749**

PRESS COMMENT

"Atari's new corporate image as an aggressive low cost computer maker is likely to mirror that of Commodore where Mr. Tramiel established the maxim that 'Business is war'."
August 21st 1984 FINANCIAL TIMES

"This is the only personal computer I know of that comes with a Midi interface as standard."
Peter Bright March 1985 PERSONAL COMPUTER WORLD

"The (GEM) version running on the Atari 68000 machines will have the additional advantage of leaving the PC version standing."
April 6th 1985 PERSONAL COMPUTER NEWS

"It would seem that GEM offers the ideal operating system."
March 7th 1985 POPULAR COMPUTING WEEKLY

"I found it (GEM) extremely easy to use and was very impressed with the way in which it disguises the unfriendly hardware and operating systems lurking under the surface."
Peter Bright Feb 1985 PERSONAL COMPUTER WORLD

"The electronics in the machine are a work of art ... The heart of the 520ST is a Motorola 68000, one of the most powerful 16-bit processors around and in many respects it is close to being a 32-bit chip ... when the machine appears in the shops, I'll be at the front end of the queue to buy one."
Peter Bright June 1985 PERSONAL COMPUTER WORLD

"This machine is significantly more powerful than an IBM PC ... If it's possible to design a sure-fire winning machine, this is it."
May 11th 1985 PERSONAL COMPUTER NEWS

"... the use of GEM makes the new range of Atari computers so similar to the Macintosh (with the added attraction of colour), that they are already being called 'Jackintoshes'."
May 2nd 1985 COMPUTING

"The new Atari ST computers truly represent to the consumer what Jack Tramiel is saying — easy-to-use computing power without the price."
March 1985 ANALOG COMPUTING

"It (the ST) uses the most modern technology that is affordable, in a package that gives a professional impression."
May 23rd 1985 POPULAR COMPUTING WEEKLY

"The Atari ST is one of the most elegant designs I have seen ... Atari has used an original and elegant method of memory management which should make the ST faster than any other PC on the market - in any price bracket ... The 64K dollar question is would I go out and spend money for one? To which the only answer is 'Try and stop me!'"
John Lambert July 1985 ELECTRONICS & COMPUTING

"The 520ST is technically excellent ... The 520ST hardware is the new standard by which others will be judged."
July 1985 YOUR COMPUTER

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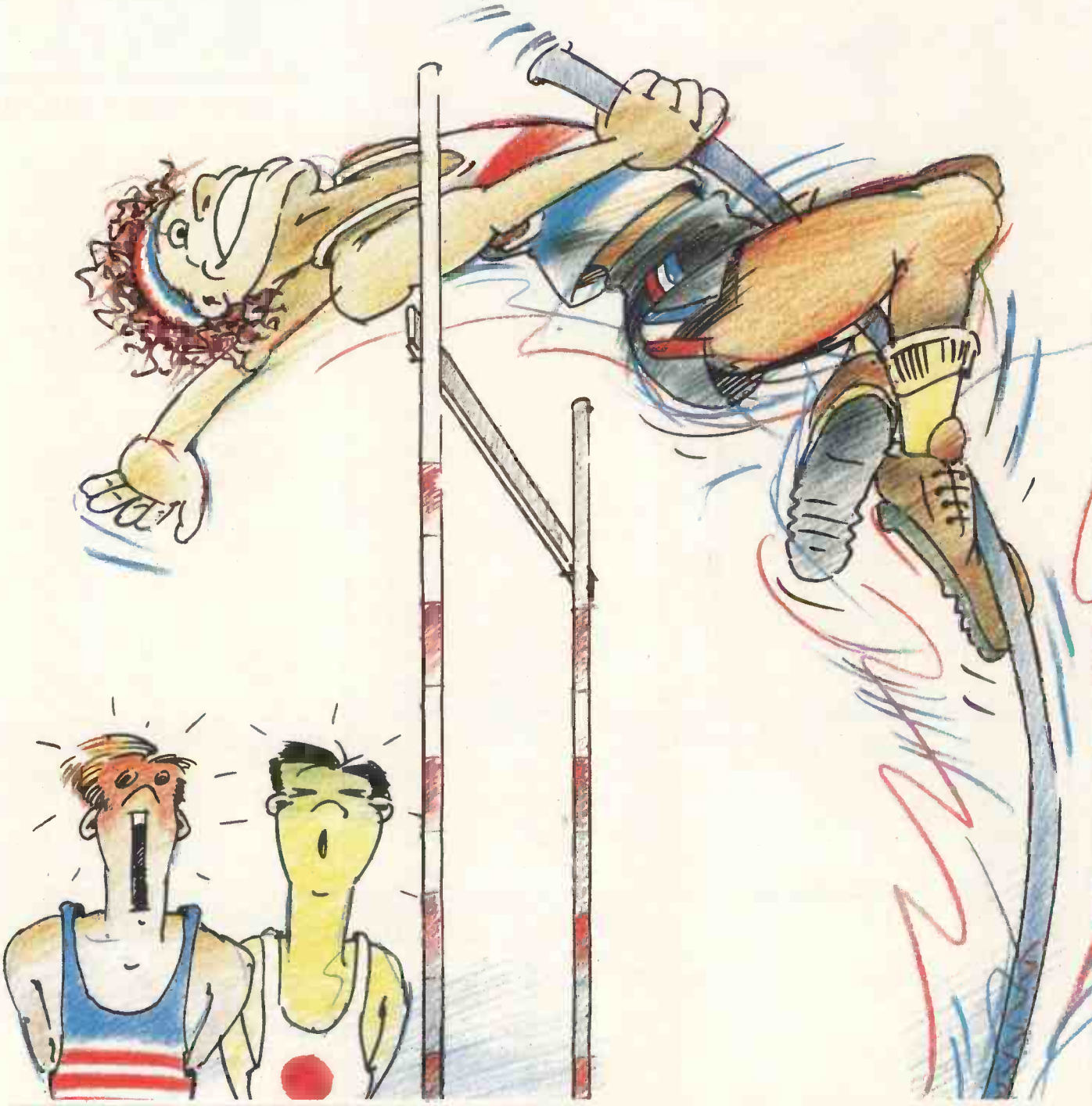

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Expandable upto	640 Kb	512 Kb
Graphic formats (7 colors)	320/640x200	320/640x200
(monochrome)	640x200/400	640x200/400
Display formats	80x25 monochr	80x25 monochr
	40/80x25 color	40/80x25 color
International character sets	11	11
Interface: Keyboard	IBM comp. (2)	IBM comp. (1)
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Expansion slots I/O	piggy backed	piggy backed
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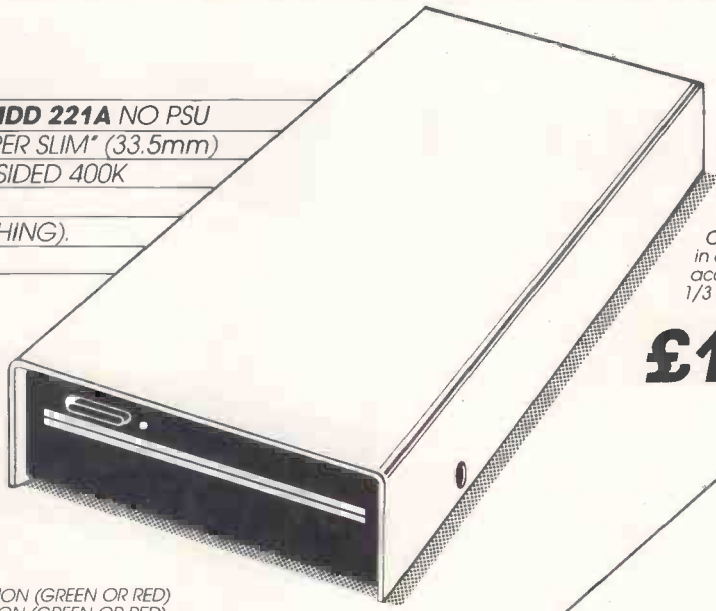

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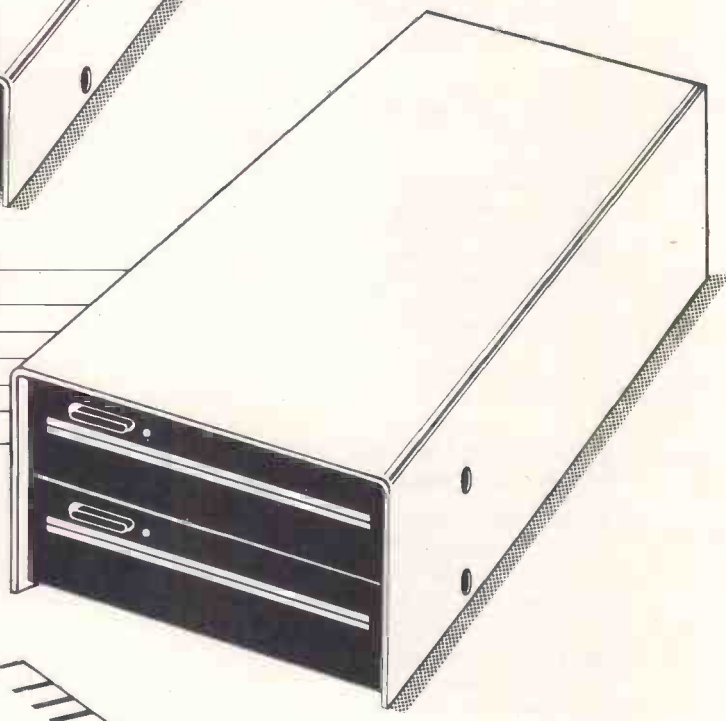

SPECIFICATIONS:
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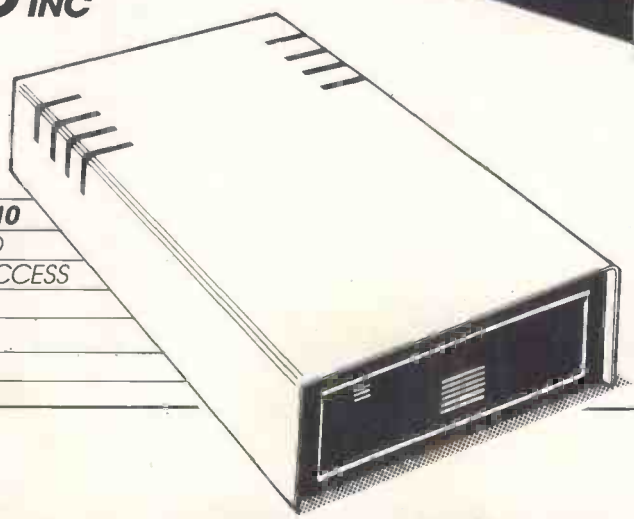

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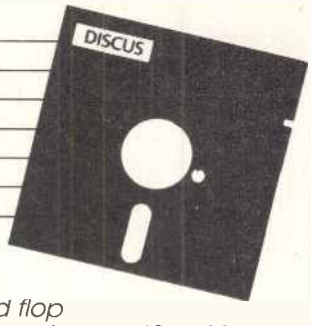

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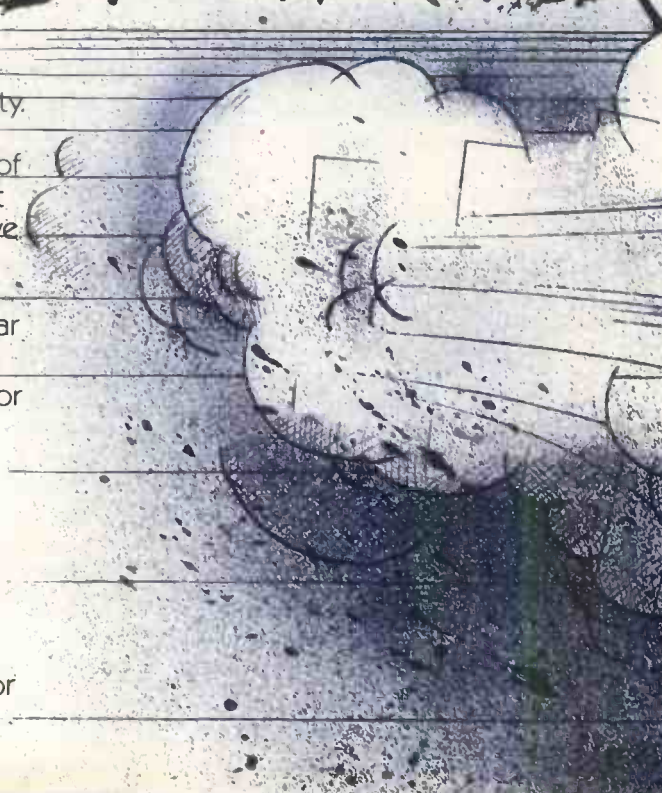

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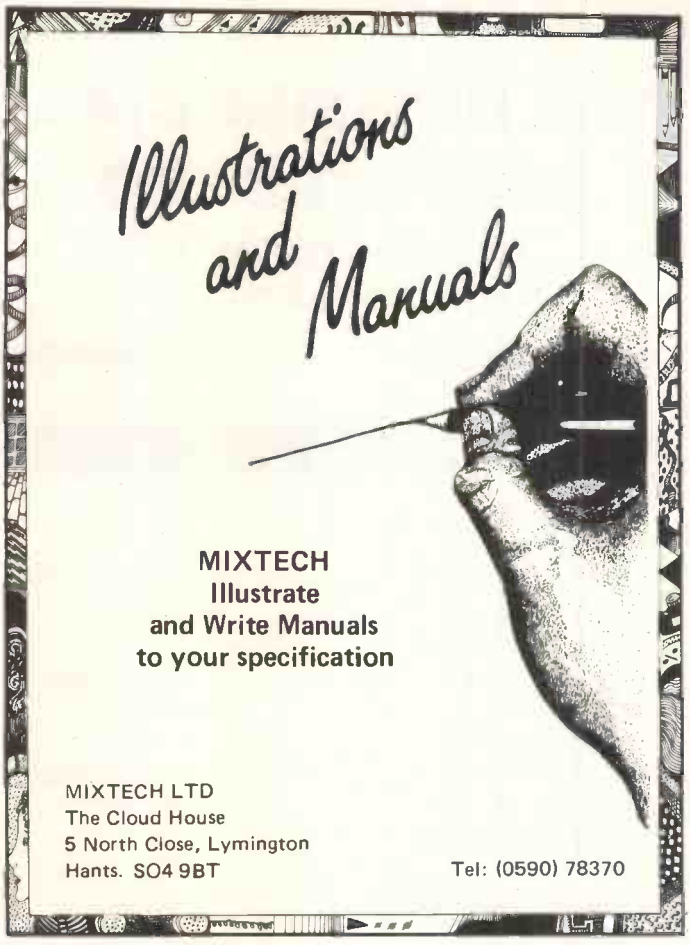

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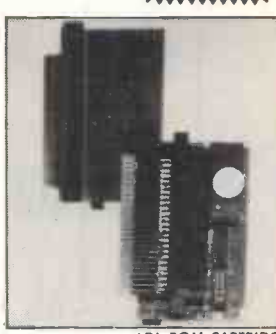
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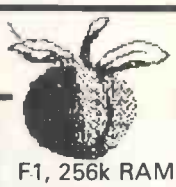

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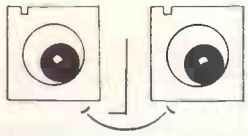

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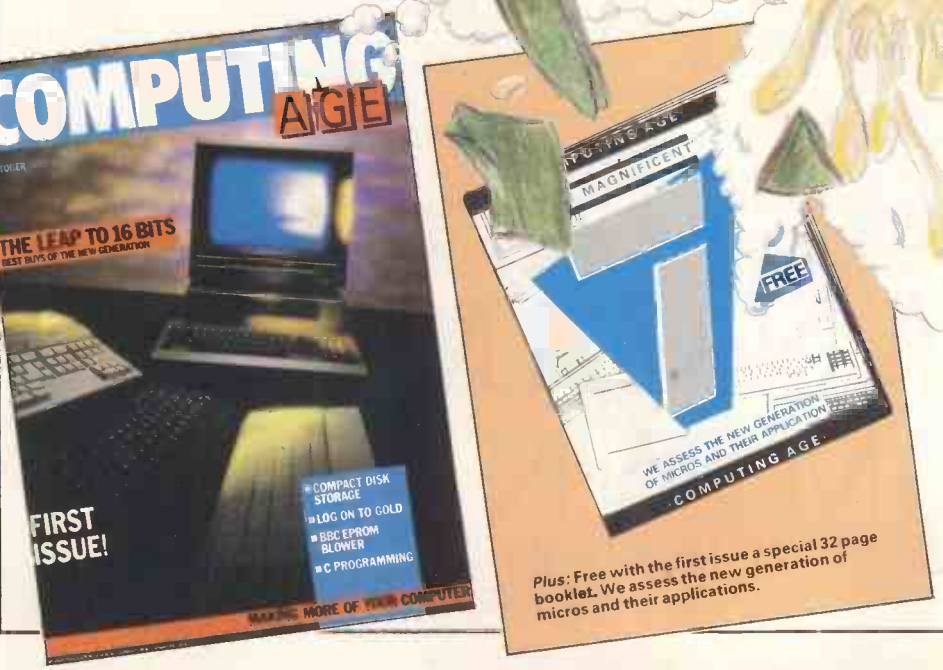

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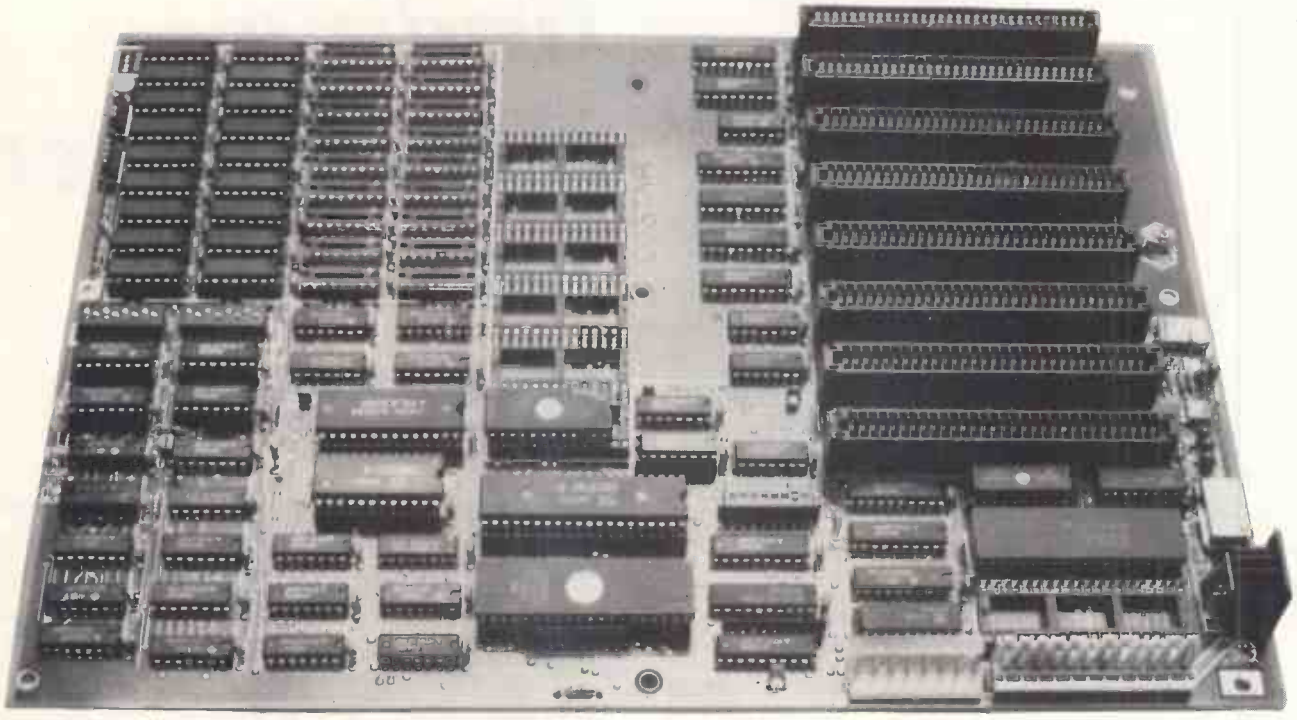

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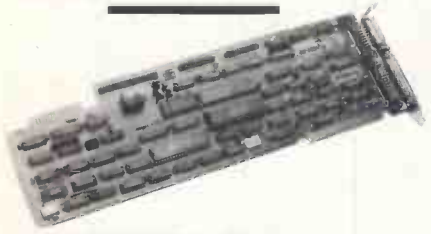

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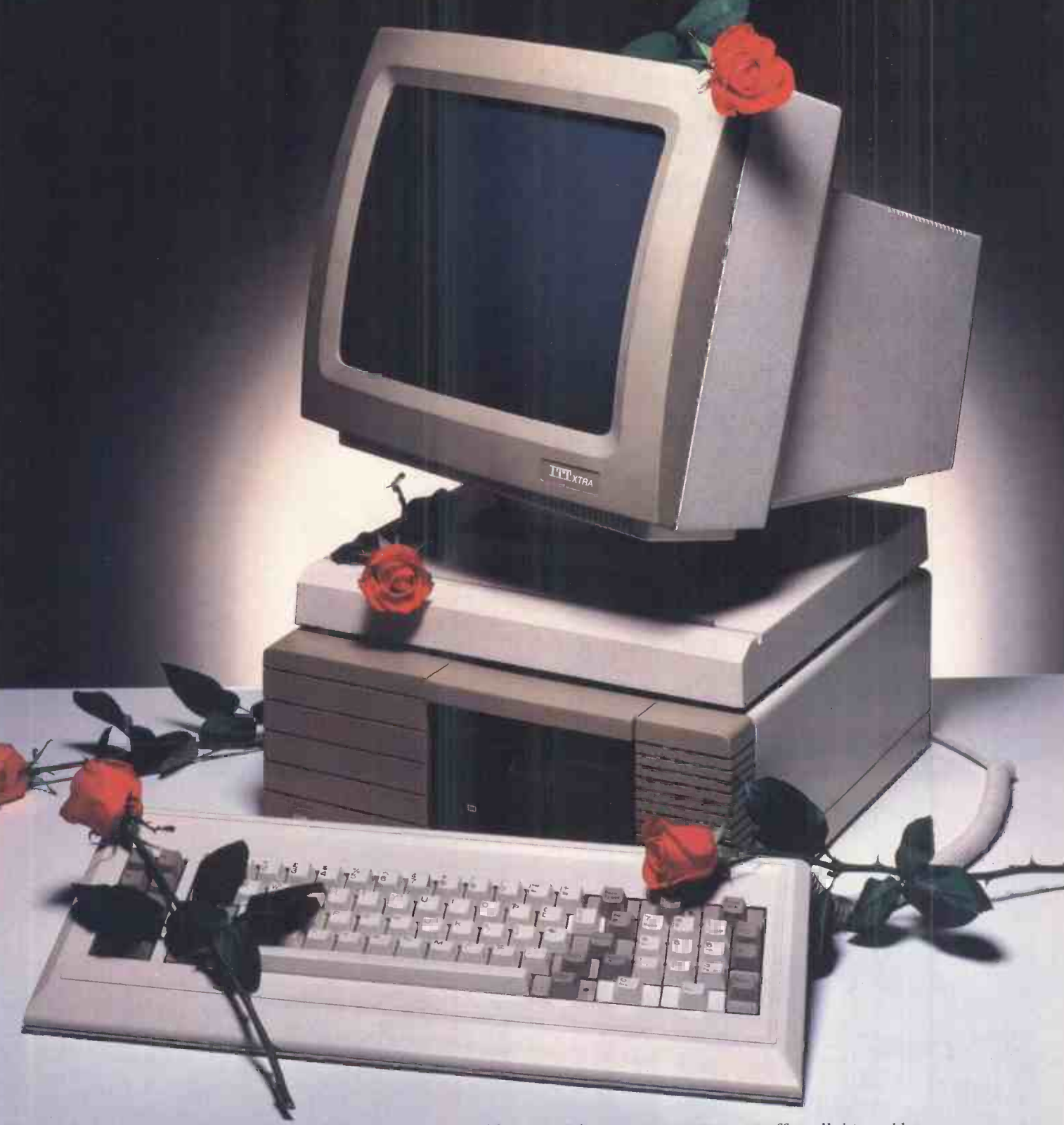

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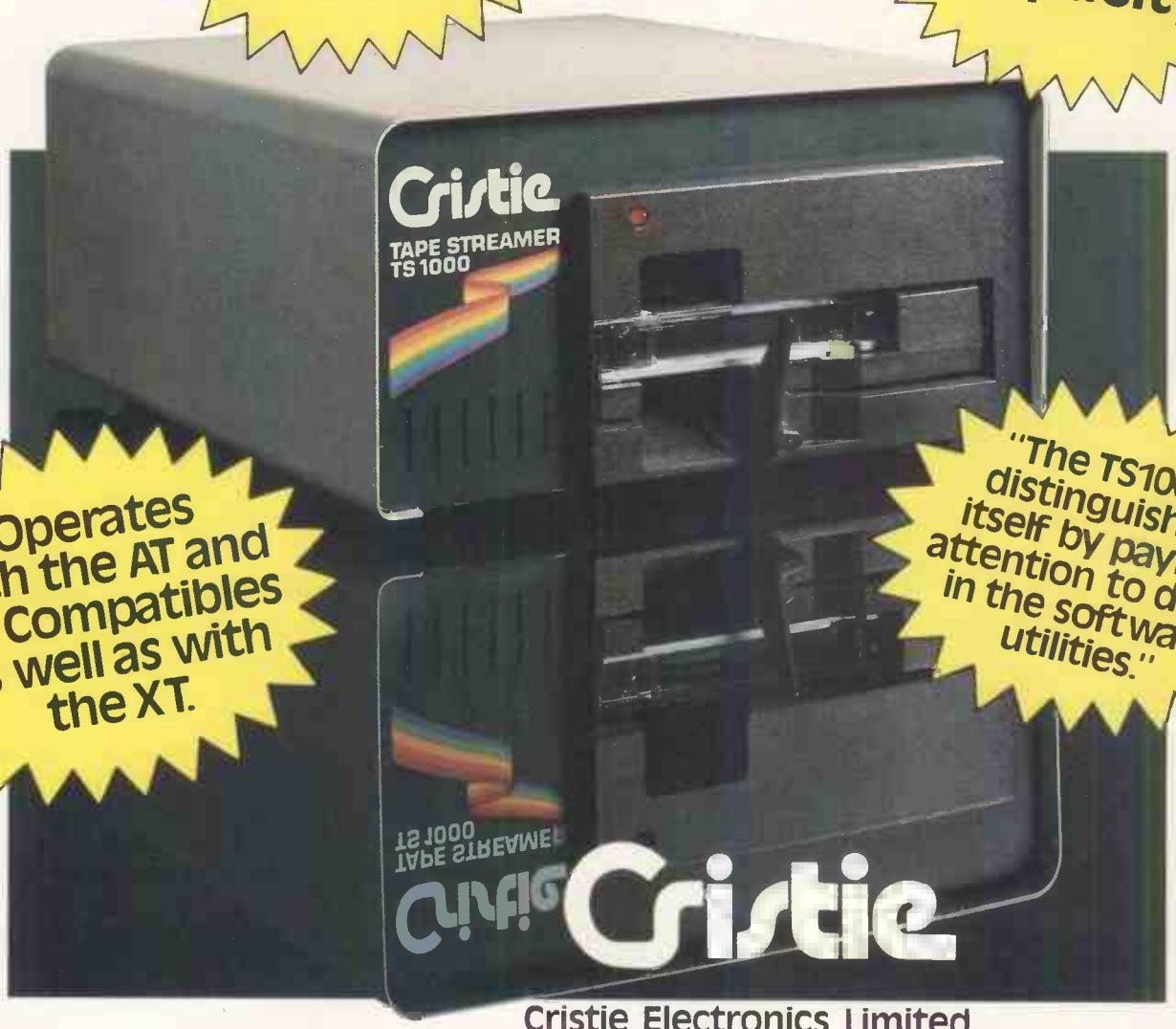

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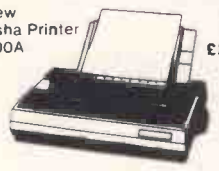

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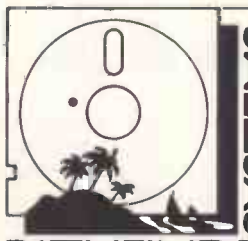

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Just when you thought it was quiet in the industry, the rumblings continue. Torch promises Unix-with-a-difference, and Robert Maxwell does a U-turn on Sinclair. Guy Kewney delivers the news.

Unix – new hope from Torch

Around October, a British micro will appear from Torch, capable of running the same operating system that so surprised the world on the Amiga — Tripos.

The new machine will be Unix-based but with a difference, say my sources. It will have Mac-like friendliness, amazing communications (including networking) with a colour bit-map (that means graphics) display, and I expect several better-known micro companies to sell this machine under their own name.

The Tripos option, however, remains just a dream at present — a dream shared by Metacomco, which wrote AmigaDOS (a version of Tripos) and Torch senior management.

To put the operating system onto the Torch Triple-X would be the work of a few short months and would certainly cost money — but, also, certainly less than £50,000.

Torch is basing its hopes of success with the Triple-X on the enthusiasm of the more established micro world, plus a recipe cooked up by Jean Yates of Yates Ventures, a Unix expert company in the States.

Yates predicted that the next 'hit product' would be Unix System V based, with user-friendly interface and strong communications, backed by one or two big names.

Apparently, at the time, she was thinking of AT&T's Unix PC with the backing of Olivetti — but as time goes by, the Olivetti link with AT&T looks to be choking over the Unix PC.

My own instincts suggest that Unix is too unwieldy for the purpose, but sources say that the main problem seems to be that the AT&T micro doesn't really have a sensible solution to the need for icons and windows under Unix.

This is not to say that I'm convinced that even Torch has actually solved the inherent problems of turning Unix into a personal computing operating system.

The possible benefits of multi-tasking and memory protection (to reduce the effects of faulty programs, say Unix admirers) have to be weighed against the enormous amount of code that Unix involves — full Unix V can require a 10Mbyte hard disk to work properly.

Apparently, the Torch design goes a long way towards overcoming these problems, and I look forward to bringing you more details as they become available.

But what really fascinates me is the possibility of a cheaper version of the Triple-X, with AmigaDOS or Tripos, at well under £2000. I think there's real potential for a British-built Tripos machine, and it's a shame that neither Torch nor Metacomco has the kind of spare cash that would make it possible to create such a machine.

A new broom

Both Acorn and Sinclair now have new bosses — and how nice it would be to hear hopes for a revival in the fortunes of both micro suppliers.

I suppose you could argue that the withdrawal of Robert Maxwell from Sinclair Research must be a good thing in the long-run, judging by the way Maxwell has been making a fool of himself, running *The Mirror*. But what other encouraging signs are there?

Nigel Searle, the previous managing director of Sinclair Research, is now running the US branch, and telling journalists over there: 'We would give you a QL to test, but we can't afford the necessary radio/TV interference tests.'

The new UK managing director is Bill Jeffrey, managing director of the TV and communications division.

Obviously he's a wonderful catch. Sir Clive issued a statement: 'Since Mr Jeffrey joined the company, the number of outlets stocking the Pocket TV has mushroomed.'

Unfortunately, wonderful catch or not, he's not the fish the company was after. At the time that 'Uncle' Clive was originally telling me about the £12 million that 'Captain Bob' Maxwell was putting into Sinclair Research, he told me a bit about the man he'd been courting.

And the man who had 'as good as said yes, provided we got the finance' was working for another computer company, said Uncle Clive. I don't doubt that there was such a gem in the wings, and I wonder why they pinched Bill Jeffrey from the communications side instead?

At Acorn, the announcement of a new high-performance computer was delayed for a month for the very simple reason that publicity consultants reckoned, quite rightly, that no-one would pay any attention to the machine until the financial problems were sorted out.

Now, officially, the financial problems are sorted out — a new series of deals with banks, creditors and the BBC, coupled with a new group managing director Brian Long — gave Acorn the chance to announce the Acorn co-processor Workstation.

Shortly after that, a truly revolutionary announcement, the Reduced Instruction Set Computer (RISC), the ARM, was announced.

In the long-term, this is very encouraging, and good news on a similar level to the development of the Transputer at Inmos, or the wafer-sized memory project at Sinclair.

But in the short-term, it tells us nothing about plans for the BBC Micro, or where Acorn will get its money for the next six months.

Inevitably, no-one took much notice of the hardware: they had read neatly between the lines the news that the BBC Micro must go.

No-one at Cherry Hinton, the Acorn headquarters, seems to be in charge of developing the BBC Micro itself, and the long list of people who have left includes many who were working on that side.

Based only on unofficial reports from ex-Acorn workers and managers, I expect the BBC Micro to be pensioned off before Christmas, except as an OEM product to people like Torch, and others who will package it inside special-purpose business hardware.

The new scientific micro, had it been launched this time last year, might well have saved the company. But in mid-1985, nothing about it makes me feel that Acorn yet grasps that the old market for micros has changed, utterly and completely.

Like the Apple II, the BBC Micro is a classic design. Unlike the Apple II, it has hardly been developed, and its original mass market has moved on. I fully sympathise with its fans, who can see no wrong in it. But when someone can say that 'an hour or two with View will tell you more about word processing than two weeks with WordStar', all I can respond with is: there's no accounting for masochism.

PC2 or not PC2

Whether or not IBM is telling the complete and unvarnished truth when it says that it never had any plans to launch the PC2 this year, you can bet that it is being accurate when it now promises that the machine will not be launched.

Plans, inside IBM, are strange things. Until a machine is actually available from the warehouse, it never pays to speak of plans as 'plans' — merely as 'options'.

The options facing IBM until it made this statement (and accused the Press of being 'irresponsible' in writing about the PC2) included a possible 80286-based, desk-top, XT price-level machine. They also included a lap-held machine, possibly battery-driven. The lap-held machine is an option on the 'plan' level, even now. The PC2, however, is a serious embarrassment to IBM as it is still earning money from the PC/XT.

In the same way that Apple refused to produce anything which would make the Apple II obsolete until IBM had done the job for it, IBM is now addicted to the PC. The AT has been deliberately

designed to be too expensive to compete, and the PC2 has been killed off.

Killed off? How can it be 'killed off' if it never existed?

The answer is that the 'option' to launch the PC2 had been worked out in some detail inside IBM, and could have been translated into a 'plan' two months ago.

But the option didn't show an improvement on the PC's low profitability (by IBM's standards) and so the corporation sat on it.

Amazing conversion

The arrival of Metacomco as a serious supplier of systems software is starting to produce uneasy reactions at the established companies in this area — Microsoft and Digital Research. The apparent rivalry between the Amiga and the Atari has had a truly profound effect on the religions of executives at the CP/M company, Digital Research.

The main problem, of course, had been the collapse of the imaginary computer market.

The imaginary computer market was that collection of no-hope American micro makers, which had nothing to offer the world except an imitation of the IBM PC, without the attraction of an IBM guarantee or even the certainty that it would run IBM software.

These people all submitted estimates of their next five years' turnover to experts.

The experts added it up, and produced a projection of the micro market based on reports of present sales which were lies, and assumptions of future sales which were pure fantasy. Eagle, Texas, NCR, Sperry, AT&T and a lot of others who are (some of them) still in the business. Most of them sought credibility by buying enormous numbers of Digital Research operating systems, and they mostly announced what they thought the contract would be worth if the machine sold in thousands. Why, I even remember Apricot predicting millions of pounds worth of Concurrent DOS sales . . .

Anyway, it never happened, and after several years of preaching the gospel of 'true concurrency', Digital Research has suddenly become a disciple of the alternative approach. 'Keep the programs in memory by all means,' it says, 'but only run one at a time.'

Normally, I brush the dust off my video screens with a paint brush to prevent the build-up of static-glued dirt. I've yet to find a product which eliminated this wretched nuisance — and then someone sent me two balloons.

Leedex accompanied the balloons with the suggestion that I needed a well-patronised ashtray, and should try out the little sachets enclosed.

According to instructions, I inflated both balloons and rubbed one on my sleeve. Then I held it over the ashtray.

The other, after inflating, was wiped with the little sachet. Thereafter, it stubbornly refused to stick to anything, no matter how hard I rubbed it.

Trying the same little trick with the video screen, I found that it works!

Staticide is available from Hellerman Electric of Plymouth. Ring for a catalogue on (0752) 701261. Hellerman has tricks to eliminate static in areas where you probably didn't realise you had static — like your laundry, for instance . . .

The reason for this strange religious conversion is simple. DR used to sell a thing called Concurrent PC-DOS, which was 'true concurrency'. It actually kept running more than one program at the same time, and even permitted two programs, under certain conditions, to read the same file at the same time.

AmigaDOS, of course, does this, but these days, Digital Research has abandoned all hope of making a serious living from Concurrent PC-DOS.

Instead, it is convinced that fame and fortune will arrive just as soon as Jack Tramiel starts selling the Atari 520ST by the thousand. The machine uses Gem DOS, under the pseudonym Tramiel Operating System, or TOS.

GEM Dos is not true concurrency, but 'context-switching and time-slicing'.

By contrast, Microsoft has always proclaimed the joys of context-switching.

It suggested that as long as the program was loaded into memory, it didn't matter to the user whether it was running — in fact, what possible program would you want to have running if you couldn't see it?

The answer to that was: if you have Windows, you can see it after all. And that's why we now have Microsoft Windows — or we will, just as soon as Microsoft's bit customers get things going and package Windows for the users of their machines.

At once, you realise the importance of Jack Tramiel to Digital Research.

Before I get this magazine accused of throwing brickbats at Atari as well as Acorn, I shall stick my neck out and say that Atari's 520ST is probably going to change the face of computing.

But before it does that, some near-miraculous events have to occur. Tramiel has to raise a considerable amount of capital to build more than 3600 machines. Dealers have to be found who are prepared to handle Tramiel's business. And software houses have to be found which will write software for the ST.

Before Digital Research became involved, these are exactly the type of things its executives would have dismissed as impossible. Now, however, they make encouraging noises.

The software people are already up and running — or trying to be. They ring me up from time to time with sad voices, saying that they have the C language, but no <stdio>, or standard input-output (without which, it's useless). Or they have a machine, but no display. Or they have software, but the disks don't work. But (they do add) they like it!

Less than 1000 (I gather around 400) STs had been delivered by press time, all to software writers like this, and all enthusiastic but frustrated.

The capital, I think, will arrive. Tramiel has always been able to wave the magic wand which generates money for a new idea, and his history is a series of triumphant launches. Following up the launches with long-term success had been, by comparison, harder for him, and that's one reason why Commodore asked him to go. But despite many bad signs, the machine is good enough to transcend doubts, scepticism and sheer bloody-mindedness in financial communities, and also in distribution quarters.

It will be launched.

However, the fact of the matter is that Metacomco has written a genuinely multi-tasking operating system for the Amiga, and Digital Research hasn't managed this trick for the Atari ST.

Thus, I was recently treated to the surreal sight of a senior DR man solemnly repeating all the warnings that Microsoft has fed me over the years about multi-tasking. How it's 'hard to persuade the user that it can be used', and how 'it isn't what the user really needs', and 'it takes up a lot of memory without providing equivalent facilities'.

The AmigaDOS multi-tasking system fits into 50k, and uses icons and a mouse, as well as a command line. If Concurrent DOS could have done this, it would have succeeded.

But Concurrent DOS with GEM on top uses very nearly half the memory capacity of most IBM PCs, and doesn't feed through to the software applications. Your applications remain as tough to use as they ever were.

On the Atari, however, the applications are built with Gem DOS in mind, and will be friendlier. Also, there is more memory available (it starts out at 512k) and the DOS uses less of it.

What about Windows?

My ex-colleague Phil Manchester, who edits a newsletter for the *Financial Times* on software, reports that Windows is fast, nice, and a genuine improvement on PC-DOS naked.

For my own part, I have to say that I find it a little vindictive. It runs, but each time I stop it, it crashes my Olivetti M24 with the message 'illegal interrupt' and refuses to let me have control of the machine.

Engineers promise that it'll be diagnosed in time for next month's column.

Enterprise revival

Games with titles like Devil's Lair, Mordon's Quest and Dambusters prove that the lost micro of Britain, the Elan (now Enterprise) is starting to attract some software after all.

The company, Enterprise Computers, has 'signed deals with' a number of European-based software companies, 'bringing to the UK games which have not previously been available'.

There are also some utility programs: for example, Enterprise has announced a graphics program which will allow you to draw and colour pictures, and a German program to teach Basic.

Don't expect the shops to make a frantic fuss and hullabaloo about these products. If you want to see one, you'll have to contact Enterprise, ask where it has a dealer, and arrange for demo software to be supplied to the dealer.

Lion without a roar

'Mr Rafael Hyams, who was chairman of the meeting for statutory purposes, was unable to answer any questions from the creditors,' reports an utterly moving little press release concerning the collapse of Lion House retail.

The shop, in London's Tottenham Court Road, has gone bust owing roughly £1 million.

For a single store, that is (as the liquidator correctly remarked) 'a massive deficiency', and, he added, 'warrants an in-depth investigation'.

The bit that brought tears to my eyes was the final, pathetic paragraph about the chairman.

The liquidator, Mr Philip Monjack, 'read a statement from Mr Hyams, stating that owing to his state of health, his doctors had advised him not to answer any questions relating to the business of the company'.

A doctor's certificate was provided.

I should think that if my store went bust owing £920,962, I'd feel pretty sick, too. It is, as you probably guessed, due to the 'dramatic decline in the microcomputer market at the end of 1984, and in particular the Christmas trading period,' which 'proved a disaster for this company,' that Lion House had to wind itself up.

The launch of memory expansion cards for the Amstrad is based on a little-remembered feature of that machine. It is possible to attach 'sideways' memory packs to the Amstrad, in rather the same way as with the BBC Micro and to a very much larger capacity — but it isn't something that many people have done.

Products from Micro Power (a games software company which has done pretty well in the BBC business) include a sideways ROM card which allows a user to plug in seven ROM chips as foreground, background, or extension ROMs. This is for the 464, and a version for the 664 is under way, both retailing at £42 including postage.

Released at the same time are two ROM-based software products, says Micro Power. The first is a £40 mailing list or club membership package, and the other is a disk user's utilities ROM.

The company promises a programmers toolbox, an assembler/disassembler, monitor, and a business package with word processor, spreadsheet, database and graphics/statistics programs — no price on these, however, as yet.

Details on (0532) 458800 in Leeds.

Dark Star operating

The idea of a genuine multi-user, multi-tasking operating system for an old-fashioned Apple II is ludicrous, and so the announcement of such a beast for the Apple II by a couple of outfits in the British Isles makes one suspect just one thing — it isn't really for the Apple II.

And, in fact, this is roughly correct. The Dark Star Systems announcement turns out to be for an Apple II so heavily modified that it really is hard to call it an Apple II.

The advantages are real. It would let you run CP/M programs together with AppleDOS 3 and PRO-DOS programs, all on the same machine — and with other users running the same programs.

The Irish firm Glanmire sells a device called the Microbus, which allows up to 256 Apple IIs to share programs and data. Dark Star Systems sells another device called Snapshot, which interrupts the Apple and saves the entire machine status to disk. Dark Star also has a Shuttle, which allows you to divide the Apple's memory into 64k and 128k workspaces.

It doesn't matter what is going on in a portion of memory — whenever the Snapshot operates, that portion is frozen. The processor can switch over to another portion, and run that.

'With a Glanmire IIe 80-column extended memory (512k) card in the Basic IIe,' says the joint announcement, 'users can switch between any four 128k applications, and use the remaining 64k as a RAM disk for fast exchange of data between programs in the system.'

Multiple Apple IIes talk to each other and share two ordinary Apple disks, through the network controller card in the first or master Apple. There's a network interface card in all the others.

Obviously, the multi-user and multi-tasking software doesn't run on an ordinary Apple IIe, but on a network of Apples, network cards, and the Snapshot shuttle card and software.

Here's the price of the extra hardware you need to turn Apples into Snapshotters.

The Snapshot card and Shuttle software costs £115. The Glanmire controller card costs £120. The 'slave' interface card costs £109 — one per networked Apple. The 512k extended 80-column card (described as 'optional') costs £399. Education sites get at least 20 per cent discount.

Details from Dark Star on (01) 900 0104, or The Source BCJ456.

Micro who? What a carry-on!

Apparently, Micro Arts software was 'almost completely ignored' by the computer press when SCUM Manifesto, Carry On Computing, Data, and Minimal were first launched.

The Micro Arts database and some software is now available on Micronet (Prestel Microcomputing), and all I can say is, I can see why it was ignored.

I can't make head nor tail of it.

There is apparently a text generation program. I got a story about how a cow forced a woman 'to bend over and put her head into a bucket of boiling water, and hold it there until thoroughly boiled — the husband was then made to add a string of pork sausages . . .' all under the title of 'COW BOILS HEAD'.

I hear that Text Engine + Word Banks (runs on 48k Spectrum) 'produces streams of poetry or text from sets of words and sentence structures held in the Word Banks'.

I shall ask my friend Martin (Word) Banks to do an intelligent column on it. I'm off to boil my head.

Details of Micro Arts from (01) 582 4618, or on Micronet.

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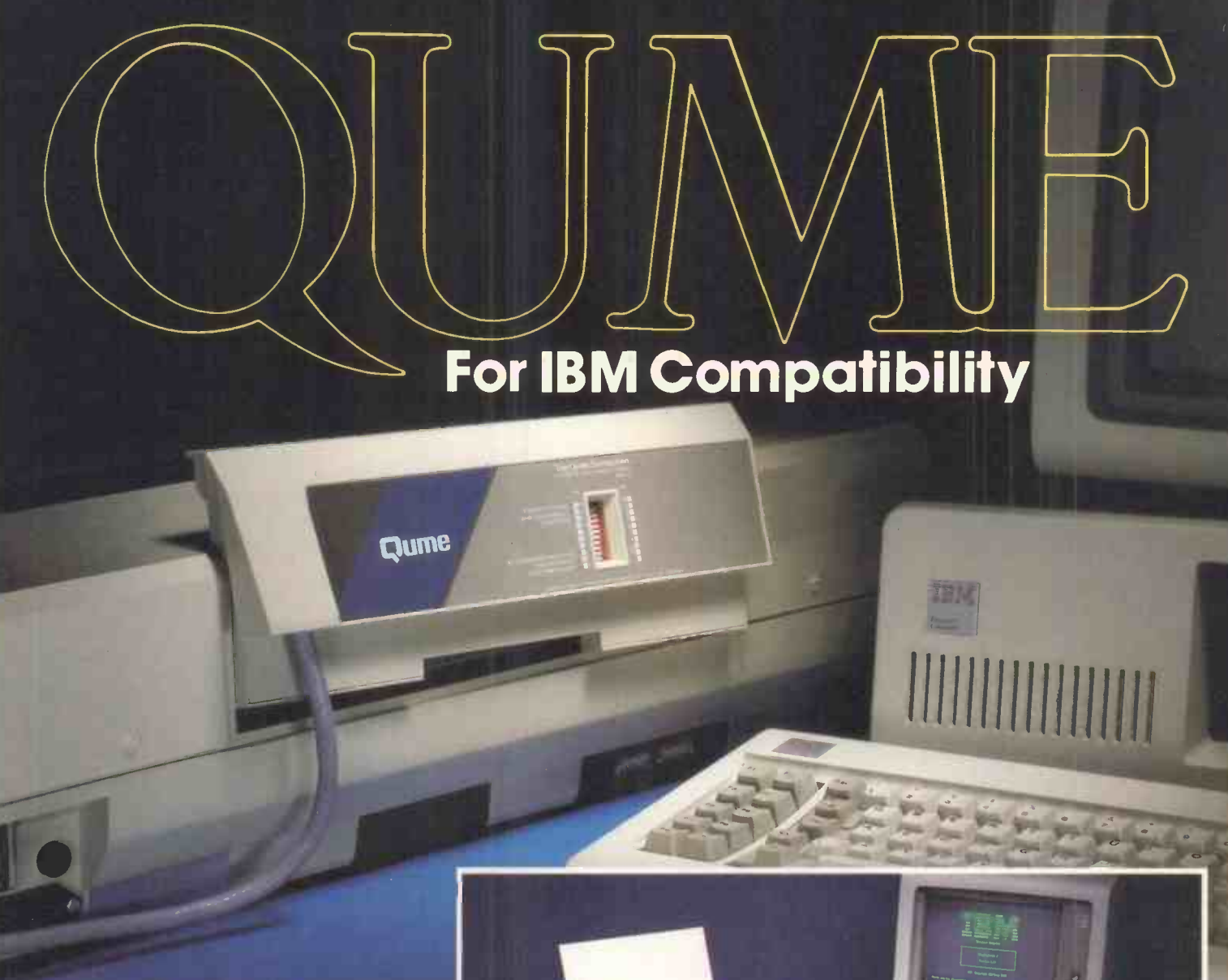

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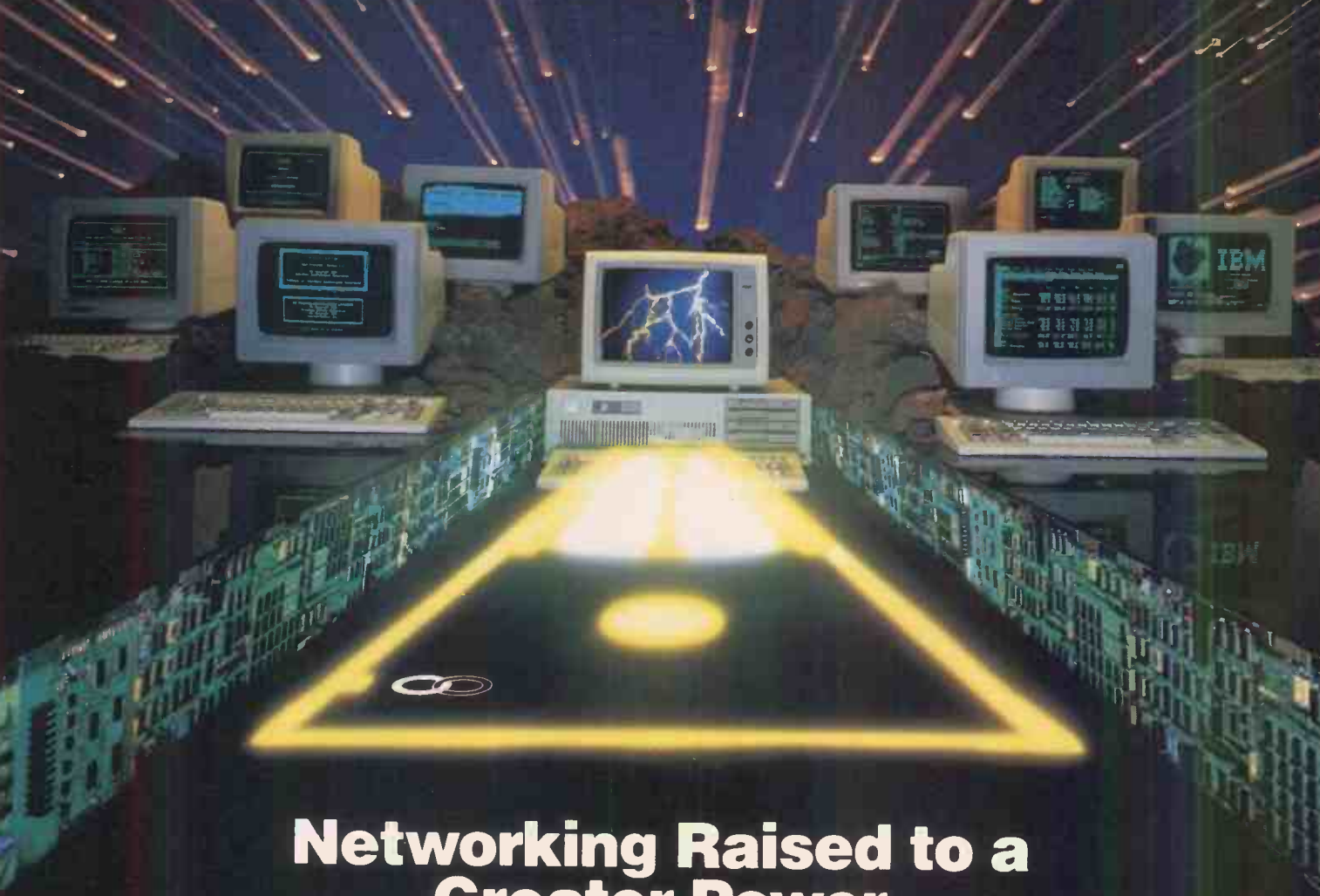

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Down to the C again

A quotation from c-farer Joseph Conrad was used by Hisoft to launch a C language compiler for the Amstrad.

This is described as a 'full-feature' compiler, but with the proviso that it follows Kernighan and Ritchie's definition 'very closely'.

Hisoft says that this £40 package has many extra features 'to make it an easy and interactive tool for learning C — with an integrated editor that behaves just like Locomotive Basic's editor, full support of sound and graphics, and immediate execution, allowing you to test out C features as you go along, full use of both tape and disk, and an extensive manual'.

The Conrad quotation? 'This could have occurred nowhere but in England, where men and sea interpenetrate, so to speak.'

Details on (0582) 696421.

Fighting about faulty returns

Oh no, not again! Amstrad is after a fight of some sort — clearly, because it has (unprovoked) issued a press statement boasting about how reliable its computers are.

'In a recent survey by a chain of computer centres in Wigan and the North West of England,' says the proud announcement, 'Amstrad came out with the lowest returns on faulty machines, with only 1.8 per cent being returned.'

This question of 'how many micros are dead when they reach the shop' provoked Acorn to issue a similar (if less impressive) boast last summer.

Enraged, Uncle Clive followed Chris Curry, then boss of Acorn, into one of his favourite pubs in Cambridge, and beat him around the head with a copy of *PCW* (or perhaps something smaller, come to think of it, or Curry wouldn't have survived). They ended up on the front page of *The Sun*

Alan Sugar, boss of Amstrad, is a rather more aggressive character than Chris Curry, however, and I should think his chances of being thumped around the cranium are rather small.

Colour isn't a usual feature of word processors, except as an operating aid to the user, so the new version of MicroScript (for MS-DOS family machines) is something of an innovation.

This one actually uses colour as part of the document — not just to show which paragraph you've marked and are able to move, or where you're inserting text.

For example, MicroScript can generate red letters, which will be printed red (if you have a colour printer) on output. There are 16 colours.

Details on (0203) 553909.

Yet another PC clone

American terminal maker Wyse is now determined to supply imitation IBM PCs, and has started UK sales with a £1595 box equivalent to a standard 256k PC, with monochrome monitor included.

It claims impeccable pedigree for the clone, with a list of 350 hardware and software accessories that are designed for the original but run on the Wyse imitation, and offers an XT version (mono) for £2495.

What makes this company stand out a little from the herd of clone-makers is that it is a reputable US computer hardware supplier, with a claimed 150,000 terminals supplied in the last two years.

UK distributor is Trinitec, based in London on (01) 628 4200.

BBC music

Wrap your ears around a BBC Micro for £2 — courtesy of Hybrid Technology.

The company makes musical add-ons for the BBC Micro which cost rather more than £1.95 to be sure, but in an attempt to persuade you how wonderful the Music 500 Synthesiser is, Hybrid has issued a rock tape.

This one is entitled, in a really funky style, An Evening in the Company of the Music 500 Synthesiser, and is supposedly 'the first on Hybrid's own label, 256 Byte Records'.

The music is only partly rock, featuring numbers by Duran Duran and interspersed with stuff by Joseph Haydn (classics) and even some compositions written specifically for Music 500.

Details from Unit 3, Robert Davies Court, Nuffield Road, Cambridge CB4 1TP, but the title's hardly catchy. How about something like: 'A Slow Monday Morning watching Guy's Whiskers Grow' or 'Gentle Silence Interspersed with Occasional Sounds of Paint Drying.'

Pegasus first?

The top-selling business software package during April and May (yes, a long time ago, but these figures filter through slowly) was not Lotus 1-2-3, but Pegasus.

Or so, at least, says Pegasus.

The figures aren't complete — they cover sales of software through specialist computer stores, not direct to corporate buyers. These days, however, Lotus does try to sell more through stores and less through the direct sales channel (in the States, the company has killed off direct sales altogether).

The figures come from a report by Context, a London-based research organisation, which adds the really quite interesting extra information that Lotus does, after all, come first, if you add Symphony and Jazz sales to Lotus 1-2-3. Lotus 1-2-3 is the second-ranked product, with WordStar third.

As for hardware (in the same period) the IBM micro sold best, followed by the ACT machines, then Apple, and then Compaq in fourth place.

A complete survey costs £350, with a year's subscription costing £1200, so you see what wonderful value a subscription to *PCW* really is.

The joke's on RITA

It's a long time till January, when the *Which Computer?* Show takes place (14 to 17 in Birmingham, for your diary) — but you've only got a couple of weeks left to join in the *Which Computer?* Joke.

I'm referring, of course, to the RITA awards.

Vast entertainment has been provided to delegates to previous Shows, by nominations for Recognition of Information Technology Achievement — an award sponsored by the Show and by several publications from a (rival) publishing house.

Recognition of achievement is a nice idea, and is usually objectively provided by the buying public. If they recognise a product as an achievement, the producer tends to get rich. This never, however, inhibits Awards organisers.

This year, we can liven things up a little. How? Well, RITA has an advantage over our own (VNU, Thames TV and *Sunday Times* sponsored) British Micro Awards. With RITA, you yourself can vote for the winners.

Last year, my hysterical shrieks of merriment and blank stares of disbelief at some of the RITA winners were met by one (I shan't reveal your identity) editor in a sponsoring IPC newspaper, with a shrug of the shoulders. 'It's what the readers voted for,' said this Pontius Pilate, helplessly.

For details of how to vote, contact Shirley Shillcock, Awards Administrator, Cahners Exhibitions Ltd, Chatsworth House, 59 London Road, Twickenham TW1 3SZ. And if I don't win the

Personality of the Year award, it'll just prove what a responsible, sober lot my readers really are.

All six of you.

French Ensemble

The impressive thing about the integrated Macintosh package, Ensemble, is not the fact that it comes from French software house, Controle X, but that it runs on the 128k Macintosh.

It may be the only real justification for buying a 128k machine, apart from the possible money saved if you can upgrade it yourself.

The package includes database management, graphics, maths functions, report and form generation, word processing and mail-merge, according to the international software distributor, Softsel.

The package is obviously intended to appeal to people who might be considering buying Lotus Jazz. Changes made to one element in a 'document' have an instant effect on related elements — for example (says Softsel), a graph based on figures in a table will automatically be redrawn if the table is altered.

What sounds nice, and is worth asking to see if you get a demo, is the 'overview icon'.

This lets you see how a document will look even if it is bigger than one screenful. It shows the lines of text as lines, diagrams as blocks, and headlines as horizontal stripes.

Cost looks quite attractive at £225. However, I haven't had a chance to test this product in everyday use yet, and will pass on further details as I get them.

FAST enforcer

I am very keen to hear from any private micro users who are hassled by the 'Enforcement Coordinator' appointed by the Federation Against Software Theft (FAST).

FAST always sought to make it clear, when pushing a law through Parliament, that it was aiming to stamp out organised crime — people duplicating games and business software to which they had no copyright, but which they hoped to sell to ordinary users.

There isn't an official recognition of the vital difference between copying to sell, and copying for your own convenience, safety and comfort.

The software world believes that people like you and me shouldn't make *any* copies of software that it 'protects' from us.

The music world, likewise, officially believes that if you buy a vinyl record, you aren't entitled to make a tape copy, even for your Sony Walkman, or to protect the vinyl disc from wear and tear. Sensibly, music lovers ignore this paranoia.

Normally, Bob Hay (the Enforcer) will be too busy chasing genuine crooks to bother about people who have disk copy utilities.

However, disk copy utilities, like twin-tape cassette units, don't reach users by magic. Storekeepers have to sell products like Copywrite, Copy II Plus, Snapshot, Zoro Disk, and so on.

It is quite possible that some busybody will take it into his head to report such a shopkeeper for supplying products 'designed to induce users to break the law' on software theft.

I know a supplier of these very useful products, and I have had occasion to be grateful that he exists.

He told me: 'My customers aren't software thieves. I sell Lotus 1-2-3, and I sell a program which copies it. I've sold 20 copies of both to large corporations, which keep their original disks in the company safe and use the copied version. The executives I sell to would be given a very hard time by their directors if they arrived at a board meeting without figures "because the Lotus disk just got corrupted and we don't have a spare." So they have to make copies.'

Zero Disk, from Quaid Software in the States, is designed to let you run 'key disk' programs from a hard disk.

One of my own favourite programs, ThinkTank, is protected by an uncopyable key disk. When I discovered that it was protected, I fear I was a little unkind to Dave Winer, the boss of Living Videotext, author of ThinkTank.

I reminded him of vituperation aimed at him by the irascible Jerry Pournelle, sci-fi writer and computer user, who told him that no writer would entrust his text to a disk that you couldn't make back-ups on.

'True,' said Winer, 'but we don't have any objection to users who make back-up copies. The reason we copy-protect is just prudence. It's the same principle which prevents you leaving your front door open so that your friends don't have to knock. Locking the door doesn't keep burglars out, but it does mean that nobody can pretend they thought it was OK to come in and help themselves to your furniture.'

In the States, of course, the sale of copy-busting programs is an everyday occurrence, and although it annoys people like Lotus, no store worth patronising would dream of being out of stock. Even Lotus 1-2-3 dealers have them.

In this country, people have taken Amstrad to court for selling twin-tape cassette player/recorders. It 'incites' people to copy tapes. People have taken Xerox to court for selling photocopiers, which 'incite' people to copy documents.

And when I go to shops for copy-protection removers, the store manager behaves as if I were buying glue for home sniffing. He tends to be shy about admitting he has the product in stock, he makes all sorts of pious statements about how he knows I'm responsible and honest, and . . .

I believe it's very important that we don't allow the good work of the FAST team in chasing genuine crooks, to be polluted by any petty-minded determination to prevent us from using software copiers for our own use.

Whatever the law says, in practice, the offence should be to sell copied software, not to merely make a copy. And

A good idea of just how excited everyone is getting about compact disk as a data storage medium can be derived from the news that Gary Kildall, writer of CP/M and founder of Digital Research, has started a CD ROM company of his own.

Of course, things could be better for Digital Research, but the move isn't that simply explained.

More exciting even than CD ROM, I think, is the Optimem project inside the 3M company.

Optimem is writeable optical ROM — partly writeable, anyway.

The system uses an incompatible data storage medium from CD, with 12in disks, data tracks divided into sectors, and a different type of laser read mechanism.

But it can create its own data.

The disk used in the Optimem 1000 incorporates 'a multilayer film coated onto a plastic pre-grooved substrate'.

To write data on these disks, a high-power laser pulse (seven to 10 milliwatt) melts an area of this recording layer, creating a hole and exposing a mirrored lower level.

An optical disk such as this holds a thousand megabytes of data which can be partly supplied by publishers, partly supplied by yourself, or completely one or the other.

I have to admit that that's more use than a CD ROM with the* Encyclopaedia Britannica *on it, but Jack Tramiel doesn't agree with me.

IBM PC SPECIALS AT MORSE

Morse Computers are of course IBM and Compaq Authorised dealers. We stock the full IBM Personal Computer range from the PC to the Enhanced AT, and the Compaq Portables and Deskpro. We also offer comprehensive after sales support and maintenance. Here's a selection of our package prices:

IBM PC, dual 360K disk drives, 256K memory, monochrome display, UK keyboard, DOS 2.1 (RRP £2250): **£1750**

IBM Authorised Dealer

Compaq Portable, dual 360K disk drives, 256K memory, dual mode display, MS-DOS 2.12 (RRP £2195): **£1650**

IBM XT, 10Mb Hard disk, 360K disk, 256K, mono display, async. comms. port, keyboard, DOS 2.1 (RRP £3625): **£2895**

Compaq Plus, the portable with a 10Mb hard disk. 360K disk, 256K, dual mode display, DOS 2.12 (RRP £3595): **£2895**

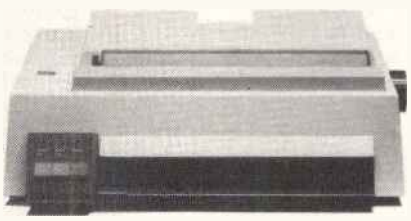
We've also pruned our Apricot prices at Morse, and we now offer stunning discounts across the entire range. Morse are Blue Riband dealers, and we give value and support. Talk to us about networking your Apricots. Call today!

Apricot PC, dual 315K disk drives, (RRP £1595): **£1125**
Apricot PC, dual 720K disk drives, (£1795), now: **£1375**
Apricot Xi, 10Mb hard disk, in black, was £2795, now: **£1990**
Apricot F1, single 720K disk drive, (was £1095), Morse: **£795**
Portable, 720K drive, speech recognition, was £1695, now only: **£895**
All with 256K memory, serial and parallel ports, and choice of displays.
Monitors: 9" £200, 12" £250, 10" colour £385.

SANYO Superdeals at Morse! Special prices on MBC 550 series mean 16-bit computing for the cost of a home computer! With 128K RAM.

Sanyo MBC 550, 160K disk drive, WordStar word-processor, CalcStar and BASIC language. Previously £795, now at Morse only: **£495**
MBC 555, twin 160K disk drives, WordStar, SpellStar, Mailmerge, CalcStar and DataStar database worth over £1000! (RRP £995) **£664**
Monitors: CRT36 12" monochrome £127, CRT70 14" colour £385.

Symphony (RRP £595)	**445.00**
Lotus 1-2-3 (£440)	**345.00**
R:Base 5000 database (£595)	**385.00**
dBASEII IBM & Apricot (£395)	**295.00**
dBASEIII (£550)	**345.00**
Framework (550)	**345.00**
WordStar 2000 (£465)	**295.00**
WordStar Professional (£399)	**269.00**
Multimate (£455)	**295.00**
Easy Junior accounting (£395)	**275.00**
Multiplan (£179)	**149.00**
Infocom games (£43) from	**27.00**



NEW! IBM Proprinter. 200cps in draft mode, 40 cps near-letter quality, with unique tractor, single sheet & envelope feed, (£495) Save £100 **395.00**

Epson FX-80 printer (£348)	**339.00**
Epson FX-100 printer (£569)	**459.00**
Epson JX-80 7 colour (£569)	**495.00**
Qume 11/40 40cps (£1490)	**1295.00**
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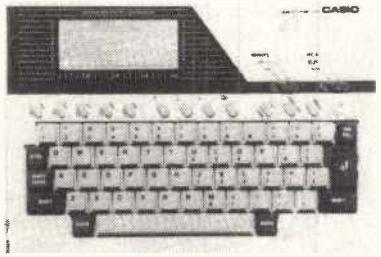
HR15 keyboard (£150)	**139.00**
Epson L2 1500 printer (1100)	**875.00**
Epson LX FC printer (255)	**209.00**



CASIO FP200, the easy-to-use portable personal computer. 24K RAM, 20x8 graphics display, spreadsheet system, database & BASIC. (RRP £299) **179.00**

Brother EP 44(£249)	**169.00**
Casio FX450 Sci (£19.95)	**9.95**
Casio PF3000 databank (£39)	**22.90**
Casio PF8000 touch (£49)	**29.90**
PFS IBM software series (£95)	**45.00**
dBMaster IBM database (£445)	**229.00**
Personal Investor IBM	**39.00**
IBM VisiCalc (£195)	**99.00**

All Morse prices exclusive of VAT at 15%. E. & O.E.

MORSE

MORSE COMPUTERS 78 HIGH HOLBORN, LONDON WC1V 6LS. 01-831 0644. TELEX 916509.

anyone who is prosecuted by a FAST executive for simple copying, please let me know — I don't know what can be done, but we'll try.

Lacking margins

On the face of it, you would suppose that something like the Omni-Reader would be quite hard work to operate. You have to line up the little scanning eye and push the head over your paper to read text into the computer.

By comparison, surely, it must be easier to use one of the much more expensive models, which take the whole page and scan it automatically?

Dest Corporation in California makes the WorkLess Station. It has just had to offer a 'margin control enhancement' for its models.

A margin control device makes sure that 'unreadable information' doesn't get into the system. Unreadable information includes such perfectly common printed marks as logos, borders and vertical lines.

The new processor lets you set margins, top and bottom, left and right, to exclude decorative additions.

What's really interesting about the announcement, however, is that the reader costs $495 (retail) in the States and it processes a page in 25 seconds. The company has only just announced results of its first fiscal quarter as a public company, when it earned $5.5 million.

Locomotive script — a late arrival

MicroPro has announced Pocket WordStar, a cheaper version of WordStar for machines like the Amstrad 464 and 664, at £149, but this may have come too late. The new Amstrad PCW8256 (Benchtested on page 132 of this issue) gives a new answer to that most common of questions from new micro buyers: 'What should I buy if all I need is a good word processor?', because bundled with the PCW8256 is a new word processor which could do quite well on other hardware.

LocoScript is the brainchild of Alan Sugar, head of Amstrad. It was turned into reality by Locomotive Software, a software house which includes most of the people who originally wrote the code for the Diamond word processor.

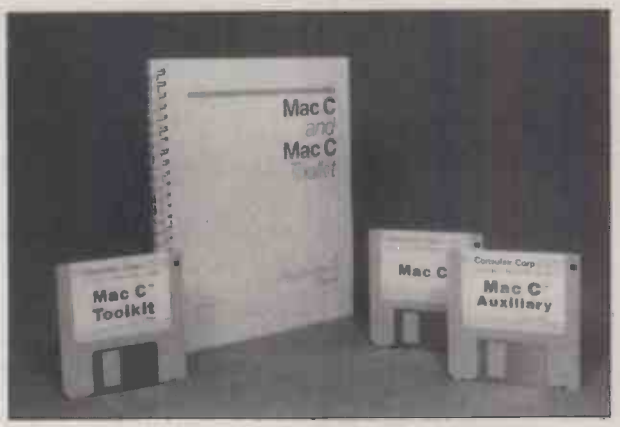
On the face of it, LocoScript is likely to stay exclusive to the new Amstrad. This isn't just because Alan Sugar had such a big part in the design ('It's got to be as simple to use as a Telex machine,' he kept insisting) but also because the code is very tightly matched to the PCW8256 hardware.

The usual method of designing a word processor is to send ASCII to a printer which has its own computer in it. The internal printer-computer analyses the incoming code, and converts it to a pattern of dots under the matrix head.

On the PCW8256 system there is only the one processor, and it drives the printer as well as the computer, tying it to one micro system — supplying versions for other micros would entail a lot of work.

With word processor, screen, printer, disk and keyboard all costing £399, I can't see any very good reasons for spending even £149 on Pocket WordStar.

Better to sell your current micro and buy the PCW8256.



Real programmers, of course, use natural (that is, machine) language to write their code, and despise anyone who writes in C, but the rest of us find C quite complex enough, and pretty powerful. Writing in C for the Apple Macintosh, however, involves rather more hard work than usual, because so many of the Macintosh's functions require system calls on a scale unknown to MS-DOS programmers.

The Mac C compiler now available (through P&P Micro) from Consulair Corporation in California, allows direct access to more than 450 Macintosh system calls, without using 'glue routines' — which is what you would have to do if your compiler didn't understand Mac features such as icons, pull-down menus, and so on.

Alone, the compiler costs £295; with the £175 Toolkit, it comes to £425, a saving of £40.

DOS control

There is a new menu program for MS-DOS machines, called Menu Maker.

The nice thing about PC-DOS is that there's such a lot of software for it, but unfortunately it is also very nearly user-proof, hence the vast number of programs designed to control the operating system for the normal user.

What makes Menu Maker different is the fact that it comes from the Indiana-based software firm, Micro Database Systems, easily the most respected producer of data management software for PC-DOS. Menu Maker is very clever (or so they say) at managing the tangled network of heirarchical file directories that latest versions of MS-DOS and PC-DOS provide.

Menu Maker, like most MDBS products, isn't really meant for the average user to buy for his own use, however. It's ideally suited to someone developing an application which requires several different programs, with lots of entries and exits from the operating command system which might confuse the unskilled user.

It costs £250, and the UK agent is Database Experts in Windsor. Tel: (0753) 840197.

Key into security

When people talk about data security and data keys, they probably don't mean anything quite as simple as PC-Fileguard. For £82, it provides protection from unauthorised access by the simple method of being built of 20-gauge steel plate and a pin tumbler lock. You can't use the computer without the key.

Details from HWL Computer Accessories in Hatfield, on (07072) 62463.

Extra BBC memory for next to nothing

When someone asks for £130 for a 64k memory module, he's either hopelessly out of touch with reality or onto something special — and the Permanent Memory Systems add-on is something special.

This memory module carries its own rechargeable battery. This means, according to PMS, that 'it can be used as a portable RAM disk' for the BBC Micro.

Just plugging memory into the 'tube' doesn't make it usable as a portable RAM disk, of course, so PMS supplies software to drive it.

One program allows the module to be used as a RAM disk, and the other lets the user do all the printing to the memory, rather than direct to the printer, giving a 63k print buffer.

Details on (03552) 32796.

Hackers' delight for Tatung

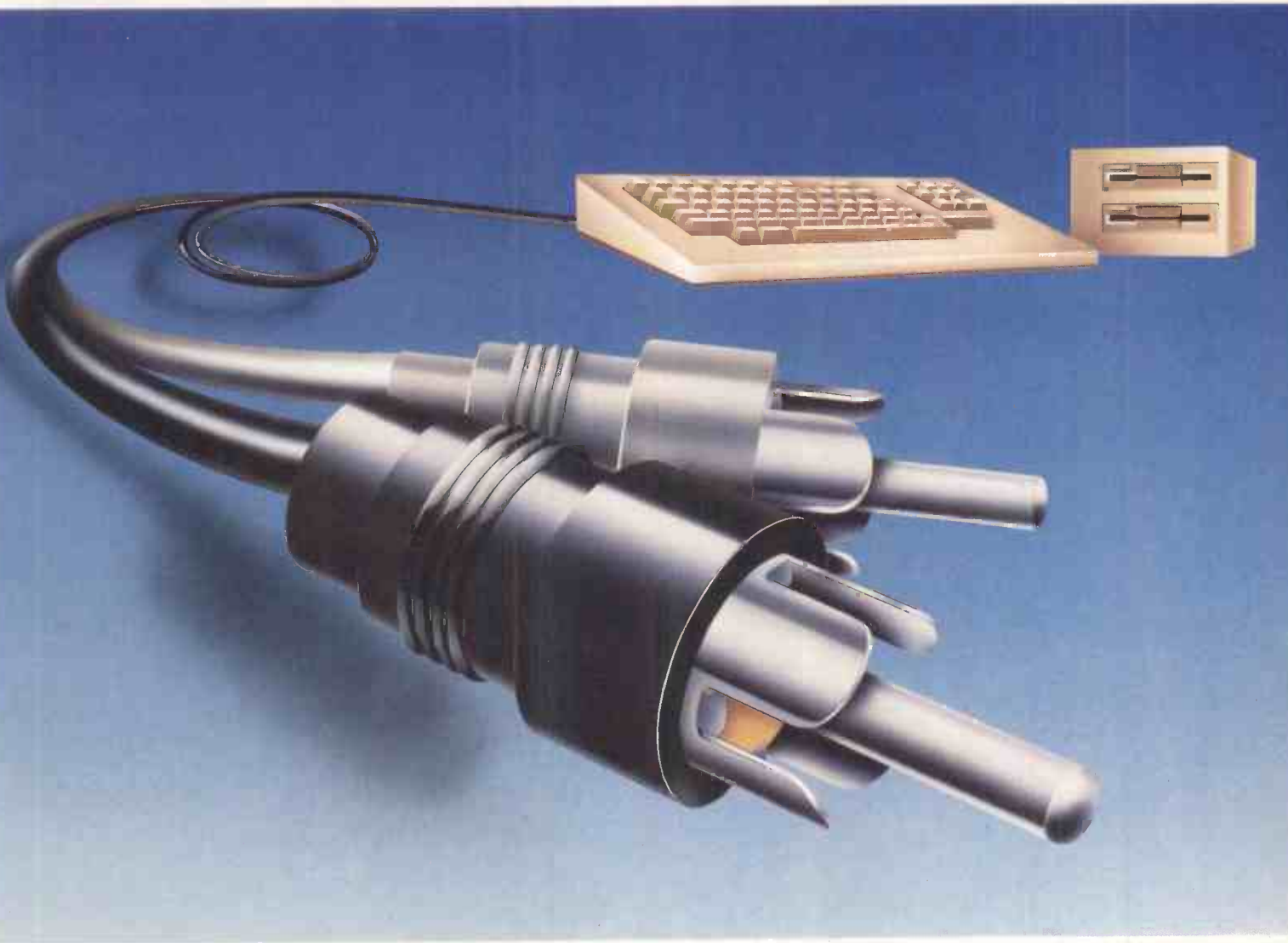
Communications on the Tatung Einstein, an area where standard CP/M software can be suspect, is now rather easier with two products from Kuma Computers.

Tim Moore assures me that his Communications with Viewdata package still copes with Prestel, but adds that he now has a product for normal bulletin boards, Telecom Gold, and so on.

This package is called (very injudiciously) Hackers' Delight, and it sells at £20.

Details on (07357) 4335.

HOW DO YOU MAKE A COMPUTER SHARPER?



PLUG IT INTO A PHILIPS PERSONAL MONITOR.

A Philips personal monitor gets the very best out of your computer. It makes using your computer more rewarding as the definition and resolution gives the clear display you need.

Philips offers you a complete range of both colour and monochrome monitors. One of them is exactly right for your computer. With over 50 years in screen technology, Philips know how to give you the right image.

Philips personal monitors are suitable for virtually all personal and home computers. Just complete the coupon and we'll send you full information.

Post this to: Stephen Paul, Marketing Manager, Computer Monitors, Philips Electronics, City House, 420/430 London Road, Croydon, Surrey CR9 3QR

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PCW1

PHILIPS. TAKE A LOOK AT OUR IMAGE.

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Apricot in
for eyes, brains

£1,495*
APRICOT F2, 512K RAM, TWIN 720K DISKS.

£2,295*
APRICOT F10, 512K RAM, 10Mb WINCHESTER.

Just looking at the Apricot 'Collection' is enough to set your taste buds jumping.

The real feast, however, comes when you realise that our computers have twice the memory of our competitors and they're often half the price.

Your only problems will be deciding between the Apricot F2 with the versatility of its twin disks; the F10 with its 10Mb Winchester and elephantine memory or the much-travelled, much-talked-about Apricot FP.

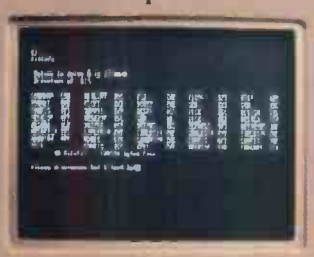
You can actually talk to this lightweight, portable computer and marvel as it responds to your commands.

Each Apricot in the range comes complete with the added bonus of both a free Mouse and a sizeable, free software package.

This includes Gem Desktop which speeds up the 'getting to know you' period. It also organises and simplifies your workload with the help of drop-down menu's, windows, icons and a pointer.

Other parts of the package are Gem Write for word-processing and Gem Paint for beautiful, colour graphics. Words and pictures being easily combined.

All of which makes our micro's a doddle to use



THE MYSTERY OF MS-DOS.

PLAIN TALKING, COURTESY OF GEM.

ONE MOUSE YOU'LL BE PLEASED TO HAVE RUNNING AROUND THE OFFICE.

You simply point the remote-control Mouse at the screen and twirl the finger-tip control.

The pointer then follows your commands to the desired point on the screen for the business task in hand.

Apricots have many other desirable features.

For starters they can run thousands of software

*PRICE DOES NOT INCLUDE MONITOR (EXCEPT WITH THE APRICOT FP) OR VAT AND IS CORR

troduce a feast and pockets.

£1,395.*
APRICOT FP, 512K RAM, SINGLE 720K DISK.

applications in colour. Our software library is actually the largest published in the UK, some leading examples of which are featured here.

LOTUS 1-2-3	PFS REPORT	OPEN ACCESS
MICROSOFT WORD	PFS GRAPH	dBASE III
MICROSOFT MULTIPLAN	PFS PLAN	POLYGON COMMUNICATIONS
PFS FILE		WORDSTAR

Then there's the Apricot Accountant. This is a modular accounting system that saves time, money and energy for more profitable pursuits.

The pursuit of knowledge is catered for by our service called Communiqué. From your single Apricot micro will flow information from the likes of Prestel, Pergamon Infoline etc.

Into the bargain you also get an electronic mail facility (via Telecom Gold) and a Telex (via Easylink). Low-cost communications within your company, between branches or from the sales-force are provided by our private Viewdata system.

As your business grows so you simply add the Apricot of your choice either from the 'Collection'; the low-cost 'Gateway' range or the mighty 'Professional' selection.

It's the world's largest compatible range of micro's. All networkable on a local basis.

Whatever the combination, up to 60 of our computers can exchange information.

If your company already has a mini or main-frame system, Apricot are happy to talk to them.

Frankly, our competitors can't match our spec.

No doubt that played a large part in our double decade of constantly successful trading.

If you'd like more information, call us on Freefone Apricot (via the operator) or fill in the coupon.

We'll send you our free 'Collection' brochure and for good measure we'll include a factual comparison between us and our competitors.

It just goes to show, without making a meal of it, that you can't beat an Apricot.

Please send me your free information package on the Apricot 'Collection.' To: Apricot UK Limited, FREEPOST, Halesowen, West Midlands B63 1BR.

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Position_____

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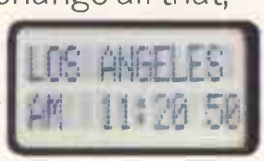
apricot COLLECTION

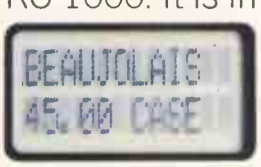
TIME OF GOING TO PRESS. GEM IS A REGISTERED TRADE MARK OF DIGITAL RESEARCH INC.

The greatest breakthrough in wrist technology since Seiko introduced quartz.

Have you ever forgotten an appointment, the price of a product, or even your own anniversary? Not any more. The new Seiko RC-1000 Wrist Terminal will change all that, permanently.



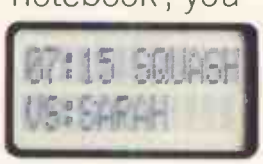
Only Seiko's advanced micro electronics technology could have produced the RC-1000. It is in fact, a computer terminal:

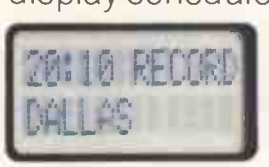


miniaturised then fitted into a small stylish module to be worn on your wrist like a watch, ready to recall important data from your personal computer* any time, anywhere.

The RC-1000 has a 24 character screen and an extensive memory that holds up to 80 screen 'pages' of information that can be sub-divided into 12 separate data files. A detachable lead allows it to interface to the RS232 port of your computer and a sophisticated menu-driven database allows you swift access to your files.

Now imagine what the RC-1000 could do for you. As an 'electronic notebook', you can keep addresses, prices, statistics, in fact any type of file, ready to recall at the touch of a button. The memory also keeps track of world time zones — vital for international business; you can display schedule reminders that can be used with the alarm function up to a year in advance (good for birthdays); or set to repeat at the same time every week. The list of uses is as endless as your busy timetable. The computer has revolutionised working lives. Now let the RC-1000 revolutionise your life.





SEIKO

RC1000 WRIST TERMINAL

The Seiko RC-1000. £99.95. At all good computer specialists, now.

*IBM PC · Apple II E · Epson PX8 · BBC Model B · Commodore 64 · Sinclair Spectrum

Mousing around

One event I didn't make it to this summer was the British Micromouse Finals, but John Billingsley was there and sent this report.

The International Personal Robots Congress at the London West Hotel lacked the bustle of last year's Computer Fair venue, but the micromice enjoyed an exciting final for all that.

Following tradition, the penultimate day was devoted to the novices. This year the newcomers had a hard decision to make: should they enter the open tussle of the novice final, or restrict their mice to the Tunnel Run?

The Tunnel Run is a test of steering alone, for those mice which have as yet no maze-solving ability. A section of maze is laid out as a simply-connected passage with no branches. It starts off straight and gentle, but after a while develops increasingly vicious bends and twists. The score is based on time to finish, or failing that on distance achieved before the mouse loses control. Only two mice elected to try it — Pete Boyce's SAM (Simulated Animal Mechanism) and young Howard Urmenyi's Where Rat. While Sam spent two-and-a-half minutes tottering around the passage, Where Rat made business-like, if leisurely progress, and completed the course in just over 50 seconds. Where Rat is a committed wall follower, using an effective if primitive dangling microswitch sensor mounted on a leading corner to tap its way around the maze. Howard won a robot watch, while Pete carried off a copy of *DIY Robotics*.

The novice final was played for higher stakes: a Zero 2 robot from Intergalactic Robots and a Tomy Dingbot. Mike Windibank's Mad Max had been two months in the making; with one or two more days it might have avoided disaster. Rattus Verticalis could also have done with a little more work from Messrs Visser, Watkins and Pitt. Sporting a complete keyboard and numeric display, Romeo showed a nice use of guidance control, winning second prize for Daniel Shoop, Robert Holding and David Sweeney. Jerry lost its novice status by being the only mouse to reach the centre. A furry rodent with sensor booms to each side, Jerry won its makers James Chidley and Derek Hall the first prize in a time of one minute 25 seconds.

On Thursday the big battalions moved in for the final. David Woodfield and Alan Dibley were particularly keen to try out the maze, which had been specially flown from Japan by the Japan Science Foundation. They were able to check for any snags which might mar their performance in the World Finals in Tsukuba, and their suggestion that the floor should be made blacker to infra-red has already been taken up.

The gentle practice maze was reconfigured to a vicious test to separate the champions, but technical problems took their toll more effectively than the clock. Bill Urmenyi's Gonzales tried and retired, to be replaced on the maze by his new mouse, Danger Mouse.

DM certainly had a good run, but was finally thwarted and settled for third place.

Jerry did its best, but was driven into fourth place by stiff competition and a stiffer maze. Thezeus the Ancient came out of retirement, but even heart massage failed to make it run — its practice exertions had proved too much for its old batteries. KnownAim also failed to live up to its reputation, and eventually retired; that left the contest open to the two favourites, Alan Dibley's T6 and David Woodfield's Enterprise.

T6 was suffering battery problems of its own and after reaching the centre on an early run in a time of one minute 51 seconds, was unable to complete a follow-up run to exploit its acquired knowledge of the maze.

Enterprise set off slickly, looking every inch a champion, but after a tortuous exploratory path it objected to one turning and snagged on a wall. It started again, with a clear memory of an initial long straight. It applied full power for a sprint start, winding up to a speed of two or more metres per second! The crunch as it hit the end wall made the audience wince. At the time, it looked as though it had 'done a wheelie', lifting the front measuring-wheel off the ground and losing track of distance. Later, David decided that the pulses had been arriving faster than his interrupt routine could cope with. Whatever the cause, Enterprise retired to the pits. Even so, its performance won David the second prize of a Commotion vision system — perhaps it will persuade him to build a Robat ping-pong robot. Alan Dibley carried off first prize of a Reekie RUR mobile robot complete with robot arm. The tail-enders won two more copies of *DIY Robotics*, while all the contestants received copies of the new Salamander book *Robots*.

For more details of Micromouse and Robat, write to John Billingsley, Department of Electrical and Electronic Engineering, Portsmouth Polytechnic, Anglesea Road, Portsmouth PO1 3DJ.

The best accounting software in the world is of no use to someone whose micro has only one disk drive, if it assumes that you have two.

The popular Apricot F1 and F2 come complete with a single disk, and so CashLink of North Wales is probably onto a good thing with a version for these machines.

There are versions for two-drive systems, too, but the single-drive version is specifically designed to make sure that you don't get into a tangle with only one drive.

It costs £525 for the F1, £695 for the standard version, and details are available on (076 686) 551 in Caernarfon.

In the hot seat: MicroScope man joins PCW as new editor

This may be the last, and shortest, story in Newsprint, but that shouldn't be held against it.

Briefly, the news is that this is the last issue of the magazine to be edited by Graham Cunningham. His replacement is Peter Jackson, who joins *PCW* from MicroScope which he has edited since its launch.

All other personal details have been withheld to spare the blushes of both parties — suffice it to say that business will, of course, continue as usual. END

Guy Kewney can be contacted on electronic mail. His numbers are Source TCK 106, and Telecom Gold 81: JDS018. The Prestel mailbox number is 01-802 2679.

YANKEE DOODLES

David Ahl brings all his experience to bear as he predicts the industry's winners and losers. He also hands out the prizes for the 10 worst computers.

Predictions

With a background of 28 years in computers, 11 years of publishing an American magazine called *Creative Computing*, and 18 months writing Yankee Doodles, I hereby present the results of my most recent crystal ball gazing. This is the future that I see for various hardware manufacturers.

IBM will make it big (surprise, surprise). Market domination, huge cash flow, loyal employees, enormous research effort, strong dealer base, and an image among corporate buyers of 'you can't lose your job by buying IBM' will contribute to continued domination.

Growth will slow at Compaq as the company becomes larger and less nimble, and as IBM fills up the pipeline. Although frequently approved in corporations as the second source for IBM, the cost advantage over IBM is relatively small. However, quality control is better, at least temporarily, than IBM's.

Texas Instruments will not make it. The TI Pro is one of the least compatible compatibles, and customers are not convinced of its advantages. Even though all the important software is available for the machine, its incompatibility image will prevent it being purchased by volume customers. TI's new approach of aiming at vertical markets is a good idea, and perhaps the only thing that will keep the Pro alive for another year or two.

Nor does the future look bright for other clone-makers — some will die a fast, merciful death and others a long, painful death. In the end, the only difference is how much the investors will lose.

Digital Equipment (DEC), on the other hand, will make it. Despite mediocre personal computers (now withdrawn) and an abysmal PC marketing strategy, the incredible installed base of DEC minis in colleges, engineering, technical, and scientific environments automatically puts DEC on the approved list of vendors whenever new systems are being purchased. Furthermore, the company has a history of wringing more years of life out of its designs than any other mini-maker (PDP-8, PDP-11, VAX). The MicroVAX will be DEC's saviour in the upper end of the micro market.

Hewlett-Packard (HP) will also make it. Like DEC, its installed base of timesharing minis and instrumentation, particularly in technical environments, causes larger corporate buyers to look to HP as they expand their networks. The 150 and the reincarnated version, the Touchscreen, is a loser and the Portable Plus is pricey, but eventually the company will get its product act together.

AT&T will be another success, if only due to its huge cash flow and enormous presence in American industry. The product line shows a total lack of planning and the effects of many competing factions within the company, but as the reorganisation dust settles, a more coherent product and marketing strategy should emerge.

NCR will fail (in the PC market). It has similar problems as TI, but it is without a dealer base or a coherent marketing strategy. On the other hand, Zenith will succeed as a result of concentrating on specialised vertical markets such as the Air Force and various government branches.

The Data General One is a product looking for a market. Making micro versions of the company's minis is the only sensible strategy for DG: whether or not it chooses to follow it is another matter.

Apple will make it as soon as the company opens its eyes to the existence of a serious home market. The Apple II is number one in schools, and could have been number one in the home market had the company not turned its attention to the business market. Likewise, the Mac is probably an equally serious contender in the home market as the business market.

Commodore may make it if it turns its focus back to marketing. Choosing a production-oriented Dutchman for president was absurd when the company needed leadership in R&D and marketing. If the new marketing crew can re-establish confidence in the dealer network and can convince third-party software vendors to focus on the company's products, there may be hope. Otherwise, not.

Atari will not make it. Jack Tramiel's lean-and-mean approach doesn't build loyalty among employees, dealers, or third-party software vendors. The Atari name — the strongest thing he had going for him — has lost much of its glitter. Trying to move the company into the business market is absurd and will fail miserably.

Tandy will hang in there. While retail computer stores seem to be everywhere, there are still many small US towns in which a Radio Shack is the only computer dealer in town. Even in larger towns, people have confidence that Radio Shack will be around as these trendy computer stores come and go. Tandy will hang on to a small piece of the home, school and small business markets, but a major player, no.

Epson is a tough one. It will continue to dominate the printer market, although IBM will probably take over first place in two or three years. Epson computers have been innovative, sometimes too much so for their own good.

NEC has enormous staying power due to the company's number two spot (behind Fujitsu) in Japan, but marketing in the US ranges from average to horrible. Unless the company gets its marketing act together, it will continue to be an also-ran in the US.

To date, no UK company has made it big in the US. ACT has had a shot at it with the Apricots, but it will have to do practically everything right. If anyone can do it, ACT can, but it won't be easy.

Sinclair products are highly innovative, interesting, and cheesy. In the long-run, the lack of quality and utility, and a cavalier approach to customers, will spell doom for the company.

The not-so-magnificent 10

Here, in alphabetical order, with no malice intended, are my choices for the 10 worst computers of all time.

APF PeCos I: with no support at all, APF released a machine that used a JOSS-type language which was totally incomprehensible to any normal person.

Coleco Adam: tape drive unreliable, printer worked only sporadically, software full of bugs and without documentation. Too much new technology and too much hype. I wouldn't give one to a Cabbage Patch doll.

Epson QX-10: nice hardware, but the Valdocs software is extremely slow, cumbersome, and frustrating.

Gavilan: the term 'vapourware' is usually applied to software. Gavilan proved it could be applied to hardware as well.

IBM PCjr: an embarrasing *faux pas* that humbled Big Blue with its inexcusable wireless Chiclet keyboard, single disk drive and memory limitations.

Mattel Aquarius: a machine so cheesy, Mattel should have supplied rubber gloves to wear while using it. The company tried to sell a touch-typing software package for it but the keyboard didn't even have a space bar.

Sinclair ZX80: with an unusable keyboard and quirky keyboard Basic, this machine discouraged millions of people from ever buying another computer.

Stonehenge: the hardware was solid — still is, but trying to debug the operating software wiped out the entire race of Druids.

TI99/4: with its Chiclet keyboard, not enough keys and non-standard Basic, this machine soured millions of people on computers forever.

Video Brain: running APLS (a scaled-down version of APL), the Video Brain required a degree in computer science to program it. It did have nice joysticks, though. END

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LETTERS

This is the chance to air your views — send your letters to Letters, Personal Computer World, 32-34 Broadwick St, London W1A 2HG. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.

Customer relations

As a recent purchaser of an Amstrad CPC664, I was appalled to read in the September issue of *PCW* of the imminent launch of the CPC6128 at a price which is considerably lower than that of the equivalent 664 system.

I bought my green-screen 664 in May this year at the full retail price of £339. I have absolutely no complaints about the machine, indeed this letter is being written with its aid. However, to learn that a vastly superior machine is to be produced very soon after the 664 at some £40 less is, to say the least, galling. I would have expected such marketing ploys from certain other micro manufacturers in this country, who have already shown themselves fully capable of such machinations in the past, but I had thought that Amstrad was above all that.

I suspect that I am not the only person in this position, and Amstrad should take some positive steps to restore the goodwill of its existing customer base. The very least step should be an offer to replace the main 664 unit, manuals, and so on, with the 6128 unit at a fairly nominal price, say £25. Bearing in mind the price structure, perhaps a direct swap would be fairer, and the best possible step would be a direct swap with a repayment of the £40... but I don't really expect Amstrad to be that magnanimous. (Owners of the colour version, replace £40 with £50.)

If such offers are not made, I am sure many 664 owners will want to change to the 6128, but with the 6128 price as stated in *PCW*, it would appear that the 664 will become unsaleable without a substantial drop in price, and this would apply to the 464 as well. As second-hand trading will be affected, the 664 owner will not be able to change to a 6128 without a substantial financial loss.

To add insult to injury, on page 36 of the same issue of *PCW*, the advertisement for the 664 says: '... the Amstrad (664) package is very hard to beat.' It obviously isn't — Amstrad has just done it, in a very short time.

I urge Amstrad, therefore, to seriously consider the proposals I have made, and to quickly restore its existing customers' confidence.

Kit Spackman, Lydney, Gloucestershire

There's a lot of users annoyed with Amstrad and we think they deserve some support, but the 'injury' needs to be put into perspective.

Obviously, any manufacturer is going to try to produce better machines at better prices — it's unlikely to stay in business unless it does. Equally obviously, upgrading previous machines won't help it stay in business in purely financial terms.

Having said that though, the brief gap in terms of time between the 664 and the 6128 — and the bigger gap in terms of price and performance — isn't much of a way to encourage present and potential purchasers.

We're keen to see what can be done to get a better deal for 664 users, but first we need some ammunition. Write to us and Amstrad if you agree with this letter.

Fuzzy logic

Martin Banks (Banks' Statement, *PCW*, September) falls into the common trap of believing that fuzzy logic is a recent innovation.

In fact, under its original name of 'quantum logic', non-Aristotelian logic which permits partial truths has been around since the pioneering work of Vasil'ev, a professor of logic at the University of Kazan, who published papers on this from 1910 onwards. The first formal propositional calculus was published by Lukasiewicz in 1920, using three values (0, 1/2, 1) and then generalised by Zawirski in 1931.

The modern concepts as used in AI were really fully developed by Watanabe, particularly while he was at the IBM Research Laboratories at Yorktown Heights, New York, and emerged in a series of papers and books from 1956 onwards. Lotfi A Zadeh did not coin the term 'fuzzy states' until 1965.

However, the whole field stems from decision analysis theory originally developing from the statistical work of Reverend Thomas Bayes in 1760, one of the founding fathers of probability theory with the concept of assessing 'degrees of belief'.

One of my favourite illustrations of many-valued or 'fuzzy' logic is the physical thought experiment, in which a cat is sealed in a black box for one hour. Inside this black box, the cat is wired up to a device which will electrocute it if a block of radioactive material decays. The material in question has a half-life of one hour (that is, a probability of decay of 0.5 in one hour). At the end of the hour, what is the truth value of the statement 'The cat is alive'? It must be 0.5!

All this goes to show that even *PCW* (and Martin Banks) can be a bit fuzzy at times, as can cats.

Surgeon Lieutenant Commander Howard Oakley, Royal Navy, Isle of Wight

Register here

Would Tatung Einstein owners be interested in setting up an informal owners' register? The object would be exchange of information and news with a view to getting the most out of this well-designed hardware.

If so, could they contact me? My daytime phone number is (0477) 71321, or write with SAE to the address below.

Paul Burgess, 24 Meredale Road, Liverpool L18 5EX

Roman to italic and back

When JH Atkinson enquired in Computer Answers, *PCW* July, p218, if there was a daisywheel quality printer that would change from roman to italic and back without the need to change the daisywheel by hand, Simon Goodwin did not mention the IBM Thermotronic typewriter (and the corresponding keyboardless printer).

For less than £1000 it gives remarkable print quality, particularly suited to reproduction by offset, slightly reduced, as the type is rather heavier in weight than most daisywheels produce. Change from one typeface to another is instantaneous; although only two are in the machine at any one time, a wide choice is available and they are quickly changed by hand.

The speed is up to 60cpi — in almost complete silence.

G Peter Winnington, Vaud, Switzerland

Portable problems

As an owner of the Apricot Portable, which in many respects I find to be an impressive machine, I feel it is well worthwhile sounding a warning to prospective purchasers regarding certain shortcomings in the package as it is sold. This is particularly relevant to prospective purchasers whose initial knowledge of computers in general, the MS-DOS operating system, or of the software packages supplied, is not that strong. In particular, I would defy any new user without computing experience to manage to do any serious work using the abysmal instruction booklets supplied.

Some examples are as follows. Firstly, let's take the absolutely vital disk and file copying system. While the disk copy utility is workable, although tedious, one seldom wishes to copy all the files on a disk to a back-up. However, the file copy utility as described in the instruction booklet not only does not work at all, but gives you an error message to the effect that you cannot copy a file to itself, and aborts. The instruction booklet also states that you can use wildcard characters in the file copy command — you can't! The best and fastest way to copy a file from one disk to another is of course to use the RAM disk utility supplied on the Activity

master disk (which does allow wildcards), but the RAM disk program does not work as installed on the Activity disk—through lack of memory, so I am informed—nor are there any instructions as to how to implement, or indeed use, the RAM disk in the instruction booklet at all. RAM disk doesn't even appear in the index.

Let's move on to the supplied software. A second disk purports to include the programs Sketch, Diary and the Voice recognition training program. I say 'purports to include' as none of these programs will load on my software disk, nor on a copy replacement supplied by my dealer. They put up the message 'Wait while ACT Sketch (or Diary or Vtrain) is loading', then the message 'invalid directory', and abort.

However, even should the programs load, I really can't see that they can be of any serious use. For Diary to be of use you need the disk in the machine virtually the whole time, otherwise by the time you have loaded it, any enquirer after an appointment with you would have long since rung off! Sketch has no print or screendump facility, so is only of use for drawing pretty pictures on the screen. I suppose the voice recognition could have some use in initiating WordStar or SuperWriter commands, but I think the serious user would find it easier, and probably more reliable, to use the keyboard. I would appreciate being able to load the programs and find out for myself, rather than relying for my views on an instruction booklet that has otherwise proved remarkably uninformative.

I also have the software programs SuperPlanner, SuperWriter, and SuperCalc. The first of these I have so far found almost unusable from the instructions in the ACT software pack. Matters are not helped at all by the function keys not doing what the instructions say they will do. I have no real complaints about SuperWriter, other than that I am more used to WordStar, nor of SuperCalc which in my mind is one of the best low-cost spreadsheet programs.

I am also a little worried about the BIOS on my machine, which appears to be a rather out-of-date version 1.2 despite my machine being purchased in July. I read in another magzine that BIOS versions prior to 2.5 give error messages with some software programs that are supposed to run on the F1 and Portable ACT computers. These don't include any I have at the moment, but it does make one cautious about buying new software.

Overall, the ACT Apricot Portable is quite an impressive little machine, particularly at its current price. The keyboard certainly could be a lot better, but one does get used to it, and the instruction booklet is not only poor but downright misleading—as has been some of ACT's advertising of the Portable and F1 range. The voice recognition seems like a bit of medio hype put in to gain more press coverage when the machine was launched, but might prove to be fun to use if I could load the system! The display certainly has its drawbacks, but might prove to be easier on the eye than the standard green screen.

It would be good if the machine could use the Apricot monochrome screen also, which I am informed it is not configured to do.

If a prospective purchaser is aware of some of the drawbacks and problems as outlined here, the Apricot Portable is still a very powerful and attractively priced machine with a good software library available, and makes an excellent home/business machine.

Lawrence Williams, Oxted, Surrey

BLUDNERS

We unfortunately left out details of the graphics characters in the listing of Knighthawk for the Spectrum in August's Program File. The graphics and corresponding letters are given in Fig 1; the details of where they should appear are as follows.

Line 130: should have " A" and "A" instead of the spaces shown.

Line 172: should have "A" instead of the last printed space.

Line 195: should have "A " instead of the three spaces shown.

Lines 216 and 217: should have "B" instead of all the single spaces.

Line 266: a$=" " should be "EC ", and b$=" " should be "DFG".

Lines 272-275: should have "H" instead of " " at the end of each line.

Line 292: . . . BRIGHT 1;" ". . . should be . . . BRIGHT 1;"I". . .

Line 293: . . .AT tpy+1,tpx; INK 3;" ". . . should be . . . AT tpy+1,tpx; INK 3;"JKL". . .

In the Program of the Month, BBC Turtlegraphic, some characters were printed incorrectly. The character à should be @, é should be {, è should be }. These changes should be made in lines 140, 1340 and 1720 of the main program, and lines 100 and 110 of the second program.

In the same issue, in TJ's Workshop, the circuit diagram for Einstein joysticks was printed incorrectly. The joystick button is shown as connected to pin 3 and the +5 volts pin 7 line. It should be connected to pin 3 and the 0 volts pin 1 line.

In September's Program File, the Program of the Month, BBC Graphics Utilities Monitor, contains one error. Those of you with Basic 1 should change line 3270 to read 3270 PROCoscli("DIR "+e$).

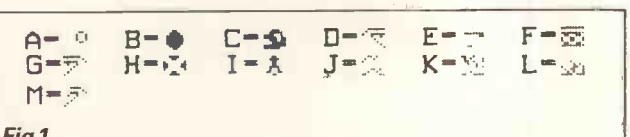

Fig 1

Amstrad speed

In the July issue of *PCW*, you featured an article ('Fast timing') containing various speed and accuracy Benchmarks for nine micros. I have carried out the tests on the Amstrad CPC464 and submit the results. As I suspected, the only two micros to outpace the CPC464 were the 16-bit machines. The two comparable machines, the BBC B and the Sharp MZ-700, were left behind as well. Having said this, the value of the speed tests as a Benchmark is, of course, dubious. As can be seen from the results of the accuracy tests, the CPC464 compared unfavourably with the BBC B.

Where necessary, the CPC464's logarithmic keywords were substituted for those shown. Also, the second statement in line 20 of the speed test program should be Y(15)=7, and the first part of the sixth expression of the accuracy tests should be SIN(X)*SIN(X). Test 15 could only be conducted in the range 1 to 88, as the exponent of a number greater than 88 gives an overflow error.

Mike Carey, Rayleigh, Essex

Amstrad CPC464 timing program

```
10 DIM X(20),Y(20), A(20,20),
   B(20,20)
20 K=5:Y(15)=7:B(5,10)=3
30 T=TIME
40 FOR I=1 TO 1000
50 REM
60 NEXT I
70 TT=TIME
80 PRINT ROUND((TT-T)/
   300,1);"SECS"
90 CALL &BB18:EDIT 50
```

Speed Tests

1	1.4

Assignment

2	0.7
3	0.6
4	1.4
5	1.3
6	1.4
7	2.1
8	3.4
9	2.0
10	2.1
Ave	1.7

Elementary mathematical operations

11	1.2
12	1.2
13	1.3
14	2.6
Ave	1.6

Mathematical functions

15	25.9
16	2.8
17	1.1
18	13.1
19	14.1
20	15.0
21	14.7
22	30.4
23	10.2
Ave	13

String operations

24	0.7
25	1.9
26	1.2
27	1.3
28	1.6
29	0.8
Ave	1.3

Miscellaneous

30	127(!)
31	0.4
32	−0.1(!)

(The GOTO must be interpreted faster than the REM)

33	1.5
34	1.1
35	1.6
36	1.0
37	0.5
Ave	0.9

Overall average 4.5

Accuracy tests

1	9.3E−10
2	8.0E−7
3	3.7E−6
4	7.0E−10
5	4.2E−9
6	1.6E−8
7	8.6E−8
8	0
9	1.8E−7
10	1.5E−7
11	1.8E−7
12	1.5E−7
13	0
14	1.1E−8
15	3.0E−8
16	1.8E−7

Maximum number 1.7E+38

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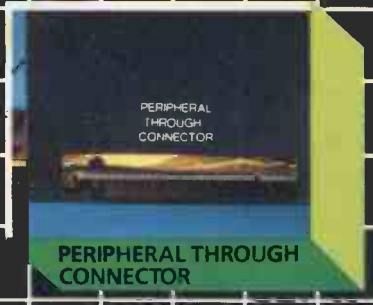

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BANKS' STATEMENT

Dedication

Martin Banks anticipates the day when the market will see an IBM-compatible, large-memory, small, dedicated computer. Who will produce it? The Japanese, he thinks.

In 1980, I had the temerity to suggest that the Japanese were about to take over the personal computer business. To be fair to me, a number of other people in the industry felt the same way, and were willing to be quoted, but I was the one who put it in writing — my head on the block to be cut off. History duly performed this humane function as the Japanese never got their act together when I said they would, which was very spiteful.

Historically, the Japanese have never let a good volume market like the personal computer slip past them, and I see no reason why they should now.

What is more, I am now wondering if they have found the way to achieve this end. If they have, then it is a way which overcomes many of the problems now facing manufacturers of small personal computer systems, especially the home-oriented machines.

The 'way' concerned is really quite simple. It is a straightforward derivation of what home computers have been (even though they have pretended to be something else entirely), and was pointed out to me by an acquaintance who runs a minicomputer company selling all those big, £50,000+ management systems. He pointed out that, despite all this expensive and clever hardware the company sold to others, its own payroll was done on 'a small Japanese thing. It cost us £400 and it's dedicated to doing payrolls. It's terrific and saves us no end of time'. 'Can you do anything else with it?' seemed a logical question.

'No. I suppose we could find some way to reprogram it for a different job, but it would be cheaper to buy a different one, dedicated to that job.'

Bingo. There you have it in one. What has been wrong with the small computer business, especially at the home end, has been that the manufacturers have tried to con both the punters and themselves into believing that the machines are 'general-purpose'. I suppose they are if you are clever enough to have the time, money and dedication to invest in making them so. Otherwise, they are not. Instead, the smallest ones have been, to all intents and purposes, dedicated games-playing machines. The answer which the Japanese seem to have come up with is to simply dedicate them to something else, something arguably more useful.

There are many advantages to the dedicated machine, advantages that apply both to the end user and the manufacturer. The end user has a machine that works, and works first time, in the way that you might expect a ruler to work first time at providing straight lines. As it is dedicated, there is a minimum learning time. Keyboards can be configured with dedicated legends for example, so that there is minimal chance of operator error. Most specifically the program is there, ready to run as soon as it is turned on.

This can be a real boon to the user, who just picks up the machine and uses it in the same way as any other tool, such as a pencil, ruler or calculator (the best example yet of a dedicated computer application). It will no longer be necessary for the user to load and boot applications programs, risk ruining floppy disks, learn complex operational routines, or risk erasing everything of value through a silly keying error. Not only that, and Digital Research please take note, concurrent operations could be easily achieved with any number of different applications, simply by using the dedicated systems required.

Here, of course, is the big advantage for the manufacturers. Rather than trying to sell the end user a single system that does *everything* (and then only poorly in many cases), they could sell each operator several machines for different tasks. This would boost their prospects considerably and would make for machines that, in all probability, would be easier and simpler to design and manufacture. As my acquaintance suggested, the little box he uses 'could probably be reprogrammed'. If it is cheaper to buy a different system, however, why should he bother? It would seem to be what the marketplace prefers.

To some extent, the machines could be considered in the same way as the pocket calculator, without in any way demeaning them. There are many calculators on the market which are both powerful and dedicated to a particular area, such as engineering or finance. It is not uncommon for an individual to have more than one calculator for different applications.

Technology certainly offers the capability to produce such a machine at an attractive price. It could also allow software producers to package their products in such a way that reduces the chances of copying and pirating, because everyone will find it easier to buy the complete machine/program package than mess about copying it. (The program could, for example, be configured to work solely on one type of machine.)

The type of machine I have in mind, and the reason I suggest that it will be the Japanese who do it, is that which I have previously outlined — the IBM PC compatible, 16-bit, MS-DOS running MSX machine. Using 256k memory chips, of which 16 make up a 512k byte memory space, it would be possible to build, now, a PC-clone the size of a Sinclair Spectrum. It would have no disks due to the operating system and applications program both being mounted in read-only memory chips, and there would be a bubble memory for data disk work. All of this would take 20 chips and a small power supply.

There would also be some complex circuits to handle I/O to and from a (most important of all) standardised communications system, where all machines use exactly the same protocols and the same pin-out. With this, it would be easy to read and write to the bubble memory so that floppy disks would not be needed on the standard machine. The easy-to-use communications link would connect the machines into a network system of whatever type the user cared to configure.

Will it happen this way? No-one knows, but the capability is there and it is one way that the market could be served with systems that actually meet the user's need to have computers both cheap and productive. It would also suit the manufacturers and software suppliers, who would achieve the volume sales they appear to need so badly. (It would also suit the City investors — a product type that they understand and are not frightened of quite so easily.)

If I'm right about this, we could see a dedicated Lotus 1-2-3 computer costing £395 in two years' time. END

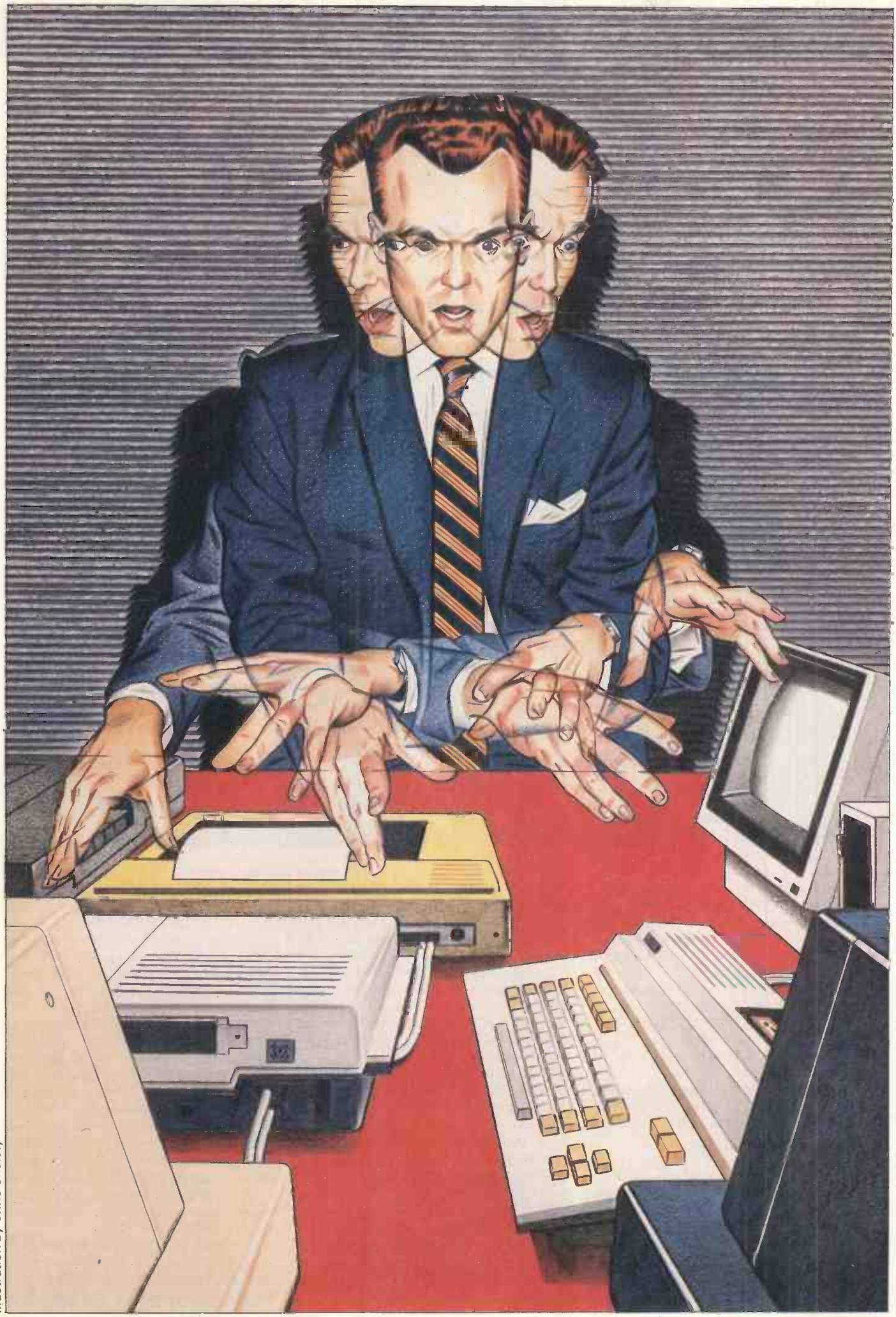

Illustration by Chris Chaisty

Amstrad PCW 8256

Amstrad's period of prolific manufacturing continues with the PCW 8256, a good-quality, great-value word processing system that includes a printer in its £399 price tag. Is there sufficient support in the 'serious' market to do it justice? Peter Bright conveys his impressions.

Amstrad has always had a reputation for producing cheap, good-value consumer electronics, ranging from music centres through TVs to videos. In the last year or so it has also developed a good reputation with its 464, 664 and latterly 6128 home micros.

Now, with its new machine, it seems to have taken its good-value image to new heights — a word processor with CP/M, a disk drive, 256k of RAM, a monitor, Basic, Logo *and* a printer for £399.

The fact that Amstrad had the nerve to call it the PCW (well, PCW 8256 actually) only served to heighten my interest.

Hardware

The name PCW stands for Personal Computer Word processor (hah!). It is made up of three separate units — the main system box, a keyboard and a printer. All three units will be supplied in one (large) cardboard box much like a domestic TV. Even in the business market, the idea of including a printer in the price of the unit is unusual, and at this price level it is unheard of.

The main system unit houses the monitor, the disk drive and all the electronics, including the power supply. It looks very like a portable television, and I wouldn't be at all surprised if the casings started out as an Amstrad portable TV. It also sits on what looks like a tilt/swivel stand except that the review model didn't tilt or swivel.

Most of the front of the main unit is taken up by the monitor screen. To its right are spaces for either one or two disk drives mounted vertically. The usual configuration is for the machine to be supplied with one disk drive in the top slot, with the bottom slot containing the PCW badge.

The back of the machine is quite bare: all it houses are power-in, a special Amstrad printer interface, and an edge connector onto the main PCB. There is also a 24-volt power-out socket to drive the printer.

The edge connector exists primarily because Amstrad will be offering an RS232/Centronics parallel printer module which will plug into the edge connector and slot into a recess on the back panel of the main unit.

The final interface on the main system unit is a DIN socket on the side panel for the keyboard lead.

You get inside the PCW in the same way that you would get inside a television — remove the screws and take off the back panel. Most of the internal space is taken up by the monitor tube and high-voltage electronics. The digital section consists of just one surprisingly small PCB. My initial reaction to this PCB was how small it is and how few components it uses. It has been totally redesigned, and uses significantly fewer components than either the 464 or the 664.

The main PCB contains a total of 17 chips. Of these, eight are 256 kbit RAM chips and another five are TTL drivers for the printer interface; this leaves just

The PCW's separate keyboard is a change of style for Amstrad

four chips to do the serious processing. These consist of a 4MHz Zilog Z80 processor, an 8041 printer controller chip, an NEC 7658 disk controller, and a large dedicated gate array. In addition there are sockets for another eight RAM chips, although Amstrad says that it has no intention to fill them.

Although the Z80 processor can usually only access 64k of RAM, the PCW makes full use of its 256k by bank-switching sections of RAM. This is usually handled by the CP/M Plus operating system.

You may have noticed that the above list doesn't include any ROM chips. This is due to the PCW being without any ROM as such — everything is loaded off disk. In order to do this you obviously need some kind of disk bootstrap loader, so Amstrad has used the 256 bytes of mask ROM available on the 8041 printer controller to squeeze one in.

The gate array is interesting in that it is mounted above a hole cut in the middle of the PCB, with its legs spanning the gaps on all sides between it and the main board. The result looks odd but is apparently easy to align for manufacture.

The low component count coupled with the fact that the PCW is manufactured in the Far East and then shipped over, means that the system is probably cheaper to produce than the 464.

The system has been designed to work with either one or two disk drives. Initially, Amstrad will be shipping each unit with one 3in 170k disk drive; an extra drive can be fitted at a later date if required. Amstrad also plans to sell a 1Mbyte (720k formatted) double-sided, double-tracking 3in disk as an extra to fit into the spare disk space. This should be available later this year.

As I have stated, it is unusual for a computer manufacturer to include a printer in the price of the machine. Amstrad hopes that one of the PCW's main selling points will be its word processing capabilities, so it follows that a printer is a good idea.

The printer casing matches the appearance of the rest of the system, and looks like a fairly standard 80-column dot-matrix unit. In fact, true to Amstrad's style, the printer is as basic as it can be while remaining capable of doing its job.

Most printers contain a processor and ROM to hold the character fonts, as well as control electronics for a Centronics printer interface. Amstrad buys in the basic printer mechanism without any control electronics at all; all printer control is done by the printer controller in the main system unit. This extends right down to telling the pins on the print head when to strike, which means that the only electronics necessary for the printer itself are a few TTL drivers to interface it to the main unit. The printer interface is non-standard and achieved via a short length of ribbon cable.

The advantage is that it makes the printer cheaper to produce. This economy even extends to ditching the Online, Line-feed and Form-feed buttons that are usually found on printers; these functions are accessed under software control from the main unit.

In use, the printer is very good considering it's free. It can handle both friction-fed and sheet-continuous stationery. The tractor feed unit clips onto the top of the printer and is driven via a gear from the roller. A nice feature is that if you are using single-sheet paper, the printer will automatically roll the paper so that it is aligned at top-of-form as soon as you pull out the bail bar; this saves you having to rotate the roller by hand. Our office typewriter does this, but I've never seen a computer printer do it.

Two type qualities are offered: draft which is fast; and high-quality which is slow but very good in terms of type quality. This obviously isn't up to daisywheel standards, but I wouldn't be ashamed of it. The printer can also reproduce graphics from the screen, either by using the built-in gaphics dump routine or by using the GSX drivers supplied. The pin patterns for the letters are all stored on disk, so theoretically you should be able to create your own typestyles. However, unfortunately they are stored in a compacted form and aren't too easy to get at.

As previously mentioned, all printer control is achieved via software from the main unit. If you are in the word processor, you can control all the printer's functions from there; but if you are in CP/M or a generic applications program, you can use the key on the keyboard marked 'PTR'. When you hit this key, a printer control menu is displayed on the last line of the main display. Using the '+' and '−' keys, you can set and unset on/off line, top-of-form, line-feed and form-feed, toggle high-quality/draft print, toggle on or off the paper-out detector and reset the printer. These functions are very easy to use when you remember that you have to control the printer from the keyboard rather than by pressing buttons on the printer.

Overall, I was impressed with the printer. It is slightly slower than modern dot-matrix printers, but the quality can be good and it's free.

Unlike previous Amstrad machines, there is no choice of display with the PCW — a monochrome green screen is what you get. No colour is available.

The display is built into the main system box; in fact, it *is* the main system box. At 14 inches the display tube is larger than average, but like other Amstrad systems it is based on television technology. This means that the display quality isn't up to pukka monitor standards, but is still quite good. I had no trouble using the screen on the review machine, although a lack of shielding on the pre-production unit did cause some display surge. My main worry was that the tube had no anti-glare coating, and consequently could be hard to read when facing a window.

As it uses a large 14in tube, Amstrad can fit more characters on the screen than usual. Most systems have 80-column by 25-line displays; the PCW has 90 columns by 32 lines, which gives 50 per cent more characters onscreen than usual. This extra size can be useful: in the word processor, for example, you can extend the number of words displayable onscreen.

Some CP/M programs can also be configured to take advantage of this extra room — I saw a version of SuperCalc 2 which managed to display more cells onscreen than it normally did. For CP/M programs which can't use the larger display, Amstrad supplies an 80 × 25 screen driver. The system is also supplied with Digital Research GSX graphics interface software, and can display graphics at a resolution of 720 × 256 pixels.

The display is OK rather than wonderful. It isn't as good as a standard monitor, but it's better than a 464 monochrome display. The larger size can be a real benefit for spreadsheets or word processing.

The PCW is a departure for Amstrad in that its previous machines have included the keyboard in the main casing; the PCW comes complete with a separate keyboard connected to the main system by a long length of cable and a DIN plug.

The keyboard unit has its own processor which scans the keys and sends the codes down the serial link.

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The 'free' printer: control is via software from the main unit

If the keyboard were a house, it would be condemned for overcrowding: a total of 82 keys are fitted into the very small unit. It's easier than usual to hit the wrong key until you become accustomed to the layout.

Many of the keys are dedicated to the word processor. This gives the whole unit a strange appearance by computer standards, but it makes the keyboard a lot easier to use. The main qwerty typing section takes up most of the space to the left and centre of the unit; to its right are four function keys marked f1 to f4, and shifted to give f5 to f8. To the right of the function keys are the cursor/numeric/word processing keys. Many of these keys have more than one function, but none has more than two — the keyboard is so cramped, there is no space between the different functional areas.

Due to many of the keyboard legends being customised for the word processor, they may not make immediate sense under CP/M. Two examples of this are the control key which is marked ALT, and the escape key which is marked EXIT and which has been moved from its traditional top-left position to the right of the space bar.

One feature which I did like was the SHIFT LOCK key. Firstly, this key has an LED built in so that you can tell when it's engaged. Secondly, unlike most computer keyboards, the PCW's is disengaged either by hitting it again or by hitting one of the SHIFT keys — just like a typewriter.

Some compensation for the confusing legends under CP/M is that the keyboard is 'soft', so you can set a key to return any character code. Under CP/M, you can set up different keyboard definitions and store them on disk, then call them in with a suitable applications program. This is useful, as it makes it easier to set up special keys such as cursor control and editing so that they work with normal CP/M programs.

It is also useful because the system has an extended international character set which gives over 200 characters; these are usually accessed via the EXTRA key. Some of these characters are quite useful: for example, the symbol to raise a number to a power isn't on the normal keyboard legends — it is accessed by hitting EXTRA-U. Some users might want to redefine key sequences such as this.

The overall feel of the keyboard is very light, although the key action felt good enough. The main problem, as I have said, is that the keys are so close together you can easily hit the wrong key by mistake, but my mistake rate fell as I became familiar with the unit.

System software

The PCW's main operating system is Digital Research's CP/M Plus (or version 3, as it is sometimes called). The only exception to this is the word processor, which doesn't use CP/M but goes straight to the hardware. The word processor does, however, use CP/M file structures, so word processor data is available under CP/M and *vice versa.*

CP/M Plus was specially developed for the new breed of Z80 8-bit machines which use more than 64k of RAM, and is much nicer and more powerful than its more popular brother, CP/M 2.2. The main advantage of CP/M Plus is that it can handle bank-switching of RAM. The Z80 processor can only directly access 64k of RAM; to handle more memory than this, you have to switch different areas of RAM into the Z80's line of vision.

Having said that, CP/M Plus on the Amstrad doesn't directly access all the available RAM. Of the total 256k, 116k is set aside as a RAM disk; as far as the operating system is concerned, this is just a very fast disk designated drive M. Of the remaining RAM, 61k is given to the transient program area (TPA), and the rest is occupied by the basic input output system (BIOS), the basic disk operating system (BDOS), the console command processor (CCP) and the disk hash tables.

Having the BIOS, BDOS and CCP in RAM is useful in that it allows you to load the system disk just once — subsequent disks don't require these routines to be present as they are in RAM.

The 61k TPA is the area of RAM which is actually available to an applications program. At first sight it might seem that 61k out of 256k isn't that good, but in fact it is more than enough to run all the popular CP/M applications programs.

Installing PCW CP/M applications

```
Keyboard is very crowded with no gaps between the different
functional groups.

Front of main unit - large screen, on/off button, one vertically
mounted 3 inch drive. Space for another below taken by PCW
badge.

PCB totally different from 464,664 and 6128 No ROM just 256 byte
bootstrap  masked on the printer controller chip.
```

Fig 1 Example of printout

The disk drives: a 720k disk drive is available as an optional extra

programs has been made as simple a possible. One of the usual problems is working out the screen control codes in order that the program will work with your display. The PCW gets around this by putting a DEC VT52 terminal emulator between the applications program and the screen hardware, so as far as the application is concerned, it is talking to a DEC terminal.

The same thing has been done with the printer. Instead of running direct to the hardware, the printer is shielded by an Epson emulator, so you set the application to think that it is talking to an Epson matrix printer. This is all very neat.

In use, the PCW implementation of CP/M Plus is very nice indeed. The only slight low point is when you first boot up. I mentioned in the Hardware section that the bootstrap loader on this machine has been squeezed into 256 bytes of mask ROM in the printer controller. As it is such a tight squeeze, there is no room for any fancy boot-up screens or any error messages.

When the machine is first switched on, the screen lights up. When you insert a system disk, the machine displays horizontal lines down the screen while the system is booting. If there is an error, the screen will flash or the system will bleep. You can force a re-try by hitting the space bar.

When CP/M is booted, it looks around the hardware to see what is there and what isn't, and adjusts itself accordingly. If you have the option serial/parallel card plugged into the back, CP/M will set itself up so that you can access it using the usual device names. The same is true if you have a second disk drive fitted.

Disk drives are nicely handled on the PCW. Even if you only have one disk drive, CP/M is set up so that two virtual drives, A and B, are mapped onto the single physical drive so you can pretend to be copying from drive A to drive B. The system automatically tells you when to swap disks. The name of the current virtual drive is displayed in the bottom-right corner of the screen.

CP/M Plus has so many improvements over CP/M 2.2 it's difficult to list them. The most useful are that you no longer have the dreaded CP/M 2.2 BDOS ERROR ON A type error — you now get an MS-DOS style Retry, Abort or Ignore? error; and there is usually no need to hit CONTROL C to tell CP/M that you've changed a disk in a drive. These both make CP/M Plus much easier to use.

Other enhancements for CP/M Plus include date-stamping of files, password protection, and an enhanced DIR command which tells you everything except how many kbytes you have free on disk. It also has a full online help facility which explains how the commands work. I loaded this onto the RAM disk for fast access when I was stuck.

Applications software

If you're going to sell a machine as a word processor, it's obviously a good idea to include word processing software. In the case of the PCW, this software is known as LocoScript. As the name suggests, it has been written by Locomotive Software which writes or converts all Amstrad's system software. LocoScript was written by Locomotive specially for the PCW, but it does intend to convert it for other systems soon.

Although the version which I saw was pre-production and had a few features missing, it is obvious that LocoScript is a very powerful word processor. One of its advantages over a generic word processor such as WordStar is that as it was written for the PCW, it can take full advantage of the hardware, different printer pitch settings, and so on.

The general user interface of the word processor is to use pull-down menus in conjunction with the function keys and the dedicated word processor keys on the keyboard. Initially I found the system intimidating, mainly because the display is cluttered and some features are hidden a few levels down. When I became accustomed to the way it works, I had few problems.

When you first boot up the word processor, you are greeted by the file control menu. This is the most confusing and cluttered display on the system as it has to display a great deal of information.

LocoScript stores its document files in one of eight 'groups'. Each group has a template associated with it, and each time you open a new document, data from the group template is copied into the new document. This can be useful if you generate a lot of standard letters: you could have one group called 'Letters' which puts your address at the top, another called 'Memos' which sets up the memo format, and so on. When you delete a file, it is moved to a holding area and is only physically deleted if the system needs the disk space, so you stand a good chance of being able to recover accidentally deleted files.

All LocoScript files can be accessed from CP/M, with the different groups stored as CP/M 'Users'; the only trouble is that LocoScript files contain control information as well as text. When it is released, it will be able to read and write ASCII files as well as Amstrad 464, 664 and 6128 datafiles.

When you are editing a document there is approximately 30k of main RAM free, but LocoScript is virtual in the sense that it reads and writes to and from the RAM disk. Assuming that your RAM disk is empty, the maximum document size is about 130k.

The editing screen is usually blank except for the command bar and the ruler at the top of the screen. The screen can 'pan' like WordStar, so you can have documents wider than the width of the screen. Up to 99 ruler settings are possible in one document, and the system always remembers the layout information associated

Benchmarks

BM1	1.1
BM2	3.8
BM3	9.9
BM4	10.1
BM5	11.0
BM6	19.1
BM7	30.3
BM8	33.9
Average	14.9

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January issue.

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with the document.

There isn't enough space here to list all the features of the word processor, which is worthy of a review in its own right, but here are some of the highlights.

As you would expect, LocoScript can take full advantage of the printer, with its different character and line pitches, line spacing, and so on. These don't show on the screen, which always assumes single-spaced text, but the page markers on the screen do adjust so you obtain correct pagination.

Unlike many word processors, including WordStar, LogoScript avoids short lines, and you can set it to prevent this by splitting paragraphs over page breaks. You can also associate a specific piece of text with something else in order that you don't lose a heading the other side of a page break, for example.

Unlike some word processors, LocoScript wordwraps both up and down: most word processors can't move a word back once they have wrapped it into the line below. This feature is especially necessary for proportional spacing, where it is possible that a short word could have been fitted into the previous line.

When you are editing text you have already written, LocoScript will only display it in the correct format when you either hit the RELAY key or move somewhere else and edit more text. This relay feature is somewhat akin to CONTROL-B in WordStar, although in LocoScript text doesn't disappear off the side of the screen as it sometimes does in WordStar.

Headers and footers are of course included, plus the ability to vary the settings for odd and even page numbers. Printing can be done in background, so you can print one document while editing another. There is a slight speed overhead for this, but nothing too excessive.

Overall, the word processor provided with the PCW is a very powerful piece of software, even though it does take some time to get used to regardless of its pull-down menus and customised keyboard. The only things it doesn't have at the moment are a merge print facility or a spelling checker. According to Locomotive, both of these are on their way.

Two other pieces of software are bundled with the machine. One is the customary (for Amstrad) DR Logo, the other is Locomotive's Mallard Basic. Given Locomotive Software's fascination with the railways, I assume Mallard Basic is named after the old steam trains rather than a duck. Either way, it has been around for a long time on business machines and is well-respected. It is totally compatible with Microsoft Basic-80, so Microsoft Basic programs should run with no problems.

The original ROM-based Basic in the Amstrad 464 is a subset of Mallard Basic with operating system extensions. The Benchmarks show that the speed is respectable for an 8-bit machine.

One nice feature of Mallard Basic on the Amstrad is that it incorporates sophisticated file-handling routines, including a B-Tree algorithm.

With regard to generic CP/M 8-bit software, the PCW should run almost anything. I saw WordStar, dBasell, SuperCalc 2, Multiplan Cardbox, Friday! and Quest accounts running quite happily on the machine.

Technical specifications

Processor:	Zilog Z80 4MHz
RAM:	256k
ROM:	None to speak of
Keyboard:	82-key semi-dedicated word processor layout
Display:	90 × 32 green screen
Mass storage:	170k 3in disk built in
I/O:	Amstrad printer interface; optional RS232/Centronics card
Operating system:	CP/M Plus
Bundled software:	LocoScript, DR Logo, Mallard Basic

In perspective

At the price level the PCW is operating at, it's difficult to find any competition. As far as word processors are concerned, you could include the Sony Model 10, or a Brother typewriter with a disk drive, for example. The Sony is an order of magnitude more expensive than the PCW, and the Brother doesn't have anywhere near the features.

If you think of it as a CP/M machine, its obvious competitors are the Osborne machines, the Wren (if you can get one) and the Apricot F1e. All these are vastly more expensive and don't include a printer. Even if you push it and consider the Sinclair QL with a monitor and printer, there is still no contest.

The main competition comes from Amstrad's own 6128. This offers the same CP/M, plus games compatibility and colour for roughly the same price, but you do lose the word processor, 128k of RAM and the free printer into the bargain.

It is often said that whereas Sinclair is driven by technology, Amstrad is driven by the market. Nowhere is this better illustrated than this machine compared to the QL. The new technology of the QL is totally outshone by the price/performance value of a good-old Z80, with production costs taken to the bone.

This brings us to pricing. At £399 including the printer, there is no doubt that this machine is spectacular value for money if you consider it to be a small business or serious home machine. However, don't forget that you can't play Amstrad games on this machine — there is no compatibility with previous Amstrads other than CP/M. Amstrad is betting that there is enough volume out there in the 'serious' market to support the low price, although I'm still not sure how large this market is.

Documentation

I was supplied with photocopies of the proof of the manuals, which seemed quite comprehensive. Apparently, the final versions will be supplied in two spiral-bound books. Most of the documentation has been produced by Locomotive Software, which makes sense — the company wrote the word processor and the Basic, and it also implemented CP/M Plus.

Prices

The PCW with a screen, 256k of RAM, one 170k disk drive, a keyboard and the printer will sell for £399 plus VAT. This represents amazing value.

Conclusion

How can you criticise a machine that gives you 256k of RAM, a disk drive, a monitor, a printer, a very good word processor, Basic and Logo for £399 plus VAT, even if it does use our name? END

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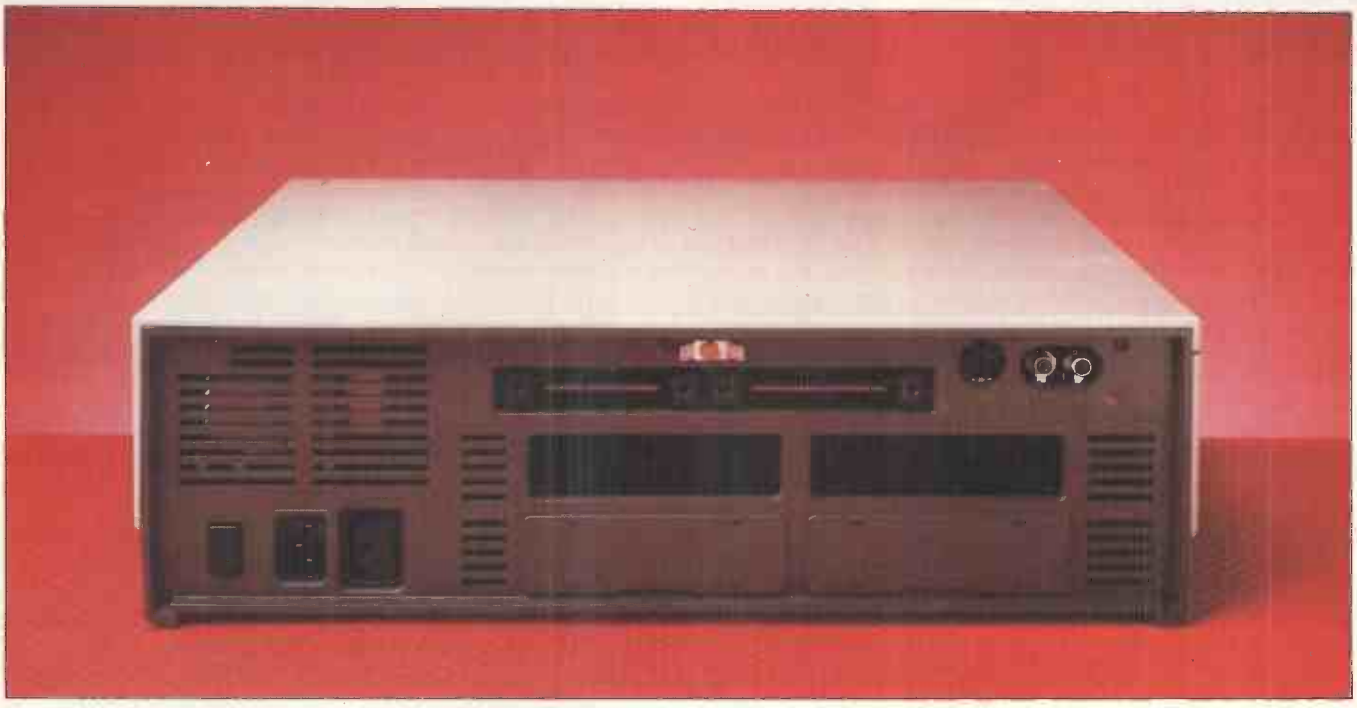
Philips: Yes

Will the Philips :Yes successfully challenge IBM for the low-cost PC market? Colin Barker puts the new Philips micro through its paces.

Photograph by Gareth Trevor



A large collection of input and output sockets dominates the back of the machine

Of all the European computer suppliers, Philips has been among the most disappointing in the PC market. An electronics giant, Philips has had great success in the home and office electronics market, but none of its personal computers have inspired enthusiasm. The situation could change with the launch of the strangely named :Yes (the colon is obligatory).

Secrecy has surrounded the micro for some time. All that has been known is that it is 16-bit and runs Digital Research's DOS-Plus operating system. The reason for the secrecy lies in the ambitious plans Philips has for this computer.

The :Yes originates from Philips in Austria. It is aimed primarily at the education and business markets but with scope for home use. With prices starting at around £1000, it should appeal to those who would like a serious business computer at home but who find the likes of the Macintosh or IBM PC too expensive. The :Yes incorporates an operating system that fully supports networking, and is compatible with MS-DOS/PC-DOS version 2.11, which should make the machine suitable as a low-cost terminal/workstation for large organisations which want to network IBM-type PCs together.

Philips plans a big advertising campaign, and is spending a lot of money on documentation and packaging in the hope of selling the machine in very large volumes. It will come up directly against low-cost systems like the Apricot F1, Sanyo MBC555 and, to some extent, the forthcoming Atari STs and Commodore's Amiga.

Hardware

A pre-production model was provided for the Benchtest (in fact it was the *only* pre-production model) so there was a lot of spaghetti-like wiring hanging off the back of the system unit, and non-standard features such as a German keyboard. Enough was as it should be in a final version, however, to be able to test it properly.

The system unit is a grey box with a large opening at the front to allow the keyboard to be slotted away when not needed, so preserving desk space. There are two 3½in microfloppy disk drives, which would fast become an industry standard in small business systems if manufacturers could only agree on how much data they want to put on the disks — in this case it is 750k unformatted, 720k formatted. The drives are from TEAC and are compatible, apparently, with the drives on the Apricot, but this doesn't mean that applications for the Apricot will run on the Philips: Yes as the systems are very different.

On the front of the machine is a feature I believed I would never see again on a business system — a socket for a 128k ROM cartridge. Philips hopes to make some applications software available on ROM cartridges. In the past software suppliers have been reluctant to take up this option on systems due to the high cost of ROM cartridges. Perhaps it is time for another look, but I can't help thinking that RAM disks are just as good and cheaper. RAM disks are also a feature of the :Yes's operating system, proving, perhaps that you cannot have too much of a good thing.

The processor is the little-used Intel 80186 (smaller brother of the 80286 which is used in the IBM PC/AT and clones). It has 16-bit addressing and, unlike the 8088, a 16-bit data bus. It potentially has a better performance than the 8088 as it incorporates the CPU and the supporting chips used in the IBM PC on one chip. It is capable of addressing up to 1Mbyte of memory and runs at a fast 8MHz. It does not have the sophisticated memory-handling facilities of the 80286 which allow that chip to address over 3Mbytes of main memory.

The 80186 is quite a sophisticated piece of technology to have in a computer costing £1000. Although it is not as sophisticated as the 32-bit addressing Motorola 68000 found in the new Atari and Commodore machines, it has the great advantage of inherent compatibility with the IBM PC.

There will be two distinct versions of the final :Yes system. The Entry Models will have 128k of RAM, using the rather dated 64k RAM chips; the other version will have a standard 256k RAM and use 256k RAM chips. Both systems have provision for memory expansion onboard — the former to 256k, the latter to 640k.

A panel on the side of the machine reveals a large gap for expansion boards to be plugged in horizontally. At the back there is a large collection of input and output sockets. Rather than explain the options on the pre-production model, I'll describe the expansion options and ports that will be available on the final machine.

The :Yes Entry Model will have 128k RAM and one disk drive. There will be two expansion slots for extra boards and the ROM cartridge slot which is standard on all models. The ports offered on this model are: an external floppy interface (suitable for attaching an IBM PC format disk drive); a parallel printer interface; a serial RS232 interface; and a composite video connection. A TV interface will be available as an option.

The Entry Model version 2 will be the same but with the provision of a second disk drive.

The :Yes PC will have 256k RAM, two disk drives and the same ports, but with the addition of a hard disk interface for one or two external drives of up to 30Mbytes capacity each, and a mouse interface. It will only have one expansion slot as the hard disk interface will take up the other one. It will also have a battery-backed clock. Finally, two extra ports for an RGB monitor and an IBM-type monochrome screen will be included.

The :Yes Top Model is the same as the PC, but has 640k RAM as standard.

All the cables plug into sockets at the back which are arranged in a fairly conventional way. On the review model there was a lot of empty space at the back letting in air and dirt, which presumably will be changed on the production versions.

A screen will not be a standard feature of the :Yes. Although Philips will make two monitors available, users are free to pick their own as long as it's compatible. There is 64k of ROM on the system, which has a self-test routine and video-handling software. The system has a wide choice of video resolutions. With a composite video or RGB monitor the options are: 640 × 250, 80 × 25 characters and four colours (RGB); 320 × 250, 40 × 25 characters and 16 colours (RGB); and 160 × 250 and 16 colours. The last two options can also be used with a TV screen. With an IBM-compatible monochrome screen, the graphics are 640 × 250 and 80 × 25 characters, black and white.

There is a 512 character set, 256 of which are compatible with the IBM character set and another 256 Philips characters that can be user-definable.

The test model had a Zenith screen (courtesy of one of the UK distributors for Philips, Systemstate) and the image was poor, but this was probably due to a fault in this model. I tested the system with Digital Research's GEM and the graphics resolution was very good when displaying that package.

'If IBM PC compatibility is proven in the final models, then it can be seriously considered as a home system for users of IBM PCs at work. It has more power and sophistication in the operating system . . .'

Two keyboards will be available for the system, and the user can choose either at no extra cost. The test model had a keyboard with flat, calculator-like keys. A keyboard with properly sculpted keys will be the other option.

The keyboard tucks under the front of the system and is attached to it by a coiled wire that is fairly easy to plug in. It follows the IBM-style layout with a few changes. The qwerty keypad has good-sized SHIFT keys, a RETURN key, two CONTROL keys and two ALT keys. These are all improvements on the IBM keyboard, although there is still nothing like the feel of a proper keyboard. That should not upset non-typists, though. There is a numeric keypad to the right and separate cursor keys below. The 10 function keys are arranged across the top of the keyboard, and two lights for CAPS LOCK and NUM(ber) LOCK are on the top right-hand side.

The keyboard is functional and a good size, but from its description I think I would look at the second keyboard if I was using this system for serious business use.

In use, the system is comfortable to work with. The box is small enough not to dominate the average desk. The disk drives are very noisy, but to be fair Philips did point this out before the review was started and said that production models will be a lot quieter. I hope Philips also does something to speed up the drives which were very slow. Speed of processing is very quick, but graphics systems like GEM still manage to appreciably slow it down. I cannot understand why this should be the case with such a hefty processor, but GEM seemed to run almost as slowly as it does on the IBM PC.

The review model's German keyboard had flat, calculator-like keys and tucked under the front of the system

System software

It is not certain yet which items of system software will be available on the final version. However, the main operating system will be DOS-Plus. It incorporates most of the best features of Concurrent-DOS (which was Concurrent CP/M-86) with a greater level of compatibility with IBM's PC-DOS 2.11.

The best features of Concurrent-DOS are the multi-tasking (up to four tasks can run at once) and windowing, but there are a lot of other features on DOS-Plus that make it one of the most powerful single-user operating systems I have ever seen.

When the :Yes is powered up (there is an on/off switch at the back of the system unit that is easy to get to) DOS-Plus can then be loaded from disk. Philips is thinking about making it available on a ROM cartridge — according to Digital Research it will comfortably fit into 64k of ROM, making it fairly compact for the features offered.

Two options are available for using DOS-Plus. The user can either go for the standard way of working via command words and the A> prompt, or use a feature called File Manager. If this option has been pre-configured, on booting DOS-Plus a window appears with four sections on it. On the top-left is the format of the disk in use and the free space available. In a large window is the directory of files, and to the right is the command panel which gives the available DOS-Plus options.

By scrolling through the commands with the cursor keys, you choose an option and then follow the instructions. This interactive system will be user-friendly for beginners but it is nice to have both options — if you are familiar with CP/M or MS-DOS, you will not have to slow yourself down with windows and menus.

There is provision of hierarchical directories as on MS-DOS versions 2 and 3. This is to make the system as compatible with MS-DOS and PC-DOS as possible.

According to Digital Research, DOS-Plus should run all the applications software written for PC/MS-DOS, which use normal operating system calls only. That is the easy part. There is also an IBM-like BIOS (basic input output system) so that applications which bypass the operating system sometimes and address the BIOS directly (for example, Lotus 1-2-3) should also run on the system. The only software that should not run are applications that talk directly to the hardware in the IBM PC (Flight Simulator is the classic example here).

Philips maintains that it is not too worried about IBM compatibility but the promotional literature states something different, with PC-compatibility being pushed as a major point of the DOS-Plus operating system. The :Yes also has a floppy interface for, presumably, an IBM format drive.

The Zenith screen gave a poor image.

DOS-Plus is also compatible with all 16-bit implementations of CP/M on Intel processors. It has the capability to multi-task, or at least run one application in the foreground and three in the background (you can only see one application working on the screen at a time, although others may be printing, recalculating, sorting, or whatever). PC/MS-DOS does not support this feature, so only one specifically IBM-type application can run at a time.

The 80186 is fully capable of supporting this type of concurrency and the results are impressive. This is a feature that every modern, single-user operating system should have as it saves so much time (especially when printing). If it is not included on further implementations of PC/MS-DOS, I will be very surprised.

Other features of DOS-Plus include full network support. It will work with both DR Net and MS Net, as well as other networks. With DR Net, the links to the network software are all included in the basic implementation of DOS-Plus. It will support up to three virtual drives in memory (if you have enough) and each of these can be designated a sub-directory in the filing system. The practical upshot of this is that, used on a network, the user may only need one disk drive (just for loading and storing personal applications and files). Centrally-held applications can be called from the file server, or wherever they are stored, and loaded into memory. Disk-based applications therefore become much quicker.

Although some of the most powerful features of DOS-Plus could not be tested on the review machine, it looks like being an extremely impressive operating system.

Optional system software will include GEM desktop — the GEM Graphics system is included in DOS-Plus.

I found the operating system easy to use and enjoyable — almost! Using the command line system is familiar territory to CP/M or MS-DOS users, and the File Manager is a useful alternative to basic housekeeping.

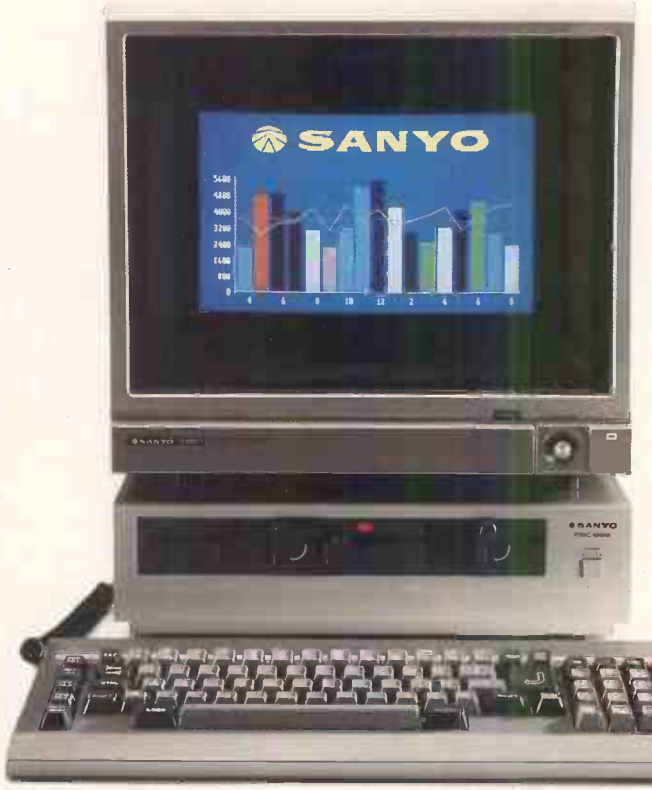
Having the option of GEM is good

Benchmarks

BM1	0.9
BM2	3.5
BM3	7.4
BM4	7.6
BM5	8.0
BM6	17.0
BM7	24.1
BM8	21.4
Average	11.24

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January issue.

MBC 885 £1,390 + VAT.* MS-DOS 2.11. 256K RAM expandable to 640K. 2 x 360K drives. RGB colour/mono outputs. Centronics printer port. Seven IBM-compatible expansion slots. Provision for hard disk. Twice as fast as IBM PC. Free Wordstar 2000 software. Full IBM compatibility.



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news for those who like that type of system, but few software companies that I know of have yet implemented software to run in the GEM windowing environment, and until that starts to happen, it still ranks as a nice idea. File Manager is perfectly adequate for the most unsophisticated user, however, and it does not slow down the machine.

Applications software

No applications software is included with the :Yes lower models, but the PC and Top models will have Open Access bundled with them. By the time the system becomes available for sale (scheduled for October), according to Philips an impressive list of software will begin to be available in 3½in format. GW-Basic, DR Logo and Turbo-Pascal will be the languages; WordStar, Multiplan and the new Logistix package from Graphox will be the main applications.

Following these will come C, Fortran and Cobol, Microsoft Word, Word Perfect, SuperCalcs 2 and 3, and dBase-II. dBaseIII will be available in November, Lotus 1-2-3 and Framework will follow early in 1986, and Philips is currently talking to many other software houses.

One of the main problems with reviewing systems that are forthcoming is that there is plenty of talk about applications software arriving, but often the plans are not matched by the eventual output. In this case, things might be a little different. Firstly, Philips appears very keen on the system and wants to make it a big success, and the company has the name and clout to persuade software companies to produce software. Secondly, the machine is semi-compatible with the IBM PC, so many software companies should find that it is not too difficult to convert IBM PC software to run on this system. We will just have to wait and see.

Documentation

All the manuals were at the printers when I reviewed this machine, but two photocopied manuals were provided. One was an amazingly incomprehensible Digital Research Guide to DOS-Plus (when is Digital Research going to achieve some consistency with user documentation?). The second manual was a Philips guide to software writers, which was comprehensive enough. The user documentation, says Philips, is going to be excellent—glossy paper, lots of illustrations, and the like.

Prices

I was given two approximate prices for the system. The bottom-end machine (one disk drive, 128k RAM, and so on) will be £995 including keyboard and operating system, but not monitor. The PC model will be around £1495 without monitor. Compared to the Commodore and Atari machines this seems rather expensive, but comparisions can only really be made if, and when, the three systems go on general sale.

Conclusion

This is not my ideal machine, but it is getting close to it. The idea of putting a fairly heavyweight processor in a low-cost box is appealing. Throw in a large degree of IBM-PC compatibility and a really powerful operating system and you're getting close to what low-cost business PCs should be like.

However, question marks remain. I was not able to see the final documentation, some of the most interesting parts of the operating system in action.

But, if Philips gets the bugs ironed out and produces top-quality documentation suitable for both first-time and experienced users, it will have the makings of a successful system. As a business system it has a lot going for it: it should be seriously considered as a low-cost option for a workstation on a network. If IBM PC compatibility is proven in the final models, then it can be seriously considered as a home system for users of IBM PCs at work. It has more power and sophistication in the operating system, which makes it a rare pleasure to use.

In the education market, it has potential for students to be able to use the type of computer that is becoming commonplace at work.

I'm going to wait and see what happens with the final model and with other suppliers. The more types of system like this there are, the better.

Thanks to Systemstate for making the Philips available for review. END

Technical specifications

Processor:	Intel 80186 running at 8MHz
ROM:	64k
RAM:	128k, 256k or 640k as standard
Mass storage:	Single or twin 720k (formatted) 3½in disk drives
Keyboard:	99 keys flat or sculpted
Size:	16½ins × 14ins × 4½ins
I/O:	One or two expansion slots, RS232, parallel printer, floppy disk interface, composite video, or RGB and IBM-compatible, TV option. Hard disk and mouse interfaces standard on top models
DOS:	Digital Research DOS-Plus

In perspective

The :Yes is very different to the Atari and Commodore machines reviewed in recent issues, and each is aimed at subtley different markets, but together they represent an interesting and important challenge to the present IBM domination of the PC marketplace .

Atari and Commodore have produced systems that will appeal to the home, educational and business markets, although they are fighting shy of directly facing IBM head-on. However, if all three computers go on sale soon at the specified prices, it will be possible to buy computers with more than twice the speed and performance of the IBM PC at just over half the price.

IBM has, unusually, gone on record saying that no PC Mark 2 will appear this year. This is because it felt speculation about a new PC would affect the sales of the PC Mark 1. IBM is dragging its heels. Atari, Commodore and now Philips are leaping into the resulting gap. All these micros look better than the IBM PC.

Many will rightly argue that IBM has produced a much superior system in the AT, but that is a big, bulky, expensive box, with power that will 'blow your hat off'. This is fine for the big corporate users who may want that kind of thing, but what about letting users with more modest purses have access to similar 'power'.

The Philips :Yes comes close to being what I think the next IBM PC should be. Faster, more compact and cheaper while remaining fairly compatible. If IBM is not willing to produce this kind of system, other suppliers are. The message seems to be that IBM has stagnated in this market for long enough, so let's get the interest back into business PCs and start moving forwards instead of marking time.

There is, however, an inertia that seems to require corporate buyers to go for IBM, however poor the product offered in terms of value for money. Any corporate user looking for a personal computer, network, terminal, and so on, must soon take notice of the new alternatives coming along in the absence of the PC2.

Threaded operation

Paul Dourish describes the principles involved in creating a threaded interpretative language (TIL) compiler, using Forth as his example language.

We have all seen pictures of the early computers; giant machines such as ENIAC which filled entire rooms with boards full of hot valves, and did calculations three times in case a valve blew half-way through. The progress made from those machines to the modern micro is easy to see. Perhaps not quite so obvious are the advances made in software, and especially in the field of programming languages.

In the early days, programs were 'hard-wired'; to change the program involved physically rewiring the computer. Later, machine code programs were keyed into the computer in binary, using switches on the front panel. Pure machine code was used as it is very machine efficient, and in those days machine time was much more expensive than human time. High-level languages were introduced, with Fortran designed by an IBM team under the leadership of John Bachus, while at about the same time, Algol was designed as a theoretical language but not implemented.

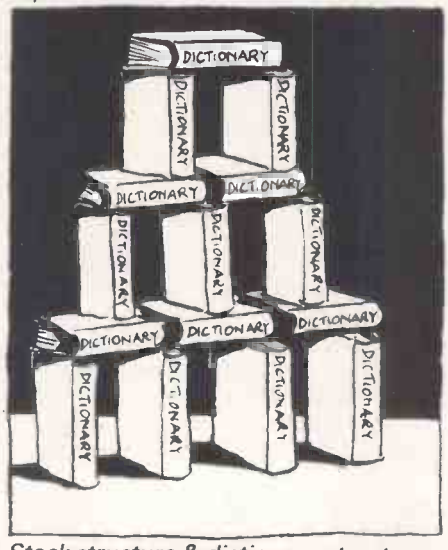
As other languages were developed, they all had their own particular features but generally followed the same pattern. These are the Algol-derived languages and are with us today in such languages as Pascal. However, at various stages, there have been programmers, dissatisfied with the state of language design, who have designed new languages with often quite fundamental changes. One departure from the standard line of programming language is Forth, designed by Charles Moore. Forth is radically different from its peers and achieves its efficiency in memory consumption, ease of use and execution speed through being a threaded interpretative language.

Forth

The main principles of Forth, which is the best example of a threaded interpretative language (TIL) and the one with which most people are familiar, are fairly well-known, and have been covered in introductory articles in this magazine and others (see, for example, July's *PCW*). Although the main purpose of this article is to show the techniques involved in building a TIL compiler, a brief outline of Forth is necessary as an introduction.

When you are supplied with your language, it really only consists of simple instructions performed by machine code routines called 'primitives', and a little code to do the compiling. Then, you build up these routines: you write your own programs and functions (in TILs, these are called 'words') to perform slightly more complicated operations, but you define these in terms of the simpler words. When defined, new words can be included in more complicated definitions, so you bridge the gap between the simple operations and the complex ones the computer is to perform.

Words which you have defined are called 'secondaries' to distinguish them from the primitives or 'primaries'. It is vaguely like defining a subroutine in Basic, or a procedure in BBC Basic. The main difference is that the TIL now regards your word as being equally as important as any of the primitives, as it cannot tell the difference between them. The other important thing you must learn about the way Forth works is the 'stack'. Where other languages use variables to store values, Forth uses the stack. You may have come across a stack before in assembly language, but for those who have not, here is a brief representation.



Stack structure & dictionary structure

The stack is a 'data structure'. It is a way of collecting many pieces of data and imposing a format upon them so that they always behave in the same way, and can, at times, be regarded as a single unit, like an array. We usually classify data structures by the order in which their elements are processed. For example, in an array, an element can be put in any position at any time: that is, you can jump straight in at the twentieth element, or at the thirty-first, or whatever.

With a stack, however, there is a definite order in which the elements are processed, read and written; the rule governing this is 'First In, Last Out' (usually shortened to FILO). Imagine a stack of books — you put each one down on top of the last, so that when you take them away again the first one you pick up is the last you put down. This is the way a data stack works (except, of course, that it uses numbers rather than books). We call the operation of putting a number onto the stack 'pushing' the number. The inverse operation, taking a number from the stack, is called 'pulling' the number, or 'popping' it from the stack. In Forth, we use the operator . (dot) to pop the stack. Using . (and pressing RETURN, of course) will cause Forth to take the number off the top of the stack and print it on the screen.

The stack forms the basis of all Forth arithmetic, which uses a format called Reverse Polish Notation. The numbers to be operated on are entered before the operator, and are pushed onto the stack. The operator then takes the values off the stack, uses them, and pushes the answer back onto the stack. This means that 3+4 must be written as 3 4 +, and 6*10+5 as 6 10 * 5 +. After, say, 4 3 +, the number 7 is on the top of the stack.

A TIL in use

How does a TIL work? We have already seen that the TIL program itself is really only a lot of small machine code routines that perform very simple operations, such as putting numbers onto the stack, doing arithmetic, and manipulating the stack in various ways. When you type a line of code into your TIL, it scans it from left to right looking for instructions. Whenever it finds a number, it pushes that number onto the

Illustrations by John Shelley

stack. Otherwise, it deduces that, if the symbols it reads do not constitute a number, then they must be a word, either a primitive or a secondary. To check this, it looks up a table called the 'dictionary'.

The dictionary contains the names of all the words which have been defined either by you or by the system, and for each it gives an indication of where the machine code is to be found so that the TIL can execute the instruction. The exact nature of the data held in a single dictionary entry depends both on the type of word defined (primitive or secondary), and on the implementation of the TIL. The beginning of the entry almost invariably holds all or part of the name of the word, and, if only part is held, then an indication of how many characters there are in the word name. However, most of the differences in dictionary entries occur in the second section, which deals with where the machine code to execute the words is stored. More detailed examinations will let us judge the relative merits of the various approaches.

Usually, the section of the dictionary entry that deals with the location of primitive code in memory contains that code itself, so that it can be directly executed. However, there are four ways of storing the same information for a secondary, and these are called direct-threaded, indirect-threaded, token-threaded and subroutine-threaded. For the purposes of this article, the first three can all be classed simply as pointer-threaded, as the only major difference in philosophy is between the first three and the fourth.

Pointer-threaded code

In pointer-threaded code, the information held in the dictionary entry consists of a series of pointers to the executable code. In other words, it contains a list of the start addresses of the routines to do each of the individual words that go to make up this word as a whole. Therefore, if we have defined a word MYWORD in terms of three primitives, PRIM1, PRIM2 and PRIM3, then the pointer-threaded code for MYWORD in the dictionary is a list of the addresses of the executable machine code for PRIM1, PRIM2 and PRIM3. This means that when we come to run the program (that is, to execute the word) we must call another program, generally called the 'inner interpreter', which will read each address, jump to that address, execute the code it finds there, and return to the address list ready to read the next address.

Subroutine-threaded code, on the other hand, takes advantage of the fact that the processor already has the ability to jump to a given address and return to the address from which it jumped, with its 'Jump to Subroutine' code (JSR in 6502 assembly language and CALL in Z80). Instead of giving just the list of addresses, subroutine-threaded code stores a JSR opcode in front of each address, effectively making each address into an instruction to jump to the subroutine at that address. For our MYWORD example, the compiler produces something akin to:

```
JSR PRIM1
JSR PRIM2
JSR PRIM3
RTS
```

Instead of having to write an inner interpreter to decode the address list, the TIL compiler designer need merely cause his program to jump to the first instruction of the code stored in the dictionary to execute the secondary. It is interesting to note that if, as previously suggested, the machine code for the primitives is stored inside the dictionary, then the TIL is behaving in the same way for both primitive and secondary words, which is more elegant than having to call an extra subroutine to run some words but not others.

The advantage of pointer threading is that, as there is no need to store JSR instructions throughout the definitions, it will take up less space. The advantages of subroutine threading are that it is faster (as the processor can interpret the code faster by itself than the inner interpreter could), it does not necessitate the design of an inner interpreter, and it is easier to implement. There is a compromise to be made, but it seems that, for a first compiler, subroutine threading has the edge.

Writing a TIL compiler

The task is so simple that it is practical to write the compiler completely in assembly language, without any recourse to the high-level languages normally used to write compilers for more complicated languages. There is a simple series of steps to follow to design a working TIL compiler, suitable for use on a micro. These are:

(i) Design of the language selected for compiling. For example, what will the primitives be? How will they fit together?

(ii) Design of stack structure and dictionary structure. These two data structures will affect every detail of your compiler, so do not skimp on their design. You must strike a balance between having enough space in the structure to implement all the features you want, and having enough space left over for the rest of the compiler, and to do something useful with the language when it is running.

(iii) Writing the basic primitives. These will be for stack manipulation, arithmetic operations, and the decoding of numbers from characters to integers. This will depend on how wide you have decided to make your stack. Do not forget negative numbers — are you going to allow them? How can you handle them?

(iv) Testing the basic primitives. I have included testing as a separate section as it is so important, and so often overlooked or hurried. You must test each individual word thoroughly, plus combinations of words, to see how they interact. Above all, you will have to adopt a methodical approach to the testing, otherwise you will be in no state to correct an error when (not 'if' — there *will* be errors!) you find one.

(v) Writing the next level of primitives. These will be the more complicated routines, for example those handling looping, jumping and branching. Their implementation will be more complicated than those of the others, and they will require considerably more thought.

(vi) Testing the next level. This is even more important than testing the other routines, as testing these is far more difficult. It is trivial to spot that a routine which claims that 2+2=37 could do with some adjustment, but the errors involved with looping are very different and fall into two groups: those that are very subtle so you don't notice them until it's too late; and those which jump off into the memory and completely crash your system.

'Make sure that you keep back-ups . . .'

Make sure that you keep back-ups. I can tell you from bitter experience that losing a day's or a week's work is extremely annoying.

(vii) Writing the parser. This is the section of the program that is, you hope, going to take your source program, produce suitable object code, and place it correctly in the dictionary. This is very tricky and can cause spectacular errors due to the number of stages at which you can go wrong. However, you should survive if you remember *exactly* what you have to do, and break it down into subsections. Code and test each subsection independently (for example, you would have one subsection to create space for a new dictionary entry, and another to find the address of the code of a previously-defined name). Don't neglect the error conditions, such as undefined words in the input.

(viii) Testing the parser.

(ix) Merging the parser with the primitives. Assuming you have been logical and consistent in your approach and haven't done anything silly such as

changing your dictionary structure mid-way, then everything should be alright. However, the fact that everything should work in theory does not relieve you of the burden of . . .
(x) Run-testing the entire system.

'Run-testing the entire system'

You can now write the compiler (don't let the apparently huge volume of work daunt you), and you will require more detailed information about the sections I have just outlined. Any examples given from now on come from my own compiler, which was written for Forth on the BBC Micro (6502 assembly language), but the algorithms and methods given are applicable to any TIL or language.

The first step is to choose the language you want to compile, and in this case I chose Forth. The version I implemented is a subset of the Forth-79 standard; as the object of the exercise was merely to see if I could write a TIL compiler at all, the actual language itself was relatively unimportant, so there was no need to take special pains to ensure a complete Forth-79 implementation.

The second step is the choice of a suitable structure for the stack and the dictionary. The first version of the compiler I wrote used a stack of eight-bit unsigned integers (that is, in the range 0 to 255). This is obviously the easiest stack to implement on an eight-bit machine, both from the point of view of the stack manipulation itself, as well as from that of the arithmetic routines. However, this really was not terribly useful for doing anything practical, so I updated it to run with a stack of 16-bit, signed integers which have the range −32768 up to 32767. This step is more difficult than it sounds, but it means I can now store addresses on the stack, which is important for the implementation of Forth variables. Two bytes of zero page storage were also laid aside as the stack pointer: that is, these two bytes hold the address of the top item on the stack.

It is far more difficult, however, to decide upon a suitable dictionary structure. I stored the entire name of the word, rather than just part of it (many Forth compilers store only the first three or four characters), and, to facilitate recognising the words, the space character is included at the end of each as if it was a part of the name. The extra space character is also counted in the byte that indicates the length of the word. It is easier for the system to handle if the length byte comes at the beginning of the dictionary entry, before the name, so the compiler always knows where to look for it. Therefore, the first byte of the entry contains the length of the word name (plus the final space), and this is followed by the name itself (again, with the final space). After the name comes a two-byte link address which points to the absolute address of the next entry in the dictionary. Finally comes the code, which usually consists of a series of JSR instructions, terminated by a return instruction. If this is not included, the processor will try to execute the length and name of the next word as machine code, and the system will probably crash. Fig 1 shows a sample dictionary entry.

Writing primitives

After all that, getting down to writing the primitives is really quite a relief. The first primitives to write are those to push and pull numbers from the stack. It is probably a good idea to set aside a section of memory, say 10 bytes long, to act as temporary storage for primitives, and for exchange of data from one section to another. In my compiler, this space runs from TEMP to TEMP+9, and the allocation of this space depends on the function or procedure being run,

'Testing the basic primitives'

although locations TEMP and TEMP+1 always hold the number to be pushed onto the stack or that just pulled from the stack, depending on the code being run. This way, the other primitives always know where the data is after it has been pulled.

After you have written the push and pull routines, the next ones to tackle are simple arithmetic and logical routines — add, subtract, and, or, not. At this stage, you may also want to add a negate, as this is not too difficult (do not confuse not and negate!). The only routines in this part of the design that might give you any trouble are multiply and divide. (Don't forget that your language may require, as Forth does, both div and mod functions, and so you should really write your divide routine to find both so that the correct answer

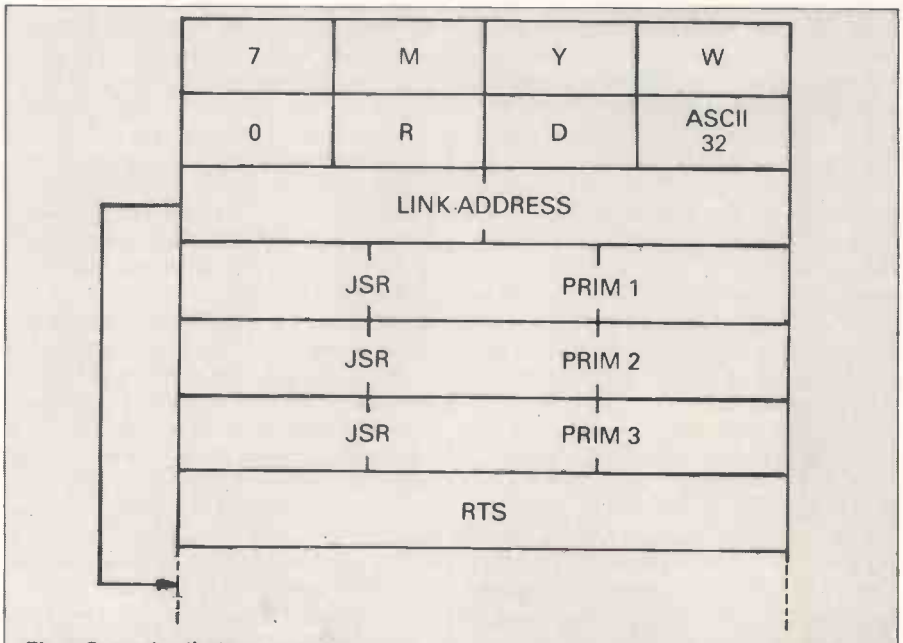


Fig 1 Sample dictionary entry

(either div or mod) can be selected at a higher level of the program, before the result is pushed back onto the stack.) However, although these are more complicated than the others, they are still relatively simple to write, and standard routines to find in books and library programs. If you can't get hold of suitable subroutines, designing your own is remarkably easy.

The best method is to do a long multiplication, in base 10, and at each stage note carefully what you are doing. Then make up some binary numbers and try multiplying them on paper in binary, following the same steps as for decimal. Now check the result of your calculation by converting the two numbers into decimal, multiplying them, and converting the answer into binary for comparison with the answer you obtained before. When you've got the hang of this, you can code it fairly simply. A similar procedure should also show you how to write a division routine. (Note: if you're using signed integers and two's complement notation, your routines will have to allow for this.)

Now that your first primitives routines are ready, you can test them. At this stage, your compiler has no section to control execution, so you will have to use a number of subroutine calls to simulate a program running in the eventual compiler. Test each section separately, then combine them, to ensure that there are no errors due to, for example, two routines overwriting each other's temporary storage space. As you go along, keep a note of the tests you have made and the results — this can be invaluable for debugging. You should also make extensive use of breakpoints to study the flow of the program. (A breakpoint is a stop or BRK instruction introduced into the program for debugging purposes. When you think you know where the program ought to be going, but the program doesn't seem to agree with you, then you can set up breakpoints in various places to see where the program goes.)

Now the difficult part begins: you must write the routines to handle looping and branching. To investigate how to do this, we must first note how to do looping in Forth. There are two standard Forth words to handle all looping: DO and LOOP. The word DO comes immediately before the body of the loop, and expects to find two arguments on the stack.

The first of these, on the top of the stack, is the initial value for the iteration counter. (The iteration counter counts how many times you have been round the loop, rather like the index variable in a Basic FOR . . . NEXT loop.)

The second argument, below the first on the stack, is the final value of the iteration counter plus one. The word LOOP signals the end of the loop body, so to repeat a word MYWORD 10 times, you would use:

```
11  1    DO MYWORD LOOP
```

'. . . those handling looping, jumping and branching'

We will now see how these words can be built in Forth. Firstly, we need a new stack, to be called the RETURN stack. This is really only for the machine's use (although Forth allows the user access to it), and it is used in loops to store the loop parameters. These parameters are the current value of the iteration counter, the final value of the iteration counter plus one, and the absolute address of the machine code making up the body of the loop. When Forth encounters the word DO, it calculates the address of the body of the loop (based on the position of the call to DO), and pushes this onto the return stack. Execution of the code then resumes.

Most of the work of the loop is done by LOOP. When a loop occurs, the current value of the iteration counter is pulled from the return stack and incremented. It is then compared with the final value plus one, to see if the loop is finished. If the comparison shows that the current value is less than the final value plus one — that is, the loop is not finished, then the current value of the iteration counter is replaced on the return stack, and the address of the body of the loop is read and replaced on the program counter, causing the program to loop. If the loop is over, then all its parameters are removed from the return stack.

Conditional statements

Conditional statements must be implemented quite differently. Forth uses the words IF, ELSE and THEN to handle conditions. IF pulls a value from the stack and decides whether it is true or false (in Forth, zero is false and any non-zero number is true). If the value is true, then it continues executing words until it finds an ELSE. If the value is false, it jumps to ELSE and begins execution from there. Whenever a THEN is encountered, normal execution resumes, regardless of the truth of the original value.

In addition, Forth has the relational operators <, > and = to allow conditional execution of words depending on the relationship between two objects. (Note: like all other Forth operators, the relational operators require Reverse Polish Notation. A < B is written as A B < .) A simple way of allowing execution of conditional statements is to have a flag (let's call it EXECUTE) which indicates whether or not the machine is in execution mode. When EXECUTE is set, words read are executed; when it is cleared, words which do not affect it are completely ignored. There is no need to jump to various sections of the code, depending on the outcome of an IF word. Instead, EXECUTE can be set or cleared depending on the state of the number on the top of the stack, and then all the code is stepped through.

When your looping, conditional and relational words have been written, you will have to test them. As was previously mentioned, testing these words is very different from testing the arithmetic words.

As they control program flow, the errors they produce can be quite spectacular, and may frequently result in crashing the system and losing your program. It is better to remember to make back-up copies of your program than to learn the hard way.

There is now only one section left to write — the parser. In fact, like most of the general TIL compilers, a TIL parser is very different from a parser for any other language as each word is a completely self-contained unit. The parser does no actual parsing at all — it is effectively a word recogniser. Words are read from the input until a separator (in the case of Forth, a space) is read. At this point, there is a word stored in the input buffer. The program checks to see if it is a valid number, and if so it is interpreted as such. Otherwise, the program looks up the name in the dictionary. If it is not found, an error is reported; if it is found, the appropriate semantic action is taken.

The parser, then, is a very simple routine which traps special cases before handing control to the dictionary search section. Another routine should be added which allows you to write bytes to the present output code location and update the output code pointer, and so on, to simplify the code generation. With that, you should have a working TIL compiler.

Conclusion

In general, a compiler is a major piece of software. However, the very fact that I have managed to describe a complete TIL compiler in such a (relatively) small space testifies to the ease with which such a compiler can be written. Writing a compiler gives an excellent insight into how a language works, and this can only help improve the quality of your programs.

TILs in particular are easy to implement and compact in design, making them well-suited to micros. END

Sord IS-11C

How does the Sord IS-11C lap-held micro hold up against strong opposition from established machines? Nick Walker assesses this 8-bit computer for the user-on-the-move.

Photograph by Terry Beddis

The keyboard comprises 62 full-stroke keys and eight calculator-type keys, including six function keys

The market for 'lap-held' computers has, over the last year, become one of the most competitive areas in micro-computing. One company that has been present in the background of the UK market has been Sord. Its two lap-held machines, the IS-5 and the IS-11, have never been a great success in the UK despite having sold in reasonable quantities in both the US and Japan. However, Sord's latest contender, the IS-11C, has a specification which makes it sound like a worthy rival to Epson's PX-8 and even Hewlett Packard's 110.

Among its attractions is built-in software covering word processing and communications, and a number of other functions for the businessman-on-the-move, for example notebooks, a calculator and a calendar. Is the IS-11C the machine to now push Sord into the limelight in the UK?

Hardware

The IS-11C isn't the most attractive lap-held I've seen, but it is well-built and solid.

The unit is finished in the usual creamy-white colour and measures 12ins x 8ins x 3ins, following the current fashion of being A4 sized, but it is rather too thick to fit comfortably in some briefcases. The liquid crystal display (LCD) makes up the top-half of the case, and the lower half consists of a keyboard and micro-cassette data drive. Two spring-loaded clips secure the keyboard and LCD together when the unit is in transit.

Opening the spring-loaded clips allows you to flip the LCD display into its operating position. The hinge mechanism is unlike any other I've seen on a lap-held machine. The display folds right back and is then pulled forwards to a position at which you feel comfortable; it will not move back again unless you fold it fully forwards and repeat the process. Although this means that the display will hold steady at almost any angle, I soon found it infuriating as I almost always ended up needing to push it back a fractional amount.

'. . . the IS-11C has a specification which makes it sound like a worthy rival to Epson's PX-8 and even Hewlett-Packard's 110. Among its attractions is built-in software covering word processing . . .'

The machine has a full-size 80-column by 25-line LCD display which is also capable of being addressed as a 640 x 200 pixel graphic screen — this is quite high for an LCD. In common with most portables the display has drawbacks, but on the IS-11C they are more acute than usual.

Portable computers should ideally be capable of being used in a variety of lighting conditions, such as natural light, office light, and even an ordinary 100-watt home light bulb. On the best LCD displays, you can just about manage this. The IS-11C's display is very dull, and due to the vertical lines of characters being only one pixel wide, there are times when the display is totally unreadable. A contrast wheel at the back of the machine ought to help, but in fact all it seems to do is illuminate the background and make the display even harder to read.

The machine is turned on by a switch at the rear and, unusually, does not have an auto power-off to conserve batteries. The machine is driven by a six-volt rechargeable battery which gives around eight hours continuous use (less if you use the microcassette often). When the power gets low, the machine emits continuous beeps until the battery charger is connected.

The keyboard consists of 62 full-stroke and eight calculator-type keys, comprising six function keys, a RESET

A contrast wheel at the back of the machine illuminates the background of the display

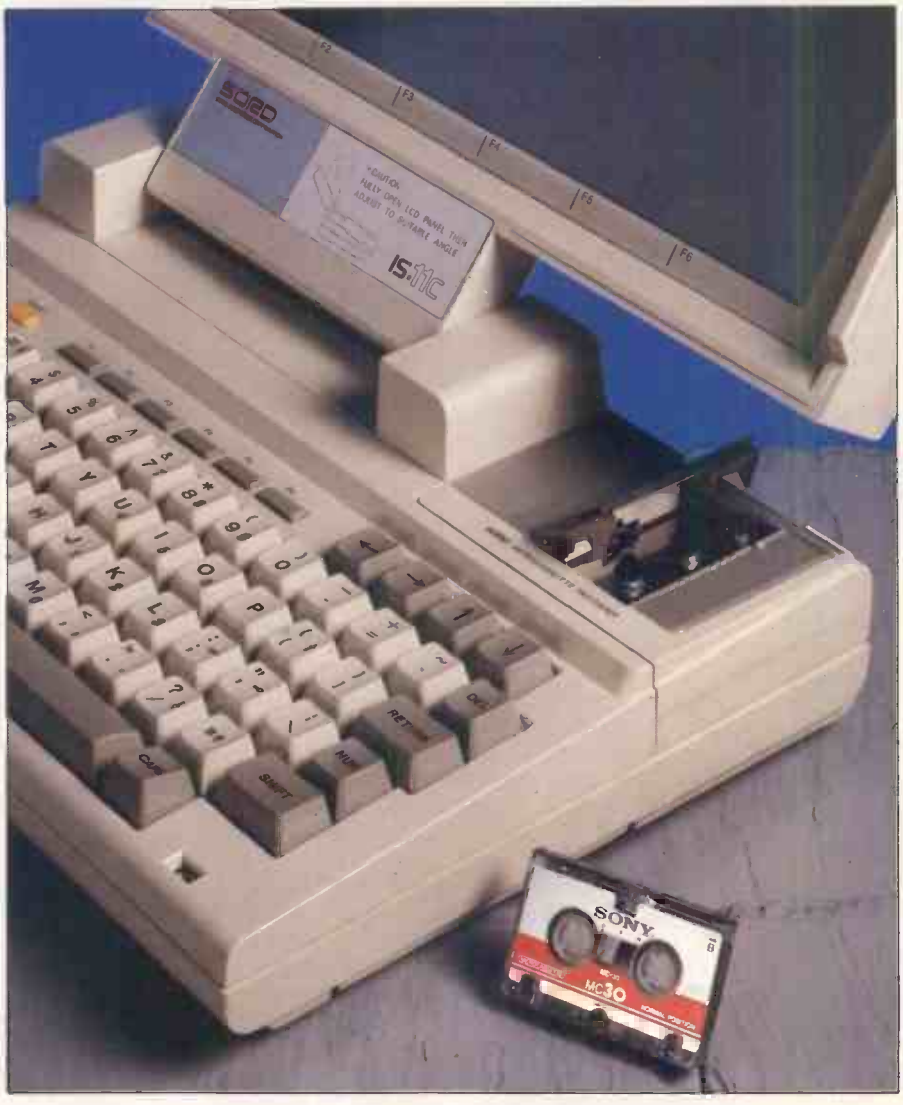
key and an ESCAPE key. Of the full-stroke keys, the alphanumeric keys are coloured white, while the control keys are coloured grey and include a group of four cursor control keys in the right-hand corner. All keys auto-repeat. By hitting the NUM key, the right-hand side of the keyboard can also be used as a numeric keypad.

As far as the built-in software is concerned, it's a shame that the function keys are only calculator-style as most of the software is driven from them. One particularly annoying habit of these keys is to stick under the plastic casing and then rapidly auto-repeat, sending the machine into some confusion.

The processor of the IS-11C is the Z80 operating at 3.6MHz. This chip just won't retire gracefully as one of the old 8-bit processors, but keeps popping up in all manner of interesting new machines.

In total the unit contains about 152k of memory, made up of 72k ROM for the built-in software and 80k RAM expandable to 144k. As the Z80 can only address 64k, it must be doing some kind of bank-switching to address all the memory. In use, however, the machine acts as though it is using one contiguous block of 80k RAM.

Although the memory is CMOS (it has to be to operate at a low battery-power level), Sord has made the absurd decision not to refresh it when the machine is switched off. It takes very little power to do this and is standard on practically all other lap-helds. Consequently you must save everything to a microcassette before switching off the machine, and after losing a couple of



The IS-11C features a software-controlled C30, 128k microcassette

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fairly important documents, I soon made sure that everything *was* saved before switching off.

Input/output ports abound on the IS-11C. Not content with cramming full the back of the machine, the I/O ports overflow onto the base of the machine. There is a ROM/RAM cartridge interface, a parallel I/O port, an RS232 interface, a modem port, a bar code reader port and a battery charger socket on the rear, and Centronics printer and external numeric keyboard ports are on the base of the machine.

One of the nicest features of the machine is the software-controlled microcassette. Each cassette is organised with a directory at the start of the tape informing the machine where to obtain the required file. After reading the directory, the tape zooms off at fast-forward speed until it gets near the file, slows to an intermediate speed to find the exact start of the file, and reads the tape at a normal play speed. This is all very clever and has an 1800 bps(bits per second) transfer speed (quite fast). The price you have to pay for this, however, is that each C30 microcassette holds only 128k.

'Pricewise, the IS-11C balances uncomfortably between the 8-bit and 16-bit lap-helds . . . it doesn't run a standard operating system, so there are not going to be many additional applications.'

Taking off the back of the machine reveals a well thought out and tightly-packed PCB. Most chips are not socketed but soldered directly onto the board. Interestingly a single screw will allow a hatch to slide forwards revealing the five socketed chips — ROMs which contain the built-in software, so presumably we can expect updates or possibly alternative software from Sord in the future.

The BARD Application Software Development System peripheral is obviously designed for OEMs (Own Equipment Manufacturers). Using this, it is possible to develop vertical market applications in both Basic and machine code, and then create a plug-in cartridge containing this application. Unlike other development systems for lap-helds this doesn't need a more powerful desk-top machine — all software is developed on the IS-11C itself. I can see this not only appealing to OEMs, but also to organisations which have a number of employees running the same application, such as salesmen. After developing custom software, you could turn the machine into a customised system by creating cartridges for all your machines.

Other peripherals available include a thermal printer, a bar code reader, a 64k RAM cartridge, a 3½in disk drive and a numeric keypad.

System software

Early in the history of lap-helds, many people considered them to be cut-down versions of desk-top machines and, as such, unable to tackle the kind of application a desk-top could run. One of the main reasons for this belief was that lap-helds ran their own custom operating system.

Starting with the PX-8 running CP/M, the trend has been to move away from custom operating systems to proprietary ones, so it was with some disappointment that I learned that the Sord has its own custom operating system.

When the machine is switched on, you have a couple of copyright lines in the top right-hand corner of the screen and a menu bar at the bottom of the screen corresponding to the six function keys. The last three of these (f4, f5 and f6) can roughly be described as system selections and are labelled Utilities, Filer and System. Hitting any key other than one of the function keys clears the menu, and replaces it with Enter Command: and a flashing cursor. From here you can enter direct operating system commands.

Hitting the Utilities option results in a second menu offering a number of system utilities. From here you can print a file, copy a file, load a file and type a file. The system has a slight air of CP/M to it, but you soon learn not to carry that analogy too far. My first attempts to use this menu resulted in an hour of frustration: a phone call to Sord solved my problems. This is a case-sensitive operating system — that is, all files must be specified exactly. I'm so used to MS-DOS, PC-DOS, CP/M, and so on, that I found it difficult to convert to case-sensitive filenames, and throughout this Benchtest I continued to consistently mis-specify filenames.

Benchmarks

BM1	4.4
BM2	7.7
BM3	45.3
BM4	51.6
BM5	58.2
BM6	87.3
BM7	96.0
BM8	184.5
Average	66.9

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January issue.

From this menu you can also call up a calculator and a 100-year calendar. These come up in a window to the right of the machine and can be called while in any application.

The Filer option leads to a second menu of file specific operations, from which you can obtain a directory of any device, erase files, rename files, copy files, change the currently-used device and initial a device. The operating system checks to see which devices are connected and offers a further menu of all the devices that a specified command could operate on. Sord has imposed arbitrary limits on the number of files on a device, the most annoying of these being the limit of 10 files on tape, even if the files are only 1k each.

'. . . the operating system is a good example of the fact that making software menu-driven doesn't necessarily make it user-friendly . . . I still found myself tied up in irritating details.'

Option f6 is a miscellany of functions such as time-setting, page-ejecting on a printer, switching the speaker on or off, and so on.

Overall the operating system is a good example of the fact that making software menu-driven doesn't necessarily make it user-friendly. Despite the menus guiding every operation, I still found myself tied up in irritating details.

Applications software

The IS-11C comes with a number of bundled applications — a word processor, a notebook, communications software and a number of extras, such as the calendar and calculator previously mentioned. All programs are held in ROM and available immediately upon switching on the machine. The three main applications are available from the main menu: f1 for the word processor, f2 for the communications and f3 for the notebook.

The word processor is the most impressive of the three and probably the most powerful word processor I've seen built into a lap-held. The word processor is driven from three menus, with the sixth function key switching between the three. The immediate impression, when using the machine for any length of time, is how nice it is to have a full 80 x 25 character screen for word processing. In use, a high degree of WYSIWYG (what you see is what you get) is supported and all the usual commands are available — search-and-

replace, cut, copy, paste, and so on, all of which operate in a natural way from the function keys, with the text being highlighted where appropriate. The most pleasant aspect of this word processor is its text formatting commands. Unlike most lap-held machines, this one has a whole host of facilities which allow you to format your text in a number of different forms, as well as support different printer configurations.

When you exit an application, the text in the upper portion of the screen stays where it is and only the lower menu bar changes. This is particularly annoying on the word processor, as it left you unsure as to whether you'd saved the text to memory.

On the review machine the communications facilities were designed to operate with US Bell-standard modems, and as such I was unable to use them. Sord is working on communications software for the UK market. The communications facilities I saw were very thorough, and if the user interface doesn't change will be more than adequate for most users.

The notebook is basically a cut-down version of the word processor with some extra search routines built in. More than any other application this suffered from having to load the required data file from tape. I have doubts about the usefulness of notebook-like programs in general, but certainly to be of any use at all they need to be instantly available.

Four application cartridges are currently available for the IS-11C: I-PIPS, a spreadsheet/business graphics program; I-TRANS, a file transfer program for connection to desk-top machines; Basic; and I-Term, a terminal emulator. Of these, I-PIPS, Basic and I-Term were supplied with the machine. To access the application within a cartridge, you hit RETURN from the main menu. This was undocumented and took me a long time to find.

I-PIPS is a very capable spreadsheet which suffered, as did the operating system, from being difficult to use and having a number of annoying little restrictions. I particularly disliked having to specify the size of the sheet before beginning. Information in the spreadsheet can be shown as bar charts and pie graphs. Considering the slowness of some of the other software, this operates quite quickly, especially the graphics. The program includes facilities for transfer of files to an IBM PC for Lotus 1-2-3, dBasell, VisiCalc, WordStar and Easy Writer.

The Basic is Miscrosoft Basic with additional commands for graphics, modem support, and handling files created by other IS-11C packages. Of these extra commands, the graphics ones are the most interesting. The full complement of commands consists of move, line drawing, elipse drawing, bar drawing, area fill, plotting and alternative character sets. The machine contains some nice quick-draw routines, it's just a shame that LCD screens take so long to refresh. Any attempt at animation results in an LCD blur flowing across the screen. According to the manual, this Basic is faster than previous Sord Basics and one of the fastest on 8-bit machines.

Although the Benchmarks are not much of a measure of the speed of the Basic, it certainly does not come out well against other 8-bit machines tested. In use the Basic seems quite slow, and I dread to think what previous Sord machines were like.

The terminal emulator program works fine. I used it instead of the communications software to successfully log-on to Telecom Gold and a number of other dial-up services.

Documentation

What documentation there is, which is not a lot, is written in a tedious 'Gee, isn't technology wonderful' style. Looking up specific details needed for this Benchtest usually resulted in the information just not being there.

For OEMs there is a 500-page manual describing the IS-11C hardware, operating system and system calls. Perhaps this is better.

Prices

The Sord IS-11C will sell for £1290. The plug-in cartridges all cost £220. Peripheral prices are as follows: thermal printer £117; first floppy disk drive £695; subsequent disk drives £495; bar code reader £166; 64k RAM £480; numeric keypad £75.

Conclusion

Throughout this Benchtest, it repeatedly occurred to me that the IS-11C is very nearly, but not quite, up to the level of its competitors. There is undoubtedly a lot of power in this machine, but implementing it proved difficult and frustrating. After a period of experimentation the idiosyncrasies became bearable, and I was able to get somewhere with the applications.

Possibly, if you buy it as your first and only lap-held you would find it a very useful piece of kit. With my knowledge of lap-helds I found the operating system annoying, and the fact that it didn't maintain memory when switched off resulted in a number of lost files.

On the plus side is the wide variety of peripherals available and the BARD Application Software Development System, making it ideal for OEMs to develop specialised software. If the machine is running specialised software, suitable for your particular business, then this alone makes it worthy of consideration, and all the other features are extras. END

Technical specifications

Processor:	Z80A running at 3.6MHz
ROM:	72k
RAM:	80k expanded to 144k
Mass storage:	Software-controlled microtape drive: 1800 bps; 128k on one MC30 microcassette
Keyboard:	62 full-stroke keys, eight calculation-style keys including six function keys
Size:	11.75ins x 8.5ins x 3.25ins
Weight	6lbs 6ozs
I/O:	Parallel I/O, serial RS232C, Centronics, numeric keypad, ROM/RAM cartridge, modem, bar code reader
Peripherals:	Thermal printer, external numeric keypad, microfloppy disks, bar code reader

In perspective

Pricewise, the IS-11C balances uncomfortably between the 8-bit and 16-bit lap-helds. However, it doesn't run a standard operating system, so there are not going to be many additional applications. Machines such as the Epson PX-8 and Hewlett-Packard HP-110 run CP/M and MS-DOS respectively, making many more applications available.

Before buying an IS-11C, I would have a close look at the Epson PX-8 (Benchtested last June) which retails for around £800 with bundled word processor, spreadsheet, data management program, diary/scheduler and Basic, all of which are retail CP/M applications rather than custom applications. Other 8-bit contenders are the Tandy 100/200, the NEC 8201 and the Olivetti M10.

For about £1500 more, you can have a 16-bit machine such as the Data General One (Benchtested last December), and Toshiba's new 1100 has a built-in disk drive giving considerably more lap-held power. Most of these are MS-DOS based machines and have limited compatibility with the IBM PC, giving access to a wider range of software.

The most likely market for the IS-11C is as a base machine for OEMs. In this context there is, at the present time, no real competitor. The bundled software makes a useful background system underneath your particular application software.

New life?

Have you ever thought of your computer as a living thing, capable of thought, movement and reproduction? Unlikely as the idea may seem, some controversy exists as to the possibility of this sci-fi state becoming reality. Geoff Simons adds to the argument.

One of the consequences of artificial intelligence (AI) work in recent years is that we are now forced to re-examine many of the conventional adjectives traditionally applied to human beings — words such as conscious, free, thinking, aware, perceptive and intelligent. The stuff of classical psychological research is surprisingly important in modern computer science.

In particular, we are seeing an evolution of the term 'intelligent'. It does not seem that long ago when reputable computer journals spoke of 'intelligent' processors, 'intelligent' terminals, and so on, with the adjective always in quotes as if to signal that it was not true intelligence that was being talked about. Today the quotation marks have completely disappeared, and it is commonplace to read of machine intelligence. Of course, there is debate as to the nature of this intelligence, but with the parade of all the modern subclasses of AI — problem-solving, advisory expert systems, pattern recognition, language understanding, and so on — the status of machine intelligence, however it is interpreted, is becoming increasingly secure.

Life-forms

There is also another startling possibility, distinct from mainstream AI but quickly seen as a similar threat to human vanity. This is the idea that computers and robots, appropriately configured, can properly be regarded as emerging life-forms. This daunting notion can be seen to be tenable when the decision is taken to regard all life-forms as essentially behaving systems of a certain type. I will argue why this decision is a reasonable one, but first it is worth pointing out that the idea of machine life is far from original.

To go back a long way, there are plenty of animated robots in Assyrian and Greek mythology. Homer (*Iliad*, Book XVIII) talked of maidens of gold, manufactured by the god Hephaestus, who were able to move and show intelligence and wisdom. Moving on to 1872, Samuel Butler suggested in *Erewhon* that machines would become conscious and able to reproduce their kind. He even declared that contemporary machines were prototypes of future mechanical life. In this century the computer scientist Joseph Weizenbaum — scarcely sympathetic to many of the claims of AI — has written that he is prepared to regard a robot, suitably configured, as a type of organism. Similarly the cybernetician James Albus has suggested that robots are an evolving life-form, and others have proposed that life-forms might be based on electronic circuits. But the point needs to be argued . . .

Many traditional definitions of life simply list what are considered to be the essential qualities of living things. Organisms may be expected to grow, to exhibit metabolisms, to process information, to develop survival strategies, and to reproduce. Already we can see the ways in which computers take in energy ('eat'), process information ('think'), grow, age, and involve themselves in the generation of new computers ('reproduce'). The emerging reproductive capability of computer-based systems is evident in many different circumstances: for example, computers are used to design new computer circuits and to supervise the manufacture and assembly of new systems such as complex disk drives, sophisticated integrated circuits, and complex computer-based facilities. (If the reader is quick to point out that human beings are essential agents in machine reproduction, I need only mention that many species on earth cannot reproduce without the assistance of other species: for example, plant reproduction is completely dependent upon insects and birds.)

Reproduction

In general, the reproductive process in any life-form entails the processing of matter/energy and information, the transmitted information being in effect the template of the new system. Information, used to define the structure of the new system, can be carried in many forms. Traditional life-forms have relied upon DNA templates, whereas emerging computer life-forms may be expected to store their species-specific templates in solid-state memories. In fact, it has been clear for several decades that genetic methods are not the only ways in which reproduction can be achieved, and I have considered in detail elsewhere the various reproductive strategies being evolved by emerging computer life-forms.

But reproduction is only one feature of living things, and even this does not characterise them all — as many a childless couple knows. It is necessary to broaden the argument to lay the foundations for a systems definition of life rather than the traditional (and excessively parochial) biochemical definition.

The millions of disparate species on earth all function in ways appropriate to their own natures. We do not expect all animals and plants to use energy, to process information and to reproduce in the same way. We should not demand that computers and robots perform in the same way as human beings in order to qualify as alive. We need to search for general criteria by which *any* life-form can be recognised as such, irrespective of the means — hydrocarbons, electronics, metaphysical substances, and so on — by which the life-form is animated. This entails recognising that the traditional life processes (for example, traditional chemical reactions in familiar life-forms) are nothing more than contingent means to realising the basic life functions. Put another way, there are many possible ways in which systems can accomplish the functions that are essential to life: chemistry is one, but there are conceivably many others.

A systems approach

JG Miller, in a remarkable book, developed a systems approach to the idea of life. He drew attention to a hierarchy of structures on earth that may be said to be carrying out living processes. The seven levels in the hierarchy are defined as cells, organs, organisms, groups, organisations, societies, and supranational systems. The systems at each level can deal with inputs, throughputs and outputs of various forms of matter, energy and information.

A key point for my argument is that

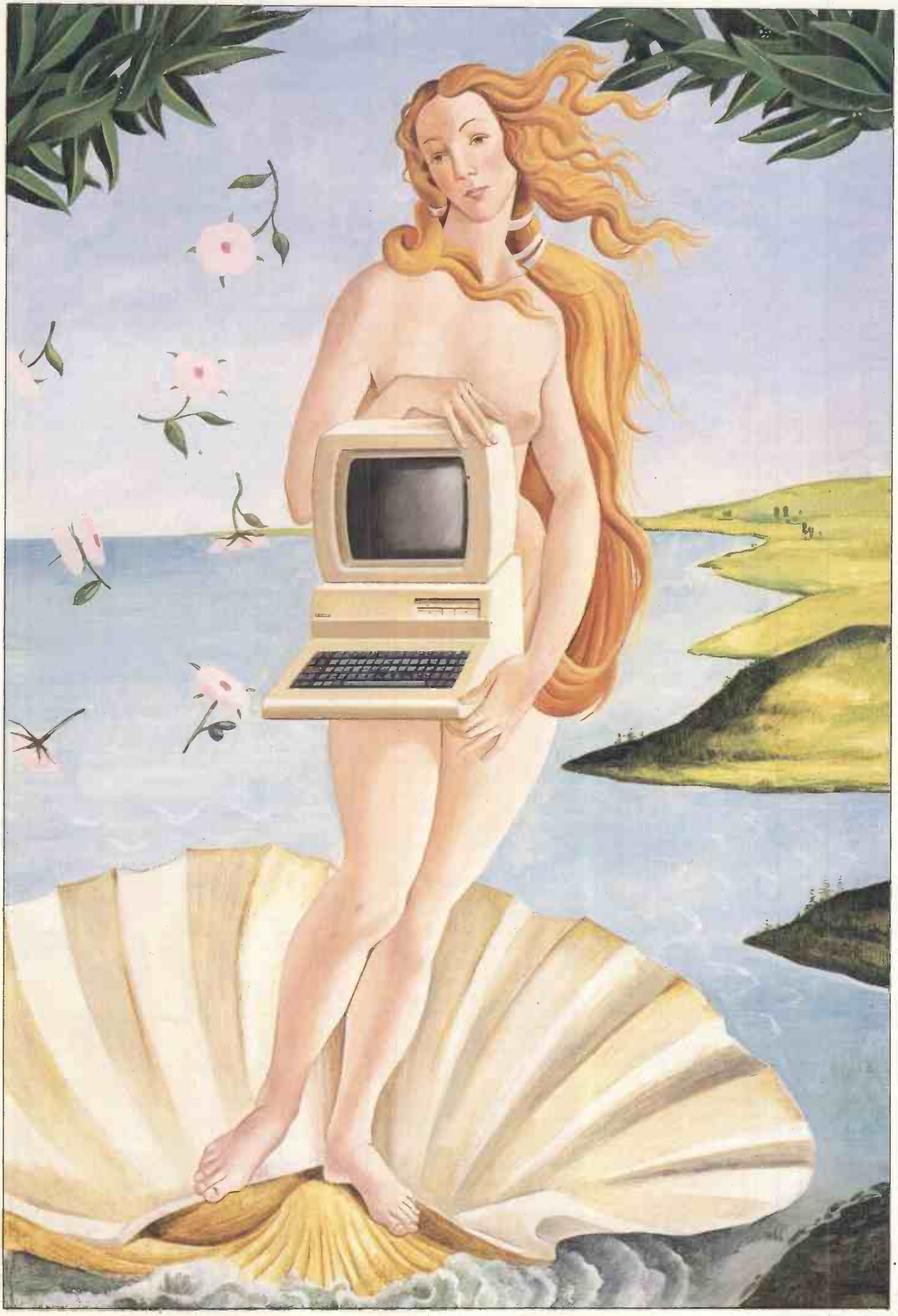

Illustration by Paul Simmons

the profound differences between the various living systems make it necessary to identify critical subsystems that are not limited to any particular type of organism or organisation. In other words, it is necessary to identify the 'critical subsystems of a living system' in such a way that no evident living system is excluded. Miller identifies 19 such subsystems, all of which can be identified in current computer systems (although he does not remark on this particular fact).

I have already looked at reproduction (the reproducer is one of Miller's critical subsystems). Other subsystems are the ingestor, the distributor, and the matter/energy store; these are variously involved in taking in energy, feeding it around the system, and getting rid of waste products (heat is an obvious waste product of all computer-based systems).

Other critical subsystems are required to handle information or to provide the life-form with the necessary physical cohesion. Here it is important to stress that the descriptions of the critical subsystems are independent of how the various subsystems are realised. There is no assumption that life has to be based on hydrocarbons. If a system can reproduce and handle energy and information in suitable ways, then the system has a claim to be regarded as living.

Behaviour

We can assume that living systems must be capable of behaving in certain ways; how the systems actually achieve the 'life behaviour' is a secondary matter. Human beings are parochially acquainted with organisms based on carbon, although this does not prevent some people from declaring that God is alive (or dead, as the case might be). It is often assumed, without analysis, that a chemical base is a necessary condition for life. However, when we adopt the systems approach to living organisms, we see that this is an unwarranted assumption.

In traditional life-forms — oaks, lice, fish, primates, and so on — the various metabolic processes are only characteristic of life insofar as they are part of the overall organic system. Metabolic 'pathways' are defined as the series of chemical reactions in which one chemical state is followed by another, which in turn is followed by another, and so on. This is of obvious chemical interest, but says nothing about biology unless we assume that the pathway is part of a subsystem that in turn is part of an overall organic system. A chemical reaction, in isolation, is nothing more than a chemical reaction. It can only gain life significance by contributing, at one level or another, to the working of the systems and subsystems that are characteristic of living things.

The central point here is that the chemical means are subservient to the system ends. It follows that in analysing what constitutes life, it is the systems that are philosophically important, not the chemistry. It is still obviously true, however, that for any chemically-based life-form, an understanding of chemistry is essential for an insight into how the organism functions. But there is the obvious corollary that an understanding of electronic circuits is likewise essential for any comprehension of the working of life-forms which are based on silicon electronics.

Any definition of life that makes biochemistry a necessary condition is unduly parochial, so chemistry can be seen to be contingent: it is one substrate for life, not the only one that is possible. Again this means that we should learn to recognise life according to life-type system activity, not according to how the activity is realised in particular instances. (We may fancifully imagine electronic creatures elsewhere in the galaxy debating whether there could ever be life-forms based on carbon molecules rather than on electrical and electronic circuits!)

'. . . computer-based systems, appropriately configured, can behave in all the ways that are essential to life . . .'

When this argument is fully appreciated, it is very powerful. I have cited some writers who have speculated on the possibility of machine life, but I need have no recourse to authority: the argument will stand or fall on its merits. If the argument is valid, then computer-based systems may be regarded as alive when they satisfy certain behavioural criteria, when the systems exhibit life characteristics by processing energy and information in certain ways (for example, in the ways identified by Miller).

It is also interesting to mention apparent support for the argument from unexpected sources. For example, the famous physicist Erwin Schrodinger approached the essence of life through an exploration of physical entropy. In a seminal work he asked: 'What is the characteristic feature of life?' and replied: 'When it goes on "doing something", moving, exchanging material with its environment, and so forth, and for a much longer period then we would expect an inanimate piece of matter to "keep going" under similar circumstances.' He identified the essence of life as being behavioural rather than chemical. It is easy to see that computer-based systems, appropriately configured, can behave in all the ways that are essential to life when it is viewed from a systems perspective.

We can take any particular (systems) feature of an organism and identify its direct equivalent in computer terms. I have already hinted at how this might be done in connection with *any* life feature. As a minimum we can suggest that living systems — computer-based or not — should be able to function as discrete entities, to exploit available energy, to process energy and information (for cognitive and/or other purposes), to evolve survival strategies, and to be able to reproduce. There is nothing here that is beyond the capabilities of modern computer systems, appropriately designed. We should also remember that life can be rudimentary: we should not demand more for computers (in allowing them to qualify as alive) than we do for the simplest organisms.

Conclusion

When we think beyond the parochial biochemical view of life and see it in systems terms, the basic argument is established. We can recognise survival strategies, for example, in the emergence of the man/computer symbiosis (try to attack an important computer and you will be resisted by the police or the military), just as cleaner fish and aphids rely upon protectors (large predators and ants, respectively) for their security. Just as survival strategies can be explored with reference to emerging computer organisms, so can many other life phenomena — such as consciousness, evolution and creativity. Nor should human involvement with computer life processes be allowed to tell against the argument.

As I have mentioned, the whole of the plant kingdom is unable to reproduce without assistance from other species (namely birds and insects). In short, when life is seen as essentially a systems phenomenon, it is clear that increasingly computer-based systems will be able to qualify as alive.

References

Miller, JG, *Living Systems*, McGraw-Hill, 1978; Schrodinger, E, *What is Life?*, Cambridge University Press, 1944; Simons, GL, *The Biology of Computer Life*, Harvester Press, 1985.

Geoff Simons is chief editor at the National Computing Centre. END

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CTIVE MALE (31), high
ated, witty, accountant seeks cr
male for unpressurised relationshi
hoto please. Box P932.

● VERY ATTRACTIVE LADY, styli
ivacious, slim, seeks young graduat
ho knows how to have a good time.
ox 933.

SYLVESTER STALLONE LOOKALIKE

tanned, hunky, Californian, body building sun worshipper, seeks similar sports-loving beauty. Take a chance I could change your life. Photo supplied Box P934

● RICH TEACHER (25), tall, slim, good-looking, witty, seeks uncomplicated female for artistic pursuits. Please send photo Box P935.

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m 'nephew' who likes sport, real ale
nusic (not necessarily in that order
Box P936.

● HUNGARIAN VEGETARIAN,
lesbian, non-smoker, seeks female w
boyish features, short hair, monkey
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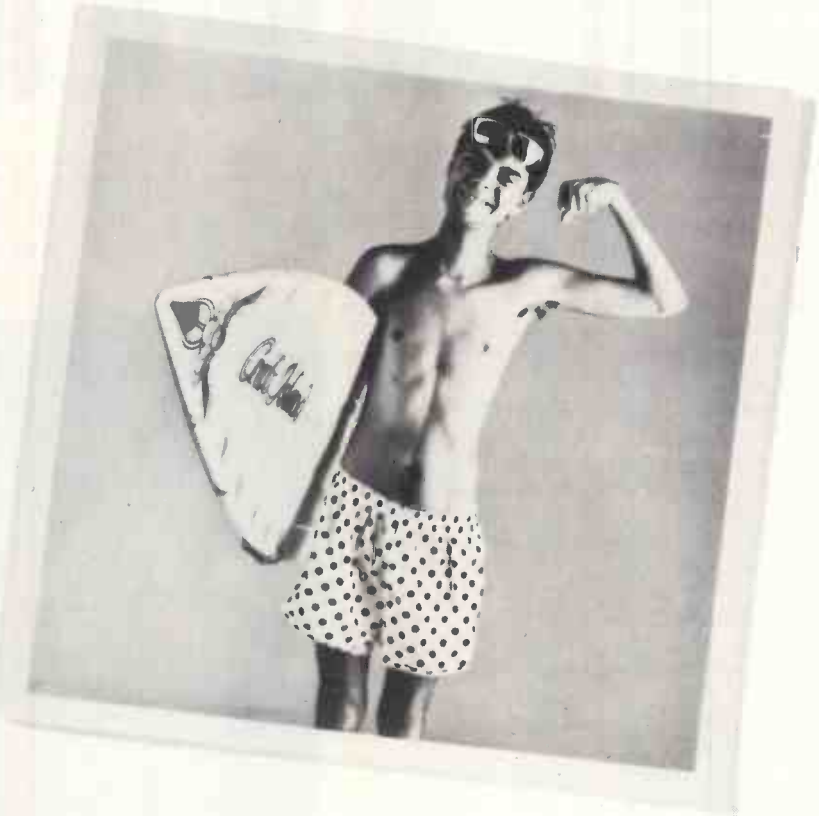

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Intelligent modems

Peter Tootill assesses the capabilities and drawbacks of five intelligent modems — the Steebeck Minimo Plus 2, the Miracle Technology WS3000, the Tandata Tm512, and the Dacom DSL 2123AD and DSL 2123GT.

There has been a boom in the communications world in the last year or so. Prices have tumbled, and modems have been selling in their thousands in both the hobbyist and business markets. As the market has matured, the demand for the more sophisticated products that can be produced using today's technology has also increased: manufacturers are producing more and better modems with all kinds of advanced features.

For this review, I have obtained a representative sample of five modems from four manufacturers to give some indication of what is available, and how well they work.

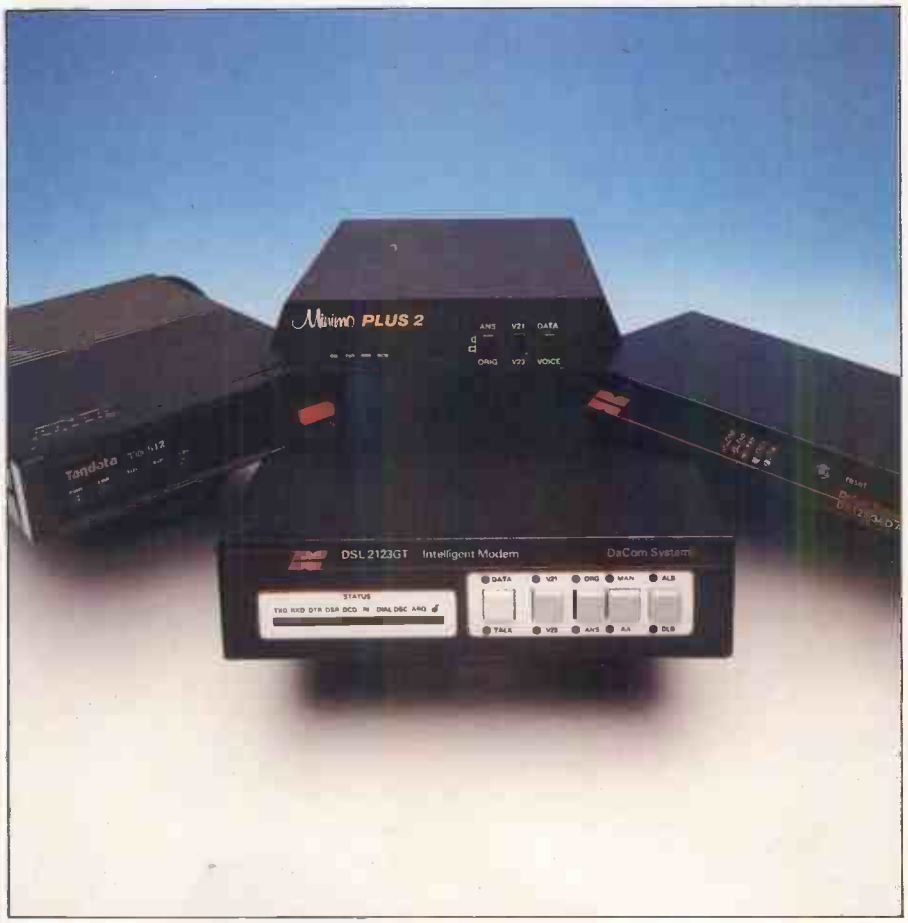
What is an intelligent modem? The models looked at here can perform certain basic tasks such as dialling a number, answering the phone, recognising the baud rate of an incoming call (except the Tm512) and, with the exception of the Steebeck, storing a list of regularly-used phone numbers that can be dialled automatically. They all include a microprocessor — a 6809 in the DaComs, a 6502 derivative in the WS3000, and so on. There is a ROM with software to control the modem's functions.

There are other features such as buffering to allow computers that can't handle split baud rates (as used by the V23 standard, for example) to talk to the modem at 1200 bits/sec in each direction (or faster in some cases), while the modem talks to the other end at 75 bits/sec and receives at 1200. This will allow IBM PC and Apricot users to use Prestel (provided that they have the software to handle the graphics). Of course, they could be far-sighted and buy a computer that can handle split rates (a Tandy Model 1, for example, or even a BBC).

Fig 1 gives an indication of the other functions performed by these modems.

Hayes protocols

Hayes protocols are the latest thing on the comms scene — everyone is talking about Hayes compatibility, but what are these protocols? Hayes Microcomputer Products Inc, is an American manufacturer of modems. It was the first on the scene in the US with a smart (or intelligent) modem (or at least the first to have any real impact). It devised a set of rules for controlling its modem which has become a *de facto* industry standard. Most other American modem manufacturers have followed Hayes' lead when producing their own smart modems, and a large body of software has grown up, designed to make use of the features. The communications features of Lotus 1-2-3 use Hayes protocols for dialling, for example.



Left TM 512, rear Minimo Plus 2, front DSL2123GT, right DSL2123AD

The software designed around Hayes modems also includes smart terminal and bulletin board software (such as Fido, see 'Networks', page 218).

The advantage of having a Hayes-compatible modem is that it enables you to tap some of this software if you are interested in serious communications, and it won't be long before home-produced comms software follows the same road. Two of the modems reviewed here claim to be Hayes compatible, and the manufacturers of the others are planning Hayes versions. There are 'Hayes compatibles' and 'Hayes compatibles' in the US

just as there are 'IBM compatibles' and 'IBM compatibles', so if compatibility is important to you, make sure that the modem in question will work with your software before you buy.

Hayes will be launching one of its own modems (the Hayes Smartmodem 2400, a V21/22/22 bis model) on the British market as soon as it completes the BABT procedure, but it is expected to be expensive.

As the modems reviewed here have auto-answer facilities, you might think that they would be ideal for individuals and businesses wanting to run bulletin boards or electronic mail systems using BBS-type software at V21 and V23 standards. This is not necessarily so: it's a matter of making sure that the modem and software are compatible before you part with your money.

Steebeck Minimo Plus 2

The Minimo Plus 2 at £282 (including VAT) is the cheapest of the modems, although it is not the cheapest intelligent modem on the market (that, I believe, is currently one produced by Thorn EMI at around £185). The Minimo Plus 2 is a Hayes-compatible modem, supporting the standard Hayes software protocols.

The modem is easily the smallest of the group, and that is with an internal power supply. It has a metal case and is well built. A nice touch is an external earth connection which is connected to the protective ground circuit (pin 1) and which should give added protection against static.

Setting up the Minimo caused me some problems, but Steebeck was very helpful. The manner in which you set the internal DIP switches to suit your terminal and application is important, but the instruction manual is not at all clear on this point. The documentation is not particularly good. Most of the information is there, but it can be hard to find and I found the layout confusing. The description of the Hayes command set is rather brief and some of the minor commands are not supported. There is no number store, which is not necessarily a problem as most Hayes-type terminal software will allow you to store numbers. I had problems with my auto-dial software as it requires the modem to echo commands, and the modem defaults to no echo of commands. When I turned on the echo it worked, but the modem would only accept seven bits, even parity for commands. Eight bits, no parity seemed to confuse it. The manufacturers tell me that this has now been sorted out.

The modem also allows a more verbose auto-dial dialog, using Steebeck's own commands which are easier to use than Hayes commands. You select one set or the other by changing an internal DIP switch. The Steebeck mode also allows a fairly complex auto-logon sequence to be programmed into the modem after the number. This can consist of up to 80 characters, and any number of send and receive fields, including control codes, can be used.

There is an on/offline control on the front of the modem. If you call PSS, hanging up can be a problem with some modems unless you can control the DTR line directly. For example, when using the software-controlled WS3000, you have to send an escape sequence (usually +++) to allow you to communicate with the modem, and then instruct it to hang up. With the Steebeck, you just press the button.

The other controls are originate/answer to select the mode when you are making the call, and V21/V23. The various combinations of the two switches allow you to select whether the modem automatically recognises the speed of the incoming call, half-duplex 1200 bits/sec working, and other things. There are a paltry four indicator LEDS on the front panel.

'. . . if compatibility is important to you, make sure that the modem in question will work with your software before you buy.'

I had no problems getting the modem to work in auto-answer mode with my BSS, but at V21 only. If the modem picks up a V23 call, it talks to the computer at the higher speed and leaves it (the computer) to work out what is happening. This is not Hayes compatible: a standard Hayes modem would signal 'connect' or 'connect 1200' for 300 and 1200 bits/sec calls respectively. Also, most American dual-speed modems output a signal on one of the RS232 pins, too (usually pin 12 or pin 22).

Miracle Technology WS3000

This modem is mid-priced at £340 (including VAT). It is claimed to be Hayes-compatible as far as it is possible, given that it provides V23 (1200/75 bits/sec) as the higher speed rather than 1200/1200, which a standard Hayes type would do. It worked well with my Hayes auto-dial terminal program.

The WS3000 is well-built and seems to work reliably, although it was a pre-production version due for some changes. The software wasn't finalised, so some features were not working. For example, the auto-answer software was not fully developed in the review model, and the auto-answer features could not be properly tested. The manual was a pre-production draft, but if it's anything to go by, the final version should be excellent. It contains the most complete documentation of commands of any Hayes type I have seen. The chapter on auto-answer was rather brief, and sections on creating software for the WS3000, general information, using the modem with amateur radio, and a quick reference card were missing, but are promised.

The modem is entirely software controlled; the only manual control is a reset button on the rear. The modem automatically senses the speed at which your terminal is talking to it, and sets itself to suit. It also sets its communications mode accordingly: for example, V21 if your terminal is set to 300 baud. V23 if it's set to 1200/1200 or 1200/75. Other modes can be selected by appropriate commands.

This modem is one of very few to be approved to use Bell 103 tones in the UK, but Bell 202 is locked out. It will be available on export models.

This modem has several interesting features both as standard and available as options. Tone is included in the basic model, as well as normal pulse dialling and ring-back auto-answer for bulletin boards (the modem only answers the phone after it has rung once and the caller has hung up and called back, which is useful if you want to run a bulletin board and still receive voice calls). Also included is a loudspeaker to monitor call progress, which is an excellent feature. It's very frustrating to automatically dial the call and not to know why you can't get through. Is it engaged, a wrong number, or has a person answered? With the WS3000 you can tell. It also lets you check that the dial tone was there before dialling started — the modem can't tell.

A novel feature is a Centronics printer port on the rear of the modem; this takes a standard BBC Micro/Tandy 100-type cable. What facilities it will allow in the final version hadn't been decided at the time of writing, but on the review model I could copy the modem's output to the printer. This is mainly of use for obtaining a printed list of the telephone number store — with 62 numbers, no ordinary person is going to be able to remember which number is which!

Likely uses will include a message-taking system, so that the modem can answer the phone and take a message without a computer needing to be connected.

Another interesting feature is the fact that other telephones on the same number don't tinkle while the modem is dialling; the Tm512 is the only other modem to have this feature. All the modems have telephone sockets on the back, and a telephone plugged into these will not tinkle.

Optional extras include V22, V22 bis (1200 and 2400 full-duplex working), a secure ring-back system (the modem asks a caller for his ID and password, and rings him back at a predefined telephone number before allowing him access to the computer. This will be useful for applications where hackers could be a problem.

The prices of the other versions are as

follows:
WS3000 with V22 option, £569 (£495 + VAT).
WS3000 with V22 and V22 bis option, £745 (£650 + VAT).
Security ring-back, £113 (£98 + VAT).

Upgrades are to be available at the cost difference plus a handling charge. The prices of the V22 and V22 bis options could fall if the chip prices fall, which is likely.

As might be expected with a new modem, there are a few bugs in its software, but the manufacturer assures me that these are being eliminated.

Tandata Tm512

The Tm512 is another mid-priced modem (£340 including VAT). It is almost exactly the same size as the WS3000, but includes an internal power supply. The case is sturdy plastic and the modem is well made. It has only one control, an on/off switch on the front (none of the other modems has an on/off switch, which is a nuisance if you like to switch things off when you are not using them, especially if the power point is inaccessible).

An unusual feature on this modem is a TTL-level interface as well as the normal RS232 standard. Connecting to computers which don't already have an RS232 interface should be easier and presumably cheaper. The RS232 connector provides a limited range of signals, omitting such things as RI (ring indicator) which shouldn't cause a problem, and CD (carrier detect) which might. You could use DSR (data set ready) instead of CD, but you might need a special cable. The TTL port doesn't support the DSR circuit, but this won't cause any problems unless your terminal software needs it (most doesn't). You might still have to deal with the CD problem, though.

Another unusual feature of the Tm512 is that it uses the CCITT V25 bis protocols for auto-dialling and auto-answering. This is a fairy recent international standard and, as far as I can determine, is not well-supported in terms of software yet. It is more difficult to use than the Hayes protocols and is really designed to be driven by software, not manually, whereas Hayes commands can easily be used manually.

For example, the Hayes command to dial a number is:
ATDO514288924 <return>
The V25 bis command is:
Ctrl-B CRS 0514288924 Ctrl-C (the spaces are just for clarity).

The modem has a number store holding eight numbers and a menu. Auto-dialling one of these numbers is easy — enter Ctrl-B followed by 3 and the menu is displayed, then select the number of the required system.

Programming the menu is not easy unless you have a Tandata terminal package. A new version of the modem's ROM should improve the situation by allowing you to program cursor controls into the modem to suit your computer.

I found it impossible to program in menu mode at all: I had to use V25 bis commands to store numbers. In this mode you can't store comments such as the name of the system which a telephone number relates to. A separate auto-logon string can be stored with each number in menu or V25 bis modes.

As with the WS3000, there is a loudspeaker to monitor the initial stages of a call. A Hayes version of the modem is also on the way.

To use the modem in auto-answer mode, your software has to accept the V25 bis protocols. When the phone rings, the modem sends the message Ctrl-B INC Ctrl-C, waits to be told if it is to answer the phone, and if so whether in V21, V23 (1200/75) or V23 half-duplex mode. You can also use pre-set auto-answer mode, but this has to be at a predetermined baud rate.

This modem doesn't detect the caller's baud rate, but the Hayes version should be an improvement in this area and will probably allow automatic detection of a caller's baud rate.

The documentation is only fair. Most of the features are adequately described and there is a useful section on trouble-shooting, but I found it confusingly laid out and the explanations are difficult to follow. The manufacturer says that it is not yet finalised, so there is hope for improvement.

DaCom DSL 2123AD & DSL 2123GT

Two DaCom modems are included in this review. The AD is the one most directly comparable in terms of features with the others. The GT version is basically the same modem, but with a number of added features. The AD costs £401 (including VAT); the GT costs £573 (including VAT).

Both modems are well-built with sturdy metal cases, and both use external power supplies. The documentation is adequate, but could be confusing to people who are new to using modems. The manufacturer says that it is in the process of being revised to improve this aspect. The following details regarding the AD will apply to the GT unless otherwise stated.

The DSL 2123AD (catchy name, isn't

	MIRACLE TECHNOLOGY WS3000	STEEBECK MINIMO PLUS 2	TANDATA TM 512	DACOM DSL 2123 AD	DACOM DSL 2123GT
SIZE (cms)	16x4x24	16x4x20	15x14x25	20 X 3 X 21	22 X 5.5 X 21
WEIGHT	750g	800g	900g	600g	830g
POWER SUPPLY	external	internal	internal	external	external
WARRANTY	1 year	2 years	1 year	1 year	1 year
MODES OF OPERATION	V21, V23 mode1,2 Bell 103, Bell 202* 1200/1200 half duplex	V21,V23 mode 2 1200/1200 half duplex	V21, V23 mode 2 1200/1200 half duplex	V21, V23 mode 2	V21, V23 mode 2
CONTROLS	reset	V21/V23 origin/answer,online	on /off	reset	online, V21/23, orig/ans, ALB/DLB
INDICATORS	power, online,DTR,RTS,CTS,DCD,TD, RD, auto-answer	power,TD,RD,DCD	power, online, DCD, TD, RD	power, TD, RD, DCD, online	power, DCD, TD, RD, DSR, RI, online, ARQ, ACI
RS232 PIN NOS.	1-10,18,20,22-25	1-10,20,22	2 - 7 & 20	1-10, 20 & 22	1 -10, 20 & 22
BAUD RATE TO TERMINAL	300, 600, 1200, 2400, 1200/75	300,1200,1200/75	1200, 2400, 4800, 9600	300, 1200	300, 1200, 2400, 9600
DITTO SETTING	auto	auto and DIP switches	auto	auto	DIP switches
CONFIGURATION	software	software and DIP switches	software	software	software / DIP switches
BAUD RATE [ORIG	manual	manual	manual	auto / man	auto / man
SETTING [ANS	auto/manual	auto/manual	manual	auto / man	auto / man
PROTOCOLS	Hayes	Hayes/Steebeck	CCITT V25bis / Tandata *	DaCom *	DaCom *
BELL/TINKLE SUPPRESSION	Yes	No	Yes	No	No
NUMBER STORE	6	0	8	32	32
AUTO DIAL METHOD	by number	N/A	menu	Keyword / Menu	Keyword / Menu
EASE OF DIAL	****	***	**	*****	*****
USE [ANSWER	***	***	***	***	***
DOCUMENTATION	(*****)	**	**	***	***
OTHER FEATURES	speaker,printer port,ringback data encryption,key switch		Autologon, speaker, tailored software	Dial tone detect, call list, tone dial	As AD plus autologon, ARQ, ACI, battery backup
OPTIONS	V22/22bis,security ringback data encryption,key switch	Apple version			
ADDRESS AND TELEPHONE NUMBER	Miracle Technology Limited St Peters St. Ipswich Suffolk IP1 1XB (0473) 216141	Steebeck Systems Limited 3 The Paddock Hambridge Rd. Newbury Berks. RG14 5TQ (0635) 33009	Tandata Marketing Ltd Albert Rd North Malvern Worcs WR14 2TL (06845) 68421	DaCom Systems Ltd Sunrise Parkway Linford Wood Milton Keynes MK14 9LU (0908) 675511	DaCom Systems Ltd Sunrise Parkway Linford Wood Milton Keynes MK14 9LU (0908) 675511
PRICE INC (EXC) VAT	£339 (£295)	£282 (£245)	£339 (£295)	£401 (£349)	£573 (£498)

NOTES
* NOT ON UK MODELS
+ NOT TO BE USED IN THE UK
• HAYES COMPATIBLE VERSION COMING

Fig 1

it?) is very slim. It has only one external control — a reset button on the front panel. Modem control is entirely by software, there are no internal switches to set. It detects the baud rate (either 300/300 or 1200/1200) and parity of your terminal automatically, and you can leave it set at the same rate all the time, no matter what type of system you are calling. DaCom has is own method of controlling the modems (although Hayes compatibility for the AD is imminent and promised for the GT), and they are by far the easiest to use of the group.

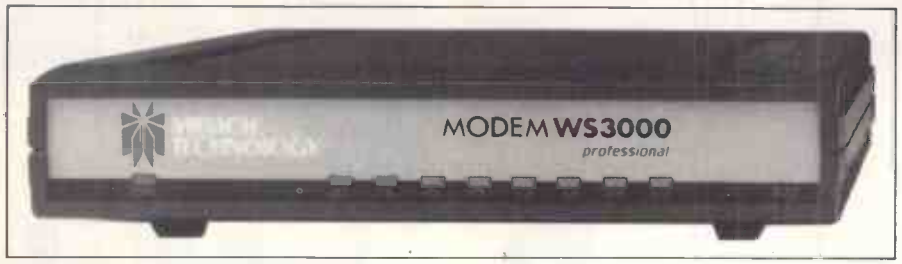
To dial a number, type it in. To dial one of the 32 stored numbers, enter the keyword (up to five characters) that you have previously allocated (I used PSS23, PSS21, Ken), and so on. With this method, there is no need to remember the number or look it up on a list. If you do forget one of your mnemonics, typing L will give you a list. R redials the last number you tried (this can also be done automatically). Sending three Control-C's gets you to the configuration menu where you can load phone numbers, select default mode, and so on.

When you are familiar with the options on the menu, there are short cuts available. The phone number store is not battery-backed (unlike the GT), so if you switch off you lose everything. The operating mode for each phone number can be specified, that is V21, V23 (either way), or it will automatically detect this for when you call. These are the only modems of the group that will do this in originate mode, as well as when answering the phone. However, I wouldn't recommend using this facility with systems that automatically detect your speed, as the two modems will each be looking for the other and you could end up with an inconvenient setting.

If you are using the modem under computer control, you can turn off the menus and use commands that are easier to use in programs. For example, &DLN0514288924B<CR> will dial Liverpool Mailbox in V21 mode (that's what the 'B' is for). In this mode, the modem's responses are also tailored for program control.

An additional feature is that you an give the modem a list of numbers to dial and it will do so, marking any where it didn't get through and coming back to them later. This is designed for users who want to call a number of systems without intervention. It could be used by a company to call all its subsidiary offices overnight and send out a notice about new products, for example, or you could use it to dial a list of BBSs and pick up all your messages in the small hours, when you are asleep. You would have to have, or write, the software to take over when the system at the other end answers, but the dialling and redialling (up to four attempts allowed by BT) is handled automatically.

The GT has all the above features,



Miracle Technology's WS3000

with the exception that the terminal baud rate settings are done via internal DIP switches; these also control the selection of human or computer interface, which is rather inconvenient if you want to change it regularly. I can foresee the cover being left loose and the screws being lost. Fortunately, there is no mains voltage inside the case.

The most obvious additional feature is the comprehensive set of switches on the front which give full manual control of modes; this makes the modem much taller than the AD. The switches can be disabled (again via an internal DIP switch) to prevent unauthorised changes. One of the front panel switches gives access to two test modes, ALB (analogue loop-back) and DLB (digital loop-back), which allow the modems to be tested.

'The DaComGT is very nice to use . . . But the WS3000, with its Hayes compatibility and its expandability (and lower price) is the one I should like to keep.'

The user has more control over the GT's configuration than the AD: whether dial tone is to be detected, the number of attempts at dialling a number, voice or data call, and time-out values can be altered. Also (as previously mentioned), the number store and software settings are held in non-volatile memory so that they are preserved when power is turned off.

The GT also has an audio call indicator, which rings like a telephone if a call comes through without a modem tone. The caller needs to be aware of the fact because he will still get an earful of answer tone when the modem answers the phone, but if he hangs on, the modem will eventually ring for a human to answer.

The major enhancements with the GT are auto-logon and ARQ (Automatic Repeat on reQuest). It is a method of error correction and needs a GT at each end of the line to work. The software in the modem monitors the incoming data and requests a repeat of blocks with transmission errors. This could be a valuable feature for organisations with important data to pass between two locations.

The auto-logon feature is quite powerful. You can store a series of prompts and the relevant answers, which is much more flexible than the usual method of sending a set string in response to an ASCII EDQ character. You could use it to log-on to Telecom Gold for example, by programming in the PSS queries (NUI?, ADD?,>, and so on) and your responses. You could even program in the prompts and responses for several systems, as the modem scans the store looking for matches and sends the related replies.

Conclusion

It's difficult to decide which of these modems is the best buy. Four of the five are BT approved, and I expect that the fifth, the WS3000, will have no problems in obtaining approval. I couldn't detect any difference in performance when online, and they offer different features at a range of prices. You pay your money and you take your choice.

The DaComs are a little overpriced in relation to what is now and will soon be available in the same price range: for the price of the GT, you could buy a V21/22/23 WS3000. V22 is nice to use, and is well-supported by online systems (but only by Liverpool Mailbox in the bulletin board world so far). Tandata and Steebeck are also planning V21/22/23 modems in the near future, as no doubt are other manufacturers.

The advantage of the WS3000 (provided that the bugs are ironed out) is that you can start with V21/23 and upgrade when you need to, or perhaps when you can afford to. The Steebeck offers Hayes auto-dial and auto-answer at a lower price than any of the others. The Tandata modem works well as an integrated package, modem, software and interface (if your system needs one) from one source, but it doesn't offer as much in the way of features as the others. The Hayes version should make it more competitive.

Fig 1 includes a full list of features, so you can decide what is of relevance to your own application.

Which am I most sorry to lose? The DaCom GT is very nice to use, and I liked the fact that it offers full manual control of its features. But the WS3000, with its Hayes compatibility and its expandability (and lower price) is the one I should like to keep. ' END

PageMaker & LaserWriter

Peter Bright looks at a very different package for the Macintosh, PageMaker, which along with Apple's LaserWriter, can help you turn out a very professional-looking publication.

It's not often that you receive a piece of software which is totally different from anything you've seen before. PageMaker is one such package. It isn't a spreadsheet, it isn't a database, it isn't even a word processor.

PageMaker is a layout package. It allows you to arrange text and graphics as pages, in the same way as a newsletter, magazine or newspaper. In conjunction with Apple's new LaserWriter printer, you can use it to generate very professional reports and newsletters, lay out business forms, generate overhead transparencies, and so on.

Until now, comparable electronic layout machines have cost tens of thousands of pounds. PageMaker runs on the Apple Macintosh.

The minimum configuration to run PageMaker is a 512k Mac with twin disk drives and an ImageWriter printer. It will become obvious, however, that if you want to get the best out of the system, you will also need access to a LaserWriter, and if you are doing large numbers of layouts, probably a hard disk as well.

The system supplied for review was actually a pre-release version of PageMaker, so there was no packaging and the manual was a photocopy of the proofs. The system was supplied on two disks — one system disk and one program disk. In addition to the usual files, the system disk contained two special LaserWriter drivers. These are different from the standard Apple LaserWriter drivers, so you must make sure you have the correct ones present. The program disk contains the PageMaker code, which at over 200k represents a fair portion of the available disk space.

PageMaker boots in the usual way by double-clicking its ikon. You can either run it directly on its own, or with another program such as MacWrite, by using the Switcher RAM partitioner from Apple. This is particularly useful because you can then write your masterpiece in MacWrite, switch to PageMaker, and have the page laid out in seconds.

The release version of PageMaker will contain a Switcher configuration resource to allocate enough RAM to PageMaker. After some experimentation, I found that 300k was the optimum.

When PageMaker has loaded, you are faced by a blank desk-top with a pull-down menu bar marked File, Edit, Tools, Page, Type, Lines and Shades. To start a new layout, you simply select New from the File menu.

The first stage of a new layout is to tell the system what size paper you are using, how big the margins are and how many pages you want. Each PageMaker file is limited to 16 pages, but you can enlarge this and still keep the automatic page numbering correct by having more than one layout file.

Paper sizes are US Letter, US Legal, A4 and B5. You can elect either for the page to be the normal way up, or on its side if you need extra width.

The layout window

When you have selected the type of paper you want, you are greeted by the main layout window. The best analogy of this window is to a layout artist's paste-board.

In the middle of the window is a blank page with the margin guides in place. The rest of the white portion of the window is the cutting board where you can keep scraps of text and pictures that you may want to use later on the page.

The bottom of the window contains a scroll bar and an icon display of the number of pages in the file and the current page; you move between pages simply by clicking the page icon. The system also contains 'Master' pages, in which you can lay out information that you want to appear in all the pages of your layout. This can save a lot of time if all your pages look similar.

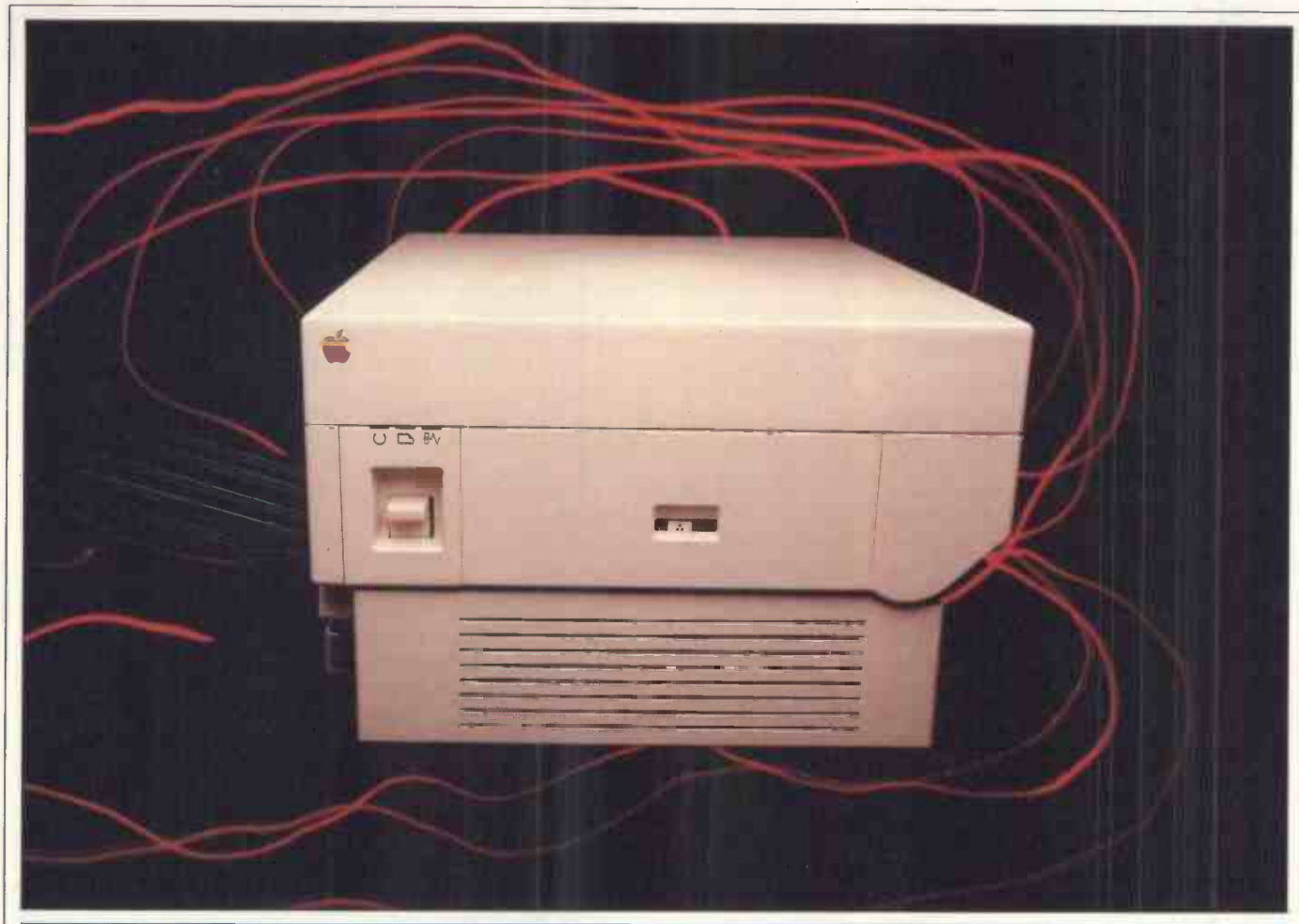
In the top right-hand corner of the layout window is another small window labelled 'Toolbox'. This contains eight icons which allow you to move parts of a layout around, edit text, crop graphics to fit a space, and draw rectangles, rounded rectangles, ovals and lines on the layout.

The normal display for the layout window is to show a picture of the whole page on the screen. As soon as you start laying out text and graphics, you need to be able to see a close-up of the section you are working on. The PageMaker Page menu allows you to display portions of the page at actual size, or in 50 per cent or 70 per cent reductions. If you are doing detailed work with small point sizes, you can choose 200 per cent magnification.

Before I began to prepare and lay out a page, I usually went to the Tools menu and selected 'Show Rulers'. As the name implies, this displays vertical and horizontal rulers along the top and left side of the layout window. You can choose the scale on the rulers from either inches, millimetres, or picas and points. The current position of the mouse pointer is displayed on the rulers so that you can use them accurately.

The layout

The first thing to do when laying out the



The use of the new Apple LaserWriter is central to the concept of PageMaker. Although you could use the standard ImageWriter at a pinch, it really isn't up to the job.

The use of the word 'laser' in the name of the new printer shouldn't be taken at face value. Contrary to some myths, it doesn't use a 'star wars' laser beam to burn the characters onto the paper. In fact, the LaserWriter has much more in common with a humble office photocopier than with laser cannon or other military hardware.

Laser printers of this type work by using exactly the same copier drum, toner and mechanism as a photocopier. The main part of the printer is a rotating drum which has a static charge over its surface. When the print data arrives at the printer, a small semiconductor laser is pulsed across the surface of the drum. Where the laser light hits the drum, the electrostatic charge is destroyed; therefore by tracing the laser across the drum, you can construct an electrostatic 'negative' of the page to be printed.

After the drum has been set up, it is coated with particles of charged plastic 'toner'. These particles only adhere to the parts of the drum where the electrostatic charge wasn't destroyed by the laser beam. Next, a sheet of paper is run past the rotating drum, which deposits the toner onto the paper. Finally, the paper is run through heated rollers which melt the plastic toner onto the paper.

Obviously, it wouldn't have made sense for Apple to construct all the printer mechanism, so it went to Canon which has a reputation for photocopier manufacture and which also makes a basic laser printer, sold in a modified form by Hewlett-Packard.

Although the Canon, Hewlett-Packard and Apple laser printers all use the same basic mechanism, there is a marked difference in their performance. The Canon isn't particularly intelligent as laser printers go, and is really designed as a fast, quiet alternative to daisywheel printers. The Hewlett-Packard is more intelligent and can handle both text and graphics, although graphics can only take up a certain proportion of the page.

By contrast, the Apple LaserWriter is very intelligent. It actually outstrips the Macintosh in terms of processing power, using a 16-bit Motorola 68000 running flat out at 12MHz (the Mac's 68000 runs at 8MHz). It has 1.5 Mbytes of RAM (even the Fat-Mac only has 0.5Mbytes) and has 512k of ROM (the Mac has 64k).

The need for all this processing power soon becomes apparent when you realise that in order to be able to do full graphics, the machine needs to hold a bit-map of the whole A4, printed page. This alone takes over 1Mbyte of RAM.

The LaserWriter comes complete with two interfaces to the outside world. One is a standard RS232 interface which is designed solely for connecting the printer to machines such as the IBM PC. If you use this interface, you lose the graphics capabilities.

The second interface is an Apple Talk network socket, which allows you to use the printer with a dedicated Mac or share it on the network among a work group. I will be looking at Apple Talk in greater depth next month, but one problem that is relevant here is that Apple Talk is a slow network so there is no question of sending a 1Mbyte page bit-map down the network from the Mac to the printer.

To get around this problem, Apple has used a printer control language, originally designed for professional typesetting machines, called Postscript. Its great advantage is that instead of describing the page as a bit-image, it describes the shapes of the objects on the page. A typical Postscript page description uses around 10k rather than the 1Mbyte needed for a bit-map.

In use, the LaserWriter is a very impressive machine. To make it work with the Mac, you have to install special driver files in place of the ImageWriter driver. Although

page is to decide how many columns the page is to have. *PCW* usually uses a three-column grid, but PageMaker lets you have between zero (that is, the whole page) and 10 columns. PageMaker then displays appropriate column guides in the layout window. If you decide you want a special column layout, you can pick up the column guide with the mouse pointer and drag it to where you want.

One of the great advantages of PageMaker over some of its rivals is that it can accept text and graphics from other packages. Text can come direct from MacWrite or Microsoft Word, files and graphics can come either from MacPaint or MacDraw. In addition, you can bring in either text or data via the Macintosh Clipboard.

If you are dealing with graphics, it is usually preferable to use MacDraw files rather than MacPaint. This is because MacPaint stores its graphics as a screen bit-map, while MacDraw stores its graphics as a series of graphic commands. The advantage of using commands is that they will work in different scales and resolutions, but with a bit-map, scaling is more difficult. Another factor is that the LaserWriter is a lot happier with MacDraw files than it is with MacPaint.

When text is brought in, most of its word processor attributes are retained, so font, point size, underline, bold, and so on, remain the same in PageMaker as they were when sent from the word processor.

While this is generally a good idea, it can be slightly problematic. When I word process on MacWrite, I use a 12-point Geneva. However, to lay out a piece in *PCW* style, the text needs to be 9-point Helvetica. The obvious answer is to word process directly into Helvetica, but I find that this is too small to read easily on the Mac screen. After I have finished the piece, I have to physically select all the text (MacWrite doesn't have a 'Select All' facility) and then change the typeface and point size, before I can run the text into PageMaker.

To import text or graphics into PageMaker, you use the PLACE... command from the File menu. This shows a directory of available text graphics on the disks and allows you to select the file you want.

When you are back in the layout window, the cursor icon will have changed from a pointer to either a text, MacWrite, or MacPaint icon to show that you are in place mode. To place the text, you simply position the icon where you want the text to start and press the mouse button. PageMaker will then run the text from the datafile down the column you have selected, automatically wordwrapping the text so that it is the correct width for the column.

When it has finished, the text will be displayed in the column along with starting and ending block markers. If there is overmatter (too much text) the ending block marker will show a '+'. If you want to make another column, you can select the '+' on the end-of-block marker, the pointer will change back to the text icon and you can carry on as before. PageMaker will only lay out one column of text at a time.

When you have placed a block of text, there are a number of things you can do with it. You can move it around; this is done by selecting the arrow-shaped pointer in the toolbox, and you can then click the block and drag it around the screen *ad infinitum*.

Next, you can change the length of the block. This is the most useful of all the features. For example, you might lay out text down a whole column from the top to the bottom of the page, and then decide that you want a picture at the bottom of the column, so you need to make a space. All you need to do is select the end-of-block marker and move it up the column until you have enough space for the picture. The extra text will now automatically be moved to the next column and space will be made.

Finally, you can change the appearance of a block of text. To do this, you select the Edit ikon (capital A) from the Toolbox. You can then edit exactly as in any Mac word processor — you can delete words, add extra text, justify, underline, and so on.

To change the font or point size of selected text, you select Type Specs... from the Type menu. This allows you to choose from the usual Mac fonts with the addition of Times and Helvetica, which are built into the LaserWriter. According to the manual, point size is selectable between four and 127 point, but, on the review system, the range was six to 72 point.

In addition, you can set attributes such as bold, underline, superscript, and so on. You can also specify leading; this is the amount of space between lines of print specified in multiples of one point. It is usually set to auto, but if you want more control, you can set it yourself.

Laying out graphics is achieved in much the same way. You use the PLACE... command from the file menu to select the graphic file you want to

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the LaserWriter drivers take up more valuable space on your system disk, they don't use the temporary print files that you need with the ImageWriter.

The print quality is extremely good — the LaserWriter has Times and Helvetica typesetting fonts built in. Other Macintosh fonts can be printed, but they aren't of quite the same quality. Different point sizes, outline, underline, and so on, are fully supported. The printer is also very quiet — it makes no more noise than a desk-top photocopier.

In real terms, the LaserWriter is also a very fast printer. The trouble is that, whereas you can watch a daisywheel printerhead printing the lines, the LaserWriter just sits and thinks and then prints a whole page at once.

Maximum print resolution is 90,000 dots per square inch. This is superb by normal computer printer standards, but isn't quite up to typesetter standards, where 1.5 million dots per square inch is standard.

The actual time taken to print a page varies according to what you want the printer to do. As you would expect, plain text is the fastest — it takes about 30 seconds to print a standard page of text. Life gets harder if you are printing graphics, where it can take anything from 30 seconds to 15 minutes for the printer to work out what the bit-map should be like and print the page. The worst time I experienced was 11 minutes for a complex page.

The main problem with my system was that the printer tied up my Mac while it was printing. I found this frustrating, as I could have been getting on with something else. Apple points out that the LaserWriter is designed for use on a network when it would be hooked into a fileserver which could spool print files. While this is true, I feel that Apple could have fitted a bigger buffer inside the LaserWriter so that it could take larger documents without tying up the Mac.

The main drawback of the LaserWriter is its price. At £6995, the price is nearly double that of the Hewlett-Packard Laser Printer, which is based on the same print mechanism. However, this machine was designed for use on a network, so its cost can be shared among a number of users. In addition, if offers features which are just not possible on other laser printers: PageMaker, for example, can only work at its best due to the possibilities opened up by the LaserWriter.

All in all, the LaserWriter is a superb machine. For general-purpose text printing it is expensive unless it is used in a network, but as a partner to a package such as PageMaker, it's cheap at the price.

use. The pointer will then change into either a MacPaint or MacDraw icon. You then move the icon to where you want the graphic to be displayed and click the mouse button.

If you want to move the graphic around, you can select the arrow pointer from the Toolbox and drag it around the screen. Using the arrow pointer, you can also scale the graphic to make it fit into a specific space. You can make a graphic thinner or wider, taller or shorter, or both, by selecting one of its 'handles' and dragging it with the mouse. Holding down the Shift button on the keyboard while you scale the graphic will automatically ensure that it stays in proportion.

In addition to scaling a graphic, PageMaker also lets you 'crop' it, trimming the edges of the picture so that it fits the space. The advantage is that the graphic stays at full size; the disadvantage is that you may lose quite a lot of the original picture.

In addition to allowing you to import pictures from graphics packages, the PageMaker Toolbox also has some drawing facilities built into it which are useful for drawing rules to separate columns, boxes around pictures, ovals for logos, and so on. A particular advantage is that you can specify shades for boxes. Benchmarks in *PCW*, for example, are run with a 20 per cent grey tint overlaid. To do this, you just draw a box around the Benchmark area and specify 20 per cent shading from the Shades menu.

Drawing rules is similarly easy. You specify the rule width from 0.25 of a point to 12 point, and then draw the line using one of the line-drawing tools in the Toolbox.

In use, I found all the features of PageMaker extremely easy to use. Its great advantage is its flexibility: even if you know nothing about the skills of layout, you can keep playing with the page until you get it right.

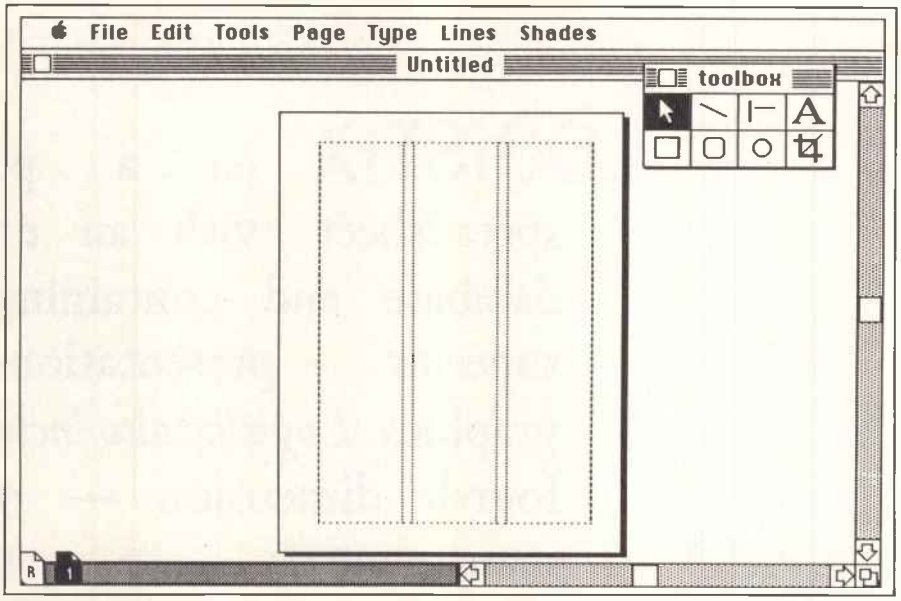
As an experiment, I laid out one of my Benchtests in the *PCW* style. Usually when I write a Benchtest, I print it out and it goes to the sub-editors, who convert it into English. From there it goes to the typesetters, then copies of what has been typeset come back to us for correction. We check them and use them to do the page layouts, although the finished versions are actually done back at the typesetters by a layout artist using a scalpel, a ruler and a Rotel pen. The whole process takes at least a week and usually two. Using PageMaker, I laid out my Benchtest the same day it was written.

Printing

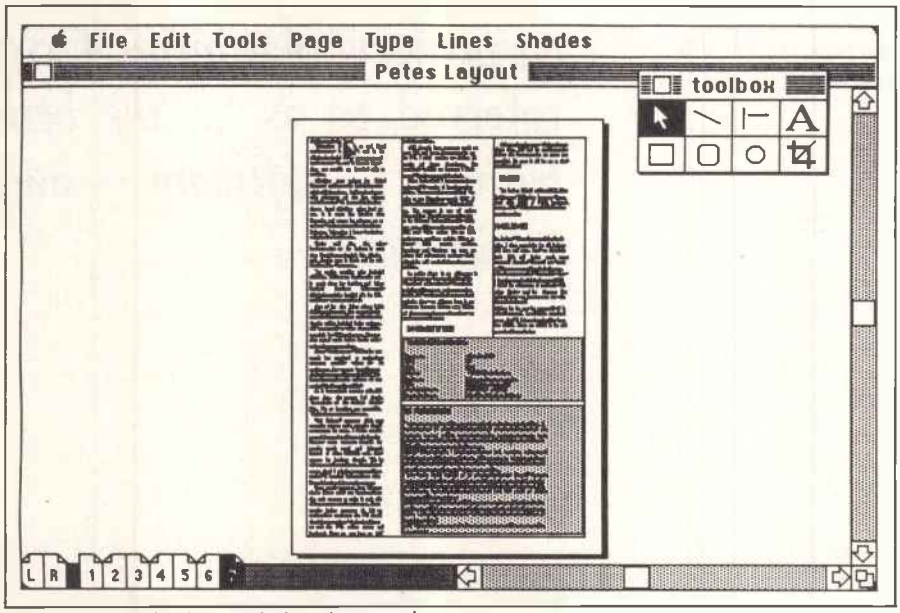
I used PageMaker with both the standard Apple ImageWriter dot-matrix printer, and with Apple's LaserWriter. Although the output on the ImageWriter was good by dot-matrix standards, I wouldn't use it for anything other than drafts of layouts.

The LaserWriter is superb (see the review within this article). There is no other computer printer that can match the quality of the LaserWriter when used with PageMaker.

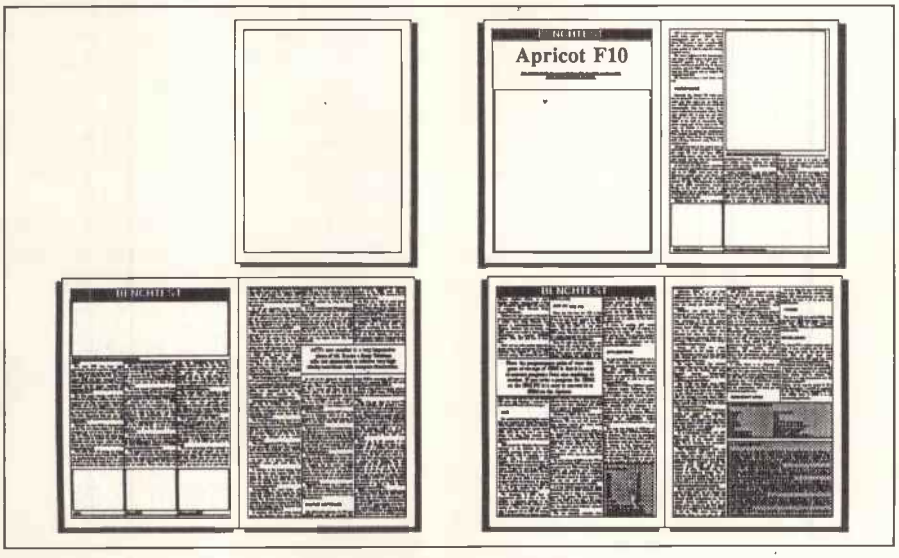
Using the LaserWriter printer driver, you can either print the page full size, or you can scale the whole page. It can be important sometimes to match the bit



The layout window



An unmagnified page is hard to read



'Thumbnails' print up to 16 pages on the LaserWriter

LOGISTIX (n) a powerful spreadsheet with an extensive database and containing truly superior presentation-quality graphics. *Logistix also includes:* the fourth dimension — (1) time management; (2) resource allocation; (3) task scheduling; (4) project planning. Commonly referred to as *'... the best idea in business software since the spreadsheet'.*

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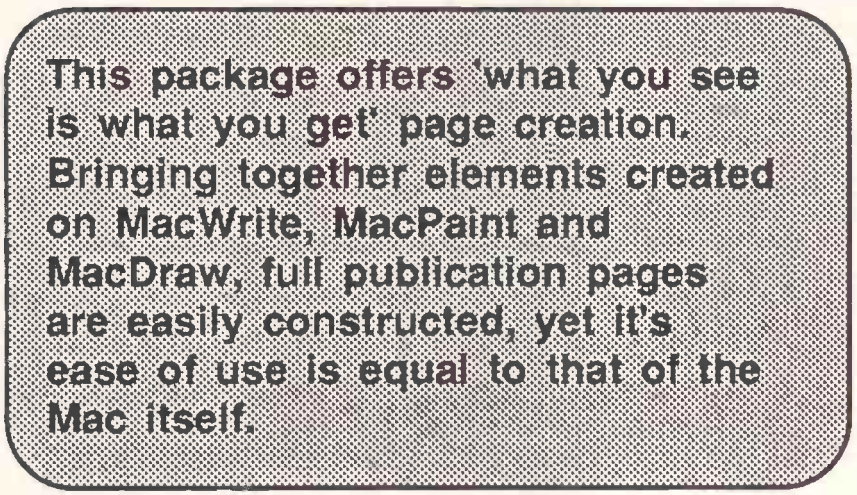
images of the graphics and the LaserWriter or typesetter you are using. You can also produce 'thumbnails' of all the pages on one sheet of paper. This looks good and is useful for making sure that double-page spreads are correct before you print the whole publication.

However, even the LaserWriter isn't quite good enough for use in magazines such as *PCW*, on which professional phototypesetting machines work at around 1500 dots per inch rather than the LaserWriter's 300. But all is not lost. PageMaker talks to the LaserWriter in a language called Postcript. This language is also used by some Linotype professional phototypesetting machines, so it should be possible to take your Mac disk, plug it into a Postscript-compatible typesetting machine and produce professional typeset pages.

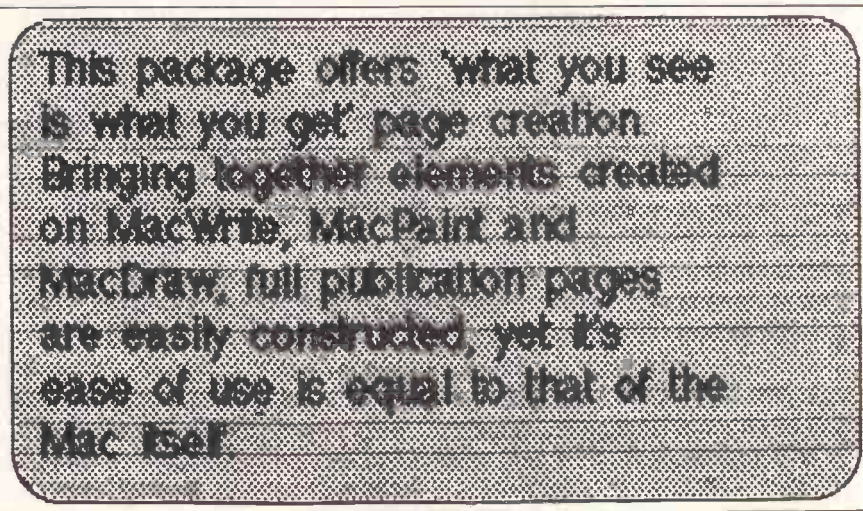
As an additional feature, Linotype is also working on a phototypesetting machine which will plug directly into the Mac just like any other printer. No prices are available yet (it is likely to be *very* expensive), but this would open up the whole professional layout field to the Mac and PageMaker.

This package offers 'what you see is what you get' page creation. Bringing together elements created on MacWrite, MacPaint and MacDraw, full publication pages are easily constructed, yet it's ease of use is equal to that of the Mac itself.

Example text from a Linotype typesetter



Example text from the LaserWriter



Example text from the ImageWriter

Documentation

I was only supplied with a photocopy of the pre-production manual, but it looked very good. The manual was prepared using Pagemaker and the LaserWriter. The quality of the text is good, with plenty of screendumps. I liked the handy hints section at the back, which explains different printer resolutions and the print reductions necessary for the best results.

I used PageMaker for about a month before the manual even arrived, and this kind of ease of use seems to be par for the course for Mac software these days.

Conclusion

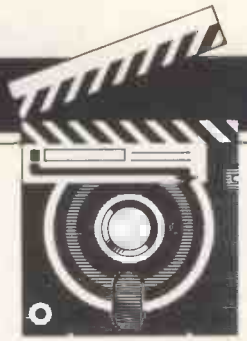
I can't count the number of times I've shown someone my Macintosh, and they've said: 'But it's just a toy! It may look pretty, but an IBM is much more useful.' Now at last I can show PageMaker to them and say 'Let's see your IBM do that!.

At first sight, it may seem that PageMaker is a specialised product only for those interested in publishing. However, the more you think about it, the more uses you can find. It adds a new dimension to internal company reports, presentations, newsletters, and form design. Any executive who needs to present high-quality reports could find a use for PageMaker.

Indeed, PageMaker isn't designed for heavy magazine production. I'm sure that if you found the right typesetter you could produce a decent colour magazine, but it would not be as easy as using professional electronic make-up equipment. But then professional electronic composition machines cost tens, or hundreds of thousands of pounds — PageMaker is expected to sell for approximately £400.

I was extremely impressed with PageMaker. It's the best Mac layout package I've seen so far.

PageMaker is distributed by Pete and Pam. Tel: (0706) 21744. END



SCREENTEST

Telewriter

Telewriter combines the features of a word processor with the communications capabilities of electronic mail. Nick Walker looks at the IBM PC version of this versatile package.

In theory it should be possible to create a document on your word processor, load up your communications package, and send the document to whoever you want through electronic mail. In practice you create it on your word processor, spend an hour converting the document from word processor format to a form suitable for your communications program, load up your communications program, configure it for the electronic mail system you're using, and send it down the wire.

It would seem that a combined word processor and communications package would be useful. Surprisingly, the only packages I've heard of for the IBM PC that combine the two functions are the full-scale integrated packages such as Symphony and Framework which also include spreadsheets, databases, and so on.

If all you want to use is a word processor or electronic mail, it's overkill to use an integrated package, apart from expensive. Telewriter is a package that fills this gap in the market, allowing you to toggle between word processor and communications mode whenever you want. This will, for example, let you read your electronic mail into a document and edit it as required, or send a document straight from the word processor to an electronic mail system.

The version of Telewriter reviewed here is for the IBM PC. This will run on the IBM PC, IBM PC/XT, IBM PC Portable and IBM PC/AT, but not on any of the PC compatible machines.

Separate versions are available for the major compatible manufacturers such as Olivetti and Compaq. There is also a version for the Apricot range of machines.

Telewriter in its entirety occupies only 35k so it will run on the smallest machine, and being all memory resident is quite fast.

Installation

Like most PC programs, Telewriter has to be installed for your particular set-up. You can run the program straight off but, unless you're very lucky, you'll soon run into problems, especially if you try to print or use the communications facilities. Set-up is a menu-driven program that enquires into the basic system you are using: for example, whether you're using a decent display or IBM's colour one, and which serial port the modem is hanging off. Overall Set-up is very comprehensive with options for type of printer, specific printer configuration, two communication settings, answer-back and pre-set responses, and defining your own printer characteristics. It will, for example, perform micro-space justification with top-quality daisywheel-type printers. One frustrating feature of Set-up is that it assumes either a parallel printer and modem in serial port A, or a serial printer in port A and a modem in serial port B. My set-up had a parallel printer, a mouse on serial port A and an onboard modem on serial port B, so was not supported.

Editing

Having installed the program you can now run it; no intermediate menus are displayed and the program loads straight into the main word processing screen. Most of the screen, as you would expect, is available for your document. Running along the bottom is a menu bar showing the current function of the 10 function keys (Fig 1), and below this is a status bar which tells you which of two co-resident documents you are working on and the current page, line and character positions.

The cursor keys move you by character within a document. You can move by line, paragraph and page, and to the start or end of a document by using the specified function keys. The function key on its own moves you down the document by the specified amount and the shifted function key will move you up again, an arrangement that soon becomes very natural to use. There is no facility to move one word within a document.

Telewriter's normal mode of operation is Overwrite — that is, new text is not automatically inserted in existing text but overwrites it. I find this easy to work with, but most people prefer insert mode. You can toggle to insert mode with one of the function keys, but be careful — certain function keys switch off this mode, while others can be used in conjunction with it. The insert function key followed by the line, paragraph or page function keys will insert a line, paragraph or page respectively.

The delete function key works on lines, paragraphs, pages and even entire documents in the same fashion. Interestingly, Telewriter has a clear option, used in the same way as insert and delete, which just wipes text leaving a blank area where it used to be.

Cut-and-paste is provided, and at first proved rather confusing. Rather than highlighting the text to be manipulated, Telewriter makes a copy of the text which is then moved around with the cursor and other control keys. When you're used to large chunks of text wandering merrily around the screen pretending to be a cursor, it's as easy to use as any other method.

All the other basic word processing operations are consistently supported, including search-and-replace, underline and centring. The format of the function to be performed followed by either the line, paragraph, page or document key runs right through the package.

A secondary menu is opened up by

hitting the F10 key, revealing a host of other functions. From this menu you can access some of the more powerful of Telewriter's word processor features, and access the communications aspects.

One of the nicest features of Telewriter is its ability to hold two documents in memory at the same time and switch between them with a single keystroke. The full power of this isn't realised until it is used in conjunction with Telewriter's communications ability and one of the features of the secondary menu.

From the secondary menu you can split the screen so that half is document A and half is document B. With this, you can abstract a document from electronic mail by cutting and pasting across to the document you are creating. Incidentally, it was during this operation that I found a bug in Telewriter — not a serious bug, but a bug nonetheless. Another option from the secondary menu is switching off the menus at the bottom of the screen. If you do this while in split-screen mode, it only switches off half the menu, leaving the other half stranded in the other document. It doesn't harm either document, it just looks untidy.

Another nice feature of this second command menu is the support of multi-column documents. As with all good, friendly software, it's easier to use than describe this facility. You can divide the screen into as many columns as you wish, and use the TAB key to move from one column to the next. When you are editing multi-column text, a whole range of key sequences becomes relevant. In particular the cursor control keys are used more, extending functions to work on columns. Unlike other word processors with a column function, everything works as you would expect it to. The only thing I missed was the ability to specify the required number of columns and leave Telewriter to space them equally.

Telewriter has quite extensive calculating facilities built into the word processor. Probably the most useful of these is the ability to total a column of numbers within a document, with the result being delivered neatly at the bottom of the column. You can also enter mathematical expressions into a calculation area and have the results dropped into your document at the current cursor position.

Disk and printer handling

Unlike many word processors, Telewriter performs all its disk and printer operations from the same level of menu as the editing functions. By specifying wildcards in the usual DOS format with the get-file option, the program will display a corresponding directory. This really comes into its own when dealing with a number of documents and Telewriter's two-documents-in-memory feature.

Telewriter does all its printing in the background, leaving you to edit text, get or store text files, and perform most other operations while the printing takes place. I can't think of a reason why, but one of the things you can't do while printing is use the cut-and-paste option — very strange. The Set-up program contains information to drive 10 popular types of printers, and Telewriter customises itself very well to optimalise any particular set-up.

Communications

Telewriter will work with either 300 or 1200 baud rate modems in either full or half-duplex via the serial port. I used an internal modem board and told the program it was hanging off serial port B, and it worked quite happily. Two communication settings can be accessed from within the word processor, so a 1200 baud modem could communicate with both 1200 and 300 baud systems without ever leaving the word processor.

Hitting the ONLINE key from the secondary menu will put you in terminal mode, where Telewriter is used like any other communications package. The really useful feature of Telewriter's communications, however, is that at any time you can hit a function key and go back to the document you are editing. All communications now write directly into your document, so you can skip all the logging-on and switch to edit mode just before the information you want in your document arrives, going back to terminal mode for the logging-off sequence.

It is possible to automate your dialling and sign-on procedure. Within the Set-up program you can define 110 preset responses which can be sent automatically to the modem. Each response is sent by pressing the ALT key followed by one of the function keys. If you use three of these presets as the telephone number, user ID and password, it is possible to log-on with just three keystrokes, providing, of course, you have an auto-dial modem to take the telephone number.

Function key	Primary menu (editing menu)	
	Unshifted	Shifted
F1	Document	
F2	Page	
F3	Paragraph	
F4	Line	
F5	Paste	Cut
F6	Delete	Insert
F7	Rule	Underline
F8	Clear	Centre
F9	Send	Print
F10	Home	Switch menu

Function key	Secondary menu (command menu)	
	Unshifted	Shifted
F1	Indent	Size
F2	Reverse	Split
F3	Justify	Calculate
F4	Local terminal	
F5	Online	
F5	Tab	
F7	Sort	
F8	Password	Find
F9	Get	Store
F10	Help	Edit

Fig 1 Function key configuration

In addition to receiving directly into memory, Telewriter gives another nice communications facility — the ability to send a prepared text directly from the word processor, with a couple of keystrokes. When sending text, Telewriter automatically enters terminal mode so you can see exactly what is being sent.

I was very surprised to find an encryption facility built into Telewriter. Given a particular password, Telewriter will scramble any documents to be transmitted, making them completely unreadable to any unauthorised recipient. Another user (with Telewriter, of course) can unscramble the text, provided he knows the password. This is usually done by a separate, expensive package so if encryption is important to you, this facility alone may make Telewriter worth buying. I can't comment on the quality of the encoding but can confirm that the text is truly scrambled and unreadable, which must give at least some extra security.

Documentation

Telewriter is supplied with a 60-page manual and a 10-page quick-reference guide. Both are well-written and explain the program operation thoroughly.

Prices

Telewriter costs £295 plus VAT for both the IBM PC and Apricot versions, and is distributed by the Bristol Software Factory. Tel: (0272) 735022.

Conclusion

As a word processor, Telewriter contains as many features as it possibly can without losing its easy-to-use approach. While some of the operations are rather odd to use, when compared with other word processor packages, the consistency of keystrokes needed to perform any operation makes it one of the simplest word processors I've ever used. After mastering the basic keystrokes, most operations follow naturally, and even operations you never performed before can often be utilised without reference to the manual.

The combination of word processor with communications facilities makes for a very powerful package. At £295 I'd have reservations about recommending it purely on the basis of its word processor. If you want a word processor and also see yourself regularly using electronic mail, this package is the simplest method to achieve this for both the IBM PC and Apricot micros. If security and encryption are also important, then I'd doubt that you'll find a better package at any price. END

On the transfer list

Geoff Wood presents some useful implementations of the DIF transfer file structure within spreadsheet programs, based on VisiCalc on an Apple II

The Data Interchange Format, commonly known as DIF, is intended mainly for transferring data between programs that recognise DIF files. If you have, say, a worksheet devised on a spreadsheet program with rows of figures for monthly sales and other items, you can transfer the values in these rows to Apple Business Graphics, PFS Graph or VisiPlot in order to draw a graph or bar chart. Or DIF can be used to transfer data from a spreadsheet program such as FlashCalc or VisiCalc to a database program such as DBMaster or PFS File.

Column>	A	B	C	D	E	F	G	H
Row 1	Departmental Cumulative Totals							
2					Cumulative Totals			
3								
4	Date	Department	Code	Amount	Dept A	Dept B	Dept C	Dept D
5								
6	Jan 3	Dept A	1	1000	1000	0	0	0
7	Jan 9	Dept B	2	1100	0	1100	0	0
8	Jan 13	Dept C	3	1900	0	0	1900	0
9	Jan 20	Dept D	4	2000	0	0	0	2000
10	Jan 27	Dept A	1	1200	2200	0	0	0
11	Feb 1	Dept B	2	1800	0	2900	0	0
12	Feb 9	Dept C	3	3000	0	0	4900	0
13	Feb 15	Dept D	4	1300	0	0	0	3300
14	Feb 20	Dept A	1	1700	3900	0	0	0
15	Feb 27	Dept B	2	4000	0	6900	0	0
16	Mar 4	Dept C	3	1400	0	0	6300	0
17	Mar 10	Dept D	4	1600	0	0	0	4900
	and so on to							
97	Dec 5	Dept A	1	1300	118000	0	0	0
98	Dec 10	Dept B	2	8000	0	117800	0	0
99	Dec 14	Dept C	3	1800	0	0	166000	0
100	Dec 20	Dept D	4	1200	0	0	0	138000

Fig 1 Departmental cumulative totals

Column>	A	B	C	D	E	F
Row 1	Quarterly and Annual Summary					
2					Quarterly	
3	Month	Apr	May	Jun	Total	
4						
5	Sales	30000	26000	30000	86000	
6						
7	Materials	15000	13000	16000	44000	
8	Wages	5000	4000	5000	14000	
9	Overheads	7000	6000	7000	20000	
10						
11	Profit	3000	3000	2000	8000	
12						
13						
14	Quarter	1st	2nd	3rd	4th	Total
15						
16	Sales	92000	86000			178000
17						
18	Materials	47000	44000			91000
19	Wages	16000	14000			30000
20	Overheads	22000	20000			42000
21						
22	Profit	7000	8000			15000

Fig 2 Quarterly and annual totals

However, DIF has other uses within spreadsheet programs. Firstly, it can be used to save memory in large worksheets. An area of the worksheet containing many formulae can be saved as a DIF file, and this file can then be reloaded into the worksheet in the same area. DIF does not save the formulae but only the answers, so the DIF file uses less memory.

Another use for DIF is to copy rows or columns of cells containing formulae into other rows or cells and, at the same time, convert the formulae into numbers. This can be useful for transferring, say, quarterly summary figures into another position for annual consolidation; the monthly figures can then be blanked out, and data for the next quarter can be entered.

DIS can also be used to change a set of data from columns to rows. When you save (or load) a DIF file, you are asked whether you want to save (or load) by row or by column. If you save a DIF file by columns and reload it by rows, the columns are converted into rows and *vice versa*. The same thing happens if you save a DIF file by rows and reload it by columns.

Most spreadsheet manuals give little information on the uses of DIF, so some examples will not come amiss. The examples here are based on using VisiCalc on an Apple II, but they can be readily adapted for other spreadsheet programs on other micros.

Saving memory

Worksheets which contain many formulae can absorb large amounts of memory. For example, the worksheet illustrated in Fig 1 contains formulae in every cell in columns E to H, and it absorbs 20k of RAM. But if the area from E6 to H100 is saved as a DIF file and loaded back into the same columns, the worksheet uses only 11k of memory. This is a saving of 9k or 45 per cent of the original. A 20k worksheet is well within the capacity of VisiCalc on most micros, but this example is given purely to illustrate the extent of the saving in memory.

The memory savings are not shown accurately by the VisiCalc display,

Column>	A	B	C	D	E	F	G
Row1	Columns to Rows						
2							
3	Year	1980	1981	1982	1983	1984	Totals
4							
5	Cust A	1000	1100	1200	1300	1400	6000
6	Cust B	1100	1200	1300	1400	1500	6500
7	Cust C	1200	1300	1400	1500	1600	7000
8	Cust D	1300	1400	1500	1600	1700	7500
9	Cust E	1400	1500	1600	1700	1800	8000
10							
11	Totals	6000	6500	7000	7500	8000	35000

Fig 3 Data by columns and rows

Column>	A	B	C	D	E	F	G	H	I
Row1	Rows to Columns								
2									
3	Year		Cust A	Cust B	Cust C	Cust D	Cust E		Totals
4	1980		1000	1100	1200	1300	1400		6000
5	1981		1100	1200	1300	1400	1500		6500
6	1982		1200	1300	1400	1500	1600		7000
7	1983		1300	1400	1500	1600	1700		7500
8	1984		1400	1500	1600	1700	1800		8000
9	Totals		6000	6500	7000	7500	8000		35000

Fig 4 Data after transfer by DIF

Column>	A	B	C	D	E	F	G
Row1	Rows to Columns						
2							
3	Year	Cust A	Cust B	Cust C	Cust D	Cust E	Totals
4							
5	1980	1000	1100	1200	1300	1400	6000
6	1981	1100	1200	1300	1400	1500	6500
7	1982	1200	1300	1400	1500	1600	7000
8	1983	1300	1400	1500	1600	1700	7500
9	1984	1400	1500	1600	1700	1800	8000
10							
11	Totals	6000	6500	7000	7500	8000	35000

Fig 5 Data by rows and columns

which records the remaining RAM to the nearest kilobyte only. Another indication of the saving is given by the number of sectors occupied by the worksheet on a disk. Fig 1 uses 74 sectors on a disk whereas, after changing columns E to H with DIF, the file occupies only 31 sectors, a saving of nearly 60 per cent of the original. The DIF file itself occupies only 12 sectors.

This means that worksheets with many complex formulae can be saved in DIF form on a disk in less than half the space needed for the full version. Of course, you lose the formulae but you may be interested in saving only the answers.

The formula in E10 is @IF (C10=1, D10+@MAX (E5...E9),0). Similar formulae are entered in columns F, G and H to test the value of the entry in column C for the numbers 2, 3 and 4 and, if TRUE, to enter the cumulative total in column F, G or H; otherwise enter 0. The formulae are replicated down the columns using R, R, N and R for the four variables in the formulae. This example shows ony 100 rows and four columns of formulae; with more rows and columns, this technique might prevent your spreadsheet program from running out of memory with very large worksheets.

If the cells you save with DIF contain values that are rounded for display purposes, the DIF file when reloaded will display the numbers with as many decimal places as will fit in the column width. (The reloaded cells can be reformatted but this can be tedious.) Alternatively, before saving the DIF file, you can use the ROUND function of Advanced VisiCalc, FlashCalc, MagiCalc and SuperCalc or the INTEGER function of PractiCalc and VisiCalc.

Conversion

Worksheets for budgets and other plans are often designed to accumulate weekly data into monthly periods, monthly data into quarterly periods, and quarterly data into annual periods. Fig 2 shows a simple worksheet with data for three consecutive monthly periods accumulated into a current quarterly total. The problem is to hold the quarterly total for accumulation into an annual total and then blank out the data for the three months.

You can enter +E5 in cell C16, +E7 in C18, and so on, and the quarterly totals will be copied, but when you blank out the monthly figures for April, May and June, ready to accept figures for the next three months, you will lose the totals in column E and the copies in the lower part of column C. By turning off the automatic recalculation feature you can hold the answers, but they will change as soon as you recalculate. An alternative is to use the # key to change the formulae in the lower part of column C into numbers, but this is tedious and prone to error with more than a few entries.

Instead, you can use DIF to save the contents of column E, then load the DIF file back into the lower part of column C. When you blank out the entries for April, May and June, the quarterly totals will be held in column C and, at the same time, the cells in column E will revert to zeroes ready to accumulate the monthly data.

Again, this example is deliberately simplified to illustrate the principle. In practice, there could be many more rows of data to save in the DIF file.

A similar technique could be used to transfer data between worksheets. The quarterly totals, saved as a DIF file, could be loaded into a different worksheet for accumulation into annual totals.

Columns to rows

How often have you spent an hour or more designing a worksheet, only to realise that it would have been far better to have the row headings in columns and *vice versa*? If you clear the worksheet and start again, you have wasted hours of work. DIF enables you to transfer the contents of rows into columns and columns into rows in a matter of minutes. Even though you lose formulae in the process, it is quicker to rebuild the formulae by replication than to start from scratch.

Fig 3 shows a simple worksheet with data for several customers over several years, and with totals per customer and per year. To change this worksheet from columns to rows, the first step is to locate the cursor in A3 and save a DIF file (by rows, not columns) with G11 as the lower-right cell.

The next step is to clear this area out of the worksheet, locate the cursor in A3 and load in the DIF file by columns, not rows; the worksheet will then look like Fig 4. This can be tidied by deleting the blank columns and inserting blank rows with the result shown in Fig 5. The formulae for totalling the rows and columns can then be re-entered and replicated.

Even with this simple example, it is faster to use DIF than to start again from scratch. With a bigger example, the time saved could be quite substantial.

Conclusion

These examples show that DIF is not just a means of transferring data between different programs. It can also be used within spreadsheet programs to save memory, to convert formulae into figures and to convert rows into columns. END

Mix 'n' match

While compatibility is rife at the business end of the market, home micros fare less well. Richard Sargent looks at moves towards software compatibility on the Memotech, Einstein and Enterprise.

Illustration by Stuart McKay

In the early days of home computing, most micros had only a very limited Basic. If, for example, a listing published for the TRS-80 was typed into the Commodore PET, it could reasonably be expected to work without much modification. Screen displays were extremely simple, and the program was usually written as though the output device was a teletype — all program output (which was invariably text) was sent to the lower left-hand corner of the monitor screen, and it simply scrolled upwards as the program developed.

Teletypes understood the ASCII character codes, so there were three mainstays of computer compatibility — Basic, ASCII and the teletype screen. There was even a standard for cassette tape recording. Called Kansas City (or CUTS), it stated the rules for recording the bits as 1200Hz and 2400Hz tones on the tape. It did not, however, lay down the rules for block structures or header information — that would have made things too compatible!

This compatibility didn't last long. Screen output became more complicated, graphics were introduced, and Basic listings began to sprout PEEKs and POKEs as users frantically tweaked their machines to get the best out of them. It was soon hardly worthwhile typing anyone else's computer program into your own machine, unless, of course, your favourite pastime was correcting the hundred or so syntax errors which invariably cropped up in even the shortest of programs.

However, standardisation was alive and well in some quarters. Well-informed users could pass unblocked tapes between the Nascom 2, the BBC Model B and the RML 380Z. All these micros have Kansas City tape format. They also have RS232/RS423 interfaces for more immediate communication, but in both cases it would only be worthwhile transferring ASCII files as their Basics are dissimilar.

Two attempts to completely disregard convention met with widespread disapproval. Sinclair's ZX80 and ZX81 did not use the ASCII character set, although this didn't prevent the computers becoming runaway successes. Even so, Sinclair didn't repeat the mistake. The second attempt to break with tradition proved serious for Jupiter Cantab. Its micro, the Ace, didn't have Basic, and although it had Forth, the public demonstrated its lack of faith by not buying it.

Basic and computers were inseparable in the eyes of the home users, but the machines didn't need to have a Basic that was in any way compatible with other Basics. Differences are accepted by the user because they are always described as 'improvements'. Even the most simple of commands vary from one computer to another: for example, positioning the character cursor. TAB(1,2) SCREEN 1,2 LOCATE 1,2 PRINT AT 1,2 are just four commands which will print a character at position 1 on line 2 of the VDU. Alternatively, RND(x) is a function which looks the same on most Basic keyword lists, but doesn't always function in the way you might expect.

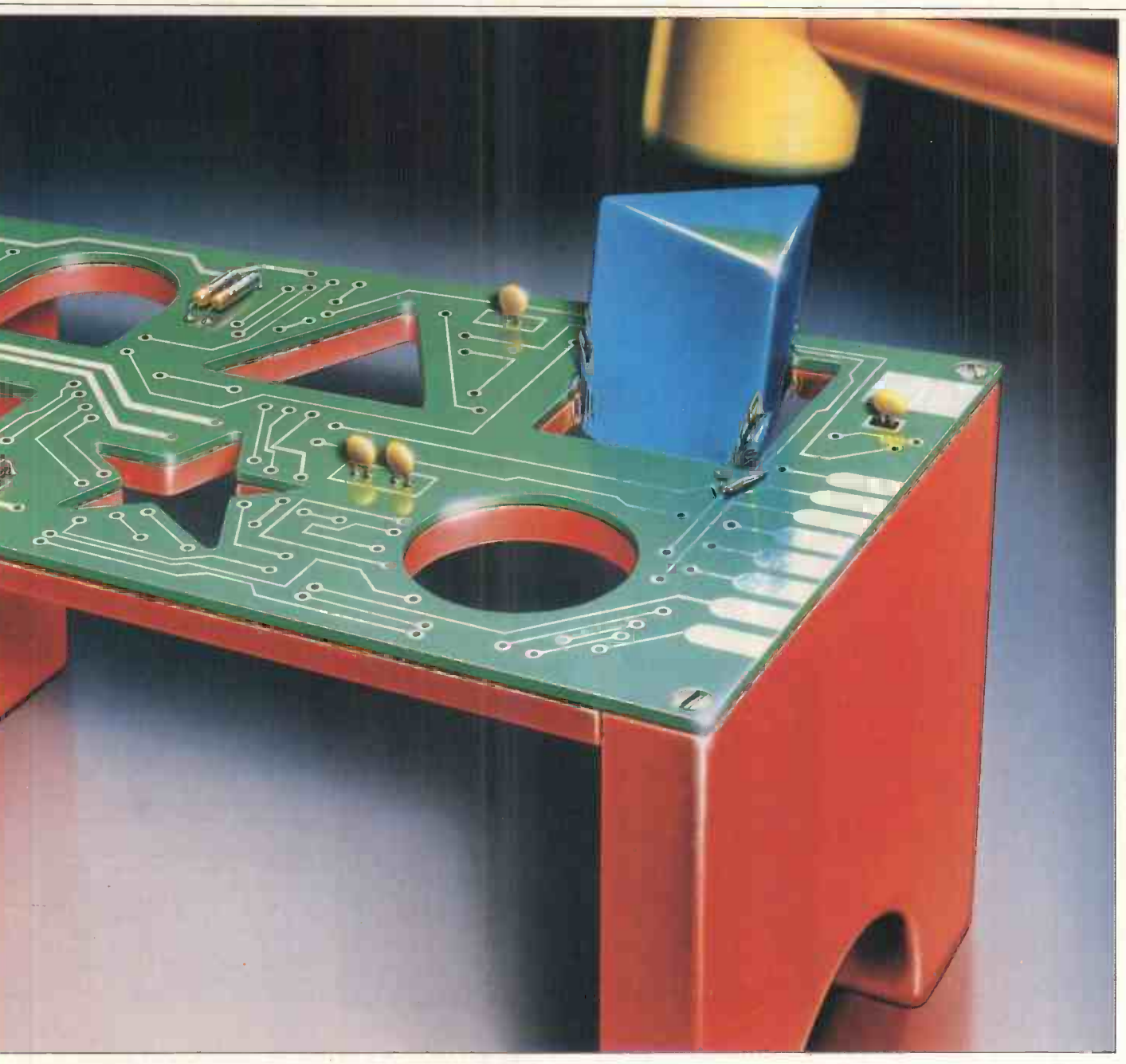
Conversion software

If you want to convert Basic programs on today's micros, it's an uphill struggle. *PCW* has, in the past, produced conversion charts which outline the differences between Basic dialects, and these are certainly a help for small-scale conversion tasks. But if the modern micro is as powerful as the makers claim it is, then shouldn't the machine be doing its own conversion? Could Basic or machine code be translated automatically or with minimal supervision from the user? Conversion software does exist, but such software takes time to develop, and those holding the purse strings have to be convinced that a market exists for the product. There are also niggling (but potentially expensive) little points such as copyright ownership to be sorted out. Then, at the end of the day and if the wind is in the right direction, micro X can run micro Y's program and read its tapes and data files: compatibility will have arrived.

Memotech, Tatung and Enterprise make low-volume sales computers, the MTX512, the Einstein and the Enterprise. Modest sales figures don't impress the software houses, which are reluctant to produce programs for the machines. With few software packages available, the selling strength of the micro is naturally impaired — a classic chicken-and-egg situation. But if the micro can run selected BBC or Spectrum titles, then, in theory at least, the software base can be expanded overnight.

Enterprise advertises a Basic-to-Basic cassette in its 1984 literature. In fact three cassettes are planned, reading in and converting Basic from the Spectrum, BBC and Commodore into the resident IS-Basic. Work on the Spectrum version is nearly finished: the Enterprise is reading Spectrum tapes, but there are still bugs to be ironed out.

It may be, of course, that the company will have as many problems in making this package available as it had bringing the original computer into the market place, but no-one has ever claimed that compatibility comes easy! The oppo-



sition, however, are rather better organised.

Tatung is supplying BBC Basic (Z80) free with the Einstein. Unlike the Enterprise system, BBC programs are not converted to the resident Basic: BBC Basic is simply loaded instead of Crystal Basic. The Einstein has 3in disks and no tape interface, so other machines' programs have to be moved across on RS232 as untokenised files, which might prove tricky if the other machine isn't in the same room.

Memotech has gone a stage further and persuaded its MTX512 (or expanded MTX500) to read and play Spectrum games tapes. The system is a combination of software and hardware, and the hardware add-on is clever and inexpensive. In a separate project, Memotech has also configured the MTX to behave like an MSX machine and read MSX tapes — a slightly less difficult task, and one which doesn't have an immediate application. Memotech sees both projects more or less in terms of a bonus for loyal customers. The Spectrum emulator is in production and will be available primarily through the Memotech User Group.

In practice

The idea of brand X computer running the best Spectrum and BBC software is quite appealing: a great deal of excellent software has been written for these two machines. The next logical stage is to suggest that the BBC Micro should run Spectrum material and *vice versa*. However, there are enormous technical difficulties behind the program emulation concept. M-Tec Computer Services, the Norfolk firm which has successfully marketed the Z80 version of BBC Basic, probably knows a lot about these problems.

BBC Basic is a public-domain language and can therefore be freely copied. However, someone had to write the Z80 version, get it going at something like the speed of the original, and make it work on computers which have strange screens, strange keyboards and strange disk or tape systems. That someone is Richard Russell, and he owns the copyright on the Z80-code version of BBC Basic. As Gerald Parry, director of M-Tec, is happy to report, Z80 BBC Basic is extremely popular.

If you're not worried about sound and graphics capabilities, then any Z80 machine running CP/M 2.2 (or later version) can run BBC Basic (Z80). There will also be a version for 8088/8086 CPU machines soon, which may well please IBM and MS-DOS users, but it's the emulation on the smaller machines which is perhaps the most interesting.

The Einstein has virtually identical port and sound facilities to the BBC Micro, yet the chips are completely different. The main problem is the screen resolution, which at 256×192 pixels is not large enough to pretend to be a BBC MODE 0, 1 or 4 screen. The extensive use of MODE commands in a program can therefore upset the

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Einstein's BBC Basic, but the Einstein has much more memory than the BBC Micro and can cope with graphical calculations which take a drawing off the Einstein screen.

Instead of crashing the computer, the graphics continue to plot themselves, even though the user can't see the result. The lines reappear when the plot coordinates come back into the Einstein screen memory area.

This highlights the emulation problem; if a micro is to pretend to be another, it needs to have either the same or much better facilities. The Enterprise, with its 672×256 pixel screen and 256 colours, should be able to cope with all the BBC screen modes. On the Einstein, compromises have to be made. Sound is handled well, despite the chip involved which is General Instruments' AY-3-8910 and not the Texas SN6489A as used by the BBC Micro. Adval is also supported, although again the analogue-to-digital

'The MTX series computers have a hardware specification which is very close to the Japanese standard . . . the MTX512 will soon be able to behave like an MSX computer.'

chips used in the two computers are different. Perhaps the best feature is the operation of the Einstein disks, which is rather more impressive than the BBC system.

Disk file-handling is not particularly well-explained in the BBC documentation, but it is in the BBC Basic (Z80) manual, and by way of a bonus, the Einstein disks are faster, quieter and hold far more information than the average BBC disk system.

By Christmas the Amstrad will have BBC Basic, and Acorn/Olivetti might begin to realise that it's losing its edge on the competition.

Machine code is something of a problem: there is nothing that can be done to make 6502 code run on a Z80 machine or *vice versa*. Embedded machine code is as good a way as any to scotch attempts at translation or emulation. CALLs, USRs, PEEKs and POKEs in a listing spell danger, and both M-Tec and Enterprise concede that there is little they can do about it, but credit must be given to M-Tec for the inclusion of an inline (Z80) assembler in its BBC Basic (Z80). You can have machine code in your programs, provided you write it yourself!

Tony Brewer has approached the problem from the other angle. He is the designer of Memotech's Spectrum emulator, which will cope with machine code programs but not with Basic.

Spectrum Basic

Spectrum Basic does not lend itself to rewriting and it wouldn't be a viable undertaking to load it into the MTX, even though it is technically possible to do so, due to the legal implications. Spectrum Z80 games code, on the other hand, can be loaded into MTX RAM without any fear of reprisal — it is not a condition of sale that a cassette tape be made to run on a particular computer! The difficulty is knowing what to do with the code when it's in the host computer, which in this case is the 64k MTX512.

Tony Brewer's solution is to page out the Memotech 16k ROM at a suitable point in time and replace it with the RAM normally mapped in the second 64k page. The computer then becomes a RAM-only machine, and there is room for the Spectrum program (5CB6H to FFFFH), the Spectrum video RAM (4000H to 5AFFH) and the Spectrum workspace (5B00h to 5CB5H). Calls to the Spectrum ROM (0000 to 3FFFH) are intercepted by small sections of specially-written code placed in key locations in what should be the Spectrum ROM area. This code is known as the interface code, and it is slightly different for each Spectrum game.

Tony Brewer has so far looked at 30 Spectrum games, and has successfully written interface code for 20 of them. How many he converts will depend on the interest shown in the first interface tape, which contains all the code to enable a mixed selection of 20 Spectrum arcade games to be played on the MTX512. The original games must be bought by the user in the normal way: Memotech is not offering Spectrum games for sale.

This particular Spectrum emulation is very clever, and the end-result is suitably impressive. Even so, compromises have been made and, as Tony Brewer is the first to point out, the system can't cope with two areas, sound and embedded Basic. Lines of Basic which help the machine code can't work as the Basic interpreter is simply not present. The small Basic loading programs are no problem as they are not part of the actual program and can be easily bypassed, but anything else and the program can't be interfaced. Sound is less of a problem and is simply ignored, and as most Spectrum arcade games suffer from poor-quality sound anyway, this is not a major tragedy.

The MTX and the Spectrum share very few features apart from their Z80 processor, and the emulation is achieved by making use of the MTX's superior specification. Again it's a case of the host computer being equal to or better than the original. The screen resolution is the same (256×192 pixels) but after that everything is better: the processor runs at a faster speed, there's more memory, the keyboard is larger and there are more colours to choose from. Even so, it takes an extra four integrated circuits to persuade the machine code running in the MTX that the computer (and particularly the keyboard) is a Spectrum. Fortunately these are inexpensive ICs and can be easily plugged into one of the many MTX ports, so establishing the concept of software compatibility is likely to be attractively inexpensive from Memotech's point of view.

Conclusion

The current development work at Memotech is not confined to Spectrum emulation. The MTX series computers have a hardware specification which is very close to the Japanese MSX stan-

'There has never been much evidence of a demand for compatibility between low-cost micros — games-conscious users bought the Spectrum or the Commodore 64 . . .'

dard, and it is likely that the MTX512 will soon be able to behave like an MSX computer. This will not be a dramatic breakthrough, but a reminder that the MSX idea was a valiant attempt by the Japanese (with a little help from Microsoft) to break into the European home computer marketplace with a range of compatible 8-bit computers. The failure to impress the computer-buying public in Britain is now so much history, and the MSX invasion was something of a non-starter.

Whether 1986 will see another attempt by the Japanese (or anyone else for that matter) remains to be seen. There has never been much evidence of a demand for compatibility between low-cost micros — games-conscious users bought the Spectrum or the Commodore 64 and in the boom years there was a wealth of software, of whatever quality, available to keep the pundits happy.

As software houses fade into oblivion, it may be that the new micros will need to be able to load and run existing software. The thought of a new 16/32-bit micro running old 8-bit software may not appeal to product image-makers, but as a way of keeping the public happy and selling computers, it might merit serious consideration. END

On the mend

When the manufacturer of your machine ceases to exist and the dealer doesn't want to know, who do you turn to for service when things go wrong? Wendie Pearson has uncovered some third-party maintenance and repair companies willing to help out — in most cases, that is.

You're in need of a fast, cheap and efficient repair service — where do you go? With companies seeming to be dropping like flies, who picks up the pieces when a manufacturer goes down?

The last 18 months has seen a rapid growth in the number of third-party maintenance companies springing up to repair orphaned machines and their peripherals. While some may accuse such companies of behaving like vultures, ready to swoop with their services the minute someone else can't come up with the goods, it reminds you that the law of the jungle is by no means dead. Wherever companies collapse, leaving users without support, other companies step in to provide whatever service the public needs.

Services

Machines whose manufacturers continue to thrive also need servicing, and there's a wide range of firms to turn to. For example, there's Personal Computers, based in London and Leeds, an authorised dealer for Compaq, IBM and Apple whose clients include the London Business School and London University. Sales director Stuart Lakey said: 'We charge our own rates, based on eight or nine per cent of the product's retail price for on-site service, and all our engineers are manufacturer trained.'

There is a same-day service for on-site, fully comprehensive cover, as well as a priority time and materials (PT & M) service whereby the client is charged a small annual premium. The latter is the cheaper option at around one per cent of the purchase price, which means that a system worth £7500 would cost you £75 a year for same-day service.

Alternatively, repairs can be done on an *ad hoc* basis when someone has a problem but no maintenance contract. However, Lakey points out that this is more expensive than the other two options.

'People tend to come to us rather than the manufacturer as we move quicker, and our terms and conditions don't demand that you have to go to a place miles away, so our service has the advantage of locality too,' he said.

Lakey says the main headache is printers, closely followed by the breakdown of mechanical parts on disk drives. This opinion was echoed by the vast majority of repair companies I spoke to, making peripherals appear to be the main liability.

'Where software is concerned, we'd ascertain what the problem was over the phone and see whether it was a hardware or a software fault. If there's a bug in the program, we're not allowed to help, but we'd act on the customer's behalf to get the problem corrected at author level,' he said.

Another company in the business field is CDS, with offices in London, Bristol, Birmingham, Manchester, Scotland and Ireland. It copes with Apple, IBM, Sirius, Mac, Apricot, and Lisa machines plus associated peripherals, and an eight-hour turnround is the norm.

Contracts manager Hazel Woodhouse said that a basic Apple system including monitor and disk drives would be £400 upwards per annum for fully comprehensive cover including parts, labour and travel. In comparison, a 256k IBM PC/XT would set you back £408.25 a year for on-site cover, but that is an absolute minimum.

Computer Terminal Services will mend your IBM, Sirius, Superbrain, Apple, Cortex or Epson micro, but its main forte is printers. It has 25 engineers throughout the UK, and charges are based on 10 per cent of a machine's purchase price, with maintenance contract customers receiving a 24-hour service while those without a contract get a 48-hour service.

'We aren't connected to any of the companies; we're purely maintenance, so we live and die on what we do,' said a spokesman. 'We lend equipment to people to go on with while we repair theirs, and although some people may be cheaper, we still feel our prices are competitive.'

But if you're looking for someone to spring-clean your magnetic media rather than mend your micro, you should consider Acron Services, which provides maintenance for all magnetic media including disks and cartridges, but not tape.

The company not only cleans your equipment, but will also tell you if your environment is too mucky. 'Each computer room has its own problems,' said managing director Alwyn Jones. 'It could be air conditioning that isn't working properly and is bringing in dirty air and dust. It could be dirt, mishandling, a head that's beginning to drop and harm the disks, for example. Dirt is a big problem, but people pay us to tell the truth, whether they like it or not.'

'We are totally impartial, doing care and maintenance as a service — not repairs, refurbishing or selling. We clean things on-site but damage is not our forte, although we can recommend people,' she said.

A minimum charge within a 40-mile radius of Acron's office is £100 a day for up to 20 packs of any kind, with subsequent packs costing £5 each.

Down in Surrey's commuter belt is Engineering & Maintenance in Woking, which does IBM, Olivetti, Sirius and Apricot repairs. An IBM PC colour system with up to 256k memory is £300 a year or £85 quarterly, while a 10Mbyte hard disk Sirius system would be £450 a year or £120 quarterly. Monitors cost between £45 and £60, while a Shugart or Qume disk drive repair would be £35. This is for a 24-hour response time with the offer of a replacement machine if the unit cannot be repaired on-site. Printer repairs vary roughly between £50 and £275 a year depending on the model you have, and can also be charged at the quarterly rate.

And now for the news on Apple repairs! Although Apple might tell you to contact its recommended repair company, GCS, you may find yourself on a bit of a wild goose chase as: a) there are six electrical companies in Middlesex which go by the name of GCS; and b) the company you're looking for is no longer called GCS but Bell Technical Services. (Will someone please tell everyone at Apple?)

Bell Technical Services was formed in January this year as a result of a

merger between Cable & Wireless and GCS Engineering, and the resulting company mends IBM, ACT, NEC, Sharp and Osborne machines as well as all makes of Apple.

Responsible for warranty work on micros from Sharp, NEC, Osborne and Apple, the company does a 24-hour, two-hour or four-hour response time, and warranty on repairs is three months (although, under the law, no-one is obliged to give you a warranty on repairs done, according to the Trading Standards Authority).

According to Bell's marketing services manager David Aird, most of the recurring problems are caused by things users do, most of which seem to happen around breakfast time. These include 'cornflakes and coffee in keyboards, people using floppy disks as coffee mats, and people demonstrating how floppy their disks are'.

Aird was also eager to point out that you shouldn't put freezing cold disks into hot machines, as condensation could result. Not only that—the worst is yet to come. According to Aird, 'women's underwear causes static problems. So does their hair'. On enquiring what precisely it was that puts women's underwear in the doghouse, it appeared that the offending property was nylon — in which case, men will have to watch what they wear, too.

The message from Bell seems to be that if you want a problem-free business micro, you must be bald and refrain from wearing nylon underwear. And you will have to keep your cornflakes away from your machine.

However, if the damage has been done and your system has a nervous breakdown as a result, you can bank on forking out £360 for an Apple III with monitor and single disk drive, or £440 for an IBM PC/XT single-disk colour system with printer. A single-disk IBM PC/AT is £264, an Osborne 1 £225, an Epson FX100 printer £85, a Brother HR1 £104, an Apple monitor £23, a Macintosh 128k £215, and an NEC PC 8000 64k business system (including keyboard, monitor, dual disk drive and expansion unit) £230.

All these are annual premiums which provide for a 24-hour response time. If you want a four-hour response it'll cost you 30 per cent extra, while a two-hour response is 100 per cent extra (any oil sheikhs please take note).

If you're located in Scotland, Holdene Microsystems in West Lothian repairs micros and printers for home and business, including ACT and Commodore models.

Prices start at £25 an hour plus parts, or £50 an hour on-site, and a courier service is available for users who can't personally deliver to Holdene.

Engineer Len Chapman said: 'The biggest problems are with Commodore, as some of their machines are getting on a bit. The main problem with micros is the interface chips, while with printers there are problems with printheads.'

The company does most makes of micro with the exception of the Spectrum, and customers include Stirling and Strathclyde universities as well as many businesses.

Trident Enterprises in Berkshire specialises mainly in Commodore machines, Sinclair QLs and Spectrums, although it does some peripherals, too. Minimum charge for business systems such as the C4000 is £46 plus parts, with the Commodore 64 costing £15 plus parts and the Spectrum £10.50 plus parts. The fixed charge for schools is £23 per machine inclusive, and turnround is 24-48 hours.

Trident attracts a lot of foreign users and, like most other third-party maintenance companies, puts its success down to competitive pricing and fast turn-round.

Spectrum owners based in Suffolk could try CE Systems which specialises solely in Sinclair products. A small, local operation, the company charges £16.95 all-in for Spectrum repairs and £12.75 for a ZX81. As various repair companies don't feel it's worth their while repairing ZX81s, it's worth making a note of this if you've grown attached to yours and don't want to throw it on the scrap-heap.

Managing director Paul Crisp will

Illustration by Karen Ludlow

mend QLs although 'they'll cost at least £20 to do, depending on the dearest component'. During September, the first QLs come out of warranty and look like being expensive machines to repair, but you can save around £30 by going to an independent company rather than to Sinclair, which charges an amazing £60 to mend the QL.

In Buckinghamshire, GC Bunce & Son deals with broken Commodore, Sinclair, BBC and MSX offerings. 'MSX machines, particularly Sony and Toshiba, are starting to flow in now — repairs on those vary between £15 and £25,' said director Mark Bunce junior.

'The most common faults on these occur around the flap where you put in the cartridge. 90 per cent of wear and tear is circuitry breakage caused by forcing in the cartridge, but not enough R&D went into their design in the first place, and I estimate that about 30 per cent of MSX machines that have had

'. . . the law of the jungle is by no means dead. Whenever companies collapse, leaving users without support, other companies step in to provide whatever service the public needs.'

12-18 months of use will have problems,' he said.

The only machine that's giving the company a real headache is the BBC, due to the spares situation. Although some companies managed to get these without too much trouble, Bunce & Son has had a good deal of difficulty. 'There's a problem mending the BBC as we can't get the spares. Now that they've become involved with Olivetti, it's time Acorn pulled their finger out as far as spares are concerned,' he said.

Repair prices for the 64 fluctuate, depending on the state of the US dollar. As the value of the dollar directly influences the price of spares over here, the price can fluctuate between £15 and £35, but Bunce never charges over £35, as that is what Commodore charges.

Spectrum owners have a standing charge of £14 if they bring in their micro, or £16.10 if it's sent by post. The company will also fix QLs.

A particularly sturdy make, Bunce finds, is the Atari 800 and 300 series. 'They were built to a good specification and the person who designed them knew what he was on about. You don't see many problems there with broken circuitry — it's more likely to be a cosmetic problem with the case, for instance.'

After several fruitless attempts to discover Sony's policy on maintenance I tried Toshiba instead, where the response was a lot more encouraging. Product manager Chris Greet said the company was training dealers selling MSX machines to provide maintenance, so that when warranty began to expire in September, a full repair service would be available. Greet said he expected other MSX manufacturers to follow suit on the subject of repairs, and that, where Toshiba was concerned, prices would be in line with those charged on other electrical goods.

Extracting information from Acorn was harder. As the entire Acorn management team was unobtainable, I spoke to chairman's secretary Angela McGarney who refused to give any information whatsoever on maintenance for Acorn machines, either in or out of warranty. Each question was met with 'no comment' and she refused to shed any light on where users should go for support. The reason given was that Acorn 'wasn't talking to the press'.

A few minutes later, a mystery male voice appeared on the phone claiming to represent Acorn but refusing to give its name. 'I don't think my name is necessary,' it said. The voice said that users should go to the dealer where they bought their machine: 'All our dealers have a procedure.' A procedure for what? I asked. 'For making sure Acorn machines are repaired,' it replied.

The alternative, said the voice, was to contact Acorn's customer service department which will send you a prepaid label so you can mail off your ailing machine to an approved Acorn repair centre. But on asking who its approved repair agents were, the mystery voice said that no-one had ever asked such a thing before.

Another call, this time to Acorn's service department, made it clear that the mystery voice was not a hoax and that users should in fact go to their local dealer with any problems. Most Acorn machines, I was told, are then sent to RCS Computer Services in Middlesex which does most of Acorn's repair work.

At RCS, consumer services advisor Lesley Hogg confirmed that it was the biggest company to do BBC repairs. Prices are £29 for an Electron and £39 for a BBC B.

Another Acorn-approved service centre is Micro Fix in west London, which like Mr. Bunce, wasn't too chuffed with Acorn either. 'The fact that Acorn doesn't actually refer people to us doesn't help, because we have to struggle ourselves to let people know we're here,' said partner Derek Mullings. 'But we're an approved service centre and we take care of most of the Inner and Greater London repairs. Also, because we're based within an Information Technology Centre, we do international repair work, too.'

It has two kinds of contract. Type A means a customer brings in the machine and collects it, and this gives you as many repairs as you need for an annual price of £24. Type B applies only to the Greater London area and provides for repairs on-site for £40 a year. If someone lives outside this area, travel costs are added on, and if you have no contract at all, a one-off repair will cost about £20. Turn-round is one week, and the company also mends all Cumana drives, Microvitec monitors and Epson FX80 printers.

Being Acorn approved, spares are no problem. 'The most common problem on BBCs, issues three and four downwards, is the ULA data RAM buffer 74LS245,' he said, 'whereas with issue seven, there are short or long circuit problems or connections going down, rather than problems with components.'

'Most third-party maintenance companies say that not only do they have technical expertise which many dealers lack, but they provide repairs much faster and more cheaply. . .'

With Sinclair's repair prices at £30 for the Spectrum, £60 for the QL and a quoted turn-round of 10 working days (although many users have found the reality a great deal slower), the Micro-Surgery in Manchester is well away in terms of competition. Spectrums are £9.50 all-in, while a ZX81 is £7.50 plus parts (Sinclair doesn't bother to mend these at all) and repairs are done within seven days.

When asked why users should use his service rather than Sinclair's, managing director Steve Bell said: 'Sinclair sub-contract out to people like me anyway, and then charge the user an arm and a leg for it. The only difference with Sinclair is that it goes through *their* system.'

You have to contact Bell via a box number or phone him at home. 'I don't like to give my home address in case I get burgled,' he says. 'I'm a fully qualified engineer, working on 16-bit minis as a permanent job and doing this in my spare time, so repairs will be done to good engineering quality.'

Bell says he deals with a lot of intermittent faults which he's trained to look out for, and some of the tools he uses are intriguing, to say the least. 'I use all sorts of things like hairdryers and freezing sprays to find out what's wrong,' he says. 'For instance, if a circuit has an intermittent fault, and you

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heat it up or freeze it, it creates the circumstances that make the fault occur, so you can spot it.'

Readers parked on the North Sea in Harrogate should visit CRAM, which repairs most home micros except Atari as it can't get the parts. There's an £18.50 set charge on the Spectrum, but prices vary on other micros. 'We'd be cheating the customer if we charged a £10 minimum and it was a £5 job,' said managing director Peter Calpin. 'Commodore are a little slow on parts, but they do arrive, and there's three months warranty on work we do.'

With each repair, CRAM sends an engineer's report and a note saying that they fulfil all statutory regulations, so you can see what you're paying for.

You may of course choose to go to the manufacturer when warranty expires. IBM, for example, has a system known as Serviceplan, available direct from the company or from dealers.

This is made up of three options. You can bring your ailing PC into any one of 15 service points throughout the UK, post it in, or pay a bigger fee for a courier who will come and collect it.

'If there's something wrong with the keyboard, printer or display, you get an immediate exchange, but if the fault lies within the system unit itself, we take it away and repair it, and the customer can come and claim it within eight hours,' IBM said.

As the annual charge is 10 per cent of the machine's cost per year, a small PC set-up is around £200 per annum for mailing or bringing it in, while a courier service is 10 per cent extra.

ACT's arrangements are somewhat different. Group marketing manager James Blackledge explained: 'When a customer buys an ACT system, he gets a document which he should fill in and return to us within two weeks of the purchase if he wants extended warranty.'

If you haven't filled that in, you should phone your dealer who will arrange for maintenance, although this will cost more than the latter method. 'If you've bought a 256k Apricot with twin double-sided disk drives and you signed the agreement within two weeks of buying it, then warranty for one year will cost you £145 while two years' cover would be £360,' said Blackledge. If you didn't sign the agreement, the damage is £270 for one year and £450 for two years.

'With companies seeming to be dropping like flies, who picks up the pieces when a manufacturer goes down?'

Blackledge also pointed out that although ACT's repair agents are called Apricot Computer Maintenance, they mend ACT's entire range including the Sirius. Turn-round is 24 hours and there's a three-month repair warranty.

Commodore said that all repairs had a 90-day warranty and that turn-round was five to 10 days. A repair on the 64 is £35, while having a Vic-20 fixed is £25 with the cassette unit costing £11.

At Atari, Max Bambridge, European sales and marketing manager said: 'Each dealer has a charter to provide service for Atari after warranty runs out, and he may elect to do it through a third-party organisation. There are two alternatives: you can send it to Atari via the dealer where you bought it, or take it to one of Atari's 60 service centres throughout the UK which are perfectly capable of repairing Atari products.' Turn-round is one week.

Les Player, Atari's European technical manager, said prices for the Atari XL and XE were £32 including postage, while the 1050 disk drive would be £60 and a typical printer £37. Warranty on repairs is three months.

Of all the manufacturers I spoke to, Amstrad (along with Acorn) was bottom of the pile when it came to a helpful attitude, which is surprising, considering its otherwise excellent reputation.

After many attempts to contact marketing manager Malcolm Miller, his eventual response was apathetic to say the least. 'Asking me for guidance on repair prices is like asking me how long a piece of string is,' he said. 'Quite frankly... if people *want* maintenance... they go off to Rumbelows ... or Curry's, or somewhere like that. Their service departments are stocked with spares from us and the turn-round would be one or two weeks.'

Insurance

If you own a home micro, it might be best to insure it. Verran Computer-Fix and the Micro Repair Club operate insurance schemes in conjunction with the Domestic & General Insurance Company. At Computer-Fix in Camberley, yearly premiums are £16.60 for micros worth up to £150, £22.60 for machines worth between £150 and £299.99, and £30.60 for machines worth up to £600. It also insures peripherals and prices vary.

In comparison, the Micro Repair Club will insure your micro at £24.95 for the first year with subsequent years costing £14.95 each.

Conclusion

Most third-party maintenance companies say that not only do they have technical expertise which many dealers lack, but they provide repairs much faster and more cheaply than the manufacturers, should the latter still be afloat. Whether you own a BBC or an IBM, repairmen are popping up to service all sectors of the marketplace at competitive prices, and their locality and ability to provide personal service are just two of the advantages.

It's worth finding out, however, if a firm will give you replacement equipment on loan while your system is fixed — and try, if possible, to obtain a quote rather than an estimate when it comes to prices. An estimate can mean just about anything, but a quote is a definite figure that you can budget around. END

Maintenance/repair companies

Acron Services, 3-6 The Colonnade, High Street, Maidenhead, Berks. Tel: (0628) 37444

Apricot Computer Maintenance, Demuth Way, Junction 2 Industrial Estate, Oldbury, Warley, West Midlands. Tel: (021) 552 1555

Bell Technical Services, 13 Mount Road, Hanworth, Feltham, Middx. Tel: (01) 898 5251

CDS, Downham Road, Ramsden Heath, Billericay, Essex. Tel: (0268) 710292

CE Systems (Computer Division), 32 Churchill Crescent, Wickham Market, Suffolk. Tel: (0728) 746759

CRAM, 82 Meddowcroft, Bilton, Harrogate, North Yorkshire. Tel: (0423) 65270

Computer-Fix Services, Units 2H & 2J, Albany Park, Frimley, Camberley, Surrey. Tel: (0276) 66266

Computer Terminal Services, Bryant House, Bryant Road, Strood, Kent. Tel: (0634) 724333

Engineering & Maintenance, Lansbury Estate, 102 Lower Guildford Road, Knaphill, Woking, Surrey. Tel: (04867) 88301

GC Bunce & Son, 36 Burlington Road, Burnham, Bucks. Tel: (06286) 61696

Holdene Microsystems, Dalriada House, South Street, Bo'ness, West Lothian, Scotland. Tel: (050682) 7506

Micro Fix, 191 Freston Road, London W10 6TH. Tel: (01) 968 9214

Micro-Surgery, PO Box 4, Cheadle, Cheshire. Tel: (061) 436 2688

Personal Computers, 220-226 Bishopsgate, London EC2M 4JS. Tel: (01) 377 1200

RCS Computer Services, Enterprise House, Central Way, North Feltham Trading Estate, Feltham, Middx. Tel: (01) 844 2044/1333

Trident Enterprises, 37 Linden House, Common Road, Langley, Slough, Berks. Tel: (0753) 48785

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Bodemstraat 12, 3830 Wellen, Belgium.
telephone 11 37 75 02 telex 39880 sencpe

Switched on

Avoid the pitfalls and excessive costs that can be incurred when locating and accessing a public information database — go online at low cost with Daniel Re'em and Charlie Brown.

Doctors, lawyers, businessmen, journalists — every information user can obtain valuable information from computer databases. With over three thousand databases available, it's likely that there's something that will be of use to you.

If you require information on medicine, the law, science, technology, business, companies, finance and banking, or almost anything else, it's probably available on a database. If you know what you're doing it's faster and more thorough than spending hours in a library, but it can be very expensive.

The value of being able to find the right information in a short space of time should be self-evident, but few professionals or businessmen use this technology to help them with their work. Cost shouldn't put you off. Some databases do cost several pounds for every minute spent online, but there are ways of dramatically reducing the damage to your bank balance.

Online searching costs can be divided into four main categories: the cost of purchasing the hardware and software; the telecommunications charges; database subscriptions, manuals and training; and the searching costs. It's possible to make savings in all these areas, but the first question you should ask is whether you want to go to the time, trouble and expense of setting up an online searching facility.

The Online Information Centre recommends that you start by talking to existing users. Find out how they have benefitted, and if the costs measure up against the benefits? If you find that the information is useful, but you don't think it's worth investing the time and the money in learning how to do it yourself, there is another option. Information brokerages will do the searching for you; the Online Information Centre publishes a guide to these services.

Hardware

If you think that online information would be invaluable and you have some money to spend, it's worthwhile investing in your own facilities. Don't skimp on hardware and software which might be difficult to use and limited in scope. You will need a personal computer, a modem, a communications software package and a telephone line. Most of your money will be spent on databases, and that's where the savings should be made.

Some hosts (remote computers storing a number of databases) such as Nexis advise that you use their equipment, but most don't mind you using your own. Personal computers are a better bet than dedicated terminals for several reasons. Firstly a micro can be used for many other business tasks. It also allows you to store the information on a disk; it can then either be printed out at your leisure or word processed. If you're writing a report, this facility is invaluable.

Unless you have a printer capable of speeds in excess of 160 characters a second (cps), a micro will also reduce online costs. If you have a terminal and a slow printer, you will waste money by having to stay online until printing has finished. The printer needs to be significantly faster than the data transmission rate of 120 cps to cope with carriage returns, and so on.

If you have a slow printer and don't want to buy a faster one, you can get round this problem by installing a print buffer to sit between the computer and the printer, and store the file to be printed. In this way, you don't have to wait for the printer to finish before logging off.

Telecommunications

Obviously you should check carefully that the modem and communications software you're interested in using will run on your micro. This is especially important with IBM lookalikes, as some software packages written for the IBM will not run on some 'compatibles'. As a rule of thumb, see it working before you hand over the cash.

Modems have a multitude of different facilities and specifications. I'll start with the simple distinction between the ones that plug directly into the telephone socket and acoustic couplers — the ones with two rubber cups for the telephone handset.

The plug-in ones have several advantages — they're faster and more reliable. Most acoustic couplers can only transmit and receive at a maximum of 30 characters a second (300 baud) but the plug-in ones can operate at four times this speed, 120 characters a second (1200 baud). Most databases charge on a connect hour basis, so a faster modem will soon justify the extra investment.

Acoustic couplers are also more likely to suffer from interference which, if it causes you to lose data or drop the line, is both irritating and expensive. They also have a reputation for wearing out much faster than plug-in modems. The plug-in variety also have the bonus of being able to support an autodialer. It often requires several attempts to log on to the host, and there is nothing more frustrating than dialling time after time, only to have the line drop after a few seconds. For the overworked, an autodialer is essential.

The best type to go for is the industry-standard 1200/75 modem which receives data at 1200 baud (120 characters per second) but only transmits at 75 baud (7.5 characters a second). This slow speed is unlikely to affect search times as few of us type faster than 450 characters, or about 80 words, a minute.

Slow transmission speed is only likely to cause problems if you want to use the modem to transmit your own files down the telephone line, but as many of the latest generation of modems operate at 300, 1200/75 and at 1200/1200 baud, you shouldn't need to worry.

If you lose any vital data during a search you may have to start from the beginning again, so it's important to have a good telephone line, preferably direct rather than through a switchboard. This will minimise the chance of interruption or line noise.

There are several ways of accessing a database: you can either dial directly or use one of the public data transmission networks. The cheapest option is a direct-dial local call, but this is usually only available to London subscribers. Long distance and international direct dial calls are expensive, so it's better to use British Telecom's Packet SwitchStream (PSS). With PSS, you pay for the volume of data transmitted plus a low hourly rate and the cost of a local call.

Many databases not available by direct dial include the PSS telecommunications costs in their online charges. Before shelling out the £25 connection charge to PSS, it's worth finding out if you will need to have your own password, as many of the hosts provide a free one. If you find you need to subscribe to PSS, dial your local telephone sales office which will give you the number of the nearest PSS sales office.

Software

There are a large number of communications software packages on the market, but only a limited number specifically designed for online searching. There are three types available: those dedicated to your micro; those dependent on the particular host; and general gateways to all hosts.

The general gateway is probably the best bet if you can find one that runs on your machine. It certainly gives you the freedom to diversify at a later date in whatever way you wish. The following is a list of the facilities you should look for when choosing communications software, and an indication of how the facility can prevent problems and reduce search costs.

Autodial This allows you to store telephone numbers on disk, and, by pressing a couple of keys, to make the computer dial the number. It saves you the bother of remembering the number and, as often happens, re-dialling half-a-dozen times.

Variable communications settings There are many different data transmission standards and parameters. The communications program should allow you to set up the parameters in advance and then store them, so rather than spending half an hour setting up the correct protocal, all you have to do is press a few keys and you're logged on. If you're accessing several remote computers all using different settings, this facility is essential.

Downloading Most printers cannot print as fast as the data comes down the telephone line, so to keep costs down, the program should allow you to store the contents of the search on a disk. Many databases forbid downloading and it is technically in breach of copyright, so check first. Avoid programs which limit the amount of information that you can download at any one time. Downloading has the added advantage in that the information can be edited later using a word processor.

Programmable function keys These allow you to set up your search strategy in advance, thereby saving online time, especially if you're a slow or inaccurate typist. This is important if you are searching different databases on the same host for the same subject.

Security If someone steals a password, you are responsible. At £90 an hour, it wouldn't take long to run up a debt of thousands. The program should allow you to store your passwords securely in order that no-one can see them on the screen. It should also allow you to set up your own passwords to stop unauthorised use of the disk.

The other facilities you should look for are: the printing and viewing of files while online; x/on x/off, a facility which tells the remote computer to temporarily stop sending data down the line; and the ability to be able to filter out unwanted control characters. Buying the right hardware and software will save both time and money in the long-run: you can save over 50 per cent on searching costs by using a faster modem and good searching software. At the end of this article there is a list of three such communications software packages.

Database

With 3000 databases available, it's likely that there's more than one which will suit you. When you require information in a particular area, it's essential to find the most relevant database. You could waste a fortune sifting through a dozen databases, picking up one or two records from each, when a search of one database may provide all the information you need. There are several directories available: one is free from Euronet Diane, others such as the comprehensive Cuadra directory can cost over $100 a year.

One of the best ways to cut costs is to be well-informed about the cheapest sources of information and where to find them. Although similar services are yet to reach the UK, the US has a newsletter, *Data Base Informer*, produced by Information USA, which exists especially to 'identify exisiting unique, free or low-cost computerised databases which can be accessed directly or indirectly'.

There are a large number of free databases, although the information contained on them may often seem somewhat obscure. Many of these are maintained by either non-profit making or government organisations.

One particularly interesting example is a foreign affairs database which contains transcripts of radio broadcasts from around the world. The BBC offers a similar monitoring service which is available on Nexis and World Reporter, but you have to pay through the nose whereas it's free from Clearpoint.

A useful guide which compares database costs on different hosts has been produced by Martin Woodrow, the County Information Librarian for Hertfordshire Library Service. It gives a detailed breakdown of all the main hosts and the rates they charge for time online, as well as the charges for other services such as offline printing.

Another useful feature of Woodrow's chart is that it gives a rough idea of the total cost likely per hour, including Telecom charges. For example Cancerlit, a medical database about cancer, costs approximately £48 an hour on the Swiss host Data Star and only £13 an hour on the German host Dimdi. With this degree of variation in cost, it's worth doing your homework. Before signing, obtain as many brochures as possible and arrange for demonstrations—the hosts are only too pleased to show off their service.

Most databases do not require subscriptions, so the cost of being online is confined to the manuals. Others have large subcription costs or minimum usage agreements, but it is often possible to use the same service without these large fixed costs. For example, you can subscribe to the Nexis/Lexis service from Butterworths, the UK agent for £400 per month. If you subscribe directly to the US outfit, it only costs $50 a month.

Before deciding on your method of subscription to this host, look into the different charges, bearing in mind the exchange rate. If you are going to use the service heavily during normal office hours, it might be better to

1) Use a 1200/75 modem
2) Use a fast printer, at least 160 cps or a print buffer, or make sure that your communications software can download to disk
3) Use a small number of hosts — different search languages can be confusing
4) Find the right database on the most convenient host
5) Find the cheapest way of accessing that host
6) Attend as many free courses and demonstrations as possible before paying for the databases
7) Take full advantage of the free time offered to new subscribers
8) Use the training, help line and search aids before you go online
9) Most database hosts have help lines. Phone them, and ask them to take you through the first search
10) Unless you want to waste a lot of money, plan your search and be familiar with the database commands before going online. Do your thinking *before* you go online
11) Remember that in some databases, you pay for both connect time and the number of records displayed. Make your search as fast and accurate as possible
12) Always log off if you get stuck

Fig 1 The Golden Rules of Online Searching (or, how not to go bankrupt while online)

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DR ASSEMBLER Plus Tools	£120
FRAMEWORK	£325
FRIDAY	£125
KNOWLEDGEMAN	£325
LOTUS 1 2 3	£299
MICROSOFT WORD	£240
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MULTIPLAN	£125
MULTIUSER ACCOUNTS per Module	£295
OPEN ACCESS	£325
PEACHPAK	£150
PEGASUS LEDGER MODULE	£200
PSION EXCHANGE	£395
R. BASE 4000	£295
SAGE ACCOUNTS	£250
SAGE ACCOUNTS PLUS	£475
SAGE CHIT CHAT	£110
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TK SOLVER	£245
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EPSON FX 100	£420
EPSON LQ 1500 200cps (NLQ)	£895
HEWLETT PACKARD LASER PRINTER	£2750
JUKI 6300 40cps	£749
MANNESMANN MT180 160cps (NLQ)	£529
MANNESMANN MT400 400cps (NLQ)	£1595
NEC 2050 20cps	£625
NEC 3550 35cps	£955
NEC PINWRITER P2(P) 180cps	£345
NEC PINWRITER P3(P) 180cps	£485
OKI 84A 200cps	£829
OKI 2350 (P)	£1435
OLIVETTI DM 5300E (P) 220cps	£815
OLIVETTI DY450 45cps (P)	£755
PANASONIC KX-P1091 120 cps + NLQ	£250
QUME 11/40 Ro + I/Face	£1345
RICOH FLOWRITER 1600 46k	£1349
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APRICOT XI 512K 20MB & Monitor	£2995
COMMODORE PC10	£1395
COMPAQ 2 256K 2 x 360K	£1695
COMPAQ DESKPRO 4 640K 10MB + 10MB Tape	£3895
COMPAQ PORTABLE 286 640K 20MB	£4295
COMPAQ DESKPRO 286 512K 30MB 1.2MB	£4295
ERICSSON 256K 2 x 360K	£1595
ERICSSON 256K 10MB	£2495
KAYPRO 286	£3650
OLIVETTI M21 128K 2 x 360KB drives	£1450
OLIVETTI M21 128K 10MB	£2195
OLIVETTI M21 640K 10MB	£2345
OLIVETTI M24 128K 2 x 360KB Drive	£1475
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subscribe via Butterworths. Some of the files on the Nexis service are also available on World Reporter. These hosts have varying pricing structures, so it's sensible to subscribe to the one that will fulfil your information requirements at the lowest cost.

It has been estimated that for the average user, 80-90 per cent of the searching costs are database charges. As these are generally based on time spent online, the key to cheap searching has to be efficient, rapid accessing and retrieval of information.

With time being the central factor, the cost per minute online need not always be the prime consideration. A well-designed, easily accessible database or one that is powerful and fast-working has its advantages over the system that is cheap but slow.

Dialog is expensive, but it is relatively simple to use and works quickly. The Textline/Newsline news abstracts service provided by Finsbury Data is slow and will cost you a fortune on a complex search. It has recently upgraded its system, but it's still best avoided at peak times.

There are discount rates in the evening for Dialog and BRS, and the direct subscribers to the Nexis/Lexis databases, usually a saving of about 50 per cent. If you are prepared to do your searching in the evening, you can save on both telecommunications and database costs.

The response time depends on how many users are on the databases, so to save money it's best to search at low use times. For the US databases your searching should be complete by midday, and for European hosts the evening is the best time. With US databases it might be cheaper to forgo their discount off-peak rates as it might take twice as long to do a search in the early evening. Either search in the early morning when the US is asleep or go for the cheap rate after six.

When you have decided which hosts to subscribe to, it's a good idea to attend the basic training courses which are usually fairly inexpensive — some are even free. Even more important are the savings that a bit of experience can bring, and such courses are one of the best ways of getting it. Datasolve's World Reporter occasionally offers a free day from time to time. A good place to look is *Online Notes*, the monthly publication produced by the Online Information Centre.

Searching

The hosts often provide a quick reference guide, so keep this by your computer and use it. You might just forget a particular command, especially if you regularly search different databases.

You will almost certainly waste money through lack of experience and/or inefficient and sloppy searching. There are certain ground rules that are worth bearing in mind which, although they appear to be obvious, are easy to forget.

Make sure you know how to get out of the system. Putting the phone down at your end does not always guarantee that you will be immediately logged off the system: it might take the host a few minutes to realise that it has a dead line. This is an easy way to lose a fiver on some systems.

To avoid this, make sure that you have a note of the relevant log-off command, and the minute you either get into trouble or feel that you need to reconsider your strategy — log off! Anyone with even a few weeks' experience online will tell you of the speed with which you can lose money the minute you become confused.

Become as well-acquainted as possible with the skills involved in searching. Get into the habit of disciplining yourself into thinking carefully about what *exactly* it is that you want. If you're trying to gain as much information as possible about a specific thing — a particular company, for example — this needn't be too difficult. Problems begin when search strategies become too general and wide-ranging, which itself is usually a product of being unsure of what you're doing.

Write down exactly what you want to know before going online. Think of all the different words which might be used to express a particular subject: for example: UK, United Kingdom, Great Britain, GB and England could all be used to describe Maggie's Farm. To get round this, you will either have to include all these terms or make use of the truncation facilities.

Some databases have special codes for particular subjects. These 'controlled terms' make searching much more thorough, so it's worth becoming acquainted with the system's 'thesaurus' facility. This way, it is possible to be sure that you are reaching every file covering the subject.

Conclusion

Ultimately, the key to cheaper searching is research and planning ahead, whether in terms of equipment purchase or the process of searching itself. It is unlikely that anyone using legitimate methods of searching is going to find it an inexpensive undertaking given the current state of the online information market, but, with a bit of effort, it's certainly possible to lessen the damage.

Information sources

The Online Information Centre is very helpful, and anyone contemplating going online should get in touch. Membership costs £30 per year, and for that you get a regular newsletter, use of the library and all the help you need.

The Online Information Centre
26/7 Boswell Street
London WC1N 3JZ
Tel: (01) 430 2502

Different hosts have different charges for databases. One useful source of information is:

Information USA Inc
12400 Beall Mt Road
Potomac
MD 20851
US

For the free foreign affairs database, contact:

Clearpoint
POB 31577
San Francisco
CA 94131
US

For the comparative costs of the major commercial databases, contact:

Martin Woodrow
County Information Librarian
Hertfordshire Library Service
County Hall
Hertford SC13 8EJ
Tel: (0992) 556629

There are a number of general-searching software packages. For a demonstration, contact:

The Library Technology Centre
309 Regent Street
London W1R 8AL
Tel: (01) 580 4562

Three of the most commonly-used searching software packages are:

Connect Software
Learned Information Ltd
Besselsleigh Road
Abingdon
Oxon OX13 6LG
Tel: (0865) 730275

Userlink
Userlink Systems Ltd
Mansion House Chambers
22a High St
Stockport
Cheshire
Tel: (061) 429 8232

Headline
Oxted Mill
Spring Lane
Oxted
Surrey
Tel: (08833) 5580/7057

The most comprehensive database directory is available from:

Cuadra Association Inc
2001 Wiltshire Blvd
Suite 305
Santa Monica
California 90403
US

A free listing of European databases is available from:

Euronet Diane
177 Route d'Esch
Luxembourg

END

SCREENTEST

Personal Consultant

Is Texas Instruments' Personal Consultant a useful tool for building an expert system? Mike Liardet evaluates this specialist package for the Professional Computer range.

In general, computers compete with humans on dull, unimaginative and repetitive tasks. But there has been a recent spate of activity, in the field of 'expert systems', which has led some industry observers to believe that this state of affairs will not last much longer.

An expert system is a computer program which can substitute for a human expert, especially in activities involving knowledge or reasoning ability. If the instensity of expert system press coverage is an indication, then there should be many human experts currently feeling very nervous about their jealously-guarded monopolies on skill and expertise.

A recent expert systems arrival is a Texas Instruments (TI) product called Personal Consultant. Expert systems products fall neatly into two categories: the expert systems themselves, and the systems to build them. The majority of products to date are in the latter category, as is Personal Consultant. It is a specialist tool for building expert systems on personal computers, currently restricted to the Texas Instruments Professional Computer range.

Personal Consultant is a commercialised version of an expert system builder called E-Mycin which was developed at Stanford University, California. Although expert systems have only recently become widely known, Stanford has been working in this field for 20 years. E-Mycin is only one of many developments at Stanford, all emanating from a pioneering project of the mid-Sixties — a system called Dendral, which was expert at deriving chemical structures.

Overview

Personal Consultant is supplied as a ring-bound manual with four disks. The programming language IQ-Lisp is required to run it, and the review system included this — another manual with a single diskette. It is not strictly necessary to be greatly familiar with Lisp, or IQ-Lisp in particular, in order to use the system. However, it does help to know something of Lisp, and in the long-run, to get the best out of Personal Consultant it will probably be necessary to revert to Lisp for some activities.

'Personal Consultant organises its knowledge in a "context tree" . . . a convenient way of dividing up the problem domain.'

The software runs on a Texas Instruments Professional Computer with a 10Mbyte Winchester disk and a minimum of half a megabyte of RAM. The Professional Computer is a rather quaint machine as it looks like an IBM PC, runs MS-DOS, works with PC format disks, but otherwise has a very low level of software compatibility. Conversely, some of the Professional Computer software, including Personal Consultant and IQ-Lisp, will not run on the IBM. The word from TI is that this state of affairs may change in the near future, and it is to be hoped that it does — there is little mileage for anyone, TI or otherwise, in trying to go it alone with software and hardware which is only superficially compatible.

Personal Consultant is intended to be used in the first instance by an expert who may spend some considerable time and effort in building up a knowledge base (database) containing a good deal of his skill, expertise and judgement. Following this, the knowledge base can then be available for advice sessions with non-expert end-users who would otherwise need to consult the human expert.

There are two very different classes of Personal Consultant user: the expert who builds the knowledge base; and the ordinary user who uses it. These two types of user each employ a different Personal Consultant module: the 'builder program' for the expert and the 'client program' (or 'knowledge engine') for the end-user. These two programs can be thought of as being quite distinct — the only thing they have in common is that they both access the knowledge base, but in each case for quite a different purpose.

The end-user should not need to understand a great deal about the internal workings of Personal Consultant. He arrives at the keyboard with a problem, answers the questions generated by the knowledge engine, and is then given the answer. He obviously needs to know the necessary keyboard procedures, and may wish to ask why the answer was given, or why certain questions were asked, but can otherwise remain completely ignorant of the knowledge base structure and the

intricacies of the knowledge engine, and so on.

Clearly the expert needs a much deeper understanding of Personal Consultant. He needs to be able to encode his knowledge into the knowledge base, test it and correct it, and organise the format of advice sessions for the end-user. The key issue is that he should have sufficient understanding of the general structure of a Personal Consultant knowledge base and how the knowledge engine uses it, in order that he can phrase his knowledge so that it can be entered into Personal Consultant. If he is not a computer expert, he is likely to find it too difficult to work directly with the builder, and would instead use a specialist 'knowledge engineer' as an intermediary.

Personal Consultant organises its knowledge in a 'context tree', which is a convenient way of dividing up the problem domain. For example, part of a context tree for car fault diagnosis may look like Fig 1. In this example, the 'root context' of the tree is Car Fault Diagnosis (yes, the tree is upside down), and it has 'sub-contexts': engine, transmission and electrical. These in turn have their own sub-contexts, and so on. The advantage of using the context tree is that it is possible to divide the problem area into small, manageable 'chunks', which can be encoded in isolation. Somewhere at the 'tips' of the tree there will be contexts for Starter Motor and Fuel Pump, which are sufficiently simple to be dealt with without further breakdown.

There is nothing absolute about the context tree for a given problem, and different experts in the same domain may develop completely different context trees. For example, an alternative to Fig 1 might divide car fault diagnosis into Broken Down, Running Badly and Minor Ailments. (An RAC mechanic might see the domain this way, in contrast to a garage mechanic.) For simple problems the context tree need not really be used — the whole problem area can be dealt with in a single context (the root context), which has no sub-contexts.

The context tree provides the overall framework and structure for the knowledge base. Attached to each context there are a number of 'parameters' and 'rules', together with some control information.

The parameters are values that are associated with the particular context: for example, a Starter Motor context might have parameters concerning 'type of starter motor', 'status' (OK, repairable, replace), and so on. In some instances, these parameters may be set directly from values entered by the user. The type of starter motor would probably be directly determined by a visual inspection, and so would be asked for directly.

If a parameter cannot be determined by a direct entry from the user, then it is determined by using the rules. The

'. . . it is invaluable for building systems for diagnosis, guidance and decision-making, but it should be remembered that there are other tasks performed by experts . . .'

'status' of the starter motor might be determined by rules such as:

IF belching smoke and sparks
OR completely dead
THEN status is replace

IF it's a bit squeaky
THEN status is repairable

IF status is (otherwise) unknown
THEN status is OK

Personal Consultant's knowledge engine uses a technique called 'backward chaining' when it needs to use rules to determine a parameter value. It looks for rules whose THEN part appears to match the parameter whose value is being sought; it then tries to find the value of the parameters in the IF part. This may involve looking at further rules or asking for values directly from the user, or a mixture of both.

For the rules, attempting to discover the status of the starter motor would generate questions to the user on smoke, sparks and squeaks until the status could be satisfactorily derived. Failing that, the third rule introduces a Personal Consultant trick of the trade — essentially it says that if nothing can be found to be wrong with the starter motor, then assume that it's OK. Notice that 'status' appears in both halves of the rule. This is 'self-referencing', and Personal Consultant will only use rules of this type if all else fails.

There are various ways in which a context's control information comes into play. A simple one occurs when the knowledge engine, in trying to derive the parameters for one context, has to drop down a level of detail to a sub-context. For example, when working in the Transmission Problem context (Fig 1) it may have derived that there is a transmission fault, but then have to consider the transmission components one by one in order to determine, say, the 'component to be fixed' parameter. Is it the gearbox or differential, and so on.

One type of context control information makes it possible to specify that a context can only be considered if the user says so. If the gearbox context were of this type then the user would first be asked: 'Do you want me to consider the gearbox?' in the middle of analysing his transmission problems, and if he said 'no', then the gearbox would be ignored. This could save him the bother of answering a lot of tedious questions about it, if for some reason he already knew there was nothing wrong with the gearbox.

In some instances, an expert's knowledge may not be completely precise. For example:

IF patient is sneezing
AND has a slight temperature
AND has a sore throat
THEN PROBABLY has a cold

Typically, experts form these 'rules of thumb' when their domain knowledge is imprecise or incomplete. This may happen either due to personal ignorance, or the need to save time (both theirs and the end-user's), or simply because their domain of expertise has not become sufficiently developed to provide a precise explanation. In the above example, who really knows all the mysteries of the common cold?

Personal Consultant can handle imprecise rules, formulated by an expert, by allowing 'certainty factors' to be attached to rules. A certainty factor can range between −100 and 100: 100 means that the conclusion of the rule (after the THEN) is definitely true when the hypotheses (after the IF) are; −100 means the conclusion is definitely false if the hypotheses are definitely true. Inbetween values indicate less decisiveness in the conclusion. Personal Consultant also substitutes words such as 'definitely', 'probably', and so on, for the numeric values, and these are usually simpler to understand.

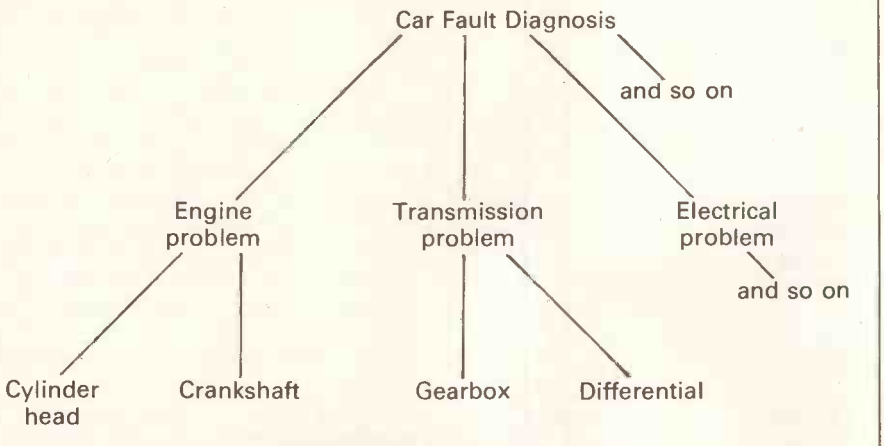
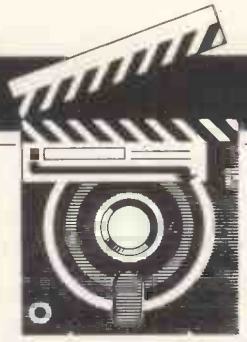


Fig 1 Part of a possible context tree for car fault diagnosis



SCREENTEST

The user can also attach a certainty factor to the answers he enters directly. He might record 100 for loud and regular sneezing, –100 for none at all, and 50 for irregular sneezing where he does not want to indicate complete certainty about the symptom. Although there is no compulsion to use the facility, it should be noted that this can be a bad technique for building an expert system, as in order to work properly, it relies on both expert and end-user attaching the same probabilities or meanings for the same situation, which is highly unlikely.

Personal Consultant uses complex mathematics to manipulate the probabilities, but I won't go into detail here. Generally, if the hypotheses of a rule have been deduced or entered with some uncertainty, then the conclusion will be even less certain. Following from this, Personal Consultant has built-in facilities for ignoring the very woolly conclusions that do not really say anything. Readers who are familiar with Bayesian statistics should note that Personal Consultant does not use Bayes Theorem, but an *ad hoc* system which is reported to be as effective in a consultation, but more simple for the builder.

In use

It is relatively easy to install Personal Consultant. A hard disk system is necessary, and it is simply a matter of using the MS-DOS COPY facility to transfer the contents of the supplied disks onto the hard disk. There are five disks containing IQ-Lisp, sample knowledge bases, facilities for converting standard E-Mycin knowledge bases into Personal Consultant format, and two copies of the Personal Consultant software. These latter disks incorporate a copy-protection scheme — the files are freely copiable, but the software will not run unless one of these disks is present in the computer.

It is possible to customise various features of Personal Consultant, but this is achieved by tinkering with IQ-Lisp so is not to be recommended for first-time users.

When the files have been copied across, a batch file can be executed to load IQ-Lisp and the Personal Consultant code, and then to start executing it. This takes several minutes and is accompanied by a number of cryptic messages, then the screen clears to a standard Personal Consultant menu display. This first menu offers the option to load whatever knowledge bases happen to be on the current disk drive, or to create a new knowledge base, or to quit.

'Personal Consultant is intended to be used in the first instance by an expert who may spend some considerable time and effort in building up a knowledge base . . . containing a good deal of this skill, expertise and judgement.'

A consultation

To gain some familiarity with Personal Consultant, it is best to start working with an existing knowledge base. Regrettably, the demonstration disk only offers three, one of which is the tutorial example used throughout the manual. This example is concerned with advising on whether to lease or buy an asset.

If the lease/buy knowledge base is selected, it is loaded from a disk and the master menu is then displayed. From this menu, the major Personal Consultant activities can be selected. The first option is Go, which starts the knowledge engine, resulting in a consultation with the user based on the knowledge base just loaded.

The lease/buy knowledge base uses just two contexts and approximately a dozen rules and parameters, but can result in quite an extensive consultation (see Fig 2). The consultation itself is not presented in the 'glass-teletype' fashion shown in Fig 2. Instead, Personal Consultant uses a windowed approach — the top area is used for titles and general prompts, the middle is used for data entry or menu selection, and the bottom identifies the currently active function keys. As each question is asked, the previous question and answer is cleared. If only a limited number of responses are necessary, a menu is presented. This is frequently the case when a yes/no response is needed, or when good/fair/poor responses are required as in the example presented here.

It can be seen that the dialogue is not completely smooth and natural. For example, in question one ASSET-1 is the internal name of the root context, but this fact does not hold a great deal of meaning for the ordinary user. Having stated that the asset being considered is a computer, the word is never mentioned again. It would be preferable if subsequent references to ASSET-1 could be replaced by 'computer', but this does not appear to be easy to arrange in Personal Consultant.

Apart from simply answering the questions, there are a number of different actions available to the user during a consultation. At the touch of a function key it is possible to ask why a question is being asked, and how a particular conclusion was reached. This facility sounds better than it really is, as unless the user is well-versed in the ways of Personal Consultant, he will make little sense of the system's replies.

At any time in a consultation, it is possible to return to the previous question and change the answer given.

The following is a demonstration system which reflects a part of a lease/buy/finance decision support system.
1) What is the asset that you are considering for ASSET-1?
COMPUTER
2) How do you describe your current credit rating (Good, Fair, Poor)?
FAIR
3) When you go to borrow money, does the lender check on outstanding leases you have?
YES
4) How would you describe your cash reserves (Good, Fair, Poor)?
FAIR
5) In your business, do you need to maintain larger-than-average cash reserves to maintain larger-than-average cash reserves in order to take advantage of unexpected opportunities?
NO
Conclusion: since experience shows that buying is almost always cheaper than leasing, and since the special cases in which leasing offers an advantage do not seem to apply in your case, buy the asset.
6) Would you care to analyse the financing for ASSET-1?
NO
Recommendation: my recommendation is: buy the asset
Payment on the asset for ASSET-1 is: None

Fig 2 Sample consultation with Personal Consultant's lease/buy demonstration advisor

```
1.  Premise of rule002:
($AND ($OR (SAME CNTXT CANNOT-BORROW)
     (SAME CNTXT PRESERVES-CREDIT)(SAME CNTXT PRESERVES-CASH)))
2. Action of rule002:
(TEXT NIL (TEXTAG TXTG1)) TALLY 1000) (CONCLUDE CNTXT BUY
     F TALLY 1000))
3. Type of TXTG1:
TEXTAG
4. Trans of TXTG1:
(lease the asset)
```

Fig 3 A small fragment of the dialogue to build the lease/buy knowledge base

Unfortunately the previous reply is overwritten by the next question, and in any case it is not possible to go back more than one question. Nonetheless, the facility can be useful for correcting slip-ups at the keyboard; without it, the only alternative would be to go back to the beginning and answer all the questions again. This is also necessary to correct a mistake made earlier than one question previously.

The final question in the consultation is asking whether Personal Consultant should enter the finance context, where repayments can be calculated. In this instance, many finance contexts can be arbitrarily created as sub-contexts of the root asset context, each considering different types of finance option. In the consultation given, zero finance contexts are created.

From the master menu there are other facilities which may be of use to the ordinary user. One of these is the ability to 'record' the dialogue. If this option is selected, the knowledge engine is run in the normal way but all questions, answers and prompts are remembered. At the end of the advice session they can be written to a file, from which they can be played back at any time using the master menu Playback option.

It would be unfortunate if this dialogue dissuaded users who are really familiar with the domain. Clearly it contains a number of howlers, and it should be said that TI could have chosen a better knowledge base to demonstrate its product. For example, in question five, the system should ask the user for his cash reserve requirements, and so on, and then reach its own conclusion about whether this is larger than average. This type of thing could easily be put right by a real expert who knows what 'average requirements' mean — obviously the end-user does not.

The knowledge-builder

The master menu contains several options which are concerned with the tasks of entering, testing or modifying knowledge. As has already been pointed out in the overview, the knowledge base for Personal Consultant is based on a tree-structured framework of contexts which have parameters, rules and control information attached.

'. . . it does help to know something of Lisp, and in the long-run . . . it will probably be necessary to revert to Lisp for some activities.'

The main menu has specific options for creating, deleting or changing each of these components. In addition to the end-user facilities, it also features options for debugging, and for creating Lisp code, plus other more complex facilities.

It is not possible to give a full run-down of Personal Consultant's powerful knowledge-building facilities here, but I'll show a randomly-chosen fragment of the dialogue involved in building the lease/buy demonstration advisor. This should dispel any illusion that a non-programming expert can easily set up the knowledge base himself (Fig 3).

One of the key features of Personal Consultant is that it uses short internal identifiers for the parameters, and so on, but can also expand them for printouts. Therefore, although Fig 3 looks very complex, when the knowledge base has been set up and expansions specified for all the identifiers, it can be neatly and clearly printed out (Fig 4).

Although Personal Consultant does offer some help with rule entry in the form of an abbreviated rule language, you should be warned that it can only print out, not understand the text of Fig 4. Bearing in mind the difference in the two figures, this is an important point which artificial intelligence researchers seem reluctant to emphasise in articles on expert systems (see *Byte*, April 1985, page 303 for a good example of this).

Conclusion

I have given an overview of Personal Consultant and attempted to show what it would be like to use, both from the viewpoint of the expert and the end-user. However, Personal Consultant is a very complex system, and inevitably some valuable features and facilities have been omitted. To summarise the omissions, it can safely be said that Personal Consultant is very powerful, and for flexibility and utility it is likely to compete very well with any other expert system currently available.

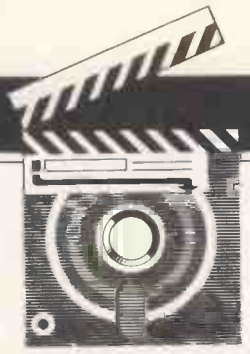
But to introduce a note of caution: in common with all other expert system builders, Personal Consultant particularly favours certain specific problem areas and not others. In Personal Consultant's case it is invaluable for building systems for diagnosis, guidance and decision-making, but it should be remembered that there are other tasks performed by experts, for example spatial reasoning and teaching, to name but two. For these other types of system, Personal Consultant is not especially well-equipped.

Anyone contempiating the purchase of Personal Consultant should be forewarned on two points: it is currently restricted in use to TI hardware; and it is unlikely that a non-computer expert will be able to build-in the knowledge directly. In fairness to TI, it should be pointed out that this latter criticism is a fault shared by surprisingly many expert system builders currently available.

Personal Consultant costs £2,000 for the package used to build the expert system, and £250 for a run-time module to consult the system. END

```
If    1) your credit is too low to get a loan, or
      2) this lease does preserve your credit rating, or
      3) this lease does preserve your cash reserves
Then  1) it is definite (100%) that my recommendation is lease the
         asset, and
      2) it is definite (100%) that determination to lease or buy the
         asset is F.
```

Fig 4 An example of the fragment of knowledge base created in Fig 3



SCREENTEST

ViewStore

Kathy Lang assesses Acornsoft's ViewStore, a BBC B data management system aimed at novice users which has links to other View packages.

As a regular user of a 16-bit machine with a hard disk, it was with some trepidation that I approached the task of using a data management system on the BBC Model B with a single disk drive — it gives about a quarter of the processor speed and about 10 per cent of the memory of my usual system. In most respects, I was agreeably surprised by both the features and the performance of ViewStore, Acorn's data management system which forms part of a group of packages centring on its word processor, View.

ViewStore comes in two parts: the main commands, including those for editing, are in a RAM chip which you can fit to the BBC (or the BBC+) yourself; and a disk containing a variety of utilities for creating and running reports, setting up a data file, and so on. You must have at least one disk drive to use ViewStore — it doesn't work from cassette tape. The package is initiated by typing a *STORE command from within Basic; thereafter, asterisk commands such as *COPY and *CAT are still available from within ViewStore when you are at the command level (that is, not running a utility or editing data).

ViewStore has some of the attributes of a conventional flat-file package in that each record in a data file has the same number of fields and occupies the same amount of space, and you cannot relate two dissimilar sets of records. Within those limits, it is a powerful and flexible package, with a number of features rarely found in much more sophisticated systems.

Constraints

The major limitations on the use of ViewStore are shown in Fig 1. The constraints on record and file size shown are maxima; the actual limits depend on the amount of memory and disk space you have, and the details are shown in Fig 2. Other points worth noting are the choice of date formats — DD/MM/YY or MM/DD/YY — and of character formats. The primary differences between these is in the way selection works. For alphanumeric fields, matching is carried out on the whole field, while for text fields, each word within the field is tested for matching. This could be quite a help in applications with a lot of free text (more on this under 'Selection & sorting').

Validation facilities include testing to see if a number or character string lies within a range of values, and checking whether it matches an item in a prespecified list.

File creating and indexing

The first step in creating a data file is to define the fields: you must give a type for each field, you may give a name and also the size of the field. Unusually, this indicates the width of field to be displayed, not necessarily that stored. You can specify whether the field is to be scrolled or not, thus 'freezing' the display of fixed items such as codes and numbers, but allowing you to display *just* part of a long text field and scroll within it when the cursor is in the field. This could be very helpful in providing compact display of records containing long text fields.

Field names may be no longer than field widths. You can get round this by having a caption or message attached to each field, which is displayed at the top of the screen when the cursor is in that field. The other attribute to be decided when the file is set up is indexing. Unless told otherwise, ViewStore displays information in the order in which it is entered. Each file may have a number of indexes attached to it, each index providing an ordering based on a single field (or the first few characters of it, if you prefer).

The number of indexes depends on the filing system you are using. For the widespread DFS from Acorn, you can have up to four indexes kept up-to-date, and a further three read-only indexes which have to be reconstituted when you have made changes which affect their ordering, or added new records. If you subsequently wish to change the index field specifications, you can alter the file definition and then use the Index utility to create the desired new indexes.

ViewStore will also ask you to define the maximum record size and the maximum file size. The usual way to define maximum record size is to request the total of field sizes plus an allowance for fields which may be greater than their displayed size. This gives some flexibility, but in practice you may still have to ask for the largest size any record could attain.

As to file size, you need not specify this at set-up time, but if you do not and the disk contains other files, you may find that the file cannot be extended even though there is disk space left. For this reason, Acorn recommends having one data file per disk on floppy systems, or allocating as much space as you could ever need. (You would certainly have to watch the space problem, especially if you have single-sided disks. ViewStore files cannot span disks, so with one single-sided disk drive you would be limited to about 800 records of 100 characters each after allowing space for indexes.)

When a file has been set up with data entered into it, reorganisation is possible in two ways. If the changes fall within the additional space allowed at the beginning, fine. Otherwise, the file must be copied using the Convert utility.

Data input and updating

You can add or amend records on the screen either in a one-record-per-line format, or in a mode which mirrors the conventional card index. To retrieve records for editing, you state which

Maximum file size	4000Mbytes
Max record size (ch)	60,706 chars
Max no fields	254
Max field size	239 chars
Max digits	10
Max prime key length	105 chars
Special disk format?	No
File size fixed?	No
Link to ASCII files?	Yes, several formats
Data types	No,char, date,text
Fixed rec structure?	Yes
Fixed record length stored?	Yes
Amend rec structure?	Copy data file
Link data files?	No
No data files open	Not possible
No sort fields	Unlimited
No keys	7
Max key length (chars,fields)	105,1
Subsiduary indexes kept up-to-date?	4 UTD
Data validation	Good
Screen formatting	PAS, default
Unique keys	No
Report formatting	Cols, default, close link to WP
Store calculated data	No
Totals & statistics	Totals, sub-totals, calculations in reports
Store selecn criteria	Permitted
Combining criteria	And, Or
>1 criterion/field?	Yes
Wild code selection?	String within
Browsing methods	Any key
Interaction methods	Menus, commands
Reference manuals+	***
Tutorial guide+	***
Reference card+	****
Online help+	**
Hot-line?	

For a full explanation of abbreviations, see 'Database dossier', page 188, January issue

Fig 1 Features and constraints

index you wish to use, and then specify the value of the key field for the record to be edited. When a record has been retrieved, you can then browse forwards or backwards in the file in order by the current index, using the cursor keys. If you specify a key value which does not exist, ViewStore provides the next record in the file. Key value specifications can include wild codes: * matches any sequence of characters, while ? matches any single character, just as in the BBC's own commands. (You can, if you wish, omit the specification of an index and just scroll through records in the order of entry.)

All editing is interactive — there are no facilities for specifying automatic updating if a group of records all require the same change. Nor are there any facilities for calculating the value of a field from another when data is input.

Screen display

When you are adding, editing or viewing records, you can show the data either in a table format very similar to that used by spreadsheets, or in what ViewStore calls 'card' mode, where each record can occupy more than one line of the screen. An initial form of card mode is set up by ViewStore from the information provided when the record format is defined; you can either modify this, or create new formats of your own. ViewStore will then fit as many records on the screen as it can, using this format. This is a good deal more flexible than is normally possible, as most packages oblige you to have one record per screen when editing.

You can have as many different ways of displaying a set of records as you wish. Field widths may be zero, providing a way to allow junior staff to display and edit parts of files which contain confidential information, such as salaries.

ViewStore also provides two forms of display for groups of records selected for viewing only. A simple list format is available if you want to show records selected on the basis of non-key fields; this shows one record per line, with as many fields as ViewStore can fit onto one screen width (that is, without sideways scrolling), and without sorting. For more sophisticated formats, or when you need to sort the records into another order, it is possible to display on the screen reports set up with the Report utility.

Printed reports

The simple list format, one record per line, can also be used to provide printed output, but normally you will want to produce more sophisticated reports, and ViewStore has a report utility for this purpose. This allows you to use as many lines for each record as you wish, and to specify precisely where the fields are to be placed. This is done by setting up, under ViewStore's instructions, a data file which contains the instructions for formatting the report. This approach makes it possible to edit the report format using the same techniques as you use for editing data.

A simple example of a ViewStore report format is shown in Fig 3; the % symbols represent the format to be used to display the fields shown on each line. Items may be field values (the full length or only part), expressions, register values, page ejects or comments. Register values make it possible to accumulate expressions over all records and over a sub-total range. You can specify as many levels of sub-totals as you wish, but the file should first be sorted into the appropriate order to make the specification meaningful.

ViewStore also provides a special type of report for printing address labels, allowing, among other features, the ability to print several sets of labels. Any type of report can be produced either on the whole data file, or on a selected set of records.

The ViewStore manual states that the package comes set up for a very basic type of printer which does not provide emphasis, and that if you want to use a more sophisticated printer you should seek help from your dealer. In fact, I could not get the line lengths to work out properly even with an Epson matrix printer, without issuing an *FX command (which not everyone wants to know about), so you should check this aspect with your dealer before you buy.

Selection & sorting

The fastest method of selecting individual ViewStore records or sets of records is via the indexes. These can be maintained automatically, or set up *ad hoc* as you need them. They are based on single fields, and on values which match exactly or are as near as possible to the test value. For more powerful and varied selection, there is a utility called Select. This allows you to either list records directly to the screen or printer, in order by the index currently in use, or to save the selected records in a file for subsequent use, in which case they may be sorted first.

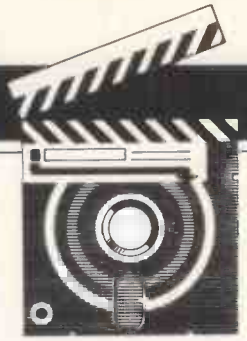
You can compare the values of fields with constants, using the usual range of comparison operators including equal, not equal, less than and greater than; both the values and, unusually, the field names may contain wild codes. The ability to include wild codes in field names means, for example, that if you have four address lines called Addr1, Addr2, and so on, and you want to find all your customers who live in Bristol, you can ask for a match on 'Addr*ViewStoreBristol', and the correct record will be selected regardless of where the town occurs in each record.

ViewStore allows you to have as many tests in a single selection as you wish, provided the total length does not exceed 255 characters. To combine tests, you can use AND and OR in any combination, using brackets to control

	Screen Mode 0	**Mode 3**	**Mode 7**
Maximum record size	5k chars	9k chars	25k chars

	40-track drive	**80-track drive**	**ADFS drive**	**Winchester drive**
Maximum file size	100k chars	200k chars	720k chars	10Mbytes upwards

Fig 2 Model-specific constraints



SCREENTEST

the order of evaluation and ensure the correct selection. Matching is, however, case-blind, so a test for 'FORD' would match 'Ford' and 'ford' as well.

For ordinary alphanumeric fields, tests are said to be satisfied if the whole field (allowing for wild codes) matches the test value. For items set up as text fields, tests are carried out on each word within the field. This could prove very useful in an application such as a library catalogue, where you might want to find key words within an abstract without necessarily storing them in separate fields.

Using the Select utility, you can request sorting on as many fields as you wish: for example, surname within department within region in a personnel application. You can restrict the sort to the first few characters for a field if that will suffice for uniqueness. The number of sort fields is limited only by the total number of characters to be sorted, which may not exceed 250.

The output from Select may, and must if the records are to be sorted, be sent to a workfile. This file is in a special format which can be read by the Report and Label utilities; it can also be translated, using the Convert utility, into a data file which can then be processed using the full range of ViewStore features. You should take care to rename any file of selected items which you wish to keep, as only one Select workfile is retained — the next selection which you make and store overwrites the previous set of selections.

Calculations

When producing ViewStore reports, items printed may be expressions; you may also accumulate field values in registers. Each register has two values — a totals value which is reset at the beginning of the report, and a sub-total value; all sub-total registers are reset when a set of sub-totals is printed. (If you have several levels of sorting, you would need to think about the level at which to accumulate sub-totals.)

Altogether 26 registers are provided. Of these, one is used to store the page count, and another to count the number of records processed.

Multiple files

ViewStore does not provide any facilities for handling several sets of records of dissimilar structure.

Tailoring

Apart from the usual facilities for adapting screen and report formats to your requirements, ViewStore's tailoring facilities are limited to an ability to store the key sequences used to carry out functions that you need to do often in the same way. This can also be a help when developing more complex reports. You can store the appropriate instructions and responses for displaying the report on the screen, reissue them as often as you need, editing the report format each time until the report is correct, and then finally change the sequence to send the report to the printer.

There are two ways to invoke such stored command sequences. You can store them in a file, called an Exec file, and invoke them by typing *Exec followed by the file name, or you can store them as a sequence to be invoked by pressing a function key. The major difference is that command sequences stored in files can subsequently be edited, while those stored as function key sequences cannot — they can only be replaced.

Security & housekeeping

Each type of file used by ViewStore — data, index, report, format, and so on — is stored in a separate directory on disk. You can pre-assign these directories in order that ViewStore will always look for them on a specific drive, thus saving typing and more remembering. All the standard DFS and other BBC commands are available through ViewStore by typing the command name prefixed by an asterisk, just as in Basic.

As you add or amend records to ViewStore, the edited records are automatically written to disk. Therefore, unless you do something very silly such as turning off the power or pressing BREAK in the middle of a session, your precious data should be safe, and even in those circumstances you may well survive. My own criticism is that this means there is no way to abandon an editing session — if you make a real mess, the only way out is to restore the back-up copy (a means which, of course, we all take regularly). There isn't even any way, as far as I could discover, to 'start over' editing a single record — if you make a change by mistake, you have to re-enter the original information.

Links with outside

ViewStore is quite flexible about the record formats it can read and write, although I couldn't figure out a way to write or read DIF format files (of the kind used by most spreadsheets). This probably wouldn't matter to most people, as ViewStore can read and write files used by the View spreadsheet. Indeed, ViewStore can read and write flexibly to all the other View modules (see Fig 4). A particularly useful and unusual feature is the ability to write totals and sub-totals in ViewSheet format, as what you usually want to do is to forecast changes from aggregate information, not from the raw data. (For example, you would be interested in projecting sales figures from the total sales of the last 12 months, not from individual sales records. The latter could be summed in your spreadsheet after transfer, but only if they would all fit in memory, which is unlikely.)

Apart from other View product formats, ViewStore can read and write most regular ASCII files. You can specify field and record delimiters (which can be more than one character each), as well as skipping headers and trailers, and there are many other useful features.

User image

You might expect that a package with basic features would be simple to use, but that is not always the case. Happily,

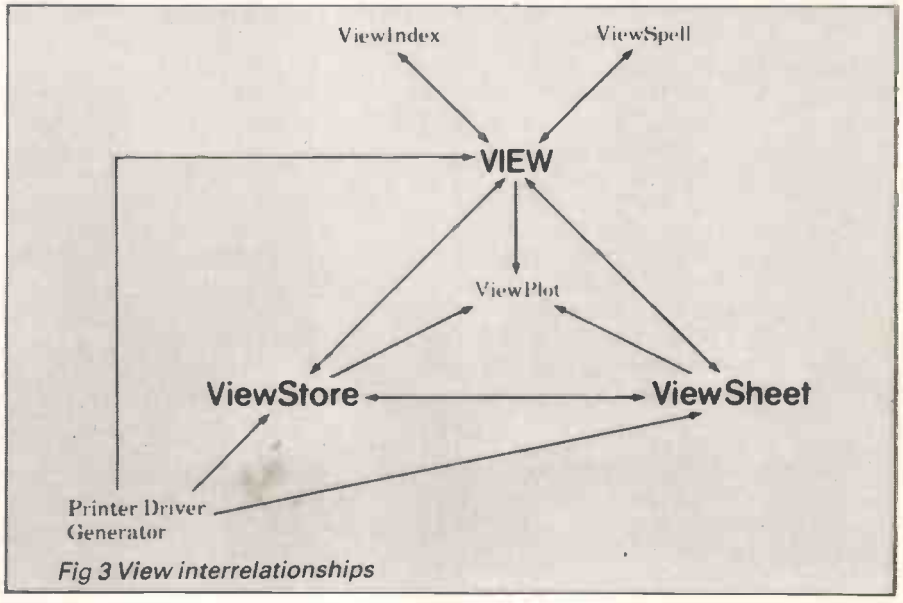


Fig 3 View interrelationships

ViewStore is extremely easy to use, with its blend of a few commands for major operations, such as setting up a report, and sensible use of function keys for tasks such as switching between the table and card modes of display and examining the record format. The most extensive use of lengthy typed commands is in the setting up of selection criteria, and here I strongly agree with ViewStore's designers that the simplicity and power of this method of specifying complex selections overwhelmingly compensates for the small extra penalty of learning the simple selection syntax.

The two modes of display complement each other well, especially when you remember that it is also possible to have several different forms of the card display. The unusual flexibility of this approach did a lot to make up for the drawbacks of using a data management program on a television screen, but I still think that for most people, the investment in an 80-column monitor would be well worthwhile. (This is especially true if you want to exploit the selection facility fully. My only criticism is that the prompt, which appears on every line, uses 17 precious characters out of 40 on a TV screen.)

Supplier:	Acornsoft
Tel:	(0223) 214411
Cost:	£59.80
Systems:	BBC B, BBC B+
Type:	Novice use, structured records
Features:	Stores records of homogeneous structure in flat file format. Flexible record display, powerful selection including matching words within fields, good reporting features including labels. Good links to other View packages, especially ViewSheet
Drawbacks:	Main disadvantage is limited disk size on most BBCs — can be used on hard disk. No file link feature
Ease of use:	Very good. Sensible mix of commands and functions keys, extensive use of wild codes. Good prompting, little other help

Fig 5 Comparison of similar data management packages

Package	Cost (£)	Summary
DMS+	195	Stripped-down version of Delta from same supplier — one file open at a time, no tailoring. Good letter-writer. Usable manuals, but no road map of menus. Separate set-up and execute (for example, in selection) tedious. Good value for money at this price.
Files & Folders	295	Good value, easy-to-use package, with basic link file facilities (three open, eight linked). Good use of screen when setting up files. Good list and sort features; no letter-writer. Menu-driven, no tailoring or batch processing. Usable manuals, no road map.
Friday!	195	Simple, cheap, good-value package for single-file, fixed-format records. Drawbacks are clumsy approach in letter-writer and designing screen formats. Excellent tutorial manual and menu charts, reference manual is good used from screen to manual.
Pearl	195	Economical storage of varying length records, multiple indexes allowed and kept up-to-date, paint-a-screen formatting for screens and reported (although no letter-writer). Entry screens can write to several files at once. Good manuals. Excellent value.
TIM IV	295	Good value for money as an easy-to-use package with basic features. Extensive indexing gives flexible direct access and ordering. Especially suitable where you need simple relationships between files, or output to range of spreedsheet formats.
ViewStore	59.80	Unusually powerful package for a small system. Well worth considering for BBC owners, or as a simple system on reasonably-priced hardware. Gives basic data management features, including flexible display, reporting and selection. Helpful text-handling.

Fig 4 Cursor movement chart

The extensive and flexible use of wild codes is also an unusual and valuable feature. It saves a lot of typing, but it also allows you to do a good many things that would be impossible in other packages. (The example of selecting a post town from several address fields provides a good illustration of this.)

Documentation

ViewStore is supplied with a manual, a keyboard template, and a reference summary card suitable for carrying in a pocket or handbag. The first few chapters of the manual explain the editing and retrieval features, using as illustration a sample data file distributed on the utilities disk. The remainder of the manual describes features not so easily illustrated in this way, such as setting up a data file of your own, but throughout the language is reasonably clear and the approach understandable.

The only exception to this is in the section on report formats, when the examples are referred to but not reproduced on the printed page. This is the only place where this happens to any extent, and the one place where it should not have happened, as report formats are quite difficult to come to grips with whatever the method of implementation.

The manual is typeset and well-printed (although in one colour only), with the screen displays being photographs of real monitors. There is a good index, but apart from the page number there are no headers or footers at all. This lack of any clues about one's whereabouts is a real problem in a manual which must subsequently do duty as a reference document. Including the chapter title on each page would have made life so much easier.

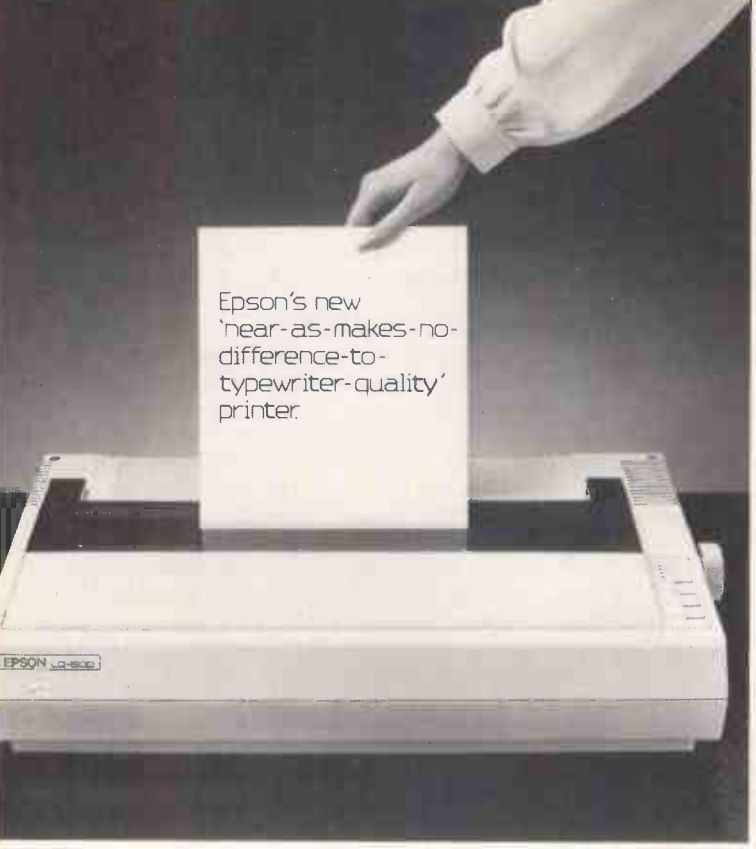
Conclusion

I found ViewStore easy to use and remarkably powerful for a package on a small system. It could certainly be used for plenty of home file tasks, and would not be inappropriate in a small office; the only real problem being disk capacity. (The program will run on the higher capacity ADFS disks, and on Winchester hard disks, too.)

The documentation is also of a reasonably high standard, especially the reference card.

I do, however, have one real bone to pick with Acorn. How can anyone distribute a disk filing system without a disk formatting program? The aggravation that this deficiency caused me far exceeded any minor hitches I experienced in coming to grips with the package.

There wasn't time to run the Benchmarks for this issue — the results will be included in next January's round-up of database reviews. END



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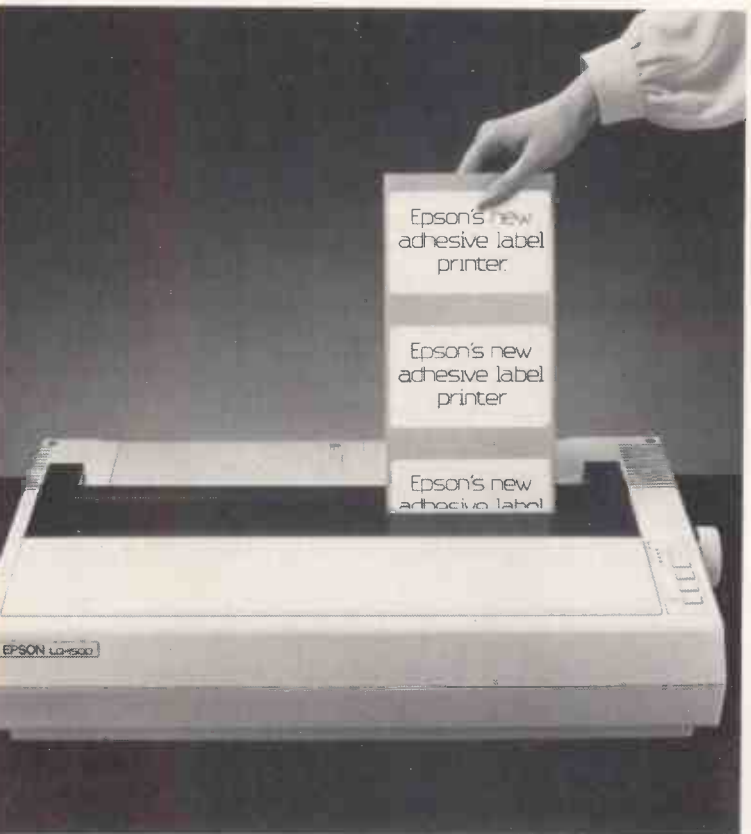

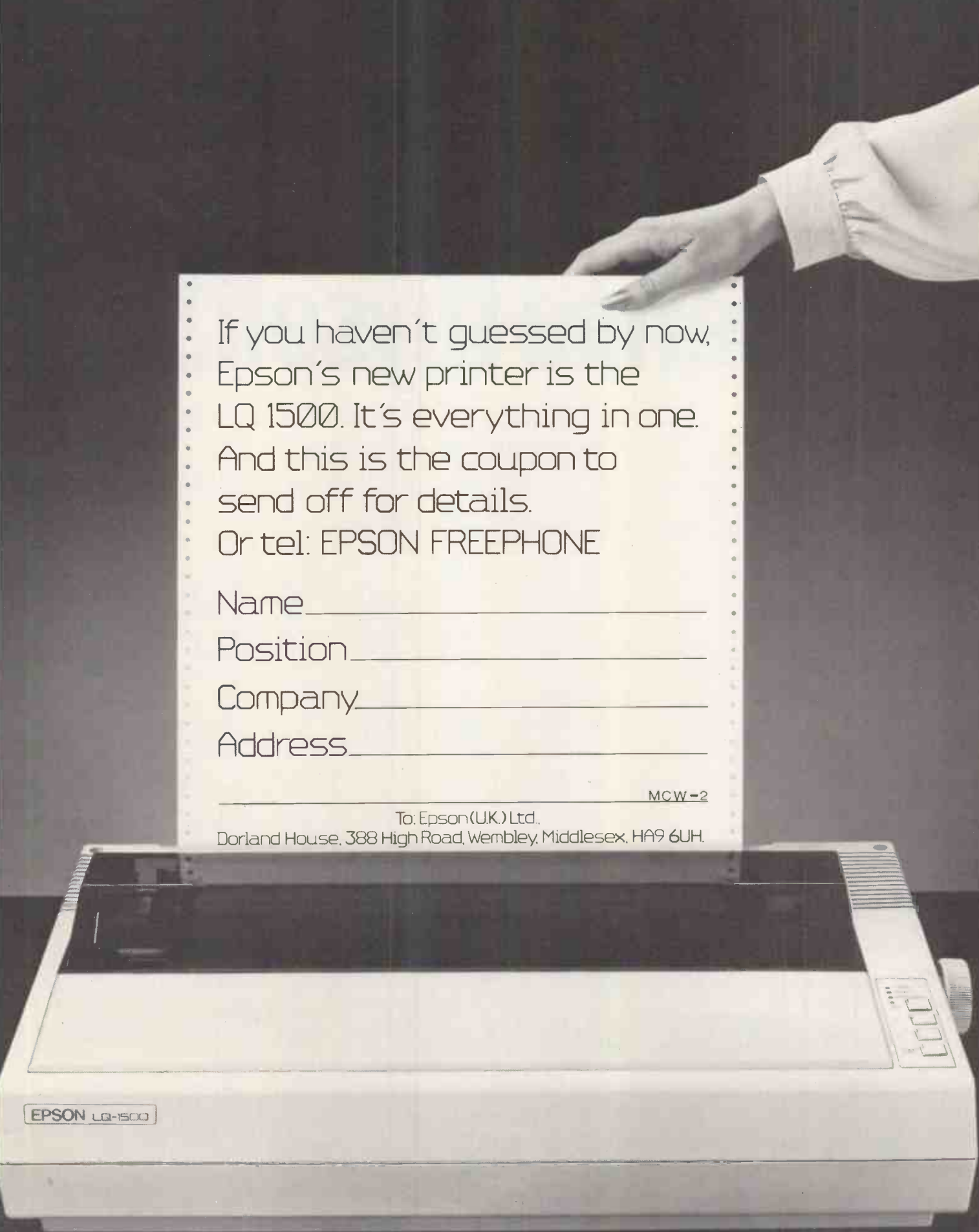

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EPSON

Procedure define thyself!

Harvey Mellar looks at how procedures are built up in Logo, and presents a simple program generator.

In the September issue I introduced programs for pattern-matching based on lists. This month I'll show how lists enter into the actual 'mechanics' of the language — how to evaluate a list as if it were a command input from the keyboard, and how the definitions of procedures are themselves built up from lists. These features allow such things as adding new control structures and creating procedures that write other procedures, but be warned — it's worrying when programs start writing themselves. All the old cliches about computers only doing what you tell them suddenly begin to look somewhat less than obvious.

I'll also examine how keyboard input is dealt with and how errors can be trapped. These extra features combined with existing knowledge will allow us to write a simple program generator.

The primitive RUN takes one input, a list, which it evaluates (runs) as if it had just been typed in at the keyboard. RUN [FD 50] would have the same effect as FD 50, and RUN [:X < 5] would return TRUE or FALSE depending on the value of :X. The usefulness of RUN is evident in those cases where a procedure constructs a list which can then be run as if it had been a command. Another use for RUN is to find the value of an expression at various times during the running of a program.

RUN can be used to add new control structures to the language. Most versions of Logo do not have equivalents of WHILE . . . DO or REPEAT . . . UNTIL constructions as the same results can be achieved by using recursion, but if you find it easier to understand and write programs using these structures, they are easily added. For example, here is a form of a REPEAT . . . UNTIL loop:

```
TO UNTIL :COND :ACTION
  RUN :ACTION
  IF ( RUN :COND ) THEN STOP
  UNTIL :COND :ACTION
END
```

An example of its use would be UNTIL [XCOR > 100] [FD 1], which would cause the turtle to keep on moving forward one unit until its x-coordinate exceeded 100.

Looking at the definition of UNTIL, RUN is used twice. The first use is to cause the original command (ACTION) to be obeyed again; this is achieved by storing the command as a list and then RUNning it each time. The second use is to re-evaluate the condition (COND) under each new set of circumstances, whenever the procedure is called.

Logo does make one concession to iteration by including REPEAT, but otherwise an equivalent could have been defined as:

```
TO .REPEAT :NO :LIST
  IF :NO < 0.5 THEN STOP
  RUN :LAST
  .REPEAT :NO — 1 :LIST
END
```

RUN has many other uses besides adding new control structures, and I will give more examples later. Basic and Pascal have no equivalent to RUN, but Lisp has the very similar function EVAL.

None of the procedures presented so far have needed to read any data from the keyboard, due to the interactive nature of the language. I have defined procedures that require inputs rather than ones which have to ask the user for certain values while they are running.

There are clearly circumstances in which it is important for a procedure to be able to tell if a key has been pressed. To handle this task, Logo has two primitives, RC? and READCHARACTER (or KEYP and READCH in LCSI Logo versions). When a key is pressed, the corresponding character is stored in an input buffer. READCHARACTER causes Logo to read the next character in the input buffer; if the buffer is empty, Logo waits for the next key to be pressed. RC? is set to TRUE if there are any characters waiting in the buffer, otherwise it is set to FALSE.

Now that we can read characters from the keyboard, it is possible to write programs in which the procedures to be run are not known at the time of writing the program. A simple case would be a menu:

```
TO MENU
  PRINT [MENU]
  PRINT [1 SALES LEDGER]
  PRINT [2 PURCHASE LEDGER]
  PRINT [3 NOMINAL LEDGER]
  MAKE "INPUT READCHARACTER
  IF MEMBER? INPUT [1 2 3] THEN RUN
    (LIST WORD "PROG :INPUT)
  MENU
END
```

To see how this works, imagine that the user types 1. The input character is stored in INPUT, then WORD "PROG :INPUT creates the word PROG1 which is the name of the procedure to run the sales ledger. (LIST WORD "PROG :INPUT) now takes the word and makes it into a list — the brackets are needed here to inform Logo that LIST is only going to have one input rather than the usual two. We now have something, [PROG1], on which RUN can work in order to run the correct procedure.

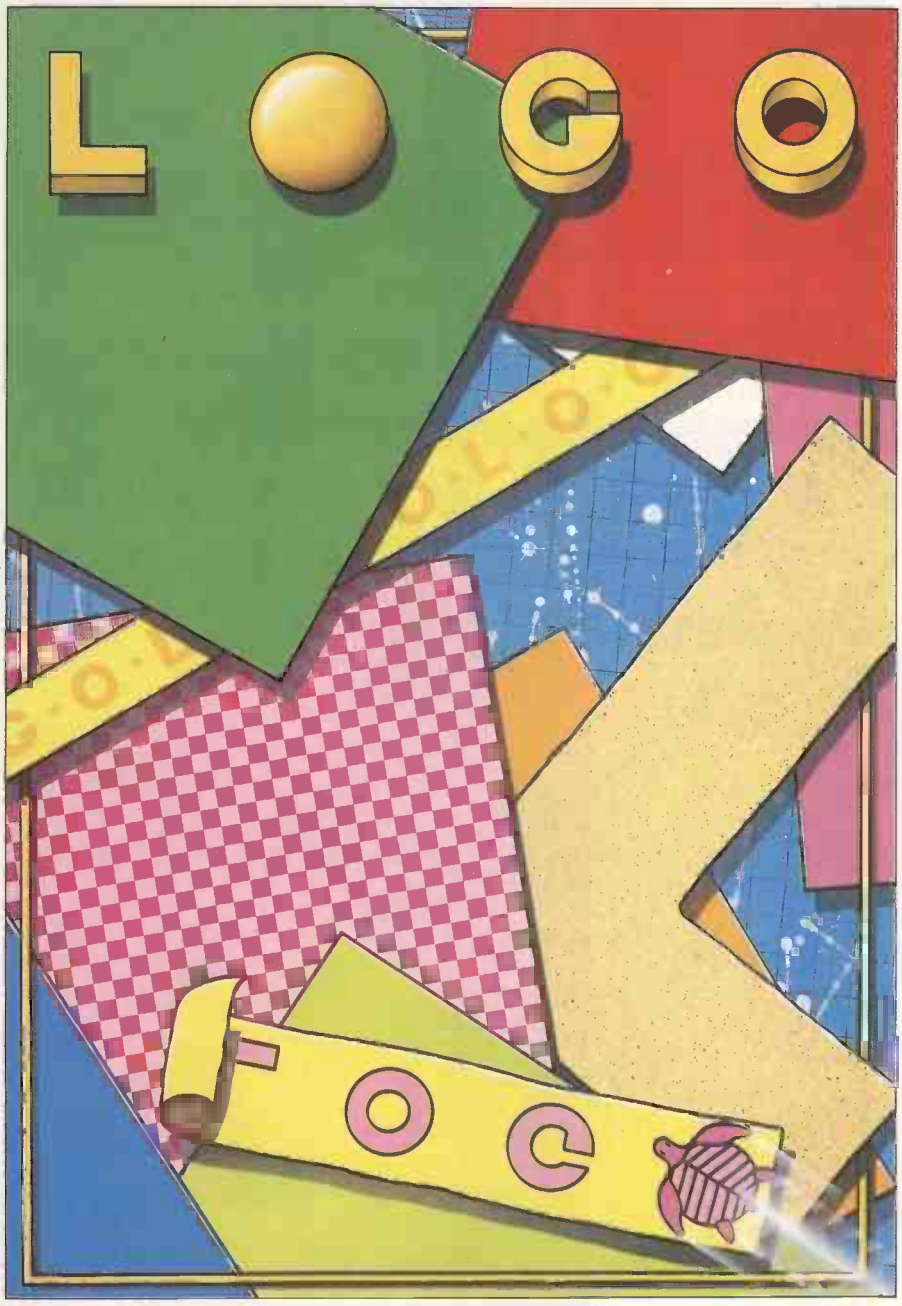
This procedure would be unsuitable for uses such as video games, and in such cases the procedure READKEY can be useful:

```
TO READKEY
  IF RC? THEN OUTPUT READCHAR-
    ACTER
  OUTPUT "
END
```

READKEY outputs a character if there is one waiting in the buffer, but otherwise outputs the empty word so that there is no delay in waiting for a keypress.

Procedure DEFINE thyself!

Now for the really interesting bit. Logo procedure definitions are stored as lists. Logo can manipulate the definitions of procedures, and by using the two primitives DEFINE and TEXT we are able to make procedures look into other procedures, to disect and rewrite them, to create new procedures — even to rewrite themselves!



To try this out, it is worth first defining a simple procedure in the editor:

```
TO TRI
  FD 50
  RT 120
  FD 50
  RT 120
  FD 50
  RT 120
END
```

TEXT takes a procedure and outputs its definition as a list. Try PRINT TEXT "TRI — the result should be:

```
[][FD 50][RT 120][FD 50][RT 120][FD
    50][RT 120]
```

PRINT always removes the outer level of brackets when it prints a list, so this is a list composed of lists, each of which is a single line of the procedure.

To see what the initial list [] is for, change the procedure to one involving inputs:

```
TO TRI :SIDE
  FD :SIDE
  RT 120
  FD :SIDE
  RT 120
  FD :SIDE
  RT 120
END
```

Now type PRINT TEXT "TRI and you should get.

```
[:SIDE][FD :SIDE][RT 120][FD :SIDE]
[RT 120][FD :SIDE][RT 120]
```

The first sub-list is simply a list of the inputs to the procedure.

The primitive which takes us the other way and defines a procedure from a list is called DEFINE. Try DEFINE "SQUARE [[][REPEAT 4 [FD 50 RT 90]]], then try running SQUARE and examining it in the editor to see exactly what has happened.

One very simple use for these primitives would be to combine them in order to make a copy of a procedure. For example:

```
DEFINE "TRICOPY TEXT "TRI
```

A more sophisticated application of these procedures would be to write a program that removes comments from a Logo program. In most versions of Logo, a ; is used to mark a line as a comment. A well-commented procedure to draw a flag might look like this:

```
TO FLAG
  ; THIS PROCEDURE DRAWS A FLAG
  ; FIRST DRAW THE POLE
  FD 80
  ; THEN DRAW A SQUARE
  REPEAT 4 [FD 30 RT 90]
  ; THEN GO BACK TO WHERE YOU
    CAME FROM
  BK 80
END
```

When it comes to running a set of procedures, space may be tight, and it is then useful to be able to strip all the comments away but leave the rest of the program unaltered. This is what the procedure STRIP does:

```
TO STRIP :PROC
  DEFINE :PROC ( FPUT ( FIRST TEXT
    :PROC ) ( STRIP1 BUTFIRST TEXT
    :PROC ) )
END
```

This redefines the procedure. The first element of the list making up the new definition is the same as that in the original — this is simply the list of the inputs. The rest of the list is obtained by omitting any lines that begin with ;. STRIP1 removes all the comment lines and outputs the remaining text:

```
TO STRIP1 :LIST
  IF EMPTY? :LIST THEN OUTPUT []
  IF FIRST FIRST :LIST = ";" THEN
    OUTPUT STRIP1 BUTFIRST :LIST
  OUTPUT FPUT FIRST :LIST STRIP1
    BUTFIRST :LIST
END
```

To understand how this works, remember that the text of a program is a list of lists, so one element of this text will be a list corresponding to one line of the program. The next line of the program is given by FIRST :LIST; the first word on this line is therefore FIRST FIRST :LIST, and it is this we want to examine to see if it is a ;.

Type STRIP "FLAG and then examine FLAG to see what has happened.

Omitting whole lines of a procedure is not difficult, but it is less easy to replace particular numerical values in a procedure with new values that must be calculated at the time the procedure is run. The next example shows how DEFINE and RUN can work together to solve this problem.

The procedure GROW takes two inputs — the name of a simple shape-drawing procedure, and a list defining an operation to be performed on every side of that shape. GROW "TRI [+ 20] will define the TRI procedure with all its sides 20 units longer.

The procedures as shown here will only rewrite procedures whose drawing commands are all of the form FD followed by a constant, and do not allow the use of REPEAT, but it is not difficult to add a number of sophistications to this basic design.

```
TO GROW :PROCNAME :OPLIST
  DEFINE :PROCNAME REWRITE.
    PROC TEXT :PROCNAME
END
```

GROW does the redefining of the

the complete office takeaway

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Brief Technical Summary: Processor: Latest CMOS technology 80C88. Memory: 256 KB CMOS RAM Standard. Optional 256 KB expansion card. Standard Interfaces fitted: RGB Color Graphics, Monochrome, printer, Second FDD port. Optional: RS232 comms Interface Display: 80 char per 25 lines. Keyboard: 83 keys. FDD: 360/720 KB capacity. Optional: External 3·5 or 5·25 inch Dimensions: 31·1 x 6·6 x 30·5 cm.

TOSHIBA

In Touch with Tomorrow

procedure, but it passes the whole task of determining the test of the new procedure to REWRITE.PROC.

```
TO REWRITE.PROC :TEXT
  IF EMPTY? :TEXT THEN OUTPUT []
  OUTPUT FPUT REWRITE.LINE FIRST
    :TEXT REWRITE.PROC BUTFIRST
    :TEXT
END
```

REWRITE.PROC divides the procedure into lines, and passes the task of rewriting each line to REWRITE.LINE

```
TO REWRITE.LINE :LINE
  IF EMPTY? :LINE THEN OUTPUT []
  IF FIRST :LINE = "FD THEN OUTPUT
    CHANGE BUTFIRST :LINE
  OUTPUT FPUT FIRST :LINE RE-
    WRITE.LINE BUTFIRST :LINE
END
```

This looks for any occurrence of FD and replaces it with a new expression. If FD 20 and :OPLIST is [* 3], the new command should be FD 60. This is the task handled by CHANGE.

```
TO CHANGE :LIST
  OUTPUT ( FPUT "FD FPUT ( RUN
    FPUT FIRST :LIST :OPLIST ) RE-
    WRITE.LINE BUTFIRST :LIST )
END
```

Notice the use of RUN here to cause the evaluation of the expression to take place before the elements are put together in the new line.

Most Logo editors do not include a global replace command which would replace all occurrences of X by Y within a procedure, for example. It is quite feasible to write a procedure along the lines of those given here, which can be used outside the editor to perform this task.

We often need to read in a line of text in one go. This is achieved in Logo by the command REQUEST which puts the input into a list.

MAKE "INPUT REQUEST causes Logo to halt until a line of text is entered, and then assigns it to INPUT. Individual items from this list can then be selected using the list processing commands. If only one word was typed, it still would have to be selected by means of FIRST :INPUT. The advantage of this method is that it does make it very easy to input several words and then to access those words individually.

RUN and REQUEST, used simultaneously are perhaps the two most fundamental commands of Logo. Consider this little procedure:

```
TO*LOGO
  PRINT1 "?
  RUN REQUEST
  *LOGO
END
```

(For PRINT1 use TYPE on LCSI versions.) Run this procedure and nothing happens! The procedure behaves exactly like Logo itself (at least until an error is found, at which point there is an error message and control returns to Logo). We can even go into the editor, define a procedure and come out again, and still be in this procedure, rather than back at top level. This procedure shows the highest-level structure of the Logo interpreter—print a prompt, get a command, run it, and do it all again.

Some versions of Logo (including most LCSI versions) have a primitive CATCH which enables us to deal with errors without the procedure losing control. We have added a simple form of error trapping to our earlier version of *Logo in the following example:

```
TO OUTER
  CATCH "ERROR[*LOGO]
  PRINT [THAT WAS AN ERROR]
  OUTER
END
```

Type OUTER. On meeting the line including the CATCH, Logo runs the final list, which in this case is simply the procedure *LOGO. However, if an error occurs while running *LOGO, control reverts to the line following CATCH "ERROR in OUTER. This prints an error message and then starts again. The only way now of breaking out of this loop is through CTRL-G or BREAK. Some versions of Logo enable you to examine the error and print out appropriate error messages or default to the original Logo error messages as required.

Program generator

The following program asks the user for a few inputs and creates a procedure. It then tries to run the procedure and if an error is found, it asks the user to start again. This particular program generator enables someone with very little knowledge of Logo to create interesting turtle graphic procedures without using the editor.

```
TO DEF
  CATCH "ERROR [DEFN]
  PRINT [ERROR, TRY AGAIN]
  DEF
END

TO DEFN
  NAME
  COMMANDS
  DEFINE :NAME FPUT [] :TXT
  RUN ( LIST :NAME )
  TOPLEVEL
END

TO NAME
  PRINT1 [NAME?]
  MAKE "NAME FIRST REQUEST
  MAKE "TXT []
END

TO COMMANDS
  STEP
  IF :STEP = [END] THEN STOP
  REPETITION
  COMMANDS
END
TO STEP
  PRINT1 [STEP?]
  MAKE "STEP REQUEST
END

TO REPETITION
  PRINT [DO YOU WISH TO]
  PRINT [1 DO ONCE]
  PRINT [2 REPEAT A FIXED NUMBER
    OF TIMES]
  PRINT [3 REPEAT INDEFINITELY UN-
    TIL A CONDITION IS MET]
  MAKE "CHOICE FIRST REQUEST
  IF :CHOICE = 1 THEN ONCE.CODE
  IF :CHOICE = 2 THEN REPT.CODE
  IF :CHOICE = 3 THEN UNTIL.CODE
END

TO ONCE.CODE
  MAKE "TXT LPUT :STEP :TXT
END

TO REPT.CODE
  PRINT1 [HOW MANY TIMES?]
  MAKE "NO FIRST REQUEST
  MAKE "TXT LPUT (LIST "REPEAT
    :NO :STEP ) :TXT
END

TO UNTIL.CODE
  PRINT1 [UNTIL WHEN?]
  MAKE "COND REQUEST
  MAKE "TXT LPUT ( LIST "UNTIL
    :COND :STEP) :TXT
END

TO UNTIL :COND :LIST
  RUN :LIST
  IF ( RUN :COND ) THEN STOP
  UNTIL :COND :LIST
END
```

The individual procedures are not difficult to understand, and as to how it all fits together, this can be explained by an example interaction. In the following, the user's input is underlined.

```
NAME? SPI
STEP? MAKE "X 5
DO YOU WISH TO
1 DO ONCE
2 REPEAT A FIXED NUMBER OF TIMES
3 REPEAT INDEFINITELY UNTIL A
  CONDITION IS MET
(User presses 1)

STEP? FD :X RT 120 MAKE "X :X + 5
DO YOU WISH TO
1 DO ONCE
2 REPEAT A FIXED NUMBER OF TIMES
3 REPEAT INDEFINITELY UNTIL A
  CONDITION IS MET
(User presses 3)

UNTIL WHEN? :X > 100
STEP? END
```

The procedure defined would be:

```
TO SPI
  MAKE "X 5
  UNTIL [:X > 100][FD :X RT 120 MAKE
    "X :X + 5]
END
```

This is part five of a six-part series. END

BIBLIOFILE

The nights are getting longer, and David Taylor is engrossed in books about graphics, music and computer-aided design in this month's literary selection.

Nights drawing in

Title: Computer Graphics
Author: John Lewell
Publisher: Orbis
Price: £12.95

In the still watches of the night, after a feverish day of word processing, database rummaging and occasional bursts online to some far-flung host, after I've checked the electronic mail boxes, backed up a few irreplaceable files and put the dog out prior to turning in, there's often the temptation to spend a heavy-lidded half-hour with Microsoft's mesmerising Flight Simulator.

As off we bob from Meigs Field, the simulated Cessna and I, I'm invariably struck by the program's ingenuity, its vivid appeal to Biggles-ish imagination, and its frankly pig-awful graphics. The sad fact is that computer graphics are a bit of a let-down on all but the most sophisticated (and pricey) of machines. Micro manufacturers make extravagant claims, suggesting that all their graphics are streets ahead of a pen and paper, but whereas the meaning or even insight may be clear enough, it's doubtful if the image will be up to much. Alien bugs might be absorbing, or pie charts instructive, but such typical micro graphics are scarcely breathtaking visual art.

Just about everything in John Lewell's slim but handsomely illustrated survey is, on the other hand, state-of-the-art. After a hurried introductory section defining terms, and an irritating chunk which tries to précis what all computers do ('A computer does nothing until it is given a role to play') he gets down to business with a review of hardware: vector and raster displays, host computers, display processors and sophisticated I/O devices. All this is fascinating stuff and all of it way beyond the means of any amateur, hence his next section on current applications — in industry, specialised sciences from medicine to space, films, TV and publishing, plus high-powered, big-budget business.

This is where the ooh-er pictures are at their densest and beautifully presented they are, too. The author seems almost spiritually affected by the wonder of it all and concludes with an impassioned, if rather woolly speculation of where it's all likely to lead. Parts of this are unintentionally black comedy ('The CIA rarely gives a presentation to the US President without the support of computer-generated analytical graphics') and other parts absurdly bleak ('By enhancing sight at the expense of touch we may literally be *losing touch* with reality . . . high technology may simply enhance our ability to build factories, destroy landscapes, upset delicate ecosystems and create an urban wasteland').

Computer-stimulated philosophy is seldom my cup of tea, any more than quick chapters summarising progress since Babbage. Inbetween these regrettable extremes of indulgence, John

Lewell has a good primer on professional-standard graphics. I can't wait for a flight simulator on a parallel-processing set-up one of these days, or nights.

Cad, bad and dangerous to know

Title: CAD/CAM with Personal Computers
Author: Patrick R Carberry
Publisher: Tab Books
Price: $14.95 (paperback)

Yet another all-American Tab paperback (there are over 750 to date), this one addresses the superficially tantalising area of computer-aided design/computer-aided manufacture (CAD/CAM) using only a PC and, frankly, it's a real dog's dinner.

It is for a start ironic that a book trumpeting computer-aided design should be padded out with such a wealth of execrably duff illustration. More seriously, while it's true that CAD/CAM applications for mainframe and minicomputers have revolutionised industry, it's rather stretching it to imply that with cheap software and a few odds and sods 'you, too, can tap this space-age technology for an amazing range of time and money-saving applications'.

You can have a bit of fun with graphics, but you cannot design your own VLSI chips or, for that matter, re-invent the mousetrap using CAD/CAM techniques on an average micro. About the only thing I've seen which is a startlingly original, quasi-CAD application for the kind of micro most happy hackers can or might one day be able to afford is the soon-to-be-released Mac Publisher. It is not mentioned here.

This book, alas, is all over the place — dodging about between fatuous potted history ('The cost of computers has dropped tremendously in the past 35 years') and simplistic explanations ('Some of the most popular auxiliary storage devices used today are the following: *Tape cassette players *Floppy disks *Hard disks. These are shown in Figs 1-10'), or indigestibly technical asides ('The magnetostrictive digitizer functions like the sonic digitizer, except that wire, as opposed to air, is used as the interface to receive the signal to be transmitted') and glib statements of the obvious ('When a user designs something on a CAD/CAM system, the images that are generated need to be sent to either a printer or a plotter').

There is an attempt to review such established (and pricey) packages as AutoCAD, CADplan and FutureNet DASH-1 for the IBM PC, or Robographics CAD-1 for the Apple II, but this section, too, is confusingly bitty.

On the whole, as you may have gathered, I wasn't much for this book.

Try this for synthesize

Title: Electronic & Computer Music
Author: Peter Manning
Publisher: Oxford University Press
Price: £19.50

It's a source of immense relief to me that Mozart came before Moog, or that Donizetti quit before the digital revolution. Try as I might to come to terms with Parisian *musique concrète* or Cologne's *Elektronische Musik*, let alone Zappa or Zinovieff, cloth-eared insensitivity as a rule prevails. All aggressively avant-garde music, so cunningly concocted from manipulated juice, tends in the end to sound to me like a demented plumber's concerto for klaxon, bin-lids, doorbell and underwater drills.

I have a sense of shame about this. When Radio 3 recently hammered out its Karlheinz Stockhausen week, I did sit for hours hoping for revelation, yet still had finally to admit that I'd get as much from sitting with my ear pressed to our Hotpoint doing a full 9lb boil wash.

Notwithstanding this Philistine streak, let me say at once that I envy Peter Manning's empathy and greatly admire this excellent book. It's a lucid, well-informed and thoroughly entertaining history of 'artificial' music from its first (19th century) stirrings, through its uncertain progression until the second world war, the explosive, 'classical' 1950s, and thus to the extraordinary strides which have been made in the last couple of decades, especially in works for tape, live electronic music and the use of electronics in rock.

A (Durham) academic with considerable hands-on experience of computerised ker-plunks, Mr Manning strikes a nice balance between critical perspective and technical know-how, but do not imagine either is by any means easily absorbed.

If your musical acuity is as pin-sharp as your predilection for sounds as science, I don't imagine you'll find a more readable résumé of this fascinating, frustrating field. Those who do not know their Nyquist frequency from their elbow might be better advised to take up the banjo or stick with Music Works on the inestimable Mac.

For those in peril using C

Title: Surefire Programming in C
Author: Warren A Stewart
Publisher: Tab Books
Price: $16.95 (paperback)

I'd have called this book 'The Cruel C' as I don't find the Unix environment half so surefire and inviting as Warren A Stewart clearly does, nor am I wholly convinced that C combines the speed of assembly and the ease of Basic in a package that's fun, fun, fun.

Still, Mr Stewart's quite right — C is an up-and-coming language (its popularity is likely to accelerate even more when (or if) bulk deliveries of IBM's PC/AT begin in earnest) and he's right again when he says you don't *have* to be Unix-based to have a go with C.

What you will need is a C compiler and the presence of mind to master compile and link commands, C input/output, parameters and relational operators, not to mention recursion, multi-file and bit-level operations.

If any of that sounds absorbing, then Warren is all set with a well-structured and nicely presented tutorial which does not, he says, require prior knowledge of Basic or any programming experience at all (although I would not recommend you to chance it) and which will certainly give you a good feel for C.

How you might then choose to go on and do something useful with C is not within the scope of this book. It's strictly for compulsive programmers, but of its kind is a recommended buy.

See Jim run

Title: Microcomputing and Children
Author: AJ Obrist
Publisher: Hodder & Stoughton
Price: £5.95 (paperback)

Hats off to Edna Pollard. Edna coped most efficiently, says the author, with his handwriting and the word processor. Mrs Obrist, too, deserves a mention. She apparently contributed much from her wide experience of education and succeeded in keeping people away while author Obrist tackled critical periods.

Here are just a few of the penetrating things this crack team have come up with:

'The microcomputer (or micro as we shall call it) has only appeared very recently.'

'Micros should prove just as compelling to mothers as to fathers.'

'Parents and teachers (and other people) are all involved in bringing up children.'

'Every normal child learns to speak, not at school but in the home. What else do they learn? Well, for instance, they learn to walk and they learn how to dress themselves.'

'Given the enormous number of home micros, it is to be anticipated that many could be used as a truly effective aid for our childrens' education.'

'Teachers on the whole are now familiar with the micro. If they are not then it is quite easy for them to find out about it.'

'The micro has a memory too, so that it can "remember" the program which tells it what to do.'

'Rapid change is difficult to cope with successfully, and in a situation as diverse as the one we are considering this is even more true.'

This book is 124 pages long.

SUBSET

David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to SubSet, PCW, 32-34 Broadwick Street, London W1A 2HG.

6502 BIT ROTATION

ROTBIT (Datasheet 1) from Andy Armstrong of Newcastle-upon-Tyne is a short and speedy version of BITROT (*PCW*, July).

Andy uses a much improved algorithm to cut the routine's length from 69 to only 17 bytes and reduce execution time to only 919 clock cycles (assuming that the loops don't cross a page boundary).

The rotation is useful for converting screen-mapped graphics based on an 8-bit by 8-bit matrix (eight bytes stacked vertically) to printer-ready bit-image values. This is necessary when dumping normal screen formats to Epson standard printers. Video logic usually maps the eight bits in each byte to a horizontal line of dots but printers expect each byte to encode the bit-image data of a vertical line of eight dots.

Many home computers use an eight by eight matrix for both graphics and alphanumerics in monochrome modes. In these systems ROTBIT could be used for turning single characters around in steps of 90 degrees to produce movement. However, colour and high resolution graphics systems can utilise quite varied bit-attribute mapping and a much more sophisticated, system-specific routine would be needed to produce the same effect.

ROTBIT would be SubSet Class 1 if only the registers and flags used in the routine were returned unaltered on exit. The only way to do this is shown in Fig 1. Unfortunately, this slight enhancement would add 12 bytes to the routine's length, four bytes to its stack use and 36 clock cycles to its execution time.

Datasheet 1

```
;
;= ROTBIT    Rotate an 8 x 8 matrix.
;
;JOB         To rotate an 8 x 8 bit matrix, stored as eight
;            contiguous bytes in page zero, clockwise by 90
;            degrees, storing the result similarly.
;ACTION      For source byte 7 to source byte 0
;            [ Read source byte to accumulator.
;              For destination byte 7 to destination byte 0
;              [ Shift accumulator msb to Carry.
;                Rotate Carry into destination byte msb. ] ]
;
;CPU         6502.
;HARDWARE    None.
;SOFTWARE    None.
;
;INPUT       8-byte source matrix in M0 to M7.
;OUTPUT      8-byte destination matrix in M8 to MF.
;            A = 0. X = Y = $FF. P changed.
;            Source (M0 to M7) is unchanged.
;ERRORS      None.
;REG USE     P A X Y
;STACK USE   0
;RAM USE     M0 to MF inclusive.
;LENGTH      17
;CYCLES      919
;
;CLASS 2      -discreet      *interruptable      *promable
;-*****       *reentrant     *relocatable        *robust
;
;
ROTBIT LDY  #7          ;Index / count of 8-byte source.   A0 07
;
RB-SRC LDX  #7          ;Index / count of 8-byte dest.     A2 07
       LDA  M0,Y        ;Read next source byte.            B9 M0 00
;
RB-DST ASL  A           ;Shift next source bit to Carry    0A
       ROR  M8,X        ;and rotate into next dest. byte.  76 M8
       DEX              ;Repeat for 8 source bits into     CA
       BPL  RB-DST      ;msb of 8 destination bytes.       10 FA
;
       DEY              ;Repeat for all 8 source bytes.    88
       BPL  RB-SRC      ;                                  10 F2
;
       RTS              ;Exit, rotation completed.         60
;
```

```
;
;                                                  cycles code
;
ENTRY  PHP              ;Save flags to stack first,    3    08
       PHA              ;followed by accumulator,      3    48
       TXA              ;then X and Y index registers  2    8A
       PHA              ;both pushed via A.            3    48
       TYA              ;This leaves A = Y, with       2    98
       PHA              ;flags N & Z set for Y value.  3    48
;
;          Routine code
;
EXIT   PLA              ;Restore Y and X index registers 4  68
       TAY              ;from stack via A.             2    A8
       PLA              ;                              4    68
       TAX              ;                              2    AA
       PLA              ;Restore accumulator, then     4    68
       PLP              ;finally the flags.            4    28
;
       RTS              ;Exit with all register and         60
;                        flag values as on input.
;
```

Fig 1

Z80 BIT ROTATION

Datasheet 2, from John Hardman of Welling, is a Z80 version of the 8-bit by 8-bit matrix rotation. Designed specifically for rotating characters in situ, it is called ROTCH.

The first part of ROTCH forms the rotated matrix in reverse order in stack memory. This process destroys the source. The second part pulls the eight bytes of the rotated matrix from stack and restores them to the source matrix space in the correct order.

ROTCH is SubSet Class 1 standard. All registers and flags used by the routine are preserved on stack during its operation and, like ROTBIT, this adds four bytes to the stack use (AF and BC only are saved for this purpose: the saving of HL is due to the routine's pointer manipulation). However, the Z80 PUSH and POP instructions act on any double register and so only four bytes are added to the length of the routine itself.

Because the full 2-byte AF, not just A, has to be pushed, the stacking of the 8-byte result in ROTCH takes 16 stack bytes.

Datasheet 2

```
;
;= ROTCH     Rotate an 8 x 8 matrix.
;
;JOB         To rotate an 8 x 8 bit matrix, stored as eight
;            contiguous bytes, clockwise by 90 degrees, storing
;            the result in the original source space.
;ACTION      Address matrix byte 0.
;            For count of 8
;            [ Save matrix pointer.
;              For count of 8
;              [ Shift addressed matrix byte lsb to Carry.
;                Rotate Carry into accumulator lsb.
;                Increment matrix pointer. ]
;              Restore matrix pointer.
;              Push accumulator value. ]
;            Address matrix byte 7 + 1.
;            For count of 8
;            [ Pull to accumulator.
;              Decrement matrix pointer.
;              Move accumulator to addressed matrix byte. ]
;
;CPU         Z80.
;HARDWARE    8-byte block of RAM containing matrix.
```

```
;SOFTWARE    None.
;-------------------------------------------------------------------------
;INPUT       HL address 1st byte of 8-byte source matrix.
;OUTPUT      HL addresses 1st byte of 8-byte destination matrix,
;              (i.e. HL is unchanged).
;           All registers and flags are unchanged.
;ERRORS      None.
;REG USE     HL
;STACK USE   20
;RAM USE     None.
;LENGTH      30
;CYCLES      3191
;-------------------------------------------------------------------------
;CLASS 1     *discreet      *interruptable      *promable
;******      *reentrant     *relocatable        *robust
;-------------------------------------------------------------------------
;
ROTCH   PUSH AF         ;Save flags and registers for          F5
        PUSH BC         ;use in ROTCH.                         C5
        LD   C,8        ;Set count for 8 result bytes.         0E 08
;
RC-RST  PUSH HL         ;Save pointer to matrix byte 0.        E5
        LD   B,8        ;Set count for 8 source bits.          06 08
;
RC-SRC  SRL  (HL)       ;Get next source byte lsb shifted      CB 3E
        RLA             ;into current result byte lsb.         17
        INC  HL         ;Point to next source byte and         23
        DJNZ RC-SRC     ;repeat until result byte filled.      10 FA
;
        POP  HL         ;Restore pointer to matrix byte 0.     E1
        PUSH AF         ;Push current result byte.             F5
        DEC  C          ;repeat until all 8 result bytes in    0D
        JR   NZ,RC-RST  ;reverse order in stack memory.        20 F2
;
;... Loop RC-SRC leaves B = 0.
;... Move result from stack to matrix memory, reversing order.
;
        LD   C,8        ;Set BC = 8, add to matrix pointer     0E 08
        ADD  HL,BC      ;to address byte following matrix.     09
        LD   B,C        ;Set count for 8 destination bytes.    41
;
RC-DST  POP  AF         ;Pop next result byte.                 F1
        DEC  HL         ;Address next destination byte         2B
        LD   (HL),A     ;and store result, repeating for all   77
        DJNZ RC-DST     ;8 result bytes in reverse order.      10 FB
;
        POP  BC         ;Restore registers and flags           C1
        POP  AF         ;used in ROTCH, and exit with          F1
        RET             ;rotated matrix in same space.         C9
;-------------------------------------------------------------------------
```

6809 MATRIX TRANSPOSITION

OSMATR from Richard Bamford of Nottingham is a 6809 routine to transpose a matrix of single byte elements in its own space.

Transposition is the action of converting from storage row after row in memory, to column after column. The action of OSMATR on a small matrix is shown in Fig 2.

If you don't need to put the result matrix in the same space as the source, or can transfer the result after transposition, then see MATRAN (*PCW* September, 1983) which does the job in only 26 bytes. The extra 57 bytes of OSMATR is the cost of sophistication.

For the record, the 6502 own-space transposition, TRANS (*PCW* November, 1983), is 102 bytes long. The Z80 equivalent, OSMTRN (*PCW* January, 1984), is only 35 bytes in length but uses a slower method involving more exchanges. As yet, no one has submitted a transposition routine for the 8086 or 68000 series.

```
Cols Rows     Start: Row following Row.
 4    3       a1  a2  a3  a4  b1  b2  b3  b4  c1  c2  c3  c4

 3    2       a1 ↳a2→a3→a4→b1┘ b2  b3  b4  c1  c2  c3  c4

 3    1       a1  b1 ↳a2→a3→a4→b2→b3→b4→c1┘ c2  c3  c4

 2    2       a1  b1  c1  a2 ↳a3→a4→b2┘ b3  b4  c2  c3  c4

 2    1       a1  b1  c1  a2  b2 ↳a3→a4→b3→b4→c2┘ c3  c4

 1    2       a1  b1  c1  a2  b2  c2  a3 ↳a4→b3┘ b4  c3  c4

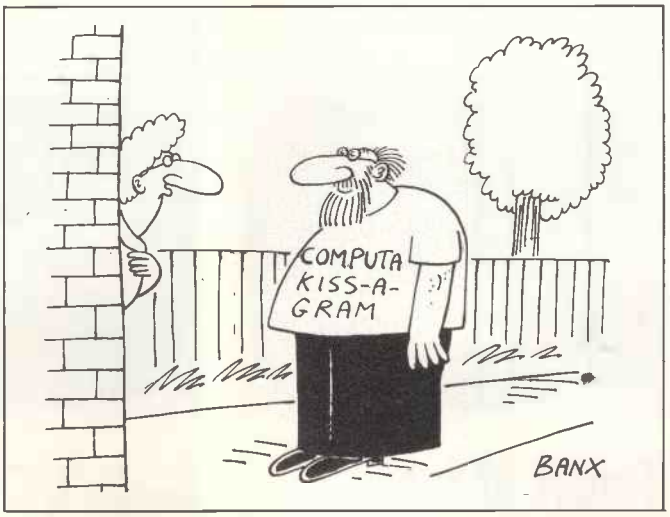
 1    1       a1  b1  c1  a2  b2  c2  a3  b3 ↳a4→b4→c3┘ c4

 0    0       a1  b1  c1  a2  b2  c2  a3  b3  c3  a4  b4  c4
              End: Column following Column.
```

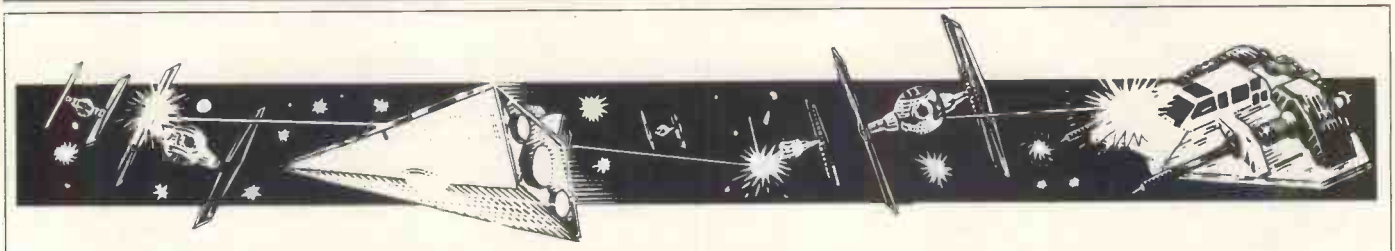
Fig 2

Datasheet 3

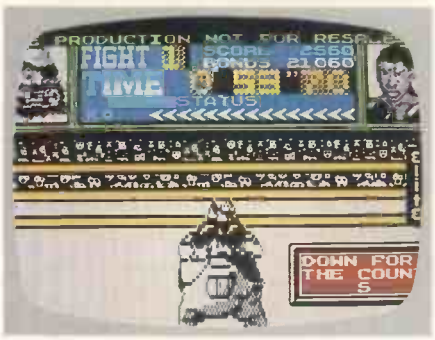
```
;-------------------------------------------------------------------------
;= OSMATR    Own Space Matrix Transposition.
;-------------------------------------------------------------------------
;JOB         To transpose a 2-dimensional array, or matrix, of
;            single byte elements, in its own space, with
;            sequential row storage becoming sequential column
;            storage, or vice versa.
;ACTION      Col-cnt = no. of columns - 1.
;            Src-ptr = dst-ptr.
;            Pass-cnt = 0.
;            FOR col-cnt
;            [ Save src-ptr.
;              Row-cnt = no. of rows.
;              FOR row-cnt
;                [ IF dst-ptr < src-ptr
;                  THEN [ Accumulator = (src-ptr).
;                         Shift Memory (dst-ptr to src-ptr -1) to
;                         memory (dst-ptr + 1 to src-ptr).
;                         (dst-ptr) = accumulator. ]
;                  ELSE [ Src-ptr = dst-ptr. ]
;                  Dst-ptr = dst-ptr + 1.
;                  Src-ptr = src-ptr + no. of columns - pass-cnt. ]
;              Restore src-ptr.
;              Src-ptr = src-ptr + 2.
;              Pass-cnt = pass-cnt + 1. ]
;-------------------------------------------------------------------------
;CPU         6809.
;HARDWARE    RAM containing matrix.
;SOFTWARE    None.
;-------------------------------------------------------------------------
;INPUT       X addresses 1st byte of matrix.
;            A contains number of columns (1 to 256: $00 = 256).
;            B contains number of rows (1 to 256: $00 = 256).
;OUTPUT      Transpose of source matrix occupies matrix space.
;            CC is changed.
;            All other registers are unchanged.
;ERRORS      Loop count error if input number of columns = 1.
;REG USE     A B X CC
;STACK USE   8: 15
;RAM USE     None.
;LENGTH      83
;CYCLES      Not given.
;-------------------------------------------------------------------------
;CLASS 2     -discreet      *interruptable      *promable
;-****-      *reentrant     *relocatable        -robust
;-------------------------------------------------------------------------
;
OSMATR PSHS U,Y,X,D   ;Save registers used in OSMATR.     34 76
       LEAS -7,S      ;Allow for variable storage.       32 79
       DECA           ;Set col-cnt = no.of cols. - 1.    4A
       CLR  6,S       ;Set pass-cnt = 0.                 6F 66
       TFR  X,Y       ;Set src-ptr = dst-ptr.            1F 12
;
LCOL   STY  ,S        ;Save src-ptr at pass start.       10 AF E4
       LDB  8,S       ;Get row-cnt for this pass.        E6 68
;
LROW   STY  2,S       ;Save src-ptr for comparison.      10 AF 62
       CMPX 2,S       ;If src-ptr = dst-ptr then no      AC 62
       BEQ  LSKP      ;rotation needed. If src-ptr       27 1B
       BLT  LOK       ;above dst-ptr then rotate.        2D 04
;
       TFR  X,Y       ;Else equalise src-ptr and         1F 12
       BRA  LSKP      ;dst-ptr ready for increments.     20 15
;
;... Rotate all memory between destination and source pointers,
;... moving byte at src-ptr to location at dst-ptr.
;
LOK    STD  4,S       ;Save col-cnt & row-cnt.           ED 64
       LDA  ,Y        ;Get byte at (src-ptr).            A6 A4
       TFR  Y,U       ;Move src-ptr to shft-ptr and      1F 23
       STX  2,S       ;save dst-ptr for shift end test.  AF 62
;
SHFT   LDB  ,-U       ;Dec shft-ptr & move next shift    E6 C2
       STB  1,U       ;byte higher by one location.      E7 41
       CMPU 2,S       ;Test if shft-ptr at dst-ptr       11 A3 62
       BNE  SHFT      ;repeating until so, shift done.   26 F7
;
       STA  ,X        ;Store rotated byte to dest.       A7 84
       LDD  4,S       ;Restore col-cnt & row-cnt.        EC 64
;
;
LSKP   LEAX 1,X       ;Increment dst-ptr.                30 01
       STB  2,S       ;Temporarily save row-cnt and      E7 62
       EXG  X,Y       ;move src-ptr to X for increment.  1E 12
;
       LDB  7,S       ;Get initial cols. and subtract    E6 67
       SUBB 6,S       ;pass-cnt then add to              E0 66
       ABX            ;src-ptr as next src address.      3A
;
       EXG  X,Y       ;Restore src-ptr to Y and          1E 12
       LDB  2,S       ;restore row-cnt from stack.       E6 62
       DECB           ;Repeat for row-cnt as one pass.   5A
       BNE  LROW      ;                                  26 CC
;
       DECA           ;Repeat for col-cnt passes         4A
       BEQ  TERM      ;then end.                         27 09
;
       LDY  ,S        ;Restore pass start src-ptr and    10 AE E4
       LEAY 2,Y       ;increment past completed part.    31 22
       INC  6,S       ;Increment pass-cnt, pass done,    6C 66
       BRA  LCOL      ;and go do another pass.           20 BB
;
TERM   LEAS 7,S       ;Clean up stack variable space     32 67
       PULS U,Y,X,D   ;and restore registers used.       35 76
       RTS            ;Exit, matrix transposed.          39
;-------------------------------------------------------------------------
```



SCREENPLAY



With padded gloves and silky shorts, Stephen Applebaum enters the ring to challenge Frank Bruno. He also suffers mental problems while bouncing on a spring, and goes on the road across the US. Just some of the scenarios featured in this month's top games selection for the Commodore 64/128, Spectrum and Amstrad.



Below the belt

Title: Frank Bruno's Boxing
Computer: Spectrum 48k,Commodore 64, Amstrad
Supplier: Elite Systems
Format: Cassette
Price: £6.95, £7.95, £8.95

Slightly bruised after last month's excursion to the land of the rising sun, I now find myself thrown into a boxing ring in the middle of Wembley Arena, apparently as a challenger for the world title in Frank Bruno's Boxing from Elite.

If you've played Punch Out in the arcades, you'll have some idea of what Frank Bruno's Boxing is all about. For those who haven't, it's a game where you control a wire-frame boxer as he fights several computer-controlled fighters, each of which has a very different interpretation of the Queensberry Rules — in other words, they cheat. Elite's game is virtually identical.

Soon after the program has loaded from cassette, a prompt appears asking for the player's initials; that done, the fight can begin. Before you can throw any punches, you have to wait for your antagonist to go through his ritual warm-up. As he goes through his pre-fight callisthenics, you have a chance to see his speciality. In the case of the first boxer, Canadian Crusher, that means a bear hug; on the other hand, Fling Long Chop, the second challenger, wouldn't look out of place in Way Of The Exploding Fist with his fast kicking and lightning movements. There are seven pugilists who have to be faced before the world champion can be taken on.

As each of the boxers occupies quite a lot of the Spectrum's memory, all, except Bruno, are stored on the B-side of the cassette. None of these can be loaded until you have obtained a special password from winning a bout.

The graphics used throughout Frank Bruno's Boxing are of a far higher standard than any I have seen in similar games on the Spectrum. During a fight, the player is given a view of the action from behind Bruno's back; this shows Bruno, his opponent, and the crowd outside the ring. Above the main display is a box containing two bars representing the strength of the two boxers. Each time a fighter receives a blow, the bar diminishes, while the opposite happens when he lands one, so the way to knock out a boxer is to bludgeon him until his strength falls to zero.

Frank Bruno's Boxing is as big as the man himself and twice as hard. It'll take a long time for anyone to reach the world champion, and even longer to beat him.

If you want a game that's going to pose a challenge for more than just a few plays, get hold of this one; you won't be disappointed.

Temple of doom

Title: Abu Simbel (Profanation)
Computer: Spectrum 48k
Supplier: Gremlin Graphics
Format: Cassette
Price: £7.95

Gremlin Graphics has produced some excellent programs recently and to reflect this, I have included two in this month's Screenplay. First off is the strangely-named Abu Simbel (Profanation).

Somewhat deceptively, the game's cassette inlay sports an Indiana Jones type figure leaping over a grotesquely large spider. In reality, the character featured in Profanation is closer to Q*Bert than Harrison Ford, and hardly

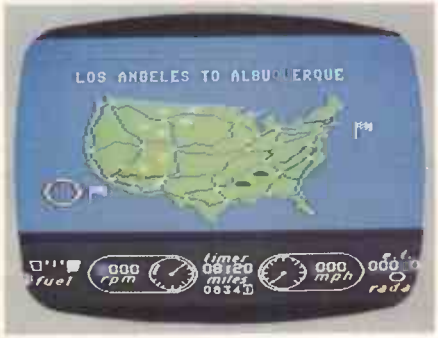
comparable to a human in any respect — except, perhaps, for the fact that it has two legs. That aside, Abu Simbel is a high-quality ladders and levels game, and an extremely difficult one to boot.

Quite simply, the idea is to enter the temple of Abu Simbel, built 3000 years ago by Rameses II, and find the treasure hidden within. Prior to your expedition, no-one had attempted to explore the temple, put off by the curse placed on it by its creator. It would have been better if you too had heeded the stories, as far from being superstitious nonsense they are all true, and you soon find yourself in a lot of trouble. The only way to break the spell cast by Rameses II is to reach the temple's mortuary chamber and discover its secrets.

Searching the temple takes a great deal of time and concentration, and certainly isn't for anyone who gives up easily: for example, it took me well over 45 minutes to get through the first screen.

The instructions supplied with Abu Simbel are rather sparse, so I'm not sure how many rooms there are to explore. I managed to get through five of them, each of which was garish in its decor and very detailed. Wandering around some of the chambers are well-animated snakes, spiders and bats, all of which are fatal to the touch. Even being splashed by water dripping from the ceiling proves calamitous. As you find yourself bumping into these a great deal, Dinamic, the Spanish company that programmed Abu Simbel, has been kind enough to give you 10 lives to play with. However, if your game skills are as wanting as mine, you'll probably find that not even these are enough.

Abu Simbel (Profanation) is not particularly original but is well-programmed, and a lot of work has obviously gone into the graphics.



Pumping gas

Title: The Great American Cross-Country Road Race
Computer: Commodore 64/128
Supplier: Activision
Format: Cassette
Price: £9.99

The Great American Cross-Country Road Race is no ordinary motor racing game; it is a colourful odyssey across the varying terrain of the US. Although there are obvious touches of Pole Position and smatterings of Enduro, Road Race is a classy program with some inventive moments.

The object of the game is simply to drive from the east coast to the west coast of the US, on what must be some of the country's busiest highways. There are four races, the longest of which is the American Tour, taking in every city between the two coasts. Shorter, but no less arduous, are straight runs between two major cities; Los Angeles to New York, Seattle to Miami, or San Francisco to Washington.

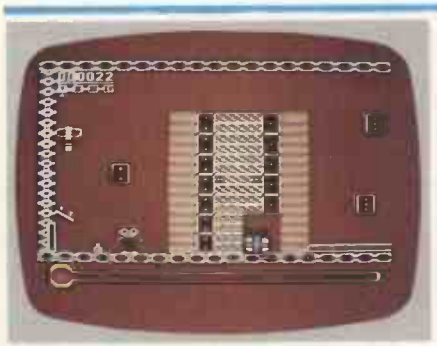
After selecting a race, a map screen allows you to choose a route. Not only does this allow you to plan your route, but also helps you avoid bad weather.

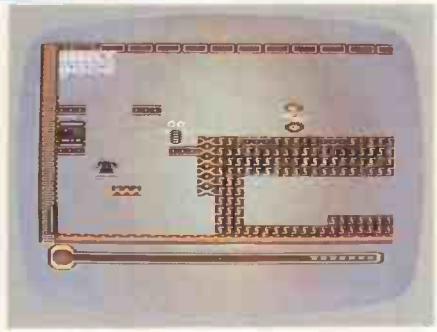
During a race, you are presented with a view looking down the road. Below the main display is a mileage indicator, a speedometer, a rev counter, and a radar for detecting police cars. Gear changes can be made by declutching (releasing the fire button) and pushing the joystick forward. Pulling the stick back causes the car to break.

As you speed along the road, other cars, motorbikes and even lorries hurtle past in abundance, but they can soon be caught by putting your foot (thumb) down on the gas. Remember to keep an eye on your fuel gauge — it's easy to run out of gas and have to pump the accelerator all the way to the next fuel station.

On some of the longer races you have to drive through the night, watching out for any grey objects that emerge from the darkness. These are either signposts or other vehicles, so they're best avoided. When you finally reach a city, the word 'welcome' flashes up on the top of the screen and a tune, plagiarised from Pole Position, plays to herald your arrival.

Unlike many of the current racing games, The Great American Cross-Country Road Race has plenty of variation; there are snowy wastelands to drive across, raindrenched highways to skid over, and even the odd police car to outmanoeuvre. Highly recommended for those who yearn for the open road.





Mental Problems

Title: Thing on a Spring
Computer: Commodore 64
Supplier: Gremlin Graphics
Format: Cassette
Price: £7.95

Thing on a Spring is the second of the two games reviewed from Gremlin Graphics, and is by far my favourite. In some respects it is similar to Profanation as once again you have to jump around different levels, exploring lots of trap-laden rooms. However, unlike the former, Thing on a Spring contains several mental problems which give it greater lasting appeal.

Instead of Pharaoh's curses and poison spiders, Thing on a Spring contains an evil, megalomaniac goblin who is wreaking havoc on the world from his underground lair. Unless he can be stopped, the planet will be sucked dry of all its wealth and treasures and held to ransom by the subterranean monster.

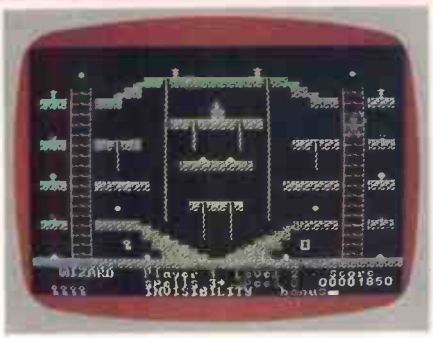
Apparently, the only one who can save us is Thing on a Spring, a cute little character who bounces around the screen like Zebedee on speed. Before he can kill the goblin, our hero must find nine pieces of a jigsaw which, when assembled, will yield a clue as to how he can be destroyed. While searching the goblin's underground installation, Thing often comes into contact with some of the monster's followers; these dastardly creatures have the fatal habit of rusting Thing's spring to the point of disintegration. Although luckily someone has left cans of oil lying around, so all is not lost.

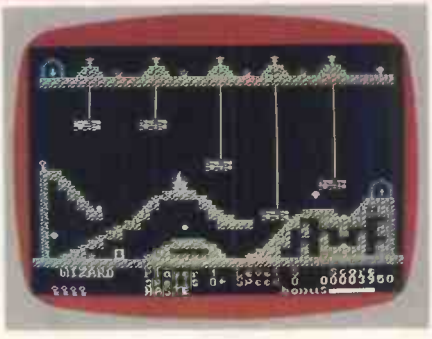
In play, Thing on a Spring is one of the most amusing and essentially frustrating games I have reviewed in a long time. As well as bouncing around the various platforms of the goblin's factory, there are elevators and moving floors to be negotiated.

It took me a long time to realise that I couldn't use the elevators without first

finding a special parcel containing a gadget to allow me to do so. There's a lot more of that kind of thing in this slightly offbeat game.

Thing on a Spring is eclectic in its scenario but is totally original in the way it has been executed. Great graphics and wonderfully playful music make this a better than usual platform-and-ladders game for everyone who likes a challenge, although not at the expense of the odd chuckle.





Magic practice

Title: Wizard
Computer: Commodore 64, other versions planned
Supplier: Ariolasoft
Format: Cassette, disk
Price: £9.95, £12.95

Wizards and magic have been part of folklore for centuries, and have recently undergone a revival due to the popularity of fantasy books such as *Lord of the Rings* and their many offspring. Wizards also made their way into the world of computer games with rapidity, bolstering the popular conception of programmers as people living in a dream world.

Despite this saturation of the computer games world with fantasy and adventure, Wizard presents magic in a slightly new light although not a new format. You will see from the screenshots that this is in part a platform-and-ladders game, the novelty being the addition of magic, and the clever way in which the program works.

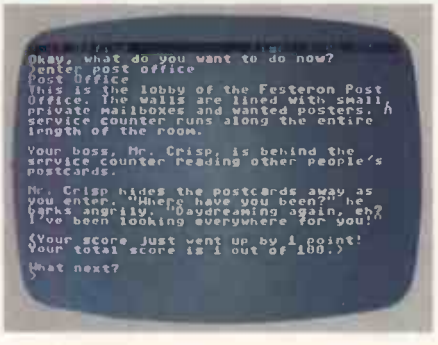
The wizard lives in a collection of caverns occupied by strange creatures with stranger habits. The only other things in this unusually limited world are diamonds, jewels, gold bars, pearls, ropes, fires, ladders, machines, magic, weird electrical phenomena . . . the list is seemingly endless. The wizard's sole purpose in life is to gain greater experience and to become a better wizard, but you in your adopted persona are really after the chance to progress to the next level and score points. As usual, this attitude hinders the game a little, but then we do all live in the real world, not a programmer's imagination.

In your role as wizard, you enter the caves via an easy cavern where you can work out what you need to do; you also get practice in the simple methods of dying like falling off rocks or jumping from ropes high up in the air. When you do proceed to the next cavern, things become more exciting, and you are chased around and treated as a casual object of random malevolence. Fortunately, you can acquire spells that will help you out of some of the more difficult situations. These don't last very long, so don't wait but use them as fast as you can wave your arms in the air.

The animation, sound and colour for the caverns and their denizens are superb, and are full of neat little touches. It's worth using lateral thinking to discover how to pass some of the objects in your way. Even if things look desperate from the start, don't despair: there is a lot of magic in the caverns, and you can trigger it quite accidentally.

If you get bored with the screens available on the disk, or you can't manage their difficulty, you have the opportunity to design your own, up to 99 of them. Although these cannot include all the features of the original set of caverns, you can prepare some very nasty surprises for your enemies (or friends). I only made it as far as the seventh screen at the lowest of several levels and at an average speed, so you should have a few sleepless nights with this one.

All in all, Wizard is rather more than just another platform game.



Not what it seems

Title: Wishbringer
Computer: Commodore 64 plus others
Supplier: Infocom, Softsel
Format: Disk
Price: £31.95, £34.95

This is yet another release from the master of the adventure game, Infocom. As usual, this is a text-only adventure with masses of detailed description and lush prose. The game's packaging is also up to the usual standard and includes the game disk, an official postal map of the small, sleepy town of Festeron, a special-delivery letter for the proprietor of Ye Olde Magick Shoppe, a local history release of the Legend of Wishbringer and a mysterious glowing stone. As this is an introductory level Infocom adventure, there is a lot of general information on the company's adventures.

The basic scenario is that you are a daydreaming postal clerk for the local Post Office. Your boss, Mr Crisp (or Corky to the librarian Miss Voss) is a cranky, nasty man who asks you to deliver the special-delivery letter to the Magick Shoppe and hurry up about it. This presents the game's first difficulty, as you need to work out how to pass the uncommunicative gravedigger in the murky and mysterious graveyard full of tombstones and old bones.

Alternatively, you could try to pass the extremely mean, vicious and hungry poodle in the street. When this is done, things start to happen, and you eventually find your way through to the Magick Shoppe where you are greeted by an old woman. She asks you to read the letter to her (which you should *not* have opened until this point—it adds to the atmosphere of the story).

You discover that all is not as it seems in the sleepy little town, and set off to discover the Evil One who has kidnapped the old woman's cat. Who knows what darkness may bring, and why does Festeron look so different in the twilight and the fog? You will have to play the game to find out, as I didn't get much further than back to town after delivering the letter.

Just remember that all small, quiet towns aren't what they seem — nor is everyone exactly who you imagine them to be. Think of Norman Bates at the sleepy Bates Motel. END

TJ'S WORKSHOP

Our monthly selection of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to TJ's Workshop, PCW, 32-34 Broadwick Street, London W1A 2HG. Please keep your contributions concise and enclose a stamped addressed envelope if you want them returned. We will pay £5-£30 for any tips we publish. PCW can accept no responsibility for damage caused by using these tips, and readers should note that any hardware modifications may render the maker's guarantee invalid.

PASCAL GREP UTILITY

This is the Unix GREP function written as a Pascal program in Turbo Pascal for the IBM PC. It should be easy to convert to Pascals for other machines. The GREP function allows you to search for the occurrence of a specific string in one or more programs and to display all occurrences of the string and where they appear on the screen.

Use is made of the windowing facility in Turbo Pascal but this can be avoided or omitted for other machines.

Finnban P Murphy

```
{=============================================================================}
{     GREP.PAS        WRITTEN BY F.P.MURPHY, CORK, IRELAND      30/01/1985    }
{                                                                             }
{  Searches  one  or more files for each occurance of a  specific  pattern,   }
{  distinguishing between uppercase & lowercase if necessary, and outputing   }
{  the complete line together with its line number to either the console or   }
{  printer.                                                                   }
{                                                                             }
{          Written for use on an IBM PC using TurboPascal and PCDOS 2.0.      }
{                                                                             }
{-----------------------------------------------------------------------------}

PROGRAM GREP;

TYPE
     string80        =    string[80];
     filestring      =    string[14];

VAR
     In_File         :    text;
     Out_File        :    text;
     NameArray       :    array[1..10] of filestring;
     OutFileName     :    filestring;
     Pattern         :    string80;
     InLine1         :    string80;
     InLine2         :    string80;
     Line_No         :    integer;
     Max_No_Files    :    byte;
     cvt2lc          :    boolean;
     No_Files        :    byte;

{=============================================================================}

FUNCTION LC(x : char): char;

BEGIN
     lc:=x;
     if(x<'Z') and (x>'A') then lc:= chr(ord(x)+32)
END;

{-----------------------------------------------------------------------------}

PROCEDURE LCASE(var x : string80);

VAR   i:byte;

BEGIN
     for i:= 1 to length(x) do x[i]:= lc(x[i]);
END;

{-----------------------------------------------------------------------------}

FUNCTION EXIST (filename : filestring) : boolean;

VAR   fil : file;

BEGIN
     Assign(Fil, Filename);
     {$I-} Reset(Fil) {$I+};
     EXIST := (IORESULT = 0);
END;

{-----------------------------------------------------------------------------}

PROCEDURE BEEP;
BEGIN
     Sound(900); Delay(200); NoSound; Sound(600); Delay(300); Nosound;
END;

{-----------------------------------------------------------------------------}

PROCEDURE INIT;

LABEL   B1;

VAR     ch  : char;
        Y,i : byte;

BEGIN
     ClrScr; WriteLn('      GREP ----- Version 1A, 27/01/1985'); WriteLn;
     Max_no_files := 0;
     Repeat
B1:      max_no_files := max_no_files + 1; namearray[max_no_files]:= '';
         Write('Search file name (CR - Exit) ----------> ');
         y:= WhereY; ReadLn(namearray[max_no_files]);
         if (not EXIST(namearray[max_no_files]) and
            (namearray[max_no_files] <> '')) then begin
            GoToXY(60,Y); Write('UNKNOWN/INVALID FILE '); Beep; GoToXY(1,Y+1);
            max_no_files:= max_no_files - 1; GoTo B1;
         end;
         for i:= 1 to 14 do begin
         namearray[max_no_files][i]:= UpCase(namearray[max_no_files][i]);
         end;
     until (namearray[max_no_files] = '') or (max_no_files = 4);
     WriteLn;
     Write('Output file name ------ ----------> '); ReadLn(OutFilename);
     Write('Pattern to search for ------------> '); ReadLn(Pattern);
     Write('Case sensitive search (Y/N ?) ----> '); ReadLn(ch);
     CVT2LC:= not(ch in ['Y','y']); if CVT2LC then lCase(Pattern);
     Assign(Out_file, OutFilename); Rewrite(Out_file);

END;

{=============================================================================}

BEGIN {MAIN}
     init;
     for no_files := 1 to (max_no_files - 1) do begin
       Assign(in_file, namearray[no_files]);  Reset(in_file);
       GoToXY(1,12); ClrEOL; Write('File : ',namearray[no_files]);
       Window(1,14,80,25); ClrScr; Beep; Line_No:= 0;
       While not EOF(in_file) do begin
           line_No := line_No + 1; readLn(in_file, inline1);
           inline2:= inline1; if cvt2lc then lcase(inline2);
           if Pos(pattern,inline2) <> 0 then WriteLn(Line_No:5,    ,Inline1);
       End;
       Window(1,1,80,25);
       End;
     Window(1,1,80,25); GoToXY(1,24);
END.

{=============================================================================}
```

BBC '*' COMMANDS

Have you ever wished that you could turn a machine code routine into a new '*' command? This utility shows you how and includes a few examples. It is done by making use of a subroutine in ROM which handles all the '*' commands (the command line interpreter or OSCLI). By intercepting its vector (CLIV) at locations &208 and &209, it is possible to include the new commands.

The routine intercepts the call to OSCLI, and checks to see if one of the new commands has been requested. If it has, it executes it and returns. If not, it passes on the OSCLI. The X and Y registers contain the location of the beginning of the string. The string is then checked by looking at the first, third and sixth characters of the string, so these will have to be different for each command.

The program is loaded into the function key section of memory at &B00, and is initialised by ?&208=&B00 MOD 256:?&209=?B00 DIV 256.

If the characters in the command stored in memory don't correspond to the name of your new routine, pass control back to OSCLI using JMP?&208+256*?&209.

Otherwise, when your new routine has been completed, pass control back to the Basic interpreter using RTS. The example here makes use of this new routine to provide a comprehensive set of new '*' commands.

Carl Dunkley

```
LIST
   10REM  BASIC extension V1.
   20REM  (c)C.Dunkley 1985
   30
   40MODE6
   50PROCassemble
   60REM Activate new * command routine....
   70?&208=0:?&209=&B
   80PROClist
   90END
  100
  110DEFPROCassemble
  120REM All comments after a \ character can be omitted
  130FORN=0TO1
  140P%=&B00
  150[OPTO
  160.cli
  170PHA:TXA:PHA:TYA:PHA:      \Save the A,X,Y registers
  180LDA&80:PHA:               \and the values of locations
  190LDA&81:PHA:               \&80 and &81 onto the stack.
  200STX&80:STY&81
  210
  220LDY#1:LDA(&80),Y:ORA#32:PHA:      \Load A with first chr$ of string
  230LDY#3:LDA(&80),Y:ORA#32:TAX:      \X with the fourth
  240LDY#6:LDA(&80),Y:ORA#32:TAY:PLA:  \and finally Y with the sixth.
  250
  260.keyboard
```

```
270CMP£ASC"k":BNEescape
280\-------------------------
290.keyboard_sub
300LDX£1:CPY£ASC"n":BEQfn_keyboard:DEX
310CPY£ASC"f":BEQfn_keyboard:JMPold
320.fn_keyboard LDA£178:JMPos
330\-------------------------
340
350
360.escape
370CMP£ASC"e":BNEcaps_cursor
380CPX£ASC"c":BNEcaps_cursor
390\-------------------------
400.escape_sub
410LDX£1:CPY£ASC"f":BEQfn_escape:DEX
420.fn_escape:LDA£229:JMPos
430\-------------------------
440
450
460.caps_cursor
470CMP£ASC"c":BNEzero
480CPX£ASC"r":BNEcaps
490\-------------------------
500.cursor_sub
510LDX£0:CPY£ASC"f":BEQfn_cursor:INX
520.fn_cursor LDA£23:JSR&FFEE:LDA£1:JSR&FFEE:TXA:JSR&FFEE:LDX&7:LDA£0
530.loop1 JSR&FFEE:DEX:BNEloop1:JMPend
540\-------------------------
550
560
570.caps CPX£ASC"p":BNEzero
580\-------------------------
590.caps_sub
600LDX£&81:CPY£ASC"f":BEQfn caps:LDX £0
610.fn_caps LDA£202:JMPos
620\-------------------------
630
640
650.zero
660CMP£ASC"z":BNEsound
670\-------------------------
680.zero_sub
690LDX£104:LDA£0
700.loop2 STA&403,X:DEX:BNEloop2:JMPend
710\-------------------------
720
730
740.sound
750CMP£ASC"s":BNEplus1
760CPX£ASC"u":BNEplus1
770\-------------------------
780.sound_sub
790LDX£1:CPY£ASC"f":BEQfn_sound:DEX
800.fn_sound LDA£210:JMPos
810\-------------------------
820
830
840.plus1
850CMP£ASC"p":BNEold
860CPX£ASC"u":BNEold
870\-------------------------
880.plus1_sub
890LDY£8:LDA(&80),Y:ORA£32:LDY£0
900CMP£ASC"f":BEQfn_plus1_off
910LDAE27#LDX£&FF:JMPplus1_end
920.fn_plus1_off LDA£&D8:LDX£&F1:INY
930.plus1_end STA&212:STX&213:LDA£163:LDX£128:JSR&FFF4:JMPend
940\-------------------------
950
960
970\::::::::::::::::::::::::::
980.old:                    \If none of the new commands
990PLA:STA&80:              \have been chosen then pass
1000PLA:STA&81:             \control to OSCLI.
1010PLA:TAY:PLA:TAX:PLA:    \After restoring the values of A,X,Y,&80 and&81.
1020JMP?&208+256*?&209
1030\::::::::::::::::::::::::::
1040
1050
1060\-------------------------
1070.os LDY£0:JSR&FFF4
1080.end:                   \If a new command has been executed
1090PLA:STA&80:PLA:STA&81:  \then restore values of A,X,Y,&80 and&81.
1100PLA:TAY:PLA:TAX:PLA:RTS:  \and return to BASIC interpreter."
1110]NEXT
1120ENDPROC
1130DEFPROClist
1140CLS
1150PRINTTAB(8);"BASIC extension V1.1"
1160PRINT'
1170PRINT"*CUR_ON"TAB(14)"Turns Cursor ON"
1180PRINT"*CUR_OFF"TAB(14)"  ''     ''   OFF"
1190PRINT
1200PRINT"*SOU_ON"TAB(14)"Enables Sound output"
1210PRINT"*SOU_OFF"TAB(14)"Disables ''    ''"
1220PRINT
1230PRINT"*KEY_ON"TAB(14)"Enables Keyboard operation";
1240PRINT"*KEY_OFF      Disables  ''      ''"
1250PRINT
1260PRINT"*CAP_ON"TAB(14)"Turns CAPS LOCK ON"
1270PRINT"*CAP_OFF"TAB(14)"  ''    ''   OFF"
1280PRINT
1290PRINT"*ESC_ON"TAB(14)"Enables Escape key"
1300PRINT"*ESC_OFF"TAB(14)"Disables  ''  ''"
1310PRINT
1320PRINT"*PLUS1_ON"TAB(14)"Enables PLUS1"
1330PRINT"*PLUS1_OFF"TAB(14)"Disables ''"
1340PRINT
1350PRINT"*ZERO"TAB(14)"Zero all Integer variables"
1360PRINT
1370ENDPROC
```

SPECTRUM PRINT USING COMMAND

This routine allows output to be formatted by specifying a number of character positions for an entire number, as well as a number of character positions for the decimal part. The function bears some resemblance to the Fortran F descriptor in the FORMAT command.

The formatting is performed recursively, and is performed up to eight times to allow for the magnitude of most numbers. The listing gives a small demonstration of an 8.4 format with eight character positions in total, four after the decimal point. The function has three arguments: T — the total number of characters to be printed (including the decimal point); A — the number of digits to come after the decimal point; and N — the number to be printed.

In the listing, the function comes after line 1000 and is called by a line of the form PRINT FN F$(T,A,N) where T, A and N are as previously described. The lines before 1000 give a simple demonstration of the routine.

Keith Finlay

```
10 REM FORMAT DEMONSTRATION
20 PRINT "1234567890"
30 FOR I = 1 TO 18
40    LET N = RND
50    PRINT FN F$(8,4,N)
60 NEXT I
70 STOP : REM END OF DUMMY PROGRAM

1000 REM          FORMAT FUNCTION.
1010 REM        COPYRIGHT K.A.FINLAY
1020 REM            APRIL 1985
1030 REM
1040 REM ROUND THE NUMBER TO A SPECIFIED NUMBER OF PLACES
1050 REM
1060 DEF FN R(X,A) = (INT ((X*10^A) + 0.5))/ (10^A)
1070 REM
1080 REM PUT A ZERO BEFORE THE DECIMAL POINT IF THERE ISN'T ONE.
1090 REM FOR INTEGER NUMBERS ADD A DECIMAL POINT.
1100 REM
1110 DEF FN I$(X$) = ("0" AND X$(1)=".") + X$ + ("." AND VAL X$=
                    INT VAL X$)
1120 REM
1130 REM MOVE LEFT UNTIL DECIMAL POINT IS IN CORRECT PLACE. THE
     THREE LOGICAL EXPRESSIONS ARE MUTUALLY EXCLUSIVE.
1140 REM
1150 DEF FN A$(X$,T,A,N) = (X$ AND (X$(T-A)=".")                    +
     (X$(2 TO)+ " " AND (X$(T-A)<> "." AND X$(1)= " ") )            +
     ("**********"( TO T) AND (X$(T-A)<> "." AND X$(1)<> ".") )
1160 REM
1170 REM MOVE RIGHT UNTIL ALL SPACES FILLED UP.
1180 REM
1190 DEF FN B$(X$,T,A,N) = (" " AND LEN X$<T) + X$
1200 REM
1210 REM RECURSIVE FORMATTER.
1220 REM
1230 DEF FN F$(T,A,N) =
      FN A$(FN A$( FN A$( FN A$( FN A$( FN A$( FN A$( FN A$(
      FN B$(FN B$( FN B$( FN B$( FN B$( FN B$( FN B$( FN B$(
      FN I$( STR$ ( FN R(N,A))),T,A,N),T,A,N),T,A,N),T,A,N),T,A,N)
      ,T,A,N),T,A,N),T,A,N),T,A,N),T,A,N),T,A,N),T,A,N),T,A,N)
      ,T,A,N),T,A,N),T,A,N)
1240 REM
1250 REM END OF FUNCTIONS.
```

BBC DIRECTORY CHANGER

This program is for those who need to frequently copy files between disks when all the files are in different directories. As the Acorn DFS does not allow the wild card symbols * and # to be used with the *RENAME command, changing all the files on a disk would mean typing a separate command for each file to be changed. This program solves the problem by individually listing each file and its directory and then allowing the user to alter the directory of the file, even if the file is locked.

How it works:

Lines 100-190 are the heart of the program.

B?0 sets up the drive

B!1 points to a location in memory

B?5 number of parameters (track, sector, and so on)

B?6 specifies read (&53) or write (&48)

B?7 is the track

B?8 is the sector

B?9 specifies one sector to be read

Lines 210 to 320 print each file and its directory, and allow the user to alter the directory via the subroutine at 370. If the directory number is greater than &7E, the file is locked. To obtain the directory, subtract ?BO.

Meirion Morgan

```
   10 REM ** DIRectory changer **
   20 REM ** by Meirion Morgan **
   30 MODE 3
   40 PRINT 'STRING$(79,"*")
   50 PRINT '"    DIRECTORY CHANGER FOR BBC MICRO (
 USED ON 8271 ) - BY MEIRION MORGAN "
   60 PRINT 'STRING$(79,"*")
   70 INPUT TAB(0,8)"Which drive ",drive
   80 IF drive<0 OR drive>3 OR INT(drive)<>drive G
OTO 70
   90
  100 DIM B 12:DIM H 255
  110 A%=&7F:X%=B MOD 256:Y%=B DIV 256
  120 B?0=drive
  130 B!1=H
  140 B?5=3
  150 B?6=&53
  160 B?7=0
  170 B?8=0
  180 B?9=&21
  190 CALL&FFF1
  200
  210 CLS:yes=0:B?6=&4B:name$=""
  220 FOR files=14 TO 254 STEP 8:IF (H?files)>&7E
OR (H?files)<&20 GOTO 330
  230 FOR peek=files-6 TO files
```

```
  240 name$=name$+CHR$(H?peek)
  250 NEXT peek:dir=H?(files+1)
  260 IF dir>&7E dir=dir-&80:yes=1 ELSE yes=0
  270 dir$=CHR$(dir)
  280 PRINT dir$;" . ";name$;
  290 IF yes=1 PRINT ;" Locked . Change ? "; ELSE
PRINT ;" Change ? ";
  300 c$=GET$:IF INSTR("YyNn",c$)=0 GOTO 300 ELSE
PRINT ;c$;
  310 IF INSTR("Yy",c$) GOSUB 370 ELSE PRINT
  320 name$="":NEXT files
  330 PRINT '"********** END OF PROGRAM ********
**"
  340 CALL&FFF1
  350 REPEAT UNTIL FALSE
  360
  370 PRINT ;" To directory ? ";:d$=GET$
  380 PRINT ;d$;:byte=ASC(d$)
  390 PRINT ;" Lock ? ";:lock$=GET$
  400 IF INSTR("YyNn",lock$)=0 GOTO 390 ELSE PRINT
 ;lock$
  410 IF INSTR("Yy",lock$) byte=byte+&80
  420 H?(files+1)=byte
  430 RETURN
```

ORIC SHADE COMMAND

Many Oric owners must want to display more than seven colours on the hi-res screen simultaneously. This routine adds a command to mix the old colours, thus creating new ones.

The command takes the form !SHADE A,B,C where A and B are the two colours to mix and C is the type of shading. IF C=1 there will be a paper shade, and if C=0 there will be an ink shade.

Trevor Latham

```
0 FOR F=#400 TO #49D:LETT=T+A
1 READ A$:A=VAL("#"+A$):POKEF,A:NEXT
2 DATA AD,C0,02,C9,02,D0,03,4C,E4,CF
3 DATA A9,53,20,DB,CF,A9,48,20,DB,CF
4 DATA A9,41,20,DB,CF,A9,44,20,DB,CF
5 DATA A9,45,20,DB,CF,EA,EA,EA,EA,EA
6 DATA A2,00,A9,00,9D,E0,02,E8,E0,0A
7 DATA D0,F8,20,DF,E8,A9,01,8D,E1,02
8 DATA 8D,E3,02,20,9D,E7,A5,33,85,00
9 DATA 20,D9,CF,20,9D,E7,A5,33,85,01
10 DATA 20,D9,CF,20,9D,E7,A5,33,C9,01
11 DATA D0,05,A9,10,85,03,EA,C9,00,D0
12 DATA 05,A9,00,85,03,EA,EA,EA,EA,EA
13 DATA 18,A5,00,65,03,85,00,A5,01,65
14 DATA 03,85,01,EA,EA,EA,EA,EA,EA,EA
15 DATA A2,64,8E,E0,BF,A5,01,8D,E5,02
16 DATA 20,FA,E8,A5,00,8D,E5,02,20,FA
17 DATA E8,AE,E0,BF,CA,D0,E7,60
18 IF T<>21560 THEN CLS:PAPER0:INK7:PRIN
T"Checksum wrong-error in p
rogram"
19 IF T<>21560 THEN PRINT"Lines 3-19.":S
TOP
20 PRINT"OK-All correct":DOKE#2F5,#400:H
IRES
21 FOR F=1 TO 99:CURSET 120,100,3:CIRCLE
F,1:NEXTF
22 FOR F=0 TO 7:FOR G=0 TO 7
23 PRINT"Ink shade":!SHADE F,G,0:WAIT100
24 CLS
25 PRINT"Paper shade":!SHADE F,G,1:WAIT1
00
26 CLS:NEXTG,F
27 !SHADE 12,1,0
28 WAIT 500:TEXT
29 PRINT"You have just been shown the fo
ll 42"
30 PRINT"shades using the new shade comm
and"
```

VISICODE REVISITED

The first broadcasts of the Visicode system for sending data over the TV consisted of text transmissions. But at the beginning of September the *Database* TV programme intended to broadcast software, starting with a Halley's Comet Predictor.

The visicode transmitted had a prefix <control>-U, indicating that it contained text which could be received universally; and that led to problems. The Commodore versions of the receive software needed a fiddle to turn respectable ASCII into the internal representation of upper and lower case — but that has now been resolved. Transmitting software instead of text has its problems, but has some simplifications too.

Since the code must be different for each machine the problems of 'universality' are avoided. Each program can be tailored specially for its recipient, and individual changes introduced as necessary. The first essential is to change the test in the existing receive software, so that instead of waiting for <control>-U each machine waits for its own individual code. For the Amstrad this will be <control>-A, (hexadecimal $141), for the BBC Micro, <control>-B (hexadecimal & 142), for the Commodore <control>-C and for the Spectrum <control>-S.

The bulk of the software will be unchanged, especially the machine code. This is simply concerned with catching the bytes and handing them to Basic to deal with. So apart from the change of get-going code, the software performs the same function of receiving bytes and tucking them away into upper memory. The problem arises when we want to get them back to execute as a program.

The changes to the BBC routine to enable it to receive software are shown in Fig 1. All lines ending in a 0 contain changes to existing lines. The other lines are new ones.

The Commodore 64 program is somewhat simplified. It is no longer necessary to perform the upper-case/lower-case amendment, since the received code is now unique to the Commodore 64. The listing therefore has very few changes from the version on page 166 of *PCW*, July 1985. The code change is easily made in line 15, by changing "CU=85" to "CU=66". By the time you reach line 80, the code has been received and tucked away in memory from location $2000 upwards. You don't want to print the code out at this stage, so lines 100–110 must disappear.

The Commodore 64 has a most useful feature — unless you add an extra ",1" onto the load command, a program will be loaded into the normal Basic start position. All the line-links will be set automatically — irrespective of where it resided at the time of saving. You, therefore, only need to save the code just captured onto disk or tape, and it can be loaded again as a normal program.

To save the code as a program, bend the system pointers so that they refer to the received code rather than to the visicode reception software — don't forget to save this receive program first, since it can self-destruct when used.

Line 100 now becomes:

```
100 R(0)=R:POKE 44,32:
POKE
  45,INT(R/256):POKE
  46,R(0)AND255
```

then we save the code either with:

```
110 SAVE "NEWPROG"
```

for cassette, or

```
110 SAVE "0:NEWPROG",8
```

for disk.

We can now dive straight into the new software by adding:

```
120 POKE 56,159:CLR:LIST
```

If it looks plausible, then run it. But you can use a version of the software which will restore the pointers to the receiver program. First you will have to note them, by adding line 90:

```
90 R(1)=PEEK(45):R(2)
=PEEK(46) then use a
```

substitute line 120:

```
120 POKE44,8: POKE45,R(1):
POKE46,R(2):END
```

The receiver program is then ready to run again — but you still do not know if your received code is garbage or not! You will have to load it to find out.

Finally, an update on what *PCW* has published so far on visicode. In July an article including receive routines for the BBC Micro and Commodore 64 was published — Spectrum and Amstrad 464 versions followed in August, along with slight corrections to the Commodore 64 routine. Final (and again slight) corrections to three of the routines were published in September's bludners — the Spectrum version is the one that hasn't been altered.

John Billingsley, Jim Crowther

```
1145 PRINT"3 Print text"
1170 UNTIL A%>@30 AND A%<@36
1225 IF A%=@35 VDU2:PROCview:VDU3:ENDPROC
1530 UNTIL A%=ASC"U" AND B%=1 OR A%=ASC"B" AND B%=1
1531 C%=A%
1532 IF A%=ASC"U" THEN T%=TRUE ELSE T%=FALSE
1561  IF T% ELSE PRINT "To receive tokenised  BASIC:-"'"Use  save
options when menu reappears"
1590 UNTIL A%<>C% AND B%<>1
1620 IF T% THEN CALL osasci
```

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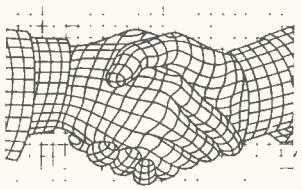

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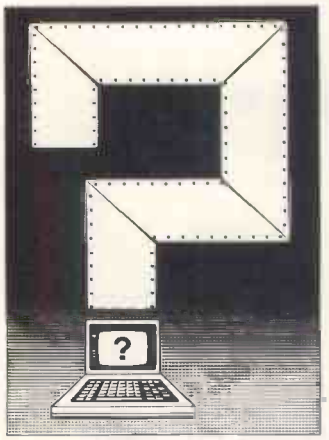


Music and the micro

I read with interest the article on MIDI, the Musical Instrument Digital Interface, in *PCW* May. I am interested in writing music software and would like more information.

Firstly, can you recommend any books on music and computing which are not specific to a machine or sound chip; and secondly, where can I get detailed information on MIDI codes and synthesiser-specific codes?
I Smith, Ripley, Derbyshire

A good introductory book about computer music is *The Musician and the Micro* by Ray Hammond, published by Blandford Press at £4.95.

If you need more information about MIDI than was in *PCW*'s article, you will probably need to contact Sequential Circuits in Holland. It will provide a full MIDI specification for a few pounds, and can be found at Sequential Circuits Ltd, Post Bus 16, 3640 AA Mijdrecht, Holland.

Alternatively, you may be able to get some information from synthesiser dealers in the UK. The May 1985 issue of the specialist magazine *Electronics and Music Maker* is also worth examining — you should be able to find a copy at your local library.

If you'd like to find out about MIDI at a very low cost, and you already own a Spectrum and Interface 1, you may be interested to learn that the Quicksilva game Zombie Zombie has the circuit diagram of a simple MIDI interface printed on the cassette insert. The game uses this circuit to provide sound effects on a powerful Yamaha DX-7 synthesiser (for those Spectrum owners lucky enough to own one), but the circuit is appropriate to any MIDI synthesiser and only costs a few pence to build.

If you use this approach you'll have to write your own software. The Spectrum's network port (used to generate the MIDI signal) is at I/O address 247; you can produce a signal (at the network socket on the back of Interface 1) by alternately writing odd and even values to that port, using the OUT instruction. Some experimentation will probably be needed to get the timings right. You may find Basic too slow for this purpose, but a language like Forth should be well-suited to the task.

The blinking Apricot cursor

I run an Apricot F1 with Omicron, Cardbox and Select software. My problem is simple but very frustrating — the cursor does not flash.

My Apricot dealer and ACT both say 'Sorry, there is nothing we can do'. Can the fault really be in the unmodified MS-DOS version 2.11?

My secretary now refuses to use the word processor due to the saga of the disappearing cursor.
JA Slater, Blackburn, Lancashire

ACT tells me that the flashing cursor which is a feature of the Apricot PC and XI machines has been replaced by an unblinking one on the cut-price F1 machine, which lacks hardware to make the cursor flash. Even so, it should be possible to produce a blinking cursor in software but it will take some operating-system level programming. In short, you may be stuck with a static cursor.

The lack of flashing cursor hardware shouldn't make the cursor disappear altogether, however. If this problem only occurs when you use certain programs, you probably have an applications software problem.

Make certain that the operating system and software you are using are Apricot F1-specific, and, if this is the case, explain your problem to the software vendor or publisher.

If the 'fault' happens on all your programs, it is more likely to lie in the operating system or the user. Most operating systems recognise a certain sequence of characters as meaning 'turn the cursor on' or 'turn the cursor off'. On many machines, these characters are Control O and Control N respectively; the relevant characters for the Apricot should be in the *User Guide*. If the cursor disappears shortly after you have started to use the program, it could be that you have accidentally hit the cursor-off sequence. The solution is to type 'Cursor On' and continue where you left off.

Neither ACT nor anyone else I spoke to has ever heard of this problem before, so it seems likely that it is of an operational nature rather than an inherent property of your hardware or software.

Amstrad merge bug

I have an Amstrad CPC464 with a DDI-1 disk interface. When I load a Basic program from disk, and then try to merge another Basic program, I usually meet an end-of-file error. A subsequent list shows that there is now no program in the memory. Basic programs can be merged from tape without any problem.

I would like to know if this is a firmware bug (rather than a fault on my system) and if you know of any way to get around it, short of resaving programs on tape and then merging them — a rather laborious process.
PG Clarke, Stockport, Cheshire

Your problem stems from a bug in the disk system software. The end-of-line error occurs because programs are — by default — saved in their tokenised form, where they contain lots of 'invisible' control characters to convey information such as line lengths and numbers. If any of these characters happen to have the code 26 (Control Z) they are treated as end-of-file markers by the disk system, which then prematurely stops reading the file.

There are two solutions to this problem. The simplest is to save programs in their textual form rather than tokenised. This is done by appending a comma and a letter A, standing for ASCII, to the normal SAVE command. ASCII is the standard code used to represent text inside micros. Such a file contains no spurious control characters so it merges perfectly.

The snag is that the file is longer and transferred more slowly than the tokenised version. If this is irritating, contact Amstrad on (0277) 228888, and it will send you a short 'patch' program which corrects the code used for merge so that it reads up to the logical end of the file, rather than up to the first end-of-file character.

A Sharp lookout

I own a Sharp MZ-700 which was bought in the UK about a year ago. Although I find the machine a good one, I cannot say the same for the software or add-ons, therefore I have a number of questions.

Do you know of any CP/M system for the machine? Are there any good Lisp, Prolog or C interpreters or compilers? What about other languages?

Is there a low-cost RS232 serial interface, modem or 80-column card? Finally, which is the best chess program available for the

machine?
PE Fouliras, Salonika, Greece

CP/M is not available for the MZ-700, and it is not possible to read CP/M disks unless you're willing to write some intricate machine code. As far as I know, the languages you mention are not available on the machine; Hisoft's subset of C should be portable to the Sharp, but I don't think a conversion is likely. There are Pascal and Forth compilers, available from Kuma and other Sharp dealers.

Peterson Electronics, of Academy Street, Forfar, Tayside DD8 2HA specialises in add-on hardware for the MZ-700. It offers an RS232 interface and a modem, but no 80-column card.

I think you may find the quality of chess programs on the Sharp rather poor, but you can obtain a full list from Kuma Computers of Unit 12, Horseshoe Park, Pangbourne, Berks RG8 7JW.

Upgrading your ROMs

I have recently purchased an Oric Atmos keyboard, and I am hoping to buy the Oric word processor. To my surprise, I received the Atmos ROM as well. The problem is that most of my software only works on the Oric ROM, and not with the Atmos. Is there anything I can buy or build that will enable me to switch from one ROM to the other?
J Green, Widmer End, Buckinghamshire

This is a problem for users of a variety of machines which can run more than one ROM; the Sinclair ZX80 was the first popular machine which could run two different Basic ROMs. The solution is simple, but it requires experimentation and some precise soldering — I would only recommend it to those confident of their ability to work with digital electronics. I don't know of any firm offering such a service.

The ROM contains the instructions which give the computer it's 'personality' — the commands it recognises, the editing mechanism, and so on. The processor indicates that it wants to read the ROM by generating an 'address' which corresponds to the ROM. Logic inside the computer detects appropriate addresses, and a special signal, called 'chip select', is produced whenever the ROM is to be accessed. The ROM then looks at the address to decide exactly what information it must supply.

If you connected two ROMs to one socket (by connecting all the pins together) you would run into problems as they would both try to present information at the same time, and in the same place, but the information would differ and be muddled together.

What you need is some way of turning off one of the ROMs when you are using the alternate one. You can do this by only allowing the chip select signal to go to one of the components. If you direct the signal to the Oric ROM you will be able to use your old software, whereas new programs will work when the signal is passed to the Atmos ROM.

You should connect all but the chip select pins of both ROMs to the socket. This is usually done by soldering one component to the back of the other (piggy-backing), and folding the chip select pins out from the packages. It is probably wiser to build a small circuit board to hold both chips, unless you're very sure of your soldering. Keep interconnection lengths to a minimum — there are signals running around those chips at a rate of millions of pulses a second, and it is easy for them to get lost or cause interference.

The next step is to take the chip select signal from the socket to the ROM pins via a two-way (change-over) switch. You should not operate the switch while the computer is turned on. It may be worth enforcing this rule by using a three-position double-pole switch, with different ROMs enabled at opposite ends of the switch travel, and the DC supply to the computer cut off in the middle position.

The location of the chip select pins on the package will depend upon the type of ROM you are using — you'll need to look them up in a catalogue or trace through the computer's circuit to find the chip select line.

This method pre-supposes that you aim to replace a single ROM with a single replacement, and that they both work without modification in the same socket. It also assumes that the ROMs do not impose a significant load when not selected; this is generally the case, but should be checked if you are not sure. If you are replacing a set of chips with a different number of components, you will need to work on a socket-by-socket basis.

Some ROMs are turned on when the chip select signal is high (logic 1) and others respond to a low level (logic 0). If you are replacing one type with another some circuit changes are needed, or the new ROMs will only assert themselves when they are *not* wanted. This problem is most common when replacing EPROMs with ROMs.

Extra columns onscreen

In your review of the Tatung Einstein it was stated that it had a 32 character-per-row video chip, but it is fooled by software to give 40 characters. Is it possible to do this on other computers as well, giving say 60 or 80 columns per row?
M Gottlieb, Edgware, Middlesex

You can squeeze extra columns onto the screen of any micro which has a 'bit-mapped' display — that is, a display where individual points can be lit or extinguished with software. On other types of computer, such as the Commodore Pet and Sharp MZ-80K, it is only possible to generate a specific set of (usually 256) symbols — you can't control the points individually.

The Einstein, like the BBC Micro, Atari XE and many other machines, can work either way. The second scheme has the advantage of speed and economical use of memory, as it is only necessary to store one byte to produce an entire character on the display, but it restricts you to a single size and shape of character.

It is possible to produce characters on a bit-mapped display by lighting and extinguishing groups of points — in fact, this is the only method available on the Spectrum and Electron. The less points you use for each character, the more you can cram onto the screen, but the cruder and harder to read the display becomes.

The practical limit beyond which it becomes impossible to represent a full alphabet comes when characters are approximately four points wide and six high. On this basis, you could get 64 columns and 32 rows onto the display of the Einstein or Spectrum, as they offer control over 256 dots horizontally and 192 vertically. 64 columns is the practical limit for most home computers used with a TV set. You may well find that hard to read, in which case you could go for characters six points wide and eight deep — this gives 40 characters per line on the Einstein. A similar format is used by the Memotech, and in the Hobbit adventure game for the Spectrum.

Really random numbers

I have an Amstrad CPC464 and I want to write certain simulation programs. In order to verify them, I need to know the formula of the random number generator (congruence formula) of the machine; unfortunately it is not in the manual. If you don't know it, can you suggest a method to crack it?
NA Papadakin, Athens, Greece

No-one at Amstrad was able to give me the formula used by the generator, which is apparently buried deep in the ROM. Almost all micros use an integer formula of the form:

SEED := (CONST1 * SEED + CONST2) MOD CONST3

where SEED is used as the basis of each 'new' random number (each number being generated from the previous one). MOD is the remainder function (so 10 MOD 7 is 3) and CONST1, CONST2 and CONST3 are constant values. CONST1 and CONST2 are usually fairly small in relation to CONST3. Preferably all the constants are prime numbers.

Successive calls return a jumbled sequence of numbers ranging in value from one to CONST3, which repeats itself every CONST3 calls.

Some computers, such as the Apple II, jumble the sequence still further by using the code or timing of the last key-press in place of CONST2. Luckily the Amstrad doesn't do this, or analysis of the sequence could become extremely difficult.

The problem should be solved if you put the command RANDOMIZE 22 (or any other constant number) at the start of your program. The RANDOMIZE function provides a new 'seed' for the random number generator, so you always get the same sequence of numbers after using RANDOMIZE with a specific value. This makes the output of the generator predictable, so it can be reliably analysed. END

Fido links

Peter Tootill looks at the inner workings of FidoNet, and rounds up the new bulletin boards at home and abroad.

Fido is not only a bulletin board, but also part of a network of Fido BBSs called FidoNet. One of the drawbacks of the standard BBS is that it is a single system, and you can only use it to exchange messages with people who call that particular system. Fido is different: you can ask it to forward a message to another Fido system used by the person you want to contact.

A Fido system consists of two parts. Firstly, there is the BBS software (which is quite a sophisticated BBS program in its own right), and secondly, there is the FidoNet software which handles the networking side. The FidoNet software takes control for a short period each day, called 'network time' (at night when call rates are low), and shuts down the BBS. Each system organises messages to be forwarded into packets and automatically dials other FidoNet members. It sends the packets to the relevant systems, and packets can even be routed via other Fido boards to their destination. If the FidoNet software receives an engaged tone when it calls another system, it simply waits for a random period (in case other Fidos are trying to talk to it) and goes on to the next on the list. It repeats this process until network time is over, or all the packets have been sent. If a call is received during network time, a message is displayed to warn users that the system is only taking calls from other FidoNet nodes. If a successful connection is established, the two nodes exchange packets, marking the ones that have been successfully transmitted so that senders know that their message has been despatched.

The author of the software, Tom Jennings, who works for Phoenix Software in San Francisco, reckons that the network system works well and that, after a few 'collisions' (engaged tones), the system settles down and the majority of calls will get through.

Obviously, sending messages in this way costs the operator of the BBS money for phone charges, so each person using the facility has an account. He pays a sum into his account, and it is debited each time he sends out a message. The costs are not high as all the calls are made at off-peak times: for example, a 2k file can be sent to the US from the UK for around 40 pence. FidoNet uses text compression to reduce the size of the messages and hence to keep costs down.

Jennings hopes to extend the FidoNet concept to include non-Fido systems as well. The FidoNet software would take over the micro at certain times of the day, and interface with the host BBS message-handling system. Fido is written in C, but Jennings firmly refuses to release the source code. The compiled programs, however, are in the public domain.

The main drawback with running a Fido system in Europe is that it requires a Hayes-compatible modem (Hayes is a US modem manufacturer which sets the standard for auto-dial modems over there) to use all its features. There are very few Hayes compatibles available over here. The V23 (1200/75) standard also causes problems: the high speed standard in North America is 1200 full duplex (equivalent to V22). If using V23, FidoNet needs to be able to control the modem, so that when it is sending messages it works at 1200 transmit, 75 receive (so-called reverse Prestel speeds) and the opposite way round when it is receiving. No doubt it is only a matter of time before these problems are sorted out. If anyone is interested in running a Fido system, contact one of the sysops who will be able to provide all the software. It needs an IBM-compatible system and an auto-answer modem (Hayes compatibility is only needed if you want to run FidoNet).

A list of the Fido systems running in Europe at the time of writing is given in Fig 1 and a couple more should be online soon. I don't know how many of them operate FidoNet, but the sysops will, of course, be able to tell you.

There are around 500 Fido systems worldwide, mostly in the US with a few in other countries. If anyone wants a full list, the sysops of any of the Fido systems listed should be able to help.

New BBSs

The number of new systems is increasing at a rapid rate. New ones that I have come across are:

CoCo BBS (091) 265 1944 9pm-10am weekdays 24 hr Sat & Sun

DUBBS Dublin (0001) 885 634 V21 8pm-8am Mon-Fri 24 hr Sat & Sun

MBBS Leconfield (0401) 50 745 V21 8.30am-midnight (24 hrs soon)

Gnome at Home (01) 888 8894 V23 7 bits, even parity, 24 hrs

System 2000 Redcar (0642) 486 643 V21 7pm-7am weekdays (sponsored by Multi-Coloured Micro Shop)

Gosport Apricot BBS (0705) 524805 V21, 24 hrs

Overseas: TBBS Melbourne (010 613) 878 6847 V21 24 hrs

Oslo: (010 47 2) 431 840 V21 (V22/22bis coming) 24 hrs, 22Mbytes of public domain download files

Germany: Mercator (010 49 203) 782 497 & 596 146. 10pm-8am Mon-Fri, 8pm-8am Sat & Sun

Brazil: CBBS Do Prado (010 55 11) 813 2016; CBBS Do Pinto (010 55 21) 247 8440; CBBS Do Otto (010 55 41) 262 4743; Forum 80 (010 55 21) 287 8844; Sistema Samoa (010 55 11) 853 6273. All systems are V21.

FidoUK1	(0635) 46480	** OFFLINE, SYSOP HAS MOVED**
Fastnet(Bell 103)	(051) 260 5607	Liverpool 10pm to 9am
Fidofore	(01) 301 4110	** OFFLINE UNTIL FURTHER NOTICE**
Compulink	(04867) 6535	** OFFLINE UNTIL FURTHER NOTICE**
Fido Day Rainbow	(010 465) 413 3170	Karlstad Sweden 24 hours
Sun City Fido	(010 465) 416 6988	Karlstad Sweden 24 hours
Fido NL1	(010 31) 8380 37156	Ede Netherlands 24 hours
Hughs Fido	(0534) 36433	St Helier Jersey 6pm to 8am
Fido Ben	(010 31) 3480 2107	Woerden Holland 7.30pm to 3am
Fido HCC DB	(010 30) 945889	Netherlands 5pm to 9am
Fido HCCN	(010 72) 116080	Netherlands 11pm to 7am
ATL	(010 465) 102 0409	Lidkuping Sweden 24 hours
Colchester Fido	(0206) 865737	Colchester 6pm to 8.30am

Fig 1 Fidos in Europe

UK free networks

Bulletin Board	Phone Number	Notes
Aberdeen ITEC	(0224) 641585	V.23
BABBS-Bath	(0225) 23276	300/300 baud rate; 9pm-8am weekdays, 9pm-noon weekends; Atari-based system, ring-back system
BABBS-Felixstowe	(0394) 276306	300/300 baud rate; 24 hours daily; Apple users' group
BABBS TWO-Basildon	(0268) 778956	300/300 baud rate; 24 hours daily; Apple users' group with special area for queries to Apple UK
Basildon ITeC	(0268) 22177	Prestel type service
	(0268) 25122	Atari based 300 baud. 24 hour
BASUG	(01) 373 6337	24 hour
Blandford Board TBBS	(0258) 54494)	300/300 baud rate; 24 hours daily
CABB TBBS	(01) 631 3076	300/300 baud rate; 24 hours daily + 1200/75
CBBS SW	(0392) 53116	300/300 baud rate; 24 hours daily
CBBS Surrey (Woking)	(04862) 25174	1200/75 and 300/300 baud rates; 24 hours daily; jokes, jobs, reviews, news
Chatham (Kent)	(0634) 815805	6pm/9am daily + weekends 7 bits, even parity; sales and wants — cars, houses, computers
CNOL Lancaster TBBS	(0524) 60399	300/300 baud rate; 24 hours daily; Clinical Notes Online service, mainly for medical users; works in conjunction with a database on the Datastar network
Computers Incorporated Newcastle (CBBS)	(0207) 543555	300/300 baud rate; 24 hours daily; primarily business-oriented
Forum 80 Hull	(0482) 859169	300/300 baud rate; 5-11.30pm weekdays, noon-11.30pm Sundays, Bell 103 standard, midnight-8am daily; international electronic mail, library for up/downloading
Forum 80 SPA	(0926) 39871	300/300 baud rate; 11pm-midnight daily; TRS-80 and Genie users' group
Forum 80 Wembley	(01) 902 2546	300/300 baud rate; 7-10pm weekdays, midday-10pm weekdays; electronic mail, library for down loading; ring and ask for Forum 80
Fido Compulink	(06286) 63571	24 hour
Fido Fastnet	(051) 260 5607	10pm-8am BELL 103/212a tones only at present
Fido Fore TBBS	(01) 301 4110	Fido 1am-8am
Hackney BBS	(01) 985 3322	V.23 Password: PUBLIC
Hamnet Hull	(0482) 497150	300/300 baud rate; 6pm-8am daily
Livingstone, Scotland	(0506) 38526	Atari, 24 hours daily
London Underground	(01) 863 0198	24 hours V.21/V.23 (Viewdata coming soon) BBC Based (colour for BBC users)
Liverpool Mailbox TBBS	(051) 4288924	300/300 baud rate; 24 hours daily; sponsored by INMAC; electronic mail, program downloading, TRS-80 information; messages for *PCW* can be left on the board and will normally be read by us within 24 hours
Mactel (Nottingham)	(0602) 289783	V.21/V.23 Macintosh users 24 hours daily
Mailbox-80 W Midlands Stourport TBBS	(0384) 635336	300/300 baud rate; 6pm-8am daily
Manchester Open Bulletin Board TBBS	(061) 7368449	300/300 baud rate; 24 hours daily + 1200/75
Marctel	(01) 346 7150	10am-10pm daily (24 hour coming, watch for announcement on Marctel) BBC based system (FBBS) with colour for Commstar users
MBBS-Mitcham	(01) 648 0018	300/300 baud rate; 24 hours; BBC-based system with jokes, graffiti, electronic mail, and Atari and BBC sections
MG-Net CBBS London	(01) 399 2136	300/300 baud rate; 5-10pm Sunday; electronic mail, program downloading
Microweb Manchester TBBS	(061) 4564157	300/300 baud rate; 24 hours daily; *Micro User* magazine, mainly for BBC users
NBBBS-North Birmingham TBBS	(0827) 288810	300/300 baud rate; 24 hours daily
NBBS-E BBC Micro	(0692) 630186	BBC Based 24 hours daily V21/V23
NBBS Lutterworth	(04555) 4798	Mon-Fri 8pm-8am, weekends 24 hrs
NKABBS	(0795) 842324	9.30pm-midnight
OBBS Manchester	(061) 4271596	300/300 baud rate; 24 hrs except 10am-10pm
Octopus RAS	(0272) 421196 (Bristol)	6pm-8.30am V21 using public domain Octopus software
PIP-Sheffield TBBS	(0742) 667983	300/300 baud rate; 24 hours daily. Bell 9pm-8.00am
REACT UK	(0376) 518818	24 hours. Mainly Dragon
SABBS Glasgow	(0698) 884804	Atari, 24 hours daily
SBBS Southern	(0923) 676644 (Watford)	11pm-8.30am daily; BBC based V.21/V.23
Southern BBS	(0243) 511077	300/300 baud rate; 8pm-2am daily; ring-back system (dial the number, let phone ring once, and then ring back); messages, downloading
Stoke ITEC	(0782) 265078	1200/75 Viewdata system; 24 hours daily
TBBS London	(01) 348 9400	300/300 baud rate; 9am-7pm daily
TYNESIDE BBS	(091) 251 4271	V.21 BBC based
VISA	(01) 958 7098	8am-11pm daily V23 Prestel type
WABBS-Worthing	(0903) 42013	300/300 baud rate; 24 hours daily; ring-back system (dial the number, let phone ring once, and then ring back); Atari-based

UK subscriber commercial/business systems

Bulletin Board	Phone Number	Notes
Comet	(0527) 28515	Message handling system: Details from Istel Ltd, Grosvenor House, Prospect Hill, Redditch, Worcs
Micronet 800	(01) 278 3143	Prestel database information for micro users. Details from Micronet 800, 8 Herbal Hill, London EC1R 5EJ
Prestel	Freefone 100 Prestel sales	Subscribers only
Telecom Gold	(01) 403 6777	All information from Sales Admin, 60-68 St Thomas Street, London SE1 3QU

TRANSACTION FILE

Your chance to buy, sell or swap equipment.

● SIRIUS/VICTOR SOFTWARE. Micro modeller, and Supercalc, £225. Tel: Chris Hatt (0323) 895900 (after 6pm).

● TANDY TRS80 Model 3 Level 2. Basic, integral monitor, cassette recorder, software, manuals. As new £160. Tel: Uxbridge (0895) 57396 (working hours) or Abingdon (0235) 24824 (after 7pm and weekends).

● SPECTRUM 48k. Sinclair printer, Comcon joystick interface, Quickshot, compiler, assembler, disassem, beginners mc book, hardware manual, etc. Darkstar, Starstrike, Fighter Pilot, etc. Other bits, £150. Tel: Windsor 58259.

● TRS 80 MOD I LII VDU, cassette programs, £100. APPLE IIE twin discs, printer, VDU, Ormbeta accounts programs, plus lots more, £1,250. Tel: 01-240 5742 (days) or 01-354 5424 (eves).

● FREEDOM 110 VDU. Modern styling, low profile keyboard, cost £600. One year old, £385. North Star board set, 4MHz Z80 CPU, 64k RAM d/d floppy controller with Dos UCSD CP/M, £300. Tel: (0670) 712624 (eves).

● KAGA 12in COLOUR MONITOR, £275 ono. Epson FX80 printer, hardly used, £275 ono. Cumana single sided, dinsity 40 track disk drive, £110 ono. Tel: 01-221 6378.

● TWIN DS DD 5¼in disc drive. Hazeltine 2000 RS232C terminal, offers. Tel: Spencer on (0482) 227181 (day) or (0482) 802072 (eves).

● ACT SIRIUS 256k RAM 1.2Mb. Excellent condition. Business software Victor graphics, Tate DBase, Wordstar, Supercalc, toolkit, etc. New Epson printer, £1,150 ono. Tel: (0749) 75783.

● CBM64 + MPS801 matrix printer and cassette deck, 150+ programs, 800 sheets of printer paper + books + speech synthesiser cartridge. 3 games cartridges, carrying case. Cost well over £850, bargain at £390 ono. Tel: (0226) 790435.

● MICROTAN 65 with graphics option. Tanex with Xbug, extra VIA, RS232C, also mini motherboard, hex keypad and manuals. All in excellent condition, £175 ono. Tel: (021) 705 4495 (after 6pm).

● DRAGON 32. Immaculate. Manual, inverse video switch, cartridge ON/OFF button, lightpen, joystick, Alldream, assem/disassem, text star word processor, Dragon chess 40+ arcade/adventure games, 'Dragon Companion', £120 ono. Tel: (0226) 766342 (after 6pm).

● APPLE II EUROPLUS 48k computer. Two disc drives, video monitor, printer interface card, £499 ono. Tel: (0865) 817797 (day) or (02403) 3837 (eves).

● APPLE II EUROPLUS 64k RAM. Kaga Denshi monitor, disc drive, Centronics printer, paddles, Visicalc, Desktop Plan, Applewriter, Data Factory, toolkit, masses of games, full documentation, all little used, £750. Tel: (0277) 840283.

● TRS-80 MODEL I. Disk and cassette programs, utilities, business and games, includes Corplan, Level 3 Basic, monitors 3 & 4, extended operating system. All prices negotiable. No reasonable offer refused. Tel: (0727) 50727.

● S100 SYSTEM, with case, boards, new Shugart DD SS disks, plus CP/M. Some work needed to complete. Reasonable offers accepted. Tel: (04895) 82186 (eves).

● TANDY MODEL THREE. Twin disk drives, plus two external disk drives, plus printer plus software, £550. Tel: (01313) 2706 or (0732) 840608 (eves).

● BBC B. 40/80 disc, solidisk 8271/1770 double density, interface, solidisk sideways RAM, Exmon, TV stand, cover, joystick. Much software including utilities, games, ROMS, (Graphics, Disc Doctor etc), £650. Tel: (0452) 812523.

● APPLE SYSTEMS ITT 2020 48k. Monitor, disk drive, Wordstar, DBase II, Supercalc, Visiplot, Visitrend, Visicalc, Apple-Writer, Zaxxon, Sargon II, Format 80 + others, £350. Excellent condition. Tel: (0304) 614447 (after 6pm or weekends).

● TAS-80 MODEL I for sale. 48k, expansion interface and green screen monitor. Includes games, business programs and utilities, plus Electric Pencil word processing program. Price negotiable. Tel: (0727) 50727.

● SHARP MZ80A (integral monitor and tape drive). Complete with Basic interpreter, education, finance, games programs, cover, manual. Brand new condition, £295 ono. Tel: Brill, Bucks (0844) 237951 (after 6pm or weekends).

● EXPANDED NEWBRAIN (64k EIM) with disk controller, 200k disk drive, CPM, Sanyo monitor, Parallel printer cable, PSUs, database programs, books, disks, cassette recorder. Seen working Norfolk, £700 ono. Tel: Denny on (0953) 850691.

● EPSON QX10 192k. C/PM, Wordstar, Datastar, Reportstar. Little used, £1,150. Tel: J. Holmes on (0400) 72175 (eves, 8-10pm).

● OSBORNE. DD80 col, Wordstar, Supercalc, Basic, UCSD, P-system, DBase II, S/Calc 2, £575. TLO, £200. MBasic compiler, £200. Spellguard, £50. Microlink and Buzzbox modem, £50. Tel: J. Holmes (0400) 72175 (eves, 8-10pm).

● BBC B with DFS, Cub colour monitor, Acorn single drive, all new. Plus software worth £1,000, bargain at £600 ono. Write to John Ward, 16 Glebe Estate, Tilney, All Saints, King's Lynn, Norfolk.

● PRINTER CP-80. One year old, excellent condition. Spec as per Epson MX-80. Must sell. Software forced upgrade, £155 ono. Tel: 01-346 0145 (day).

● BBC Z80 PROCESSOR + software + blank discs, £280. LVL DD FS, £50 ono. Brother EP22, £50. Tel: Russell Clark (0432) 271114 (day) or (0981) 250496 (eves).

● WANTED. Used Sinclair Spectrum in working order, reasonable price. Tel: Reading 695916.

● TANDY CGP115 colour printer plotter with spare paper and lead, £100. Also ORIC-1 plus software, manuals, £100. Both for £175, hardly used. Tel: Dave Yan on (021) 552 6126 (work number).

● SHARP MZ80k (48k). Plus Basic and assembler, plenty of games and manuals, includes hardback books. Quick sale, hence £180. Tel: Gary on (0462) 816980.

● EPSON 80 TRACK double sided disk drives, ½ height, £150 pair. Ditto 40 track, £130 pair. Wanted, used disks, 5in + 8in, cheap. R. Smith, 138 Holtye Road, East Grinstead, Sussex RH19 3EA. Tel: (0342) 313883.

● OSBORNE ONE. Double density, upgraded with separate 12in screen, hardly used, £600 ono. Tel: Moses on 01-809 1488 (office hours).

● SHARP MZ80A. Expansion unit, printer interface, disk drive, printer, manuals and software, pristine condition, £950, no offers, genuine reason for sale. Tel: Canvey Island 698940 (anytime).

● WREN PORTABLE COMPUTER 64k RAM. Twin disk drive, modem, Centronics & RS232 interfaces, built in 7in screen, CP/M, Z80, BBC Basic, Perfect Writer, Calc, Filer. Hardly used, £690. Tel: (0992) 554469 (day) or (092084) 300 (eves).

● PERSONAL COMPUTER NEWS. All issues published for sale as a complete set. Issue 1 (18/3/83) to issue 110 (11/5/85). All very good condition. Tel: 01-668 2289 (eves and weekends).

● RESEARCH MACHINES 380Z. 56k RAM, DUAL 5¼in floppy disks, CP/M, Basic interpreter, Algol compiler, Z80 assembler, editor, all manuals, disks, £500. Tel: I.O.W. (0983) 883656 (after 6pm).

● TRS-80 MODEL IV SYSTEM. Twin drives, 128k, software including CP/M+, Cobol, £850 ono. Line printer VI, Centronics interface, 13½in for above, £200 or both for £1,000 ono. Tel: (05645) 78218.

● APRICOT. Immaculate twin 320k disks, 256k RAM, 9in monitor. 11 months old and barely used. Original boxes and manuals plus some extra software, £1,095 ovno. Tel: 01-622 0801.

● SHARP MZ80A. 48k and Basic. Tiptop condition, £180 ono. 96 High Street, Wimbledon Village, SW19. Tel: 01-946 7649 (anytime).

● SHARP MZ-80A. Built in monochrome monitor and cassette recorder. Perfect condition. Books and a wide range of software. Worth about £520, sell for £210 or nearest. Tel: (0792) 205875.

● WANTED URGENTLY. NEC-PC 8201A. Any age provided in good working condition, £155. Tel: 01-467 0369 (after 6pm).

● APPLE II+ 64k. Disk drive, 80 cols, language, clock, speech, printer, and colour cards MX100 printer, b/w monitor, lots of software, manuals, £700. Tel: Bracknell (0344) 429923 (anytime).

● EPSON HX-20. Built-in cassette drive, memory expansion unit, carrying case, charger, manuals, spare printer ribbon and paper, plus seven micro cassettes. Original boxing, £320 ono. Tel: Ian on (0734) 733404.

● MEMOTECH MTX500. Cassette recorder, joystick, magazines, software including Composer, Alice In Wonderland, Mission Alphatron, Blobbo, Goldmine. All for £170 ono. Mark Cytera, 6 Callicroft Road, Patchway, Bristol BS12 5BS. Tel: (0272) 691021.

● COMMODORE 64. 1541 disk, MPS-801, graphics tablet, TV, joystick, C2N and software worth £350+ including Pascal, Simons, Assembler, Easy Script and books, magazines, disks and paper. Worth £1,200, sell for £700 ono. Tel: Paul on (0734) 471790.

● COMMODORE 64k.

TRANSACTION FILE ADVERTISEMENT FORM

All Transaction File ads must be submitted by readers on this form or a photocopy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by a flat fee of £2.50. Make cheques or POs payable to *Personal Computer World*. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send your completed form to: Transaction File, *PCW*, 32-34 Broadwick Street, London W1A 2HG.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

TRANSACTION FILE

Datasette joystick software worth £50. Simons Basic worth £50. Sell for £200 ono. 28 Sainfoin Road, London SW17 8EP. Will consider less.

● CE-155 8k memory module for Sharp PC-1500 pocket computer, £25. Tel: Manchester 061-773 3965.

● FOR SALE. COTRON RGB-MONITOR. 24in screen, £1,299. Also 2 Digisolve LVVGP. 4E Vector processors, ideal hi-res microcomputer graphics, 64 and 4096 colours, £500 and £1,000. Offers considered. Tel: L. Williams on 01-249 2016 (after 6pm).

● MICROVITEC 1451/DQ3 Medium Resolution Monitor. Perfect for BBC computer. Brand new never been used, still with year's guarantee, £190. Tel: Sheerness 663615.

● APPLE IIE. Single drive three user manuals + sample software £550 ono. Tel: Loughborough (0509) 504312 eve.

● SPECTRUM 48k. With low profile keyboard, Alphacom printer, joystick, SPDOS disc system, disc drive, power supply, green monitor, cassette recorder, discs with software, loads of cassette software, manuals. Good condition, £400. Tel: (01) 623 0018.

MICROCHESS

A grandmaster plays blindfold against a strong West German computer program. The contest is observed by Kevin O'Connell.

I once had to describe to someone who knew nothing at all about computers, but a great deal about chess, how a computer 'sees' a position on the board. I used the analogy of the human master playing a game blindfold. Exhibitions of blindfold play are very rare, especially by players of the first rank. However, the challenger to the world title, Garry Kasparov, recently gave a display of blindfold simultaneous play against nine very strong West German players and the strongest West German computer program.

Without sight of any chessboard, Kasparov crashed through the opposition, scoring eight wins and two draws. In case you think that is no great achievement, just try playing one game without a board and set and see how long it is before you lose track of the position of all the pieces.

White: Kasparov. Balck: Mephisto. Opening: Spanish Opening

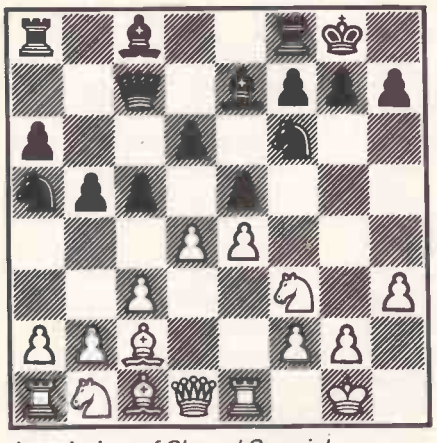
1	e2–e4	e7–e5
2	Ng1–f3	Nb8–c6
3	Bf1–b5	

(This is the Spanish Opening, invented by the Iberian cleric Ruy Lopez in the 16th century.)

3	. . .	a7–a6
4	Bb5–a4	Ng8–f6
5	0–0	Bf8–e7

(Black cannot win a pawn with 5 . . . Nf6xe4 (the Open Variation) — White can regain the pawn comfortably with 6 Rf1–e1 or 6 Qd1–e2 or 6 d2-d4 b7–b5 7 Ba4–b3 d7–d5 8 d4xe5 (the main line).)

6	Rf1–e1	b7–b5



A variation of Closed Spanish

7	Ba4–b3	d7–d6
8	c2–c3	0–0
9	h2–h3	

(The starting point for the main variation of the Closed Spanish.)

9	. . .	Nc6–a5
10	Bb3–c2	c7–c5
11	d2–d4	Qd8–c7

(This position has been seen in master level play many thousands of times.)

12	d4–d5	

(This, however, is a rarity, but an excellent move to play against a computer, as it guarantees that the centre will remain closed and that it will be extremely difficult for Black to formulate a plan, while White mounts a steady and progressive attack on the king-side. Because of the points I have just mentioned, allied with the provenance of this opening, players sometimes refer to these variations as 'The Spanish Inquisition'.)

12	. . .	Bc8–d7
13	b2–b3	Qc7–b6

(13 . . . Na5–b7 14 c3–c4 b5–b4 was played by a human, the Yugoslav grandmaster Matanovic, against Kasparov in a tournament at Banja Luka in 1979. Matanovic drew that game, but Kasparov is now a much stronger player than he was six years ago and Mephisto is nowhere near as good as Matanovic.)

14	Nb1–d2	Rf8–c8
15	Nd2–f1	

(This knight manoeuvre is always an important part of White's plan in this line — it is headed for g3 and then f5.)

15	. . .	h7–h6
16	Bc1–e3	Qb6–d8
17	Qd1–d2	Nf6–h7
18	Nf1–g3	Ra8–b8

(All Black's pieces are developed, but what can they do? Where is the plan?)

19	Ng3–f5	Bd7xf5
20	e4xf5	Nh7–f6
21	g2–g4	

(The commencement of the type of pawn storm that has been seen on countless occasions in this opening.)

21	. . .	Nf6–h7
22	Kg1–g2	

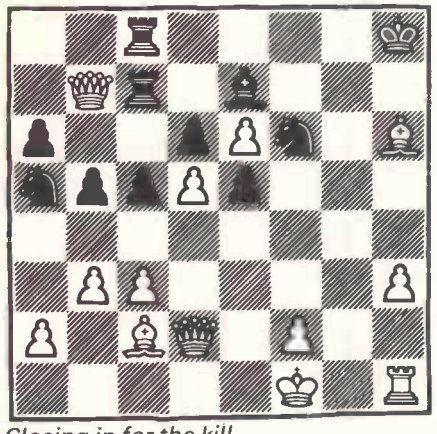
(It is very easy to formulate a plan for White here — move the rooks to h1 and g1, get the king out of the way and charge forward with the king-side pawns. Of course it is even easier when you are one of the two best players in the world. Black's plan? — to survive!)

22	. . .	Rb8–b7
23	Re1–h1	Nh7–f6
24	Ra1–g1	Qd8–b6
25	Kg2–f1	Rb7–d7
26	g4–g5	h6xg5
27	Nf3xg5	Qb6–b7

Kasparov's White army!

(Now Black has a lot of pieces on the queen-side, but Kasparov has his entire army pointing at Black's king.)

28	Ng5–e6!	f7xe6
29	f5xe6	Rd7–c7
30	Rg1xg7+!	Kg8xg7
31	Be3–h6+	Kg7–h8



Closing in for the kill

32	Bh6–g7+!!	

(Now Black will have a vast amount of extra material, but the next world champion has all he needs.)

32	. . .	Kh8xg7

(If 32 . . . Kh8–g8 then 33 Qd2–h6 and mate next move.)

MICROCHESS

33	Qd2–g5+	Kg7–f8	35	Bc2–g6+	Ke8–d8	(It is mate in two moves: 36. . .Be7
34	Qg5–h6+	Kf8–e8	36	Qh6–h8+	Black resigns	–f8 37 Qh8xf8+ Nf6–e8 38 Qf8xe8.)

NUMBERS COUNT

Mike Mudge investigates problems in the theory of continued fractions.

Definition An expression of the form:

$$a_0 + \cfrac{1}{a_1 + \cfrac{1}{a_2 + \cfrac{1}{a_3 + \cfrac{1}{\ddots}}}}$$

(where $a_0, a_1, a_2, a_3, \ldots$ are positive integers) is called a regular (or simple) continued fraction.

For ease of printing it is written $(a_0;a_1,a_2,a_3,\ldots)$, the a_i are called the partial quotients.

Theorem I Given any rational number greater than zero, that is a fraction p/q where p and q are positive integers with no common factor, the associated continued fraction is finite.

$131/17 = (7;1,2,2,2) =$

$$7 + \cfrac{1}{1 + \cfrac{1}{2 + \cfrac{1}{2 + \cfrac{1}{2}}}}$$

Theorem II (The converse of theorem I.) Any finite continued fraction represents a rational number. (Loosely we may say that any finite continued fraction can be 'wrapped up'!)

$(2;3,1,7,) = 70/31$

Theorem III (See for example *Continued Fractions* by A Ya Khinchin, translation from the Russian published by The University of Chicago Press in the Phoenix Science Series 1964, pp 47-50.)

Any positive real root of a quadratic equation has a periodic simple continued fraction.

$2\frac{1}{2} = (1;2,2,2,..) = (1;\dot{2})$

$3\frac{1}{2} = (1;1,2,1,2,1,2,...) = (1;\dot{1},\dot{2})$

$7\frac{1}{2} = (2;1,1,1,4,1,1,1,4,1,1,1,4,...) = (2;1,1,1,4)$

The converse is also true, any periodic continued fraction represents the root of a quadratic equation.

$$x = (1;7,7,7,...) = (1;7,\cfrac{1}{x-1})$$

here

$$x = 1 + \cfrac{1}{7 + (x-1)}$$

thus $x^2 + 5x - 7 = 0$ and $x = (5\frac{1}{2} + 5)/2$ approximately 1.140054944

It should be noted that (1;7) is approximately 1.142857142 (1;7,7) = 57/50 = 1.14 while (1;7,7,7) = 407/357 is approximately 1.140056022.

Certain special continued fractions are to be found in the literature, for example, *Continued Fractions* by C D Olds Appendix II includes (Euler 1737)

e = (2;1,2,1,1,4,1,1,6,1,...) = (2;1,2n,1)

n = infinity

n = 1

also (Lambert 1770)

Pi = (3;7,15,1,292,1,1,1,2,1,3,1,14,2,1,1, 2,2,2,2,1,84,2,...) with no apparent pattern.

However general results are somewhat sparse. In the summer of 1970 the Maniac computer at Los Alamos used 25000 decimal digit arithmetic to calculate the first 8000 partial quotients in the continued fraction expansion of the cube root of two; the theoretical interest centring around the statistical distribution of these a_i.

Nearer home, *J Inst Maths Applic* (1969) Vol 5 pp 318-328 R F Churchhouse and S T E Muir report that the real root of $x^3 - 8x - 10 = 0$ (approximately 3.318628217750185) was calculated to 200 decimal places and the first 200 partial quotients (beginning (3;3,7,4,2, 30,1,8,3,1,1,1,9,2,2,1,3,22986,2)) were also determined in a total of 10 seconds on Atlas at S R C Chilton!

Problems 1) Determine the period of the continued fraction expansion of a given quadratic irrational that is, $p + q(x)\frac{1}{2}$. . try $(4517\frac{1}{2} - 61)/3$.

2) Determine the continued fraction expansion of a real number given to an arbitrary precision. Try 0.1234 56789101112131415116.

3) Compute exactly the rational number (fraction) corresponding to a given finite continued fraction. Try (1;2,3,4,5,6,7,8,9,..n)

4) Compute the positive real root(s) of a given cubic (or higher degree equation) equation to arbitrary precision and use the result of (2) to find the continued fraction expansion.

The statistical distribution arising in this theory will be discussed in a later Numbers Count article if the response warrants it.

Readers are invited to submit their program listings, together with hardware descriptions, run times, any comments and of course the output relating to the above problems. These submissions will be judged, using suitably vague criteria, and a prize will be awarded to the 'Best' entry received at 'Square Acre', Stourbridge Road, Penn, Nr. Wolverhampton, Staffordshire WV4 5NF; (tel (0902) 892141) by 1 January 1986.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided. Expanded reviews of previous problems together with, subject to the approval of the contributor, copies of detailed programs from the prize winning entry may also be requested.

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MULGEN VER. 850621 TIME: 00:00:02

INPUT MULTIGRADE OF ORDER 6:
A:  39  38  28  27  16  10  5  1
B:  40  36  31  25  14  13  3  2
TRANSLATION =  150

-------------------------------------------------------------------------

NUMBER OF TERMS = 8
A:  151  155  160  166  177  178  188  189
B:  152  153  163  164  175  181  186  190
POWER SUMS:
A ^ 1 =  1364                    B ^ 1 =  1364                    EQUAL SUMS FOR EXP. =  1
A ^ 2 =  234060                  B ^ 2 =  234060                  EQUAL SUMS FOR EXP. =  2
A ^ 3 =  40418048                B ^ 3 =  40418048                EQUAL SUMS FOR EXP. =  3
A ^ 4 =  7022349636              B ^ 4 =  7022349636              EQUAL SUMS FOR EXP. =  4
A ^ 5 =  1227303597344           B ^ 5 =  1227303597344           EQUAL SUMS FOR EXP. =  5
A ^ 6 =  215710267243380         B ^ 6 =  215710267243380         EQUAL SUMS FOR EXP. =  6
A ^ 7 =  3.81164883514671D+16    B ^ 7 =  3.81164882413935D+16
A ^ 8 =  6.76929308317756D+18    B ^ 8 =  6.76929293303717D+18
TIME: 00:01:14
-------------------------------------------------------------------------
```

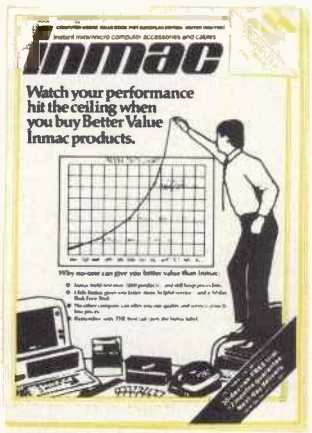
Fig 1

Prize winner April

The first response to Sums of Powers used a simple approach in Basic on a TI-99/4A, subsequent contributors ranged over the spectrum of combinations of theory and empirical programming and over the globe from Oxford to Cambridge to Saudi Arabia.

The winner this month is Henry Ibstedt of 4, rue Gramme; 75015 Paris, a regular contributor to the mail bag, with a very well presented combination of theorems with proofs, followed by detailed implementation in Basic for an IBM PC with 256 kbyte Ram. The detailed results would suffer badly from the condensation needed to fit the available space. Fig 1 gives a sample of Henry's style.

Q Where can you find a floppy that gives 100% read/write accuracy guaranteed for life?



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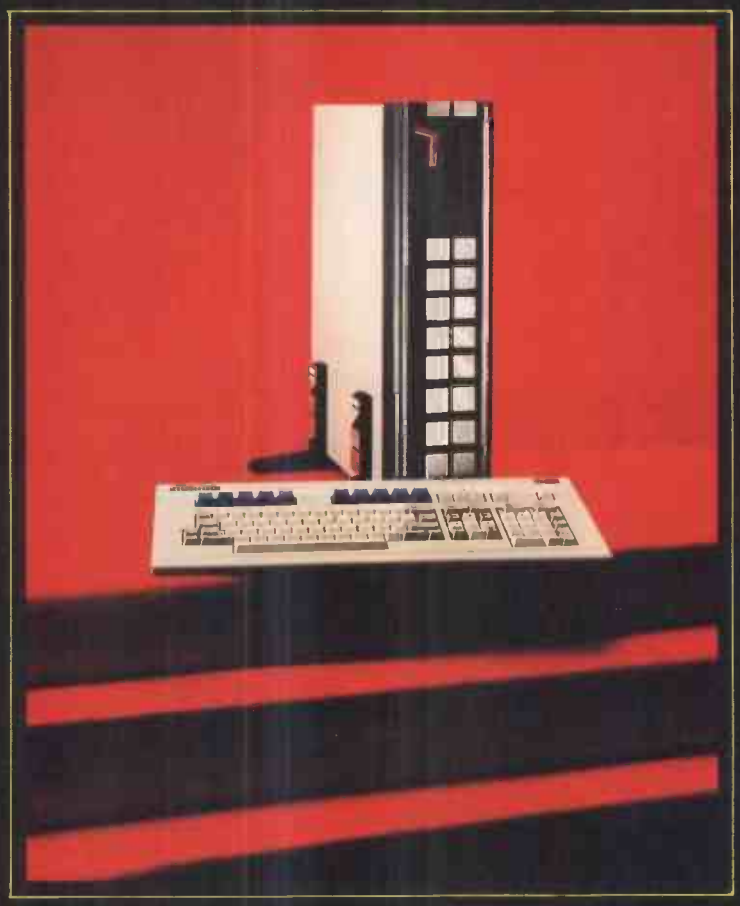

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LEISURE LINES

Brain-teasers from J J Clessa

Quickie

Suppose we take the word 'QUICKIE' and sort its characters into alphabetical sequence, we would get 'CEIIKQU'. If we did the same with the word 'LEISURE' we would get the character string 'EEILRSU'.

Suppose we could make a character string, in this manner from every word in the standard dictionary. It would certainly make a useful anagram dictionary. If we then sorted all the character strings into alphabetical sequence, clearly, the first entry in the resulting list would be 'A' (the indefinite article). What would be the second? And what would be the last?

Prize puzzle

My thanks for this months puzzle go to Mr Colin Duff of London SW19.

When the King of Babylon died he left many millions of gold coins to be shared among his children. His only son would receive one half of the coins, and each of his 11 daughters an equal share of the remainder.

When it was time to share out the money, it was found that the son's share had been laid out in the form of an exact triangular array, and that the remainder had been set out in equal square arrays.

Assuming no coins are cut, what is the least number of coins that there must have been. (Note that a triangular array contains 1, 3, 6, 10, 15, and so on, coins, a square array contains 1, 4, 9, 16, and so on).

Solutions on post cards only (not backs of envelopes) to *PCW* Prize Puzzle, October Leisure Lines, 32-34 Broadwick Street, London W1A 2HG. Entries to arrive not later than 31 October 1985.

July Prize Puzzle

There was a fairly good response to the 'roll of cloth' problem — over a hundred entries received, including correct solutions from as far afield as the US, Malta and the Middle East.

The required solution was that the roll of cloth was 2531 inches — or 70 yards 11 inches long.

The winning entry came from H B Brook of Sheffield, Yorks. Congratulations Mr Brook.

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making arrangements, in order to avoid wasted journeys due to cancellations, printer's errors, and so on.

Berlin	CAMP 85, Computer Graphics. Contact: Spectrum Communications, (01) 749 3061	24-27 Sept
London	(Olympia), IBM User Show. Contact: EMAP International Exhibitions, (01) 837 3699	25-27 Sept
Manchester	(University), Electron & BBC User Show. Contact: Database Publications, (061) 456 8383	27-29 Sept
London	(Mount Royal Hotel), First International Export Systems Conference. Contact: Jean Mulligan, (0865) 730 275	1-3 Oct
London	(Movotel), Amstrad Computer User Show. Contact: Computer Market Place Ltd, (01) 930 1612	6 Oct
London	(Heathrow Penta), Home Computers Trade Show. Contact: Turret Wheatland Ltd, (0923) 777000.	6-7 Oct
Aberdeen	(Exhibition Conference Centre), Offshore Computers' Exhibition Conference. Contact: Offshore Conference & Exhibitions Ltd, (01) 549 5831	8-10 Oct
London	(Barbican), DEC User Show. Contact: EMAP (as above). (01) 837 3699	15-17 Oct
Netherlands/ Amsterdam	(RAI Exhibition Centre), COMDEX. Contact: Interface Group, Rivierstaete, Amsteldijk, 166, 1079 LH Amsterdam	15-17 Oct
London	(Wembley Conference Centre), Computer Graphics Exhibition. Contact: Online Conference, (01) 868 4466	15-18 Oct

WRITING FOR PCW

Your chance to contribute to the magazine.

We're offering readers the chance to get rich (well, at least richer) and to influence what's published in the magazine — by writing for it. We welcome approaches from would-be writers, including those who have never appeared in print before. It's often users with practical experience who have the most interesting things to say, so don't worry if your prose is less than perfect, we can take care of the polishing.

If you have an idea for a feature write, with a brief synopsis, outlining the proposed structure and content. If your article is already written, then send it in for consideration. Remember to put your name and address on both the covering letter and the manuscript — along with a daytime phone number if possible. Manuscripts should be typed or printed out (dot matrix output is fine), in double-line spacing with ample margins top and bottom and on each

WRITING FOR PCW

side.

Any accompanying program listings should be supplied on disk or cassette, ideally with a printout as well. We'll try to return all submissions sent in with a suitable sae, but make sure you keep a copy of everything you submit as well for reference.

Bear in mind that it's worth taking a look at the Back Issues advertisement to see what sort of things we have already published — after all there's no point in reinventing the wheel. And please be sure to tell us if you've contacted another magazine (perish the thought): it would be very awkward if the same article appeared elsewhere. Frankly, we're more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work — the rate is £65 per 1000 words, and payment usually follows about four-six weeks after publication.

ACC NEWS

As the autumn season opens for computer clubs, Rupert Steele casts his eye over the latest events.

The Association of Computer Clubs (ACC) is an amateur, democratic body which looks after the common interests of affiliated computer clubs in the UK.

The early autumn is a particularly important time for computer clubs, which are often closed in August (and sometimes early September). It marks the start of a new 'season', and many clubs will have taken special care over the summer to set up a good programme of events to kick off with. So it's a good time to visit your local computer club and see what it is doing. If you don't know where your local club is, try looking in libraries, computer shops, scan the events column in your local paper, or contact the ACC. It will try to put enquirers in touch with their local computer clubs, as listed on the national database.

What's on

The Kensington & Chelsea Computer Society (KCCS), meets at the Parish Rooms, St Philips Church in the Earls Court Road. Many members own BBC micros, but the club welcomes all micro enthusiasts with a varied programme of talks and demonstrations by members and visiting speakers. For more information, write to me at the address given at the end, or call (01) 370 0601.

Also in London is the North London Hobby Computer Club, one of the earliest and largest groups in the country. It is based on the 'Recreational Computing' microcomputer course at the Polytechnic of North London. There are weekly lecture sessions on Mondays, Tuesdays and Wednesdays during term times, as well as an informal BBC group on Thursdays, a Communications group (third Tuesday monthly), and Sinclair/hardware groups on Mondays. Additional possibilities are groups looking at MS-DOS, Unix, C and Prolog. Now is the best time to join the club, as the subscription is tied to the academic year, so contact Chris Carter on (01) 226 1234 ext 2221 or write to the Department of Electric and Communications Engineering, Polytechnic of North London, Holloway Road, London, N7 8DB.

I have also had a couple of letters from the Independent Enterprise User Group, and the first issue of its very attractive newsletter called 'Private Enterprise'. The group was originally conceived as a club for Enterprise owners in London, but it has been broadened to a national (international?) user group. It may still have London meetings if there is a demand. The membership for the remainder of 1985 is £4, and includes the first three isues of Private Enterprise. If the next two are anything like the first, it must surely be a must for Enterprise owners. For more information, contact the club president, Mark Lissak, 40 Mansfield Road, London, NW3 2HT.

Further out is the Southgate Micro Club. It meets on alternate Wednesdays during term time in room B106, Southgate Technical College. The sessions are 7.30pm-9pm.

John Mileham writes as the assistant education secretary of RACS. He runs two groups; a ComputerTown which meets at the RACS offices, 147 Powis Street, London, SE18 6JN, on the first Thursday of each month; and a club ROYCOM of which I have no details. You can get more information by calling John on (01) 854 2000 ext 408. The machines that tend to feature at club meetings are the BBC and Commodore 64, but there are usually TI and Atari machines about.

Sharpsoft has written to me to say that it runs a newsletter service for Sharp owners. The main group is known as Sharpsoft User Notes (SUN), and published six issues in 1984. The notes are edited by Dr Mike Brinson of the Polytechnic of North London, but for information you should contact Sharpsoft Ltd, 86-90 Paul Street, London, EC2A 4NE, or call (01) 739 8559.

Moving on to Barnet, Tony Gibbs has given me details of the Milfield Computer Group, of which he is the publicity secretary. His address is Farover, Barnet Road, Arkley, Barnet, Herts, EN5 3HB, or you can call him on (01)449 9619 if you are in the area.

And finally from London, Mr A Shipton writes from 17 Woodlands Avenue, Eastcote, Ruislip, Middx, HA4 9RL. He is involved with Eastcote ComputerTown. It meets on the first and third Tuesday of each month, 6pm to 8pm at the Eastcote library, Field End Road, Eastcote. Machines in evidence include the BBC, Apple and Spectrum. The ComputerTown concentrates on providing information for new and prospective computer users and offers training in programming.

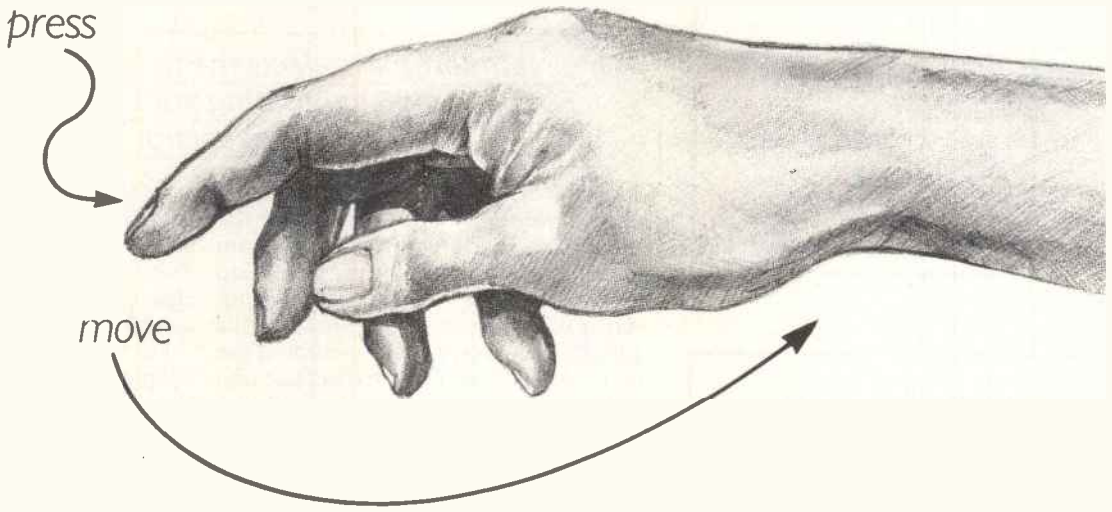
The Comex 35 National Users Club has moved! You should now contact David Hitchins at 1 Fyfe Crescent, Baildon, Shipley, West Yorks, BD17 6DR or call David on Bradford (0274) 580519.

A mention for John Day and the Nottingham Microcomputer Club, which is one of the more impressive clubs around at the moment ('full of fizz' is how John describes it). It meets on Mondays at the Castle Cate Congregational Federation Building (opposite the central Nottingham branch of Marks & Spencer). The first Monday of the month is the club's 'main monthly event'; the second is a user group for Atari, BBC and Dragon; and third is for Amstrad and Sinclair and the fourth is for Atari and Commodore. It is setting up an extra evening meeting for specialist groups, about training, Basicode, communications and projects; these groups will involve owners of many different machines.

The club also has a library of books and magazines, and contributes from time to time to the weekly computer programme on the local Radio Trent. For more information, contact John Day, 8 Warkton Close, Chilwell, Notts, NG9 5FR or call him on (0602) 225660.

For a mention in this column, to notify the ACC of a new or existing club, or to obtain club address labels: Rupert Steele, 12 Philbeach Gardens, London, SW5 9DY.

Any other enquiry, including the address of your local club: John Bone, ACC Chairman, 2 Claremont Place, Gateshead, Tyne & Wear, NE8 1TL, or call (091) 477 0036. END



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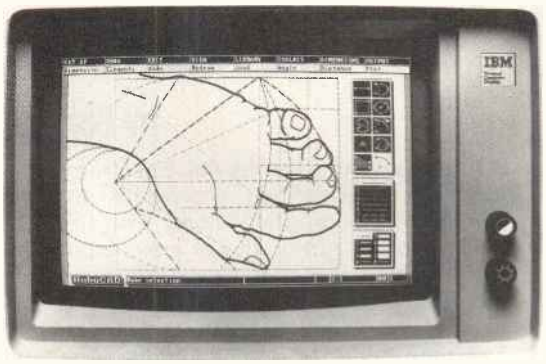

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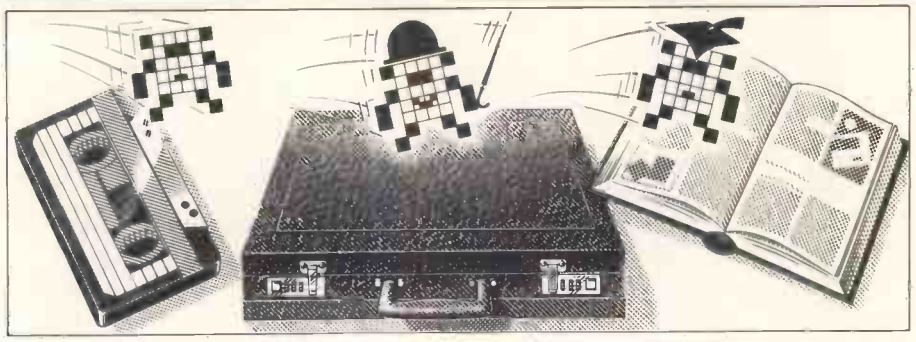
PROGRAM FILE



Owen Linderholm selects the best of reader's programs. For details on submitting your own, see the end of this section.

Program of the Month is a complex and difficult football manager game for the Spectrum. Guide your favourite team from third division to European Cup without leaving your seat. This program is one of the best and most realistic simulations I have seen, including the commercial ones. Don't expect exciting action, but do expect tussles with the boardroom, injuries to players, troubles on the transfer market (but not on the terraces) and drops in crowd figures (or rises if your team is doing well).

Business and professional users can keep track of their lives with Diary for the Sirius or other MBasic machines. It allows you to make comprehensive entries for every day of the year and review them in many different ways, including as a year planner. For the BBC there is a short program demonstrating a utility to dramatically increase the number of colours available by carefully mixing the old ones. Structured programmers and all those who regard Basic as a refuge for dinosaurs and poor stylists should find the Pascal Calendar program of interest.

Again for the BBC is an educational program to help teach O and A Level students how simple logic gates work. The program has been tested on real classes, and pupils have found it to be of great help.

For the Commodore 64, there's a tiny program to print the time in the top left-hand corner of the screen and keep it there, even when the screen is altered. Atari users have a simple windowing front end for the disk operating system, making disk operations friendlier. For Dragon users, there's an elegant graph-plotting program.

Games
Scientific/mathematic
Business
Toolkit/utilities
Educational/Computer Aided Learning

Spectrum Football Manager

by Chic James

This program is for the 48k Spectrum. All the user-defined characters are given in the program along with the instructions. Although you may be put off by the length of this program, I can assure you that if you even think you might be interested, then you will certainly find it fascinating. Although no play takes place onscreen, the results of all matches played throughout the season are given as they take place. You get your chance in the Milk Cup, the FA Cup, and all the European cups that you qualify for, but don't expect success to come easily — you are more likely to be called to the boardroom than to the champions' podium!

The user-defined graphics are given without the program near the end. When typing in the program, the symbol ↑ should be entered as the # symbol.

```
1 BRIGHT 0
5 DIM d$(15,12)
6 DIM p$(4,14)
8 RANDOMIZE
```

PROGRAM FILE

```
  10 GO SUB 7500
  11 LET sx=sea*10
  12 DIM z$(sx,32)
  13 DIM q$(1,17)
  15 RESTORE 9800: READ ea,xa,xf,xp,ef,ep,he,ae,b,epl
  17 RESTORE 9810: READ yx,xhe,xae,p,q,s,c,g,d
  18 LET sx=sea*10
  19 GO TO 1115
  20 RESTORE 9830: REM *** new season ***
  30 READ rep,z(4),z(5),win,y,t,ha,cp,l,u(5),u(4),e,x,ps
  40 LET x3=1+INT (RND*15)
  50 LET x1=3.75
  60 IF d=1 THEN  RESTORE 9930
  70 IF d=2 THEN  RESTORE 9920
  80 IF d=3 THEN  RESTORE 9910
  90 IF d=4 THEN  RESTORE 9900
 110 PRINT AT 9,0; PAPER 6; INK 2;"rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr"
 120 PRINT  PAPER 6; INK 2;AT 11,0;"rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr"
 125 PRINT  BRIGHT 1;AT 9,29; PAPER 0; INK 7;" ◇ ";AT 11,29;" ◇ "
 130 PRINT  BRIGHT 1;AT 9,12; PAPER 0; INK 7;" ◇ ";AT 11,12;" ◇ "
 140 GO SUB 9600
 200 READ b$: REM *** main season ***
 205 LET z(6)=z(6)+1
 210 IF d=1 AND l=19 THEN  RESTORE 9930
 215 IF d=2 AND l=19 THEN  RESTORE 9920
 220 IF d=3 AND l=19 THEN  RESTORE 9910
 225 IF d=4 AND l=19 THEN  RESTORE 9900
 230 IF l=20 THEN  LET ha=1
 235 LET q$(1)=l$
 240 IF l<7 THEN  GO TO 280
 245 IF z(6)=1 AND z(1)=1 THEN  GO TO 2500
 250 IF l>31 THEN  GO TO 260
 255 IF z(6)=2 AND z(1)=1 THEN  GO TO 2510
 260 IF z(6)=3 AND z(2)=1 THEN  GO TO 2600
 265 IF l>33 THEN  GO TO 275
 270 IF z(6)=4 AND z(2)=1 THEN  GO TO 2610
 275 IF z(6)=5 AND z(3)=1 THEN  GO TO 2700
 277 IF l>35 THEN  GO TO 280
 279 IF z(6)=6 AND z(3)=1 THEN  GO TO 2710
 280 IF z(6)=7 AND z(4)=1 THEN  GO TO 4000
 285 IF z(6)=8 THEN  LET z(6)=0: IF z(5)=1 THEN  GO TO 4100
 292 GO SUB 9500: REM print positions
 295 GO SUB 9700: REM clear bot.screen
 305 IF if=0 THEN  GO TO 8200: REM injury
 307 LET r=r+1
 310 IF r>u THEN  GO TO 8300: REM injury recover
 315 GO SUB 9000
 317 IF l=33 THEN  GO SUB 9400
 320 IF l>=34 THEN  PRINT  BRIGHT 1;r-0; INK 4; PAPER 0;"PRESS ANY KEY FOR NEXT M
ATCH ": PAUSE 0: INPUT "": GO TO 360
 325 PRINT  BRIGHT 1;AT 15,0; INK 1;" 1: BUY A PLAYER "' INK 2'" 2: SELL A PLAYE
R "' INK 3'"ANY:PLAY NEXT MATCH "
 335 PRINT r-0; BRIGHT 1;" PRESS 1,2 or ANY "
 337 PAUSE 0
 340 INPUT ""
 345 IF INKEY$="1" THEN  GO TO 2e3
 350 IF INKEY$="2" THEN  GO TO 2200
 355 PRINT  BRIGHT 1;AT 10,0; PAPER col;"                              "
 360 GO SUB 9700: REM cl bot screen
 365 GO SUB 9300: REM calc scores
 370 GO SUB 8600: REM print teams & scores
 375 GO SUB 9100: REM calc pos & cap
 395 IF l=40 THEN  GO TO 1e3
 400 IF z(1)=1 OR z(2)=1 OR z(3)=1 THEN  GO TO 200
 410 IF l=20 AND p>11 AND d>2 THEN  GO SUB 5000
 420 IF l=20 AND p>16 AND d<3 THEN  GO SUB 5000
 450 GO TO 200
1000 GO SUB 9500: REM *** end of season ***
1001 PRINT  INK 7; PAPER 3; BRIGHT 0;AT 16,0;"
      END OF SEASON                                "
1002 FOR j=1 TO 3
1003 FOR n=8 TO 20
1004 PRINT  BRIGHT 1;AT 17,n; PAPER 3; INK 9; OVER 1;" ": PAUSE 5
1005 PRINT  BRIGHT 0;AT 17,n; PAPER 3; INK 9; OVER 1;" "
1006 NEXT n: NEXT j: CLS
1007 GO SUB 9600: REM print header
1008 LET epl=0
1010 PRINT AT 3,0;" SEASON ";s;" RESULTS : DIVISION:";d
1015 PRINT AT 5,13;"GP  W   D   Pts Pos"
1017 PRINT AT 6,0; BRIGHT 1; PAPER col;"                              "
1020 PRINT AT 6,0; BRIGHT 1; PAPER col; INK 9;a$;TAB 13;l;TAB 17;win;TAB 21;y;TA
B 25;t;TAB 29;p
1025 GO SUB 6000: REM track record
1027 IF d=1 AND p>1 THEN  GO TO 1032
1030 IF p=3 OR p=2 THEN  LET z$(yx,15 TO )=" PROMOTED ": LET yx=yx+1: GO TO 1035
1031 IF p=1 THEN  LET z$(yx,15 TO 27)="  CHAMPIONS ": LET yx=yx+1: GO TO 1035
1032 IF p>18 AND d<>4 THEN  LET z$(yx,15 TO )=" RELEGATED ": LET yx=yx+1: GO TO
 1035
1034 IF p>18 AND d=4 THEN  LET z$(yx)=" FAILED TO BE RE-ELECTED ": LET yx=yx+1
1035 PRINT AT 12,0;c$(2);AT 12,16;"ROUND:";u(2): IF z(2)=1 THEN  PRINT AT 12,16;
 PAPER 6; INK 2; FLASH 1;u$: GO SUB 6100
1040 PRINT AT 14,0;c$(1);AT 14,16;"ROUND ";u(1): IF z(1)=1 THEN  PRINT AT 14,16;
 PAPER 6; INK 2; FLASH 1;u$: GO SUB 6200
1042 PRINT AT 16,0;c$(3);AT 16,16;"ROUND ";u(3): IF z(3)=1 THEN  PRINT AT 16,16;
 PAPER 6; INK 2; FLASH 1;u$: GO SUB 6250
1045 PRINT AT 10,0;"CAPITAL:£";c
1046 IF u(2)=0 THEN  PRINT  PAPER 7; BRIGHT 1;AT 12,16;"DID NOT COMPETE"
1047 IF u(1)=0 THEN  PRINT  PAPER 7; BRIGHT 1;AT 14,16;"DID NOT COMPETE"
1048 IF u(3)=0 THEN  PRINT  PAPER 7; BRIGHT 1;AT 16,16;"DID NOT COMPETE"
1050 PRINT AT 18,0;c$(4);AT 18,16;"ROUND ";u(4): PRINT  BRIGHT 1;AT 20,0;c$(5);A
T 20,16;"ROUND ";u(5)
1052 IF u(4)=5 AND z(4)=1 THEN  LET z(3)=1
1055 IF u(4)=4 AND z(4)=0 THEN  PRINT AT 18,16;s$
1060 IF u(4)=5 AND z(4)=0 THEN  PRINT AT 18,16;t$
1070 IF u(4)=5 AND z(4)=1 THEN  PRINT AT 18,16; INK 3; FLASH 1;u$
1075 IF u(5)=5 AND z(5)=1 THEN  LET z(1)=1
1077 IF u(5)=4 AND z(5)=0 THEN  PRINT AT 20,16;s$
1080 IF u(5)=5 AND z(5)=0 THEN  PRINT AT 20,16;t$
1085 IF u(5)=5 AND z(5)=1 THEN  PRINT AT 20,16; INK 3; FLASH 1;u$
1087 GO SUB 6300
1088 IF d=1 THEN  GO TO 1092
1090 IF p<4 THEN  PRINT AT 8,10; INK 1;"PROMOTED"
1092 IF p=1 THEN  PRINT AT 8,10; PAPER 6; INK 0; FLASH 1;"CHAMPIONS"
1093 IF d=4 THEN  GO TO 1096
1094 IF p>18 THEN  PRINT AT 8,10; INK 2; PAPER 7;"RELEGATED"
1095 IF d=1 AND p=1 THEN  LET z(2)=1
1096 IF d=4 AND p>18 AND c<1000 THEN  PRINT AT 20,0;"YOU HAVE FAILED TO BE RE-EL
ECTED          GAME  OVER                ": PAUSE 150: GO TO 6500
1097 PRINT r-0; BRIGHT 1; INK 4; PAPER 0;"PRESS ANY KEY FOR NEXT SEASON"
1098 PAUSE 0
1099 IF s=sea-1 THEN  GO TO 1200
1100 IF p<4 THEN  LET d=d-1: IF d<1 THEN  LET d=1
1105 LET s=s+1
1110 IF p>18 THEN  LET d=d+1: IF d>4 THEN  LET d=4
```

PROGRAM FILE

```
1112 LET p=10
1115 IF d=1 THEN  LET j=400: LET k=1500: LET x2=41
1120 IF d=2 THEN  LET j=100: LET k=500: LET x2=41
1125 IF d=3 THEN  LET j=25: LET k=100: LET x2=38
1130 IF d=4 THEN  LET j=10: LET k=75: LET x2=38
1132 LET wages=q*200
1135 LET r=1
1140 CLS
1145 LET if=0
1150 FOR n=1 TO 5: LET u(n)=0: NEXT n
1155 LET z(6)=0
1160 GO TO 20
1199 REM *** cheat last season ***
1200 PRINT AT 10,0;"                                "
1210 PRINT AT 12,0;"                                "
1220 GO SUB 9700
1230 PRINT AT 10,0;"THIS IS YOUR LAST SEASON AS      MANAGER OF ";a$
1240 PRINT AT 13,0;"IT IS POSSIBLE TO CHEAT YOUR WAYINTO ALL THE EUROPEAN CUPS F
OR  THIS LAST SEASON"
1250 PRINT AT 17,0;"IF YOU WISH TO DO SO THEN PRESS "c" FOR CHEAT"
1260 PRINT AT 20,0;"IF NOT PRESS ANY OTHER KEY"
1265 PAUSE 0
1270 IF INKEY$="c" THEN  GO TO 1300
1280 PRINT  FLASH 1;AT 21,0; PAPER col; INK 9;" GOOD LUCK FOR YOUR LAST SEASON "
1285 PAUSE 200
1290 GO TO 1100
1300 FOR n=1 TO 3
1310 LET z(n)=1
1320 NEXT n
1330 PRINT  FLASH 1;AT 21,0; PAPER col; INK 9;" O.K. CHEAT ! : WIN SOMETHING ! "
1340 PAUSE 200
1345 LET z$(yx)=" CHEATED LAST SEASON !!! "
1350 LET yx=yx+1
1355 GO TO 1100
1500 CLS
1510 BRIGHT 1: BORDER 1: PAPER 1: INK 5
1515 CLS
1520 GO SUB 7800
1530 PRINT AT 5,0;"YOU ARE THE MANAGER OF A THIRD  DIVISION FOOTBALL TEAM"
1535 PRINT
1540 PRINT "YOUR AIM IS TO WIN AS MANY      CHAMPIONSHIPS AS YOU CAN IN A   SET
AMMOUNT OF SEASONS."'"WINNING MILK CUPS,F.A.CUPS &    EUROPEAN CUPS ON THE WAY."
1545 PRINT
1550 PRINT "YOU START WITH A CAPITAL OF     £50,000 AND A SQUAD OF 13       PLAY
ERS"
1555 PRINT
1560 PRINT "THE MAXIMUM SQUAD ALLOWED IS 17 PLAYERS."'"THE MINIMUM IS 13 PLAYERS
."
1565 PRINT ~0;"PRESS ANY KEY TO CONTINUE"
1570 PAUSE 0
1572 IF INKEY$="c" THEN  COPY
1575 INPUT ""
1580 GO SUB 6900
1585 PRINT AT 5,0;"PLAYER PRICES"
1590 PRINT
1595 PRINT "DIV.4:£10,000 TO £75,000"
1600 PRINT "DIV.3:£25,000 TO £100,000"
1605 PRINT "DIV.2:£100,000 TO £500,000"
1610 PRINT "DIV.1:£400,000 TO £1,500,000"
1615 PRINT
1620 PRINT "BUYING A PLAYER INCREASES YOUR  SCORE POTENTIAL BY .5 , 1 or 1.5SELL
ING A PLAYER DECREASES IT.  (DEPENDING ON THE PRICE)"'"YOU MAY BUY AND SELL PLA
YERS AT ANY TIME EXCEPT IMMEDIATELY     BEFORE ANY CUP GAME AND AFTER 34LEAGUE G
AMES HAVE BEEN PLAYED."
1625 PRINT ~0;"PRESS ANY KEY TO CONTINUE"
1630 PAUSE 0
1632 IF INKEY$="c" THEN  COPY
1635 INPUT ""
1640 GO SUB 6900
1645 PRINT AT 5,0;"AT THE BEGINING OF EACH SEASON  YOUR SCORE POTENTIAL IS 2.75"
1650 PRINT
1655 PRINT "YOUR OPPONENTS IS 3.75"
1660 PRINT
1665 PRINT "IN THE MILK & F.A. CUPS ONLY    YOUR SCORE POTENTIAL COUNTS TO  THE
TEAM WHICH IS DRAWN AT HOME."
1670 PRINT
1675 PRINT "LEAGUE POSITIONS"
1680 PRINT
1685 PRINT "DIVISION's.";TAB 14;" 1&2 ";TAB 24;" 3&4 "
1690 PRINT "RELEGATION";TAB 14;"43pts.";TAB 24;"39pts."
1695 PRINT "PROMOTION";TAB 14;"76pts.";TAB 24;"70pts."
1700 PRINT "CHAMPIONSHIP";TAB 14;"80pts.";TAB 24;"74pts."
1705 PRINT : PRINT "   WIN = 3pts. : DRAW = 1pt."
1710 PRINT ~0;"PRESS ANY KEY TO CONTINUE"
1715 PAUSE 0
1717 IF INKEY$="c" THEN  COPY
1720 INPUT ""
1725 GO SUB 6900
1730 PRINT AT 5,0;"AS YOU MOVE UP THE TABLE YOUR   ATTENDANCE GOES UP,IF YOU DRO
P  DOWN THE TABLE YOUR ATTENDANCE  GOES DOWN."
1735 PRINT
1740 PRINT "YOU RECIEVE ALL THE GATE MONEY  FROM HOME LEAGUE GAMES, HALF THEGATE
 MONEY FROM ALL CUP GAMES."
1745 PRINT
1750 PRINT "EXPENCES (£5,000) AND PLAYERS   WAGES (£200 PER GAME EACH) ARE  DEDU
CTED AFTER EACH GAME"'"FOR ALL GAMES AGAINST EUROPEAN  CLUBS EXPENCES ARE £7,00
0"
1755 PRINT ~0;"PRESS ANY KEY TO CONTINUE"
1760 PAUSE 0
1762 IF INKEY$="c" THEN  COPY
1765 LET a=0
1770 GO TO 7525
1999 REM *** player purchase ***
2000 PAPER 1: INK 7: BRIGHT 1
2005 GO SUB 9700
2010 PRINT  BRIGHT 1;AT 15,1; INK 7;"PLAYER PURCHASE"
2015 IF q=17 THEN  PRINT  BRIGHT 1; FLASH 1;AT 17,0;"  YOU CANNOT HAVE MORE THAN
 17       PLAYERS IN YOUR SQUAD       ": GO TO 2085
2020 PRINT  BRIGHT 1;AT 15,1;"New Players cost: "'"£";j*1000;" to £";k*1000;" "
2025 GO SUB 9200
2030 PRINT AT 18,0; INVERSE 1;"   THIS  PLAYER:"; INVERSE 0;" £";i
2035 PRINT  BRIGHT 1; INVERSE 1;AT 19,0;"SCORE POTENTIAL:"; INVERSE 0;"  ";s1
2040 IF i>c THEN  PRINT  FLASH 1; BRIGHT 1;AT 20,0; INK 7;"  IS MORE THAN YOU CA
N AFFORD    ": GO TO 2085
2045 PRINT ~0; BRIGHT 1;"Do You Wish To Buy? Y/N "
2050 PAUSE 0
2055 INPUT ""
2060 IF INKEY$="n" THEN  GO TO 2085
2065 LET q=q+1
2070 LET x=x+s1
2075 LET wages=wages+200
2080 LET c=c-i
2085 PAPER 7: INK 0: BRIGHT 0
2090 GO SUB 9500
```

PROGRAM FILE

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2095 PRINT ⌐0; PAPER 4; INK 0; BRIGHT 1;"PRESS ANY KEY TO PLAY NEXT GAME "
2100 PAUSE 0
2105 INPUT ""
2110 GO SUB 9700
2115 GO TO 355
2199 REM *** player sale ***
2200 PAPER 2: INK 7: BRIGHT 1
2205 GO SUB 9700
2210 PRINT  BRIGHT 1;AT 15,1; INK 7;"PLAYER SALE"
2215 IF q-1<13 THEN  PRINT  FLASH 1;AT 17,0;" YOU CANNOT HAVE LESS THAN 13
 PLAYERS IN YOUR SQUAD        ": GO TO 2285
2220 PRINT  BRIGHT 1;AT 16,1; INK 7;"Player sale raises: "'"£";j*1000;" to £";k*
1000;" "
2225 GO SUB 9200
2230 PRINT  INVERSE 1;AT 18,0;" THIS PLAYER:"; INVERSE 0;" £";i
2235 PRINT  BRIGHT 1; INVERSE 1;AT 19,0;"SCORE POTENTIAL:"; INVERSE 0;"  ";sl
2240 PRINT ⌐0; BRIGHT 1;"Do you wish to sell?(PRESS Y/N)"
2245 PAUSE 0
2250 INPUT ""
2255 IF INKEY$="n" THEN  GO TO 2085
2260 LET wages=wages-200
2265 LET c=c+i
2270 LET x=x-sl
2275 IF x<=1 THEN  LET x=1.25
2280 LET q=q-1
2285 IF l=33 THEN  PAPER 7: INK 0: BRIGHT 0: GO SUB 9700: GO TO 290
2290 GO TO 2085
2499 REM *** europe cups main routine ***
2500 LET xa=0: LET xf=1: LET u(xf)=u(xf)+1: LET x3=x3+1: GO TO 3000
2510 LET xa=1: LET xf=1: GO TO 3000
2600 LET xa=0: LET xf=2: LET u(xf)=u(xf)+1: LET x3=x3+1: GO TO 3000
2610 LET xa=1: LET xf=2: GO TO 3000
2700 LET xa=0: LET xf=3: LET u(xf)=u(xf)+1: LET x3=x3+1: GO TO 3000
2710 LET xa=1: LET xf=3: GO TO 3000
3000 GO SUB 8700: GO SUB 9500
3005 LET q$(1)=c$(xf)
3010 IF xa=0 THEN  LET r$=e$(1)
3015 IF xa=1 THEN  LET r$=e$(2)
3020 IF l>30 THEN  LET r$=e$(4)
3025 PAPER 7: INK 0: GO SUB 7000
3030 IF r$=e$(4) AND a>h THEN  GO SUB 8420: PAUSE 150: LET z(xf)=0: LET v(xf)=0:
 LET w(xf)=0: LET xa=0: GO TO 3050
3035 IF r$=e$(4) AND a<h THEN  GO SUB 8400: LET v(xf)=0: LET w(xf)=0: LET xa=0:
GO TO 3050
3040 LET v(xf)=v(xf)+h: LET h=v(xf)
3045 LET w(xf)=w(xf)+a: LET a=w(xf)
3050 PAUSE 150
3055 LET q$(1)=1$
3060 IF xa=0 THEN  LET b$=k$: GO TO 290
3065 GO SUB 7100
3070 IF h>a THEN  GO SUB 8400: GO TO 3085
3075 LET z(xf)=0
3080 GO SUB 8420
3085 PAUSE 150
3090 LET v(xf)=0: LET w(xf)=0
3095 LET b$=k$
3100 GO TO 290
3500 IF r$=e$(2) THEN  PRINT  BRIGHT 1;AT 10,13;a: PAUSE 30: PRINT  BRIGHT 1;AT
10,30;h
3510 IF r$<>e$(2) THEN  PRINT  BRIGHT 1;AT 10,13;h: PAUSE 30: PRINT  BRIGHT 1;AT
 10,30;a
3520 IF a>h THEN  GO SUB 8420
3530 IF h=a THEN  GO SUB 8410
3540 IF h>a THEN  GO SUB 8400
3545 RETURN
3999 REM *** domestic cups main routine ***
4005 GO SUB 9500
4010 LET u(4)=u(4)+1
4020 LET q$(1)=c$(4)
4030 GO TO 4200
4105 GO SUB 9500
4110 LET u(5)=u(5)+1
4120 LET q$(1)=c$(5)
4200 IF l>36 THEN  LET r$=e$(4): GO TO 4250
4210 IF l>28 THEN  LET r$=e$(3): GO TO 4250
4220 LET hb=INT (RND*2)
4230 IF hb=0 THEN  LET r$=e$(1)
4240 IF hb=1 THEN  LET r$=e$(2)
4250 GO SUB 9000: REM next fixture
4260 PRINT AT 14,0;r$;"Vs:-";b$
4270 FOR n=15 TO 20: PRINT AT n,0;"                                ": NEXT n
4280 IF r$=e$(2) THEN  GO SUB 8900: GO TO 4300
4290 IF r$<>e$(2) THEN  GO SUB 8800: LET c=c+g
4300 GO SUB 9300: REM calc scores
4310 PRINT  BRIGHT 1;⌐0; INK 4; PAPER 0;"PRESS ANY KEY FOR RESULT"
4315 PAUSE 0
4320 INPUT ""
4330 GO SUB 8100
4340 IF h=a THEN  GO TO 4600
4350 IF r$<>e$(2) AND h>a THEN  GO TO 4500
4360 IF r$=e$(2) AND h<a THEN  GO TO 4500
4370 GO SUB 8420
4375 PAUSE 150
4380 IF q$(1)=c$(4) THEN  LET z(4)=0
4390 IF q$(1)=c$(5) THEN  LET z(5)=0
4400 LET q$(1)=1$
4410 GO TO 292
4510 GO SUB 8400
4515 PAUSE 150
4520 LET g=g+1e3
4525 LET rep=0
4530 LET q$(1)=1$
4540 GO TO 292
4600 REM *** replay routine ***
4610 GO SUB 8410
4620 IF rep=1 THEN  GO TO 4700
4625 LET rep=1
4630 PAUSE 150
4640 PRINT AT 14,0;" REPLAY                                ": LET g=g+500
4645 IF r$=e$(4) OR r$=e$(3) THEN  GO TO 4270
4650 IF r$=e$(1) THEN  LET r$=e$(2): GO TO 4270
4660 IF r$=e$(2) THEN  LET r$=e$(1): GO TO 4270
4699 REM *** extra time dom.cups***
4700 LET rep=0: PAUSE 150
4705 GO SUB 9700
4710 PRINT AT 14,0;"EXTRA TIME"
4720 LET h=h+INT (RND*3)
4730 LET a=a+INT (RND*3)
4740 PRINT ⌐0; BRIGHT 1; INK 4; PAPER 0;"PRESS A KEY FOR EXTRA-TIME SCORE"
4745 PAUSE 0
4750 INPUT ""
4760 GO TO 4330
4999 REM *** boardroom routine ***
5000 GO SUB 9500: PAPER 6: INK 0
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PROGRAM FILE

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5005 GO SUB 9700
5010 PRINT  BRIGHT 1;AT 14,0; PAPER 6; INK 0; FLASH 1;"CALLED TO THE BOARDROOM"
5020 PRINT AT 15,0;"The board are not happy with    the teams performance this
     season.                              YOU MAY (1)Ask for more money          (2)C
ut Players Wages          (3)Sell a player"
5030 PRINT ~0; BRIGHT 1;"PRESS 1,2 or 3 "
5033 PAUSE 0
5037 INPUT ""
5040 IF INKEY$="1" THEN  GO TO 5300
5045 IF INKEY$="2" THEN  GO TO 5200
5050 IF INKEY$="3" THEN  GO TO 5100
5100 GO SUB 9700
5110 PRINT  BRIGHT 1;AT 14,0; PAPER 0; INK 6;"CALLED TO THE BOARDROOM"
5115 GO SUB 9200
5120 PRINT AT 15,0;"PLAYER SALE                        Selling a player has raised
:"'"£";i;'"This will not effect your score potential."
5125 IF c+i<0 THEN  PRINT AT 19,0;"THIS IS NOT ENOUGH TO CONTINUE": GO TO 5500
5130 LET c=c+i
5132 LET q=q-1
5133 LET wages=wages-200
5135 LET bdr=RND*15
5140 IF bdr<.5 THEN  GO TO 5500
5142 PAPER 7: INK 0
5145 GO SUB 9500
5150 PRINT ~0; BRIGHT 1; INK 4; PAPER 0;"PRESS ANY KEY TO CONTINUE"
5155 PAUSE 0
5157 INPUT ""
5158 GO SUB 9700
5160 RETURN
5200 GO SUB 9700
5210 PRINT  BRIGHT 1;AT 14,0; PAPER 0; INK 6;"CALLED TO THE BOARDROOM"
5220 PRINT AT 15,0;"CUT PLAYERS WAGES"'"Players wages have been cut by  £50 each
 per match"
5225 LET bdr=RND*15
5230 IF bdr<7 THEN  PRINT AT 19,0;"HALF THE PLAYING SQUAD HAVE     REQUESTED TRA
NSFERS              ": GO TO 5500
5235 LET wages=wages-q*50
5240 PRINT ~0; BRIGHT 1; INK 4; PAPER 0;"PRESS ANY KEY TO CONTINUE"
5250 PAUSE 0
5252 INPUT ""
5255 PAPER 7: INK 0
5257 GO SUB 9700
5260 RETURN
5300 GO SUB 9700
5310 PRINT  BRIGHT 1;AT 14,0; PAPER 0; INK 6;"CALLED TO THE BOARDROOM"
5320 PRINT AT 15,0;"REQUEST FOR MORE MONEY"
5325 LET bdr=RND*15
5330 IF bdr<.5 THEN  PRINT AT 19,0;"THE BOARD ARE UNABLE TO RAISE   ANY MORE FUN
DS                  ": GO TO 5500
5340 LET fnd=(INT (RND*k))*1000
5345 PRINT AT 16,0;"The board are able to provide   £";fnd
5350 IF c+fnd<0 THEN  PRINT AT 19,0;"THIS IS NOT ENOUGH TO CONTINUE  ": GO TO 55
00
5355 LET c=c+fnd
5360 PAPER 7: BRIGHT 0
5365 PRINT ~0; BRIGHT 1; INK 4; PAPER 0;"PRESS ANY KEY TO CONTINUE"
5370 PAUSE 0
5375 INPUT ""
5380 GO SUB 9500
5385 GO SUB 9700
5390 RETURN
5500 PAUSE 300
5505 GO SUB 9700
5510 PRINT  BRIGHT 1;AT 14,0; PAPER 0; INK 6;"CALLED TO THE BOARDROOM"
5520 PRINT  BRIGHT 1;AT 16,0; PAPER 5; INK 0;"THIS WAS THE WRONG DECISION     TH
E BOARD HAVE REQUESTED YOUR   RESIGNATION                    GAME OVER
                "
5525 PAUSE 400
5527 GO SUB 6000
5530 LET z$(yx)="     SACKED     "
5535 LET yx=yx+1
5540 GO TO 6500
5999 REM *** team records ***
6000 LET z$(yx)=" SEASON "+STR$ s+" RESULTS : DIVISION:"+STR$ d
6010 LET yx=yx+1
6020 LET z$(yx)="              GP  W  D  Pts   Pos"
6025 LET yx=yx+1
6030 LET z$(yx)=a$
6032 LET z$(yx,14 TO )=STR$ l+"  "+STR$ win+" "+STR$ y+"  "+STR$ t+"   "+STR$ p
6035 LET yx=yx+1
6040 RETURN
6100 LET z$(yx)=c$(2)+" "+u$
6105 LET yx=yx+1
6110 RETURN
6200 LET z$(yx)=c$(1)+" "+u$
6205 LET yx=yx+1
6210 RETURN
6250 LET z$(yx)=c$(3)+" "+u$
6255 LET yx=yx+1
6260 RETURN
6310 IF u(4)=5 AND z(4)=0 THEN  LET z$(yx)=c$(4)+" "+t$: GO TO 6330
6320 IF u(4)=5 AND z(4)=1 THEN  LET z$(yx)=c$(4)+" "+u$: GO TO 6330
6325 LET z$(yx)=c$(4)+" ROUND "+STR$ u(4)
6330 LET yx=yx+1
6410 IF u(5)=5 AND z(5)=0 THEN  LET z$(yx)=c$(5)+" "+t$: GO TO 6430
6420 IF u(5)=5 AND z(5)=1 THEN  LET z$(yx)=c$(5)+" "+u$: GO TO 6430
6425 LET z$(yx)=c$(5)+" ROUND "+STR$ u(5)
6430 LET yx=yx+1
6440 LET z$(yx)="▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪"
6442 LET yx=yx+1
6445 IF sea=s THEN  PAUSE 150: GO TO 6500
6450 RETURN
6500 CLS
6510 GO SUB 9600
6520 FOR n=1 TO sx
6525 IF z$(n)="                                        " THEN  GO TO 6545
6530 PRINT z$(n)
6540 NEXT n
6545 PRINT  BRIGHT 1;"▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪"
6550 PRINT  BRIGHT 1;"GAME OVER PRESS 'C' FOR COPY"
6560 PRINT ~0; BRIGHT 1; FLASH 1;" ANOTHER GAME?  (Y/N) "
6570 PAUSE 0
6572 IF INKEY$="c" THEN  GO TO 6600
6575 IF INKEY$="n" THEN  STOP
6580 GO SUB 8000
6590 GO TO 11
6599 REM *** print records ***
6600 CLS
6605 GO SUB 9600
6608 LET w=19
6609 IF sx<17 THEN  LET w=sx
6610 FOR n=1 TO w
6620 PRINT z$(n)
6630 NEXT n
```

```
6640 COPY
6650 FOR n=20 TO sx
6660 IF z$(n)="                                        " THEN  GO TO 6690
6670 LPRINT z$(n)
6680 NEXT n
6690 LPRINT "                                "
6695 GO TO 6560
6900 FOR n=4 TO 21: REM *** clear screen ***
6910 PRINT AT n,0;"                                "
6920 NEXT n
6930 RETURN
6999 REM *** europe cups sub routine ***
7000 GO SUB 9700
7005 GO SUB 9000
7010 IF x3>15 THEN  LET x3=1
7012 LET k$=b$: LET b$=d$(x3)
7015 PRINT AT 14,0;r$;"Vs: ";b$
7020 PAUSE 150
7025 IF r$=e$(2) THEN  GO SUB 8900: GO TO 7035
7030 IF r$<>e$(2) THEN  GO SUB 8800
7035 GO SUB 9300
7040 PRINT  BRIGHT 1;r0; INK 0; PAPER 4;"PRESS ANY KEY FOR RESULT"
7045 PAUSE 0
7050 INPUT ""
7055 GO SUB 3500
7065 IF r$=e$(4) AND h=a THEN  GO TO 7300
7070 IF r$=e$(4) THEN  LET v(xf)=0: LET w(xf)=0
7080 RETURN
7100 GO SUB 9700
7110 PRINT  BRIGHT 1;r0; INK 4; PAPER 0;"PRESS ANY KEY FOR AGRIGATE SCORE"
7120 PAUSE 0
7130 INPUT ""
7140 GO SUB 8150
7150 IF h=a THEN  GO SUB 8410: GO TO 7300
7160 RETURN
7300 LET x$=" PRESS 'A' FOR EXTRA-TIME SCORE "
7301 LET e1=3
7302 PAUSE 150
7305 GO SUB 9700
7310 PRINT  BRIGHT 1;r0; INK 4; PAPER 0;x$
7325 LET h=h+INT (RND*e1)
7330 LET a=a+INT (RND*e1)
7340 PAUSE 0
7345 INPUT ""
7350 IF r$=e$(4) THEN  GO SUB 8100: GO TO 7365
7360 PRINT  BRIGHT 1;AT 10,13;a;AT 10,30;h
7365 IF h=a THEN  GO SUB 8410: GO TO 7375
7370 RETURN
7375 PAUSE 150: LET x$="PRESS'A'FOR GOAL SHOOT OUT SCORE"
7380 LET e1=8
7385 GO SUB 9700
7390 GO TO 7310
7500 REM *** instructions ***
7505 BORDER 1: PAPER 1: INK 6
7510 CLS
7515 LET a=1
7520 GO SUB 7850
7525 BRIGHT 1: CLS
7530 PRINT  BRIGHT 1;AT 0,2;"   ";TAB 27;"   "
7535 PRINT  BRIGHT 1;AT 1,2;"   ";TAB 27;"   "
7540 PRINT  BRIGHT 1;AT 2,2;"   ";TAB 27;"   "
7545 PRINT  BRIGHT 1;AT 3,2; INK 3;"   ";TAB 27;"   "
7550 PRINT  BRIGHT 1;AT 18,2;"   ";TAB 27;"   "
7555 PRINT  BRIGHT 1;AT 19,2;"   ";TAB 27;"   "
7560 PRINT  BRIGHT 1;AT 20,2;"   ";TAB 27;"   "
7565 PRINT  BRIGHT 1;AT 21,2; INK 3;"   ";TAB 27;"   "
7570 INK 5
7610 PRINT AT 6,0;"C                               "
7615 PRINT AT 7,0;"H                               "
7620 PRINT AT 8,0;"I                               "
7625 PRINT AT 9,0;"C                               "
7630 PRINT AT 10,0;"                                "
7635 PRINT AT 12,0;"J                               "
7640 PRINT AT 13,0;"A                               "
7645 PRINT AT 14,0;"M                               "
7650 PRINT AT 15,0;"E                               "
7655 PRINT AT 16,0;"S                               "
7660 IF a=0 THEN  GO TO 8e3
7665 PAUSE 200
7670 GO TO 1500
7800 PRINT  INK 6;"                                "
7805 PRINT  INK 6;"                                "
7810 PRINT  INK 6;"                                "
7815 PRINT  INK 3;"                                "
7820 PRINT AT 1,7; PAPER 5; INK 0;" FOOTBALL MANAGER "
7825 PRINT AT 2,9; PAPER 6; INK 0;" INFORMATION "
7830 PRINT AT 3,6; PAPER 3; INK 7;" PRESS ~C~ FOR COPY "
7835 RETURN
7849 REM *** graphics ***
7850 RESTORE 9931
7860 FOR j=USR "a" TO USR "n"+7
7870 READ b: POKE j,b: NEXT j
7880 RETURN
8000 INPUT "ENTER YOUR TEAMS NAME (MAXIMUM  12 LETTERS) ";a$
8002 INPUT "ENTER TEAM COLOUR (0 to 7):";col
8005 PRINT AT 21,0; BRIGHT 1;" 10 SEASONS TAKES APROX. 1 HOUR "
8006 INPUT "HOW MANY DO YOU WISH TO PLAY ";sea
8007 DIM c$(5,17): REM *** cup titles ***
8009 REM *** cup titles/team names ***
8010 LET c$(1)="CUP WINNERS CUP"
8011 LET c$(2)=" EUROPEAN CUP  "
8012 LET c$(3)=" EUAFA    CUP  "
8013 LET c$(4)="                    MILK CUP    "
8014 LET c$(5)="   F.A. CUP    "
8015 LET l$="  LEAGUE GAME  "
8016 LET s$=" SEMI-FINALISTS "
8017 LET t$="   FINALISTS    "
8018 LET u$="                    W I N N E R S  "
8020 LET d$(1)="BAY/N MUNICH"
8021 LET d$(2)="LIVERPOOL"
8022 LET d$(3)="DY/MO MOSCOW"
8023 LET d$(4)="BARCELONA"
8024 LET d$(5)="S.V.HAMBURG"
8025 LET d$(6)="REAL MADRID"
8026 LET d$(7)="MANCHESTER U"
8027 LET d$(8)="AJAX"
8028 LET d$(9)="DUKLA PRAGUE"
8029 LET d$(10)="INTER MILAN"
8030 LET d$(11)="ST. ETIENNE"
8031 LET d$(12)="JUVENTUS"
8032 LET d$(13)="NOTTS.FOREST"
8033 LET d$(14)="BRISTOL RVS."
8034 LET d$(15)="EVERTON"
8035 LET p$(1)="CENTRE FORWARD"
```

PROGRAM FILE

```
8036 LET p$(2)="GOAL KEEPER"
8037 LET p$(3)="TEAM CAPTAIN"
8038 LET p$(4)="SWEEPER"
8040 DIM a$(4,11)
8041 LET a$(1)=" HOME "
8042 LET a$(2)=" AWAY "
8043 LET a$(4)=" FINAL "
8044 LET a$(3)="SEMI-FINAL "
8049 PAPER 7: BORDER 5: INK 0: BRIGHT 0: CLS
8050 DIM z(6): DIM u(5): DIM v(5): DIM w(5)
8052 REM *** cup indicators ***
8055 FOR n=1 TO 5
8060 LET z(n)=0
8065 LET u(n)=0
8070 LET v(n)=0
8075 LET w(n)=0
8077 NEXT n
8080 RETURN
8099 REM *** print scores ***
8100 PRINT  BRIGHT 1;AT 10,13;h
8110 PAUSE 30
8120 PRINT  BRIGHT 1;AT 10,30;a
8130 RETURN
8150 PRINT  BRIGHT 1;AT 10,13;a
8160 PAUSE 30
8170 PRINT  BRIGHT 1;AT 10,30;h
8180 RETURN
8200 LET b=RND*15: REM *** player injury ***
8205 IF b>5 THEN  GO TO 315
8207 PAPER 5: BRIGHT 1
8210 GO SUB 9700
8215 LET u=2+INT (RND*9)
8220 PRINT  BRIGHT 1;AT 14,0; PAPER 7; FLASH 1;"  PLAYER INJURY  "
8222 LET p1=1+INT (RND*4)
8223 GO SUB 9200
8225 PRINT AT 15,0;"Your ";p$(p1);" has been""injured.He will be out of actionf
or up to "; PAPER 7;u; PAPER 5;" games."
8227 IF p1=2 THEN  GO TO 8285
8230 PRINT AT 18,0;"Your score potential has been   reduced by "; PAPER 7;s1
8235 LET x=x-s1
8240 LET if=1
8242 PAPER 7: BRIGHT 0
8245 GO SUB 9500
8250 PRINT  BRIGHT 1;r0; PAPER 4;"PRESS ANY KEY TO CONTINUE"
8260 PAUSE 0
8265 INPUT ""
8270 GO SUB 9700
8280 GO TO 307
8285 PRINT AT 18,0;"Your oponents score potential   has been increased by "; PAP
ER 7;s1
8290 LET x1=x1+s1
8295 GO TO 8240
8300 PAPER 5: BRIGHT 1
8305 GO SUB 9700
8310 PRINT  BRIGHT 1;AT 14,0; PAPER 7; FLASH 1;"  PLAYER INJURY  "
8315 PRINT AT 15,0,"Your ";p$(p1);" is now""recovered."
8320 IF p1=2 THEN  GO TO 8380
8325 PRINT AT 18,0;"Your score potential has been   re- adjusted."
8330 LET x=x+s1
8335 PAPER 7: BRIGHT 0
8340 GO SUB 9500
8345 PRINT  BRIGHT 1; PAPER 4;r0;"PRESS ANY KEY TO CONTINUE"
8350 LET r=0
8355 PAUSE 0
8360 INPUT ""
8365 LET if=0
8370 GO SUB 9700
8375 GO TO 315
8380 PRINT AT 18,0;"Your oponents score potential   has been re- adjusted."
8385 LET x1=x1-s1
8390 GO TO 8335
8399 REM *** win/lose/draw ***
8400 PRINT  BRIGHT 1;AT 17,9; PAPER 3; INK 7; FLASH 1;"   W  I  N   "
8405 RETURN
8410 PRINT  BRIGHT 1;AT 17,9; PAPER 1; INK 7; FLASH 1;"   D R A W   "
8415 RETURN
8420 PRINT  BRIGHT 1;AT 17,9; PAPER 2; INK 7; FLASH 1;"   L O S E   "
8425 RETURN
8499 REM *** capital & position calculations ***
8500 GO SUB 8800
8505 LET c=c+g*2
8510 LET c=c-wages
8515 LET c=c-5000
8520 GO SUB 8100
8525 IF h=a THEN  LET t=t+1: LET y=y+1
8530 IF h>a THEN  LET t=t+3: LET win=win+1
8535 LET l=l+1
8540 LET ha=1
8550 RETURN
8630 IF ha=0 THEN  GO TO 8500
8640 GO SUB 8900
8645 GO SUB 8150
8650 LET c=c-wages
8654 LET c=c-5000
8655 IF h=a THEN  LET t=t+1: LET y=y+1
8660 IF h>a THEN  LET t=t+3: LET win=win+1
8677 LET l=l+1
8678 LET ha=0
8679 RETURN
8700 REM *** capital calculation europe ***
8710 LET c=c+g*2
8720 LET c=c-wages
8730 LET c=c-7000
8740 RETURN
8799 REM *** print teams/league ***
8800 PRINT  BRIGHT 1;AT 10,0; PAPER col;"                              "
8810 PRINT AT 10,0; BRIGHT 1; PAPER col; INK 9;a$;TAB 17;b$
8820 RETURN
8900 PRINT  BRIGHT 1;AT 10,0; PAPER col;"                              "
8910 PRINT AT 10,0; BRIGHT 1; PAPER col; INK 9;b$;TAB 17;a$
8920 RETURN
8999 REM *** print next fixture ***
9000 PRINT  BRIGHT 1;AT 13,0;"NEXT FIXTURE:";q$(1)
9010 RETURN
9099 REM *** position/gate calcs ***
9100 LET p=x2-INT (t/1*20)
9110 IF p>21 THEN  LET p=21
9120 IF p<1 THEN  LET p=1
9130 IF p=1 THEN  LET g=g+250: GO TO 9170
9140 IF p=21 THEN  LET g=g-250: GO TO 9170
9150 IF p<ps THEN  LET g=g+500
9160 IF p>ps THEN  LET g=g-500
9170 LET ps=p
9175 IF g<1500 THEN  LET g=1500
```

PROGRAM FILE

```
9180 IF g>45000 THEN  LET g=45000
9190 RETURN
9199 REM *** player price calcs ***
9200 LET e=j+INT (RND*(k-j+1))
9210 LET i=e*1e3
9215 LET sp=INT (k-j)/3
9220 IF e<j+sp THEN  LET sl=.5: RETURN
9230 IF e>j+sp AND e<k-sp THEN  LET sl=1: RETURN
9240 LET sl=1.5
9250 RETURN
9299 REM *** score calcs ***
9300 LET h=INT (RND*x)
9310 LET a=INT (RND*x1)
9320 RETURN
9399 REM *** last chance ***
9400 PAUSE 50
9405 FOR n=1 TO 3
9410 PRINT  BRIGHT 1;AT 10,0; FLASH 1;"   LAST CHANCE TO BUY OR SELL   "
9420 PAUSE 50
9430 IF d<3 THEN  PRINT  BRIGHT 1;AT 10,0;"PROMOTION 76pts:RELEGATION 43pts": GO
 TO 9445
9440 PRINT  BRIGHT 1;AT 10,0;"PROMOTION 70pts:RELEGATION 39pts"
9450 PAUSE 150
9455 NEXT n
9460 PRINT  BRIGHT 1;AT 10,0; FLASH 1;"   LAST CHANCE TO BUY OR SELL   "
9470 RETURN
9499 REM *** print capital etc. ***
9500 PRINT AT 3,0;"CAPITAL £";c;"  ";AT 3,20;"POSITION:";p;" "
9510 PRINT AT 7,0;"SQUAD:";q;TAB 22;"POINTS:";t
9520 PRINT AT 5,0;"DIVISION:";d;TAB 16;"GAMES PLAYED:";l
9530 PRINT  BRIGHT 1;AT 21,2;" SQUAD SCORE POTENTIAL:";x;" "
9540 PRINT AT 12,0;"ATTENDANCE:";g;"  "
9550 RETURN
9599 REM *** print header ***
9600 PRINT  BRIGHT 1;AT 0,0; PAPER 1; INK 6;"  ▟▙  "; PAPER 5; INK 0;" FOOTBAL
L
 MANAGER "; PAPER 1; INK 6;"  ▟▙  "
9601 PRINT  BRIGHT 1;AT 1,0; PAPER 1; INK 6;"  ▜▛                    ▜▛  "
9602 PRINT  BRIGHT 1;AT 2,0; PAPER 1; INK 6;"  ▜  "; PAPER 4; INK 1;"▐
          ▌"; PAPER 1; INK 6;"  ▜  "
9603 PRINT  BRIGHT 1; PAPER col; INK 9;AT 1,9;"                "
9605 PRINT  BRIGHT 1; PAPER col; INK 3;AT 1,10;a$
9610 PRINT  BRIGHT 1;AT 2,7; PAPER 4; INK 0;"SEASON No.";s;"   ";AT 2,20;"of ";s
ea
9620 RETURN
9699 REM *** clear bot/screen ***
9700 FOR n=14 TO 20
9710 PRINT AT n,0;"                                "
9720 NEXT n
9730 RETURN
9799 REM *** variable data ***
9800 DATA 1,1,0,0,0,0,0,0,5,0
9810 DATA 1,0,0,10,13,1,5e4,8e3,3
9830 DATA 0,1,1,0,0,0,0,0,0,0,0,0,2.75,10
9900 DATA "ALDERSHOT","HEREFORD","BLACKPOOL","READING","BRISTOL C","MANSFIELD","
CHESTER","NORTHAMPTON","CHESTERFIELD","SWINDON","DARLINGTON","COLCHESTER","DONCA
STER","WREXHAM","HALIFAX","TORQUAY","PETERBOROUGH","HARTLEPOOL","ROCHDALE","CREW
E"
9910 DATA "BOLTON","WIMBLEDON","BOURNEMOUTH","PRESTON","BRENTFORD","MILLWALL","E
XETER","WALSALL","HULL","BURNLEY","NEWPORT","ORIENT","BRADFORD","OXFORD","LINCOL
N","PLYMOUTH","WIGAN","PORT VALE","SCUNTHORPE","GILLINGHAM"
9920 DATA "BARNSLEY","FULHAM","BLACKBURN","HUDDERSFIELD","CARLISLE","CAMBRIDGE",
"CHARLTON","CARDIFF","CHELSEA","DERBY","CRYSTAL PAL","MAN. CITY","GRIMSBY","SHRE
WSBURY","LEEDS","NEWCASTLE","OLDHAM","BRIGHTON","PORTSMOUTH","MIDDLESBORO"
9930 DATA "ARSENAL","LUTON","ASTON VILLA","WEST BROM.","EVERTON","STOKE","IPSWIC
H","TOTTENHAM","LEICESTER","NOTTS COUNTY","Q.P.R.","NOTTS FOREST","SOUTHAMPTON",
"SUNDERLAND","NORWICH","WATFORD","COVENTRY","WEST HAM","WOLVES","LIVERPOOL"
9931 REM *** graphics data ***
9932 REM a=( )
9933 DATA 0,0,0,0,0,0,0,13
9934 REM b=(▟)
9935 DATA 56,56,56,16,124,56,254,255
9936 REM c=( )
9937 DATA 0,0,0,0,0,0,0,96
9938 REM d=( )
9939 DATA 19,17,16,16,8,6,1,1
9940 REM e=(▀)
9941 DATA 255,255,254,254,254,254,255,255
9942 REM f=( )
9945 DATA 144,16,16,16,32,192,0,0
9946 REM g=( )
9947 DATA 0,1,3,3,1,0,0,0
9948 REM h=(▜)
9949 DATA 254,255,255,255,255,254,56,254
9950 REM i=( )
9951 DATA 0,0,128,128,0,0,0,0
9952 REM j=( )
9953 DATA 1,1,1,3,7,15,7,3
9954 REM k=( )
9955 DATA 0,0,0,128,192,224,192,128
9957 REM l=(▜)
9960 DATA 254,189,93,125,125,85,187,255
9962 REM m=up( )
9965 DATA 0,24,36,66,129,231,36,60
9967 REM n=down( )
9970 DATA 60,36,231,129,66,36,24,0
```

Sirius Diary

by Barbara Binless

Diary is designed to keep track of appointments, holidays and anniversaries for a year at a time. Easter and other important dates are generated automatically when the file for the first year is opened, and other repeating dates such as birthdays and anniversaries can be included in data statements at lines 61000 onwards. Entries for each day consist of up to three lines with up to 16 characters each, displayed in a scrollable window of 10×3 characters. A full month appears on the screen at a time. Hard copy is available as a chart

PROGRAM FILE

for each month, as a planner for the year, and as a list of dates with entries.

The program is written in Microsoft Basic and should compile without alteration. It shouldn't be too difficult to adapt it for any other machine with an 80-column display, reverse, underline and an addressable cursor. Lines 5130 to 5550 are specific to the Sirius, but only make the year planner display more clear by reversing weekends and highlighting alternate weekdays; colour could be substituted to good effect. CHR$(177) is a grey block, CHR$(176) is a central vertical line, and CHR$(186) is a double vertical. Function keys 1 to 7 are expected to return ASCII values 241 to 247 respectively.

The printed output needs a wide carriage printer or compressed print. The year planner requires 162 columns (13½ins at 12 pitch), the monthly charts take 120 columns (10ins) and the simple list is 90 columns wide. If hard copy is not required, then lines 4000-4170, 4200-4300 and 4500-4570 should be replaced by RETURN statements.

The program is menu-driven, and instructions in the form of HELP screens are provided.

```
1 '     DIARY   (a screen-a-month diary facility)
2 '
3 '     For any year the program creates and maintains a calendar/diary displaying a
4 '     month at a time for text entry/update, up to three lines of 16 characters can
5 '     be stored for each day.  The diary can be printed as a chart for each month,
6 '     as a list of entries in date order, or (abbreviated) as a year planner.
7 '
10      DIM INFO$(31,3),MONTH$(12),DAY$(7),DAYS%(12),D%(12),R%(31),C%(31),GN%(28)
17 '
18 ' Common initialization block
19 '
20      DEF FNC$(ROW%,COL%)=ESC$+"Y"+CHR$(31+ROW%)+CHR$(31+COL%) :
        DEF FNRAND(X%)=INT(RND(1)*X%+1)
30      DEF FNCENTRE$(ROW%,T$)=FNC$(ROW%,40-LEN(T$)\2)+T$ :
        DEF FNUP$(X$)=CHR$(ASC(X$+"~")+32*(ASC(X$+"~")>96))
40      ESC$=CHR$(27) : CLS$=ESC$+"E" : ERBOL$=ESC$+"K" : ERBOF$=ESC$+"J" :
        ERBOL$=ESC$+"o" : ERBOF$=ESC$+"b"
50      HION$=ESC$+"(" : HIOFF$=ESC$+")" : REVON$=ESC$+"p" : REVOFF$=ESC$+"q" :
        UNDON$=ESC$+"0" : UNDOFF$=ESC$+"1"
60      CURON$=ESC$+"y5" : CUROFF$=ESC$+"x5" : CURSAV$=ESC$+"j" :
        CURBAK$=ESC$+"k" : BELL$=CHR$(7)
70      LINON$=CURSAV$+ESC$+"x1"+FNC$(25,1) : LINOFF$=ESC$+"y1"+CURBAK$ :
        BLINKON$=ESC$+"2" : BLINKOFF$=ESC$+"3"
80      CLRALL$=ESC$+"z" : YES%=-1 : NO%=0 : WIDTH 255 : WIDTH LPRINT 165
97 '
98 ' Get calendar base name and year required
99 '
100     GOSUB 6000 : PRINT SCREEN$ FNC$(10,15) "What year do you want" FNC$(10,40);
110     INPUT YEAR$ : PRINT FNC$(11,15) "Name (up to 6 letters)" FNC$(11,40);
120     INPUT BASE$ : X$=BASE$ : GOSUB 7000 : BASE$=X$ : Y%=VAL(YEAR$) : GOSUB 6500
147 '
148 ' Open calendar file
149 '
150     OPEN "R",£1,BASE$+RIGHT$(YEAR$,2)+".DRY",64
160     FIELD £1,16 AS SPEC$,16 AS INFO1$,16 AS INFO2$,16 AS INFO3$
167 '
168 ' Get header record, display and bump last-used date
169 '
170     GET £1,1 : IF LEFT$(SPEC$,7)<>"OLDFILE" THEN GOSUB 10000
        ELSE PRINT FNC$(13,15) "Last updated:" FNC$(13,40) INFO1$ : FOR K=1 TO 1000 : NEXT
180     LSET SPEC$="OLDFILE" : LSET INFO1$=DATE$ : PUT £1,1
187 '
188 ' Loop until 'quit' pressed
189 '
190     FINISHED%=NO% : D%=0
200     WHILE NOT FINISHED%
210             IF D%=0 THEN 300
220             GOSUB 2500 : GOSUB 2000
227 '
228 ' Update info on screen, then replace in file
229 '
230             KEEP%=NO% : GOSUB 3000 : IF NOT KEEP% THEN 300
240             FOR I%=1 TO D%(M%) : LSET SPEC$=INFO$(I%,0)
250                     LSET INFO1$=INFO$(I%,1) : LSET INFO2$=INFO$(I%,2)
260                     LSET INFO3$=INFO$(I%,3) : PUT £1,SKIP%+I%
270             NEXT
297 '
298 ' Get next command
299 '
300             PRINT SCREEN$ PMT1$ CUROFF$ FNCENTRE$(5,"Using diary file "+BASE$+YEAR$)
310             PRINT FNCENTRE$(23,"Press one of these function keys")
320             KEY%=0 : WHILE KEY%<1 : KEY%=ASC(INPUT$(1))-240 : WEND
330             ON KEY% GOSUB 8000,500,1000,4200,4500,5000,5000
340     WEND : CLOSE : RESET : PRINT CLRALL$ : END
500     FINISHED%=YES% : RETURN
997 '
998 ' Get month to use
999 '
1000    PRINT SCREEN$ PMT2$ : PRINT FNC$(12,20) "Month to edit ";
1010    INPUT MONTH$ : X$=MONTH$ : GOSUB 7000 : MONTH$=X$ : IF MONTH$="" THEN RETURN
1020    IF MONTH$="SPECIAL" THEN GOSUB 11000
1030    D%=0 : M%=VAL(MONTH$) : IF M%<13 AND M%>0 THEN 1100      'month number entered
1040    FOUND%=NO% : M%=1
1050    WHILE NOT FOUND% AND M%<13
1060            IF MONTH$=LEFT$(MONTH$(M%),LEN(MONTH$)) THEN FOUND%=YES% ELSE M%=M%+1
1070    WEND : IF NOT FOUND% THEN RETURN                         'not recognised
1097 '
1098 ' Get day number of first day
1099 '
1100    Y1%=(Y%-1)\100 : Y2%=Y%-1-100*Y1% : D%=(1+Y2%+Y2%\4+Y1%\4-Y1%-Y1%) MOD 7
1110    D%=(DAYS%(M%-1)+D%) MOD 7-2 : IF D%<1 THEN D%=D%+7
1120    RETURN
1997 '
1998 ' Draw calendar for month
1999 '
2000    PRINT CLS$ PMT3$ CUROFF$
2010    FOR I%=1 TO 21 STEP 4
2020            PRINT FNC$(I%,1) VN$ : PRINT V$ : PRINT V$ : PRINT VN$;
2030    NEXT : PRINT FNC$(1,5) UNDON$ MONTH$(M%) "  " YEAR$ UNDOFF$
2097 '
2098 ' Fill in the dates and stored info
2099 '
2100    KDAY%=DAY% : FOR DAY%=1 TO D%(M%)
2110            R%=4*((DAY%+D%)\7)+1 : C%=11*((DAY%+D%) MOD 7)+2
2120            R%(DAY%)=R%+1 : C%(DAY%)=C%
2130            PRINT FNC$(R%,C%) UNDON$; : PRINT USING "££";DAY%;
2140            PRINT " " LEFT$(INFO$(DAY%,0),7) UNDOFF$; : GOSUB 3500
```

PROGRAM FILE

```
2150    NEXT : PRINT P1$ P2$ P3$ P4$ CURON$; : DAY%=KDAY% : RETURN
2497 '
2498 ' Get info for each day in month M%
2499 '
2500    SKIP%=1+DAYS%(M%-1)
2510    FOR I%=1 TO D%(M%) : GET £1,SKIP%+I%
2520            INFO$(I%,0)=SPEC$ : INFO$(I%,1)=INFO1$
2530            INFO$(I%,2)=INFO2$ : INFO$(I%,3)=INFO3$
2540    NEXT : RETURN
2997 '
2998 ' Update info for this month, loop until saved or aborted
2999 '
3000    DAY%=1 : COL%=C%(DAY%) : QUIT%=NO% : I%=0
3010    WHILE NOT QUIT%
3020            I%=I%-(I%<3) : ROW%=R%(DAY%)+I%-1 : PRINT UNDOFF$; : IF I%=3 THEN PRINT UNDON$;
3030            PRINT FNC$(ROW%,COL%); : IN$=INPUT$(1) : MOV%=NO%
3040            IF IN$=CHR$(27) THEN IN$=INKEY$ : GOSUB 3400 : GOTO 3200 ' Cursor keys
3050            IF IN$>CHR$(240) THEN ON ASC(IN$)-240
                GOSUB 3240,3220,3210,3230,3270,3250,3260 : I%=0 : GOTO 3200 ' Function keys
3060            IF IN$=CHR$(13) THEN 3200                                  ' Enter
3100            INFO$="" : PRINT FNC$(ROW%,COL%) SPACE$(10);               ' Replace info
3110            WHILE IN$<>CHR$(13) AND IN$<CHR$(240) AND NOT MOV%
3120                    IF IN$=CHR$(8) THEN IN$="" :
                        IF LEN(INFO$)>0 THEN INFO$=LEFT$(INFO$,LEN(INFO$)-1)
3130                    PSN%=LEN(INFO$)-8 : IF PSN%<1 THEN PSN%=1
3140                    INFO$=LEFT$(INFO$+IN$,16) : PRINT FNC$(ROW%,COL%) MID$(INFO$,PSN%,10);
3150                    IN$=INPUT$(1) : IF IN$=CHR$(27) THEN IN$=INKEY$ :
                        INFO$(DAY%,I%)=INFO$ : GOSUB 3500 : GOSUB 3400
3160                    IF IN$=CHR$(13) OR IN$>CHR$(240) AND IN$<>CHR$(242)
                        THEN INFO$(DAY%,I%)=INFO$
3170                    IF IN$>CHR$(240) THEN ON ASC(IN$)-240
                        GOSUB 3240,3220,3210,3230,3270,3250,3260 : I%=1
3180            WEND : IF IN$<>CHR$(13) AND NOT MOV% THEN I%=I%-1
3200    WEND : RETURN
3207 '
3208 ' Deal with function keys
3209 '
3210    KEEP%=YES%                              'F3 Store this month
3220    QUIT%=YES% : RETURN                     'F2 Abort changes
3230    GOSUB 4000 : RETURN                     'F4 Print the month
3240    GOSUB 8500 : RETURN                     'F1 Help routine
3250    GOSUB 3500 : RETURN                     'F6 Left scroll
3260    GOSUB 3600 : RETURN                     'F7 Right scroll
3270    SKIP%=DAYS%(M%-1)+1 : GET £1,SKIP%+DAY% 'F5 Restore original data
3280    INFO$(DAY%,0)=SPEC$ : INFO$(DAY%,1)=INFO1$
3290    INFO$(DAY%,2)=INFO2$ : INFO$(DAY%,3)=INFO3$
3300    GOSUB 3500 : RETURN
3397 '
3398 ' Movement between boxes
3399 '
3400    IF IN$="A" THEN DAY%=DAY%+7*(DAY%>7) : MOV%=YES%
3410    IF IN$="B" THEN DAY%=DAY%-7*(DAY%<(D%(M%)-6)) : MOV%=YES%
3420    IF IN$="C" THEN DAY%=DAY%-(DAY%<D%(M%)) : MOV%=YES%
3430    IF IN$="D" THEN DAY%=DAY%+(DAY%>1) : MOV%=YES%
3440    I%=0 : COL%=C%(DAY%) : PRINT FNC$(ROW%,COL%) UNDOFF$; : RETURN
3497 '
3498 ' Scroll box left or right
3499 '
3500    FOR J%=1 TO 2
3510            PRINT UNDOFF$ FNC$(R%(DAY%)+J%-1,C%(DAY%)) LEFT$(INFO$(DAY%,J%),10);
3520    NEXT
3530    PRINT FNC$(R%(DAY%)+2,C%(DAY%)) UNDON$ LEFT$(INFO$(DAY%,3),10) UNDOFF$;
3540    RETURN
3600    FOR J%=1 TO 2
3610            PRINT UNDOFF$ FNC$(R%(DAY%)+J%-1,C%(DAY%)) MID$(INFO$(DAY%,J%)+SPACE$(10),7,10);
3620    NEXT
3630    PRINT FNC$(R%(DAY%)+2,C%(DAY%)) UNDON$ MID$(INFO$(DAY%,3)+SPACE$(10),7,10) UNDOFF$;
3640    RETURN
3997 '
3998 ' Print this month
3999 '
4000    LPRINT MONTH$(M%) "  " YEAR$ : LPRINT : LPRINT
4010    FOR I%=0 TO 6 : LPRINT USING "  \           \";DAY$((I%+5) MOD 7); : NEXT
4020    LPRINT : LPRINT : P%=((D%+2) MOD 7)-1 : P%=P%-7*(P%<0) : PD%=((D%(M%)+P%)\7+1)*7
4030    FOR I%=1 TO PD% STEP 7
4040            FOR J%=0 TO 6 : LPRINT "|"; : IPJ%=I%-P%+J%
4050                    IF IPJ%>0 AND IPJ%<=D%(M%) THEN LPRINT IPJ%;
4060                    LPRINT TAB(17*J%+18);
4070            NEXT : LPRINT "|" : LPRINT L$
4100            FOR K%=0 TO 3
4110                    FOR J%=0 TO 6 : LPRINT "|"; : IPJ%=I%-P%+J%
4120                            IF IPJ%>0 AND IPJ%<=D%(M%) THEN LPRINT INFO$(IPJ%,K%);
4130                            LPRINT TAB(17*J%+18);
4140                    NEXT : LPRINT "|"
4150            NEXT : LPRINT L$
4170    NEXT : RETURN
4197 '
4198 ' Print year planner
4199 '
4200    LPRINT BASE$ " Year planner " YEAR$ : LPRINT
4210    FOR M%=1 TO 12 : LPRINT USING "\       \";MONTH$(M%);
4220            GOSUB 1100 : GOSUB 2500 : LPRINT SPACE$(4*D%) "|";
4230            FOR I%=1 TO D%(M%) : LPRINT USING " ££|";I%; : NEXT : LPRINT
4240            FOR K%=0 TO 3 : LPRINT TAB(10) SPACE$(4*D%) "|";
4250                    FOR I%=1 TO D%(M%) : LPRINT USING "\ \|";INFO$(I%,K%);
4260                    NEXT : LPRINT
4270            NEXT : LPRINT TAB(14) STRING$(149,"-")
4280    NEXT : LPRINT TAB(15);
4290    FOR I%=0 TO 36 : LPRINT USING "\ \ ";DAY$(I% MOD 7); : NEXT : LPRINT
4300    D%=0 : RETURN
4497 '
4498 ' Print non-blank dates for year
4499 '
4500    LPRINT BASE$ " calendar for " YEAR$
4510    LPRINT : LPRINT : M%=1
4520    FOR I%=1 TO DAYS%(12)
4530            GET £1,I%+1 : IF I%>DAYS%(M%) THEN M%=M%+1 : LPRINT
4540            IF SPEC$+INFO1$+INFO2$+INFO3$=SPACE$(64) THEN 4570
4550            LPRINT USING "\         \  ££    "; MONTH$(M%);I%-DAYS%(M%-1);
4560            LPRINT INFO1$ "  " INFO2$ "  " INFO3$ "  " SPEC$
4570    NEXT : RETURN
4997 '
4998 ' Display year planner, showing first two characters only
4999 '
5000    PRINT CLRALL$ LINON$ CUROFF$; : GET £1,1
5010    FOR M%=1 TO 12 : PRINT FNC$(M%+M%-1,1) HION$ LEFT$(MONTH$(M%),3);
5020            GOSUB 1100 : PRINT " " HIOFF$ STRING$(D%+D%-2,177) HION$;
5030            FOR DAY%=1 TO D%(M%) : PRINT USING "££";DAY%; : NEXT
5040            PRINT HIOFF$ STRING$(2*(38-D%-D%(M%)),177)
5050            PRINT "    " UNDON$ STRING$(D%+D%-2,177) HION$;
5060            FOR DAY%=1 TO D%(M%)
5070                    GET £1 : IF KEY%=7 THEN INFO$=SPEC$ ELSE INFO$=INFO1$
5080                    PRINT USING "\\";INFO$;
```

PROGRAM FILE

```
5090            NEXT : PRINT HIOFF$ STRING$(2*(38-D%-D%(M%)),177) UNDOFF$;
5100    NEXT : PRINT FNCS(25,5) HION$;
5110    FOR I%=0 TO 36 : PRINT USING "\\";DAY$(I% MOD 7); : NEXT : PRINT HIOFF$
5120    PRINT REVON$; : PRINT USING "\ \";YEAR$; : PRINT REVOFF$ LINOFF$;
5127 '
5128 ' Reverse video weekends and un-highlight alternate weekdays
5129 '
5130    DEF SEG=&HF000 : FOR M%=1 TO 5
5140            START%=(M%-1)*14+4 : ATTR%=64 : GOSUB 5500
5150            START%=START%+2 : GOSUB 5500
5160            ATTR%=192 : GOSUB 5500': GOSUB 5500
5170            ATTR%=64 : GOSUB 5500
5180    NEXT : START%=START%+2 : GOSUB 5500
5190    A$=INPUT$(1) : PRINT CURON$ : DEF SEG : D%=0 : RETURN
5497 '
5498 ' Mark next two columns
5499 '
5500    GOSUB 5510
5510    START%=START%+1
5520    FOR XP%=START% TO 2000 STEP 80
5530            XX%=XP%+XP%-1 : IF PEEK(XX%-1)=21 THEN 5550
5540            POKE XX%,(PEEK(XX%) OR ATTR%)
5550    NEXT : RETURN
5997 '
5998 ' Define graphics and prompts
5999 '
6000    SCREEN$=CLRALL$+HION$+REVON$+FNCENTRE$(1,"  D I A R Y  ")+REVOFF$
6010    RESTORE 60000 : FOR I%=0 TO 6 : READ DAY$(I%) : NEXT : SEP$=REVOFF$+"  "+REVON$
6020    PMT1$="  Help  "+SEP$+"  Quit  "+SEP$+"  Edit  "+SEP$+" P.plan  "+SEP$+
        " P.list  "+SEP$+" D.plan  "+SEP$+" D.splan "
6030    PMT1$=LINON$+"  "+REVON$+PMT1$+REVOFF$+LINOFF$
6040    PMT2$="  Enter month required or type 'SPECIAL'  "
6050    PMT2$=LINON$+REVON$+FNCENTRE$(25,PMT2$)+REVOFF$+LINOFF$
6060    FOR I%=0 TO 6 : PMT3$=PMT3$+LEFT$(DAY$((I%+5) MOD 7)+SPACE$(5),11) : NEXT
6070    PMT3$=LINON$+REVON$+"  "+PMT3$+REVOFF$+LINOFF$
6080    P1$=FNCS(21,46)+EREOL$+REVON$+UNDON$+"F1-Help  "+UNDOFF$+SEP$+UNDON$+
        "F4-Print  "+UNDOFF$+SEP$+UNDON$+"F6-Left  "
6090    P2$=FNCS(22,46)+EREOL$+"F2-Abort "+UNDOFF$+SEP$+UNDON$+"F5-Restore"+
        UNDOFF$+SEP$+UNDON$+"F7-Right "  '
6100    P3$=FNCS(23,46)+EREOL$+"F3-Save  "+REVOFF$+UNDOFF$
6110    P4$=FNCS(24,46)+EREOL$+" Cursor keys move between days"
6120    V$=CHR$(179)+SPACE$(10) : V$=V$+V$+V$+V$+V$+CHR$(186)+SPACE$(10)+V$+CHR$(186)
6130    VN$=UNDON$+V$+UNDOFF$ : L$="|"+STRING$(16,"-") : L$=L$+L$+L$+L$+L$+L$+L$+"|"
6140    FOR I%=1 TO 12 : READ MONTH$(I%) : NEXT : RETURN
6497 '
6498 ' Get number of days before start of each month for this year
6499 '
6500    RESTORE 60020 : DAYS%(0)=0
6510    FOR I%=1 TO 12
6520            READ D%(I%) : DAYS%(I%)=DAYS%(I%-1)+D%(I%)
6530    NEXT : IF Y%<100 THEN Y%=1900+Y%
6540    IF Y% MOD 4>0 THEN RETURN
6550    IF Y% MOD 400=0 THEN 6570
6560    IF Y% MOD 100=0 THEN RETURN
6570    D%(2)=29 : FOR I%=2 TO 12 : DAYS%(I%)=DAYS%(I%)+1 : NEXT : RETURN
6997 '
6998 ' Convert x$ to upper case
6999 '
7000    XL%=LEN(X$) : X%=1
7010    WHILE X%<=XL% : MID$(X$,X%,1)=FNUP$(MID$(X$,X%,1)) : X%=X%+1 : WEND
7020    RETURN
7997 '
7998 ' Help screens
7999 '
8000 PRINT SCREEN$ : PRINT : PRINT : D%=0
8010 PRINT "Press:-" : PRINT : PRINT
8020 PRINT "'Edit'    to add information to the diary.  When asked for a month, enter "
8030 PRINT "          either the month number or a few letters of the name, or type"
8040 PRINT "          'Special' to add information to the special line" : PRINT
8050 PRINT "'Quit'    to exit from the program" : PRINT
8060 PRINT "'P.plan'  for a hard copy of the year planner" : PRINT
8070 PRINT "'P.list'  to print out a list of all dates with entries" : PRINT
8080 PRINT "'D.plan'  to display year planner showing first two letters for each day,"
8090 PRINT "          then press <space> to return to command mode" : PRINT
8100 PRINT "'D.splan' to display year planner showing first two letters of special"
8110 PRINT "          dates, press <space> to return"
8120 PRINT LINON$ REVON$ FNCENTRE$(25," Press space when ready  ") REVOFF$
8130 WHILE INPUT$(1)<>" " : WEND : PRINT CLS$ LINOFF$ : RETURN
8500 PRINT SCREEN$ : PRINT : PRINT
8510 PRINT "Move to the right date using the cursor keys, then enter text as required,"
8520 PRINT "the box will scroll if neccessary to allow 16 characters for each line.  If"
8530 PRINT "there is already an entry on a line, pressing <return> will move to the next"
8540 PRINT "line without destroying any information." : PRINT : PRINT
8550 PRINT "The function keys act as follows:-" : PRINT
8560 PRINT "'Abort'   forgets any changes to this month and returns to command mode"
8570 PRINT "'Save'    saves the current data for the month and returns to command mode"
8580 PRINT "'Print'   prints a copy of the current data for this month only"
8590 PRINT "'Restore' gets the original contents of the cursor box from the disk"
8600 PRINT "'Left'    scrolls cursor box to the left"
8610 PRINT "'Right'   scrolls to the right"
8620 GOSUB 8120 : GOSUB 2000 : RETURN
9997 '
9998 ' Initialise file
9999 '
10000   PRINT FNCS(15,15) "Creating a new diary called " BASE$ YEAR$
10010   FOR I%=2 TO DAYS%(12)+1
10020           LSET SPEC$="" : LSET INFO1$="" : LSET INFO2$="" : LSET INFO3$=""
10030           PUT #1,I%
10040   NEXT
10097 '
10098 ' Get repeating days from data
10099 '
10100   RESTORE 61000 : READ M%,D%,INFO$
10110   WHILE D%<>0
10120           GET #1,1+DAYS%(M%-1)+D% : LSET SPEC$=INFO$ : PUT #1,1+DAYS%(M%-1)+D%
10130           READ M%,D%,INFO$
10140   WEND
10197 '
10198 ' Work out and add Easter & related dates
10199 '
10200   RESTORE 60500 : FOR I%=1 TO 28 : READ GN%(I%) : NEXT
10210   GN%=(Y%+1) MOD 19 : IF GN%=0 THEN GN%=19
10220   IF Y%<2100 THEN SL%=6 ELSE SL%=5
10230   SL%=(INT(1.25*Y%)+SL%) MOD 7 : I%=1 : FOUND%=NO%
10240   WHILE NOT FOUND% AND I%<29
10250           IF GN%=GN%(I%) THEN FOUND%=YES% ELSE I%=I%+1
10260   WEND : IF NOT FOUND% THEN PRINT "Data error at line 60500" : STOP
10270   D%=(13-SL%-(I%+1) MOD 7) MOD 7 : IF D%=0 THEN D%=7
10280   D%=21+I%+D% : IF D%>31 THEN D%=D%-31 : M%=4 ELSE M%=3
10300   INFO$="Easter Day" : GOSUB 10500 : D%=D%-2 : IF D%<1 THEN D%=D%+31 : M%=3
10310   INFO$="Good Friday" : GOSUB 10500 : D%=D%-19 : IF D%<1 THEN D%=D%+31 : M%=3
10320   INFO$="Mothers Day" : GOSUB 10500 : D%=D%-25
10330   IF M%=3 THEN IF D%<1 THEN D%=D%+28 : M%=2 : D%=D%-(DAYS%(12)=366)
10340   IF M%=4 THEN IF D%<1 THEN D%=D%+31 : M%=3
```

```
10350   INPO$="Ash Wed." : GOSUB 10500 : D%=D%-1 : IF D%=0 THEN D%=28-(DAYS%(12)=366) : M%=2
10360   INPO$="Shrove Tue." : GOSUB 10500 : RETURN
10500   GET £1,1+DAYS%(M%-1)+D%
10510   IF SPEC$=SPACE$(16) THEN LSET SPEC$=INPO$ ELSE LSET INPO1$=INPO$
10520   PUT £1,1+DAYS%(M%-1)+D% : RETURN
10997 '
10998 ' Allow for other details like holidays etc.
10999 '
11000   PRINT SCREEN$ PNC$(5,1) "Enter special details -" : DONE%=NO%
11010   PRINT REVON$ LINON$ PNCENTRE$(25," Press return to stop ") REVOFF$ LINOFF$;
11020   WHILE NOT DONE% : PRINT
11030         INPUT "Month number      ";M% : IF M%<1 OR M%>12 THEN DONE%=YES% : GOTO 11060
11040         INPUT "Day               ";D% : IF D%<1 OR DAY%>D%(M%) THEN 11030
11050         INPUT "Note              ";INPO$ : GOSUB 10500
11060   WEND : PRINT SCREEN$ : RETURN
59997 '
59998 ' Data block
59999 '
60000   DATA Wednesday,Thursday,Friday,Saturday,Sunday,Monday,Tuesday
60010   DATA JANUARY,FEBRUARY,MARCH,APRIL,MAY,JUNE,JULY,AUGUST,
        SEPTEMBER,OCTOBER,NOVEMBER,DECEMBER
60020   DATA 31,28,31,30,31,30,31,31,30,31,30,31
60499 ' next line is used to fix Easter
60500   DATA 14,3,0,11,0,19,8,0,16,5,0,13,2,0,10,0,18,7,0,15,4,0,12,1,0,9,17,6
60999 ' following is for repeating dates - birthdays, anniversaries eg:
61000   DATA 1,1,New years day,2,14,Valentine's day,3,17,St Patrick
61010   DATA 4,23,St George,7,15,St Swithin,10,31,Halloween,11,30,St Andrew
61020   DATA 12,25,Christmas day,12,26,Boxing day,12,31,New years eve
61989 ' next line finishes list
61990   DATA 0,0,""
```

BBC Logic Tester

by Anthony Philips

This is an educational program intended to provide a method of testing the understanding of simple logic circuits. It has been tested by students on A Level courses in Physics and Physics with Mathematics.

The user is asked to follow through a simple series of logic gates and predict the output at each point, given the initial input. A random series of AND, OR and NOT gates are generated, with a random set of input states for the initial gates. The user then has to give the output state for each gate, ending up with the final gate. The program marks the answers, and gives the option to try again or display the correct answers.

Each circuit is displayed with three different sets of input, and then a new circuit is generated.

Full instructions are given with the program.

```
  10 *FX225,128
  20 MODE4
  30DIMSPX(8),SPY(8)
  40DIMG(9,24),A$(9)
  50DIMGATE(8),B(16)
  60PROCINIT
  70 *FX15,1
  80 PRINT"DO YOU WANT THE INSTRUCTIONS              (ENTER Y OR N)"
  90 A$=GET$
 100 IFA$="Y"THENPROCINST:GOTO120
 110 IFA$<>"N"THEN90
 120 CLS
 130 PRINTTAB(18,2);"LOGIC";TAB(18,3);"TEST";TAB(18,5);"A.PHILLIPS";TAB(18,6);"
(c) 1985."
 140*FX15,1
 150*FX138,0,128
 160PROCFKEY
 170FORI=1TO4
 180A=(RND(1)*100)
 190IFA>75THENPROCSETOR:GOTO230
 200IFA>50THENPROCSETAND:GOTO230
 210IFA>25THENPROCSETINV:GOTO230
 220PROCNOGATE
 230PROCDGATE(SPX(I),SPY(I),GATE(I))
 240NEXTI
 250FORI=5TO7
 260A=RND(1)*50
 270IFA>25THENPROCSETOR:GOTO290
 280PROCSETAND
 290PROCDGATE(SPX(I),SPY(I),GATE(I))
 300NEXT
 310I=8
 320IFRND(1)>.6THENPROCSETINV:GOTO340
 330PROCNOGATE
 340PROCDGATE(SPX(8),SPY(8),GATE(8))
 350PROCLINKS
 360IC=65
 370FORI=1TO4
 380IFGATE(I)=1ORGATE(I)=2THEN400
 390GOTO430
 400G1$=G1$+CHR$(IC)+" "+CHR$(IC+1)
 410IC=IC+2
 420GOTO450
 430G1$=G1$+" "+CHR$(IC)+" "
 440IC=IC+1
 450G1$=G1$+" "
 460NEXTI
 470NIP=IC-65
 480CT=6
 490ICS=IC
 500IFGATE(8)=3THENCT=7
 510CNT=3
 520REPEAT
 530IC=ICS
 540RESTORE3290
 550FORI=1TOCT
 560READTX,TY
 570PRINTTAB(TX,TY);CHR$((I-1)+IC)
 580NEXTI
 590IC=IC+CT
```

MICROMART

PROGRAM FILE

```
600IFCT=7ANDNIP=8THENH$="P"ELSEH$="O"
610PRINTTAB(27,9);H$
620FORI=1TOLEN(G1$)
630PRINTTAB(1,I+1);MID$(G1$,I,1)
640 NEXT
650FORI=1TONIP:PRINTTAB(9+((I-1)*2),20);CHR$(64+I);:NEXT
660FORI=1TO(IC-NIP-65)
670PRINTTAB(9+((I-1)*2),24);CHR$(I+NIP+64);
680NEXT
690PRINTTAB(9,27);H$
700 PROCBL(0)
710 A=INT(RND(1)*2^NIP)
720 PROCGIP(A)
730CV=1
740FORI=1TO4
750IFGATE(I)=1THENPROCGOR(B(CV),B(CV+1))
760IFGATE(I)=2THENPROCGAND(B(CV),B(CV+1))
770IFGATE(I)=3THENPROCGINV(B(CV)):CV=CV-1
780IFGATE(I)=4THENR=B(CV):CV=CV-1
790CV=CV+2
800B(8+I)=R
810NEXT
820CV=9
830FORI=5TO7
840IFGATE(I)=1THENPROCGOR(B(CV),B(CV+1))ELSEPROCGAND(B(CV),B(CV+1))
850CV=CV+2
860B(I+8)=R
870NEXT
880B(16)=-1
890IFGATE(8)=3THENPROCGINV(B(15)):B(16)=R
900 FORI=1TONIP:PRINTTAB(9+((I-1)*2),21);B(I);:NEXT
910GOTO930
920PRINTTAB(8,25);"                    ";TAB(8,28);"          ";
925PROCBL(0)
930X=8:L=25
940PRINTTAB(X,L);
950Z=CT
960Z1=Z
970PRINTTAB(X,L);">";
980 PROCFKEY
990IFASC(A$)=127THEN1120
1000IFASC(A$)=48THEN1030
1010IFASC(A$)=49THEN1030
1020GOTO980
1030PRINTTAB(X,L);" ";A$
1040A$(Z1-Z+1)=A$
1050X=X+2
1060Z=Z-1
1070IFZ>0THEN970
1080A$=GET$
1090IFASC(A$)=13THEN1180
1100IFASC(A$)=127THEN1120
1110GOTO1080
1120PRINTTAB(X,L);"  ";
1130X=X-2
1140Z=Z+1
1150IFZ>Z1 THEN Z=Z1:X=19
1160PRINTTAB(X,L);"  ";TAB(X,L);
1170GOTO970
1180PROCBL(2)
1190PRINTTAB(8,28);"> ";CHR$(127);
1200PROCFKEY:B$=A$
1210IFA$="1"ORA$="0"THENPRINTA$;:GOTO1230
1220GOTO1200
1230 A$=GET$
1240IFASC(A$)=127THEN1180
1250IFASC(A$)<>13THEN1230
1260 PRINTTAB(10,25);
1270 CR=0
1280 FORI=1TOCT
1290 P$="x"
1300 IFVAL(A$(I))=B(I+8)THENP$=CHR$230ELSECR=CR+1
1310 PRINTTAB(10+((I-1)*2),25);P$
1320 NEXT
1330P$="x"
1340Z=0
1350IFVAL(B$)=B(9+CT)THENP$=CHR$230:Z=1
1360PRINTTAB(10,28);P$
1370 PROCBL(1)
1380IFZ=1ANDCR=0THENPRINTTAB(1,30);"WELL DONE, ALL CORRECT";:GOTO1580
1390IFZ=1ANDCR<>0THENPRINTTAB(1,30);"LUCKY GUESS ON THE FINAL STATE!"
1400IFZ=0ANDCR=0THENPRINTTAB(1,30);"PRESS THE WRONG KEY HUH?"
1410IFZ<>1ANDCR<>0THENPRINTTAB(1,30);"SORRY, YOU DIDN'T DO TOO WELL..."
1420PROCBL(6)
1430A$=GET$
1440IFA$="R"THENPROCBL(1):GOTO920
1450IFA$<>" "THEN1430
1460RESTORE3290
1470FORI=1TOCT
1480READTX,TY
1490PRINTTAB(TX,TY);CHR$(B(I+8)+48);
1500NEXT
1510GH=1:FORI=1TOLEN(G1$)
1520IFMID$(G1$,I,1)=" "THEN1540
1530PRINTTAB(1,I+1);CHR$(B(GH)+48);:GH=GH+1
1540NEXT
1550PROCBL(1)
1560OP=B(16):IFB(16)=-1THENOP=B(15)
1570PRINTTAB(27,9);OP
1580IFCNT=1THENPROCBL(5):GOTO1600
1590 IFCNT=2THENPROCBL(4)ELSEPROCBL(3)
1600 REPEAT UNTIL GET$=" "
1610 FORI=0TO14:PRINTTAB(I+8,25);" ";TAB(I+8,28);" ";:NEXT
1620 PROCBL(1)
1630 CNT=CNT-1
1640 UNTILCNT<1
1650CLS
1660TIME=0:REPEAT UNTIL TIME>125
1670RUN
1680DEFPROCSETOR
1690GATE(I)=1
1700ENDPROC
1710DEFPROCSETAND
1720GATE(I)=2
1730ENDPROC
1740DEFPROCSETINV
1750GATE(I)=3
1760ENDPROC
1770DEFPROCNOGATE
1780GATE(I)=4
1790ENDPROC
1800DEFPROCDGATE(GX,GY,GN)
1810FORDX=1TO3
1820FORDY=0TO2
```

PROGRAM FILE

```
1830PRINTTAB(GX+DX,GY+DY);CHR$(G(((DY*3)+DX),GN));
1840NEXTDY
1850NEXTDX
1860ENDPROC
1870DEFPROCINIT
1880*FX20,1
1890RESTORE
1900FORI=1TO8:READSPX(I),SPY(I):NEXT
1910DATA4,2,4,6,4,10,4,14,10,4,10,12,15,8,21,8
1920FORI=1TO24
1930FORJ=1TO9
1940READG(J,I)
1950NEXTJ
1960NEXTI
1970DATA200,201,202,203,32,204,205,206,207
1980DATA208,209,210,211,32,212,213,214,215
1990DATA216,217,32,218,219,220,221,222,32
2000DATA32,32,32,223,223,223,32,32,32
2010DATA223,223,223,32,32,32,223,223,223
2020DATA223,224,32,32,225,223,32,32,32
2030DATA32,226,223,223,227,32,32,32,32
2040DATA223,224,32,32,228,32,32,228,32
2050DATA32,32,225,32,32,32,32,32,226
2060DATA32,228,32,32,228,32,223,227,32
2070DATA65,228,66,223,229,223,48,228,48
2080DATA48,228,49,49,228,48,49,228,49
2090DATA228,79,32,229,223,32,228,48,32
2100DATA228,48,32,228,48,32,228,49,32
2110DATA228,49,32,228,49,32,228,49,32
2120DATA65,228,79,223,229,223,48,228,49
2130DATA49,228,48,32,32,32,32,32,32
2140DATA32,65,223,32,32,32,32,66,223
2150DATA32,32,32,223,79,32,32,32,32
2160DATA32,32,32,78,79,84,32,32,32
2170DATA32,32,32,65,78,68,32,32,32
2180DATA32,32,32,32,79,82,32,32,32
2190DATA32,32,32,32,32,32,32,32,32
2200DATA32,32,32,32,65,223,32,32,32
2210*FX20,1
2220VDU23,200,&FE,&47,&20,&F0,&10,8,8,8
2230VDU23,201,0,0,&E0,&18,6,3,0,0
2240VDU23,202,0,0,0,0,0,&80,&40,&30
2250VDU23,203,&C,4,4,2,2,4,4,&C
2260VDU23,204,8,4,2,1,1,2,4,8
2270VDU23,205,8,8,8,&F0,&10,&20,&47,&FE
2280VDU23,206,0,0,3,6,&18,&E0,0,0,0
2290VDU23,207,&30,&40,&80,0,0,0,0,0
2300VDU23,208,7,4,4,&FC,4,4,4,4
2310VDU23,209,&FE,1,0,0,0,0,0,0
2320VDU23,210,0,&80,&40,&20,&10,8,4,2
2330VDU23,211,4,4,4,4,4,4,4,4
2340VDU23,212,2,1,1,1,1,1,1,2
2350VDU23,213,4,4,4,&FC,4,4,4,7
2360VDU23,214,0,0,0,0,0,0,1,&FE
2370VDU23,215,2,4,8,&10,&20,&40,&80,0
2380VDU23,216,6,5,4,4,4,4,4,4
2390VDU23,217,0,0,&80,&40,&20,&10,8,4
2400VDU23,218,4,4,4,&FC,4,4,4,4
2410VDU23,219,2,1,0,0,0,0,1,2
2420VDU23,220,0,&1C,&A2,&41,&41,&A2,&1C,0
2430VDU23,221,4,4,4,4,4,4,5,6
2440VDU23,222,4,8,&10,&20,&40,&80,0,0
2450VDU23,223,0,0,0,&FF,0,0,0,0
2460VDU23,224,0,0,0,&F0,&10,&10,&10,&10
2470VDU23,225,&10,&10,&10,&10,&1F,0,0,0
2480VDU23,226,0,0,0,&1F,&10,&10,&10,&10
2490VDU23,227,&10,&10,&10,&10,&F0,0,0,0
2500VDU23,228,&10,&10,&10,&10,&10,&10,&10,&10
2510VDU23,229,&10,&10,&10,&FF,&10,&10,&10,&10
2520 VDU23,230,0,1,2,4,8,&10,&A0,&40
2530ENDPROC
2540DEFPROCLINKS
2550PROCDGATE(7,3,6)
2560PROCDGATE(7,11,6)
2570PROCDGATE(7,6,7)
2580PROCDGATE(7,14,7)
2590PROCDGATE(12,8,9)
2600PROCDGATE(13,5,8)
2610PROCDGATE(13,11,10)
2620PROCDGATE(18,8,4)
2630PROCDGATE(24,8,4)
2640PRINTTAB(25,16);"TABLE SELECTION"
2650 PRINTTAB(28,18);"f0= OR GATE"
2660 PRINTTAB(28,19);"f1=AND GATE"
2670 PRINTTAB(28,20);"f2=NOT GATE"
2680PRINTTAB(29,22);CHR$230;"= CORRECT"
2690PRINTTAB(29,23);"x= WRONG"
2700X=1
2710FORI=1TO4
2720IFGATE(I)=3ORGATE(I)=4THENGN=4ELSEGN=5
2730PROCDGATE(X,(((I-1)*4)+2),GN)
2740NEXT
2750PRINTTAB(1,20);"INPUTS:";TAB(1,21);"STATES:"
2760PRINTTAB(1,24);"OTHERS:";TAB(1,25);"STATES:"
2770 PRINTTAB(1,27);"FINAL :";TAB(1,28);"STATE :"
2780ENDPROC
2790DEFPROCFKEY
2800A$=INKEY$(0)
2810IFASC(A$)=128THENRESTORE2900:GOTO2860
2820IFASC(A$)=129THENRESTORE2960:GOTO2860
2830IFASC(A$)=130THENRESTORE2980:GOTO2860
2840IFASC(A$)=-1THEN2930
2850GOTO2930
2860FORP=1TO8
2870READTX,TY,GN
2880TX=TX-3
2890PROCDGATE(TX,TY,GN)
2900NEXT
2910PRINTTAB(29,1);"TRUTH TABLE"
2920PRINTTAB(35,3);"GATE"
2930ENDPROC
2940DATA33,2,22,32,5,18,35,5,1,38,5,19
2950DATA34,9,11,37,9,13,34,12,12,37,12,15
2960DATA33,2,21,32,5,18,35,5,2,38,5,19
2970DATA34,9,11,37,9,13,34,12,12,37,12,14
2980DATA33,2,20,32,5,24,35,5,3,38,5,19
2990DATA34,9,16,37,9,23,34,12,17,37,12,23
3000DEFPROCGAND(A,B)
3010R=A AND B
3020R$=CHR$(R+48)
3030ENDPROC
3040DEFPROCGOR(A,B)
3050R=A OR B
3060R$=CHR$(R+48)
```

PROGRAM FILE

```
3070ENDPROC
3080DEFPROCGINV(A)
3090R=0
3100IFA=0THENR=1
3110R$=CHR$(R+48)
3120ENDPROC
3130DEFPROCGNAND(C,D)
3140PROCGAND(C,D)
3150PROCGINV(R)
3160ENDPROC
3170DEFPROCGNOR(C,D)
3180PROCGOR(C,D)
3190PROCGINV(R)
3200ENDPROC
3210DEFPROCGIP(N)
3220FORI=7TO0STEP-1
3230 Z=1
3240N=N-(2^I)
3250IFN<0THENN=N+2^I:Z=0
3260 B(I+1)=Z
3270NEXT
3280ENDPROC
3290DATA10,3,10,7,10,11,10,15,14,8,14,10,20,8
3300DEFPROCBL(M)
3310IFM=1THEN3390
3320IFM=2THEN3410
3330IFM=3THEN3430
3340IFM=4THEN3450
3350IFM=5THEN3470
3360IFM=6THEN3490
3370PRINTTAB(1,30);"ENTER ALL EXPECTED STATES EXCEPT FINAL  THEN PRESS RETURN";
3380GOTO3500
3390PRINTTAB(1,30);"
                   ";
3400GOTO3500
3410PRINTTAB(1,30);"ENTER OUTPUT STATE THEN PRESS RETURN
                   ";
3420GOTO3500
3430PRINTTAB(1,31);"PRESS SPACE BAR FOR NEXT TRY";
3440 GOTO3500
3450 PRINTTAB(1,31);"PRESS SPACE BAR FOR LAST TRY";
3460GOTO3500
3470PRINTTAB(1,31);"PRESS SPACE BAR FOR ANOTHER CIRCUIT";
3480GOTO3500
3490PRINTTAB(1,30);"PRESS SPACE BAR TO DISPLAY CORRECT      STATES OR R TO TRY
AGAIN";
3500ENDPROC
3510DEFPROCINST
3520 CLS
3530PRINT'"Instructions for logic test"
3540 PRINT'"The object of the exercise is to work   through the various stages
of a randomlychosen network of the three basic logic gates, AND,OR,NOT"
3550 PRINT'"I will select the series of gates and   then choose a random series
 of inputs,  you then enter the state at which you   think each intermediate sta
ge is.   You then predict the final output state."
3560 PRINT"I will then tell you how you did.       There will be three tests fo
r each      network then a new one will be built up."
3570 PRINT'"You may look at the truth tables for thegates in use and the tables
 are selectedby the function keys."
3580 PRINT''"Press the space bar for the next page"
3590 REPEAT UNTIL GET$=" "
3600 CLS
3610PRINT''"The first three function"'"keys select the truth"'"tables for the t
hree gates"'"in use"
3620PRINT'"These gates are as follows"
3630PROCDGATE(4,11,1)
3640 PROCDGATE(12,11,2)
3650 PROCDGATE(21,11,3)
3660 PRINTTAB(2,15);"OR GATE  AND GATE  NOT GATE"
3670PRINT'"Try the function keys for a bit until   you are ready to try the tes
ter."
3680*FX138,0,128
3690PRINT'"f0=OR GATE. f1=AND GATE"'"f2=NOT GATE."
3700 PRINT'"Entry of the states is by either        pressing 0 or 1 for each st
age.When you are happy all are correct, press the    return key.Delete can be us
ed to correctmistakes."
3710PRINT'"Entry of the final state is as above."''"Press the space bar to use
the tester.";
3720PROCFKEY
3730*FX15,1
3740REPEAT
3750PROCFKEY
3760UNTIL A$=" "
3770ENDPROC
```

Pascal Wall Calendar

by HM Keegan

This is a short program written in Pascal to print out a yearly calendar in either standard or academic year format. It is written in Hisoft Pascal for the Amstrad CPC464, but will easily convert to run on other Pascal compilers and machines. The program will produce a calendar for any year from 1985 to 9999, and output can be directed to a printer or the screen.

The only modifications which may be required are as follows:

Lines 67-71 are used to toggle control-P (chr(16), used to turn the printer on and off in Hisoft Pascal. This procedure can be replaced by the appropriate procedure in another compiler.

Lines 157-160 set up the screen display for the Amstrad. These statements are not strictly necessary, and can be deleted or amended if required.

Lines 63-64 are used to turn underlining on and off. The codes used here are for a Taxan Kaga printer and should be replaced if a different printer is used.

The program is carefully documented internally.

```
1 PROGRAM wallcalendar;          {PROGRAM BY H M KEEGAN}
2                                {WRITTEN IN HISOFT PASCAL}
```

PROGRAM FILE

```
  3 CONST bc='*';                    (FOR THE AMSTRAD CPC464)
  4
  5 TYPE
  6   months=(JAN,FEB,MAR,APR,MAY,JUN,JUL,AUG,SEP,OCT,NOV,DEC);
  7   monthlengths=28..31;
  8   years=1985..9999;
  9   week=1..7;
 10   switch=(off,on);
 11   montharray=ARRAY [1..18] OF char;
 12   caltype=(academic,normal);
 13
 14 VAR
 15   year       :years;
 16   firstday   :week;
 17   monthstring:montharray;
 18   printswitch:switch;
 19   key        :char;
 20   calendar   :caltype;
 21 {-------------------------------------------------------------------------}
 22 FUNCTION isleap(year:years):boolean;
 23
 24 BEGIN
 25  isleap:=(year MOD 4=0) AND (year MOD 100<>0) OR (year MOD 400=0);
 26 END;
 27 {-------------------------------------------------------------------------}
 28 FUNCTION numdays(month:months):week;
 29
 30 BEGIN
 31   CASE month OF
 32     JAN,MAR,MAY,JUL,AUG,OCT,DEC:numdays:=31;
 33     APR,JUN,SEP,NOV:numdays:=30;
 34     FEB:IF isleap(year+1-ord(calendar)) THEN numdays:=29 ELSE numdays:=28
 35   END;
 36 END;
 37 {-------------------------------------------------------------------------}
 38 FUNCTION day1:week;   {determine day OF week 1st day falls on}
 39
 40 VAR  yr:years;
 41      day:integer;
 42
 43 BEGIN
 44   IF calendar=normal THEN day:=6 ELSE day:=5;
 45   FOR yr:=1985 TO year DO
 46     IF isleap(yr-ord(calendar)) THEN day:=day+2 ELSE day:=day+1;
 47   day1:=(day MOD 7)+1;
 48 END;
 49 {-------------------------------------------------------------------------}
 50 PROCEDURE spaces(num:integer);
 51
 52 BEGIN
 53   WHILE num>0 DO
 54     BEGIN
 55       write(' '); num:=num-1;
 56     END;
 57 END;
 58 {-------------------------------------------------------------------------}
 59 PROCEDURE underline(uline:switch);
 60
 61 BEGIN
 62   IF printswitch=on THEN
 63     IF uline=on THEN write(chr(27),chr(45),chr(1)) {turn on underlining}
 64                 ELSE write(chr(27),chr(45),chr(0)) {turn off underlining}
 65 END;
 66 {-------------------------------------------------------------------------}
 67 PROCEDURE printer;
 68
 69 BEGIN
 70  write(chr(16));  {toggles CTRL-P}
 71 END;
 72 {-------------------------------------------------------------------------}
 73 PROCEDURE prtmonths(first,last:months);
 74
 75 VAR month:months;
 76     next:week;
 77
 78   PROCEDURE printmonth(daysinmonth:monthlengths);
 79
 80   VAR day:integer;
 81
 82     PROCEDURE pm(sp:integer; monthstring:montharray);
 83
 84     VAR k:integer;
 85
 86     BEGIN  {pm}
 87       spaces(sp); underline(on);
 88       k:=1;
 89       REPEAT
 90         write(monthstring[k]);
 91         k:=k+1;
 92       UNTIL monthstring[k]='.';
 93       underline(off); spaces(sp);
 94     END;
 95
 96   BEGIN  {printmonth}
 97     write(bc); spaces(10);
 98     CASE month OF
 99       JAN:pm(2,'J a n u a r y.....');
100       FEB:pm(1,'F e b r u a r y...');
101       MAR:pm(4,'M a r c h.........');
102       APR:pm(4,'A p r i l.........');
103       MAY:pm(6,'M a y.............');
104       JUN:pm(5,'J u n e...........');
105       JUL:pm(5,'J u l y...........');
106       AUG:pm(3,'A u g u s t.......');
107       SEP:pm(0,'S e p t e m b e r.');
108       OCT:pm(2,'O c t o b e r.....');
109       NOV:pm(1,'N o v e m b e r...');
110       DEC:pm(1,'D e c e m b e r...')
111     END;
112
113     spaces(49); writeln(bc); writeln; write(bc);
114     write('  Mon  Tue  Wed  Thu  Fri  Sat  Sun');
115     spaces(41); writeln(bc); writeln; write(bc);
116     spaces((firstday-1)*5);
117
118     FOR day:=1 TO daysinmonth DO
119       BEGIN
```

```
120          write(day:5);
121          IF ((day MOD 7)+firstday) MOD 7=1 THEN
122            BEGIN
123              spaces(41); writeln(bc);writeln; write(bc);
124            END;
125        END;
126        IF (firstday+daysinmonth) MOD 7=0 THEN next:=7
127                                          ELSE next:=(firstday+daysinmonth) MOD 7;
128        spaces(76-(next-1)*5); writeln(bc);
129        writeln; write(bc); spaces(76); writeln(bc); writeln;
130    END;
131
132 BEGIN {prtmonths}
133   FOR month:=first TO last DO
134     BEGIN
135       printmonth(numdays(month));
136       firstday:=next;
137     END;
138 END;
139 {-------------------------------------------------------------------------------}
140 PROCEDURE titles;
141
142 VAR I,J:integer;
143
144 BEGIN
145   FOR I:=1 TO 4 DO
146     BEGIN
147       write(bc);
148       FOR J:=1 TO 9 DO
149           BEGIN
150             write(year:4); write(year+1-ord(calendar):4);
151           END;
152     writeln(year:4,bc);
153     END;
154 END;
155 {-------------------------------------------------------------------------------}
156 BEGIN {main PROGRAM}
157   write(chr(4),chr(2));                    {mode 2}
158   write(chr(28),chr(0),chr(23),chr(23)); {paper}
159   write(chr(28),chr(1),chr(0),chr(0));   {pen}
160   write(chr(29),chr(23),chr(23));        {border}
161
162   writeln('           C A L E N D A R');
163   writeln('           ---------------'); writeln;
164
165   writeln; write('Enter year: '); read(year);
166
167   calendar:=normal;
168   writeln; write('Normal or Academic Calendar (N/A): ');
169   readln; read(key);
170   IF (key='A') OR (key='a') THEN calendar:=academic;
171
172   printswitch:=off;
173   writeln; write('Printer on? (Y/N): '); readln; read(key);
174   IF (key='Y') OR (key='y') THEN printswitch:=on;
175
176   IF printswitch=on THEN printer;
177   writeln; titles;
178   write(bc); spaces(76); writeln(bc); writeln;
179
180   firstday:=day1;
181   IF calendar=normal THEN prtmonths(JAN,DEC)
182     ELSE
183       BEGIN
184         prtmonths(SEP,DEC);
185         prtmonths(JAN,AUG);
186       END;
187
188   write(bc); spaces(76); writeln(bc); titles;
189   IF printswitch=on THEN printer;
190 END.
191 {-------------------------------------------------------------------------------}
```

BBC Multicolour

by Jonathan Temple

Have you ever looked enviously at other computers with all those different colours to choose from? This program provides the BBC Micro with about 28 new colours in mode 2, and will also work in modes 0 and 1.

To try the program, type in the listing, save it and then run it. This gives a demonstration of some of the new colours. To use the utility in your own programs, include PROCreplace and PROCassemble near the end of your program, and a line such as '10 PROCassemble' near the start.

The program works by colouring alternate pixels in different colours which blend together, creating new colours. Any areas on the screen of one of the normal colours can be replaced by one of the new colours.

To do this, use PROCreplace (0,C1,C2) where 0 is the old colour to replace, and C1, C2 are the two colours to mix to create the new colour. For example, to colour the whole screen orange, use:

```
COLOUR 129
CLS
PROCreplace (1,1,3)
```

Here 1 is red, the colour to replace, and 1 and 3 are red and yellow, combining to make orange.

```
10  REM                    MULTI-COL
20  REM          (C) Jonathan Temple
30  :
40  PROCassemble
50  MODE 2
```

```
 60  REPEAT
 70    PLOT 85,RND(1279),RND(1023)
 80    PROCreplace(7,RND(7),RND(7))
 90    UNTIL FALSE
100  END
110  :
120  DEFPROCreplace(S%,X%,Y%)
130  LOCAL A%,B%,M%,N%,R%
140  M%=?&355
150  IF M%>2 ENDPROC
160  R%=&C424-(M%=1)*2-(M%=2)*6
170  ?&70=R%?S%
180  A%=?&362
190  B%=?&363
200  !&71=0
210  FOR N%=1 TO (2-M%)*2
220    ?&71=?&71+(R%?X% AND A%)+(R%?Y% AND B%)
230    ?&72=?&72+(R%?Y% AND A%)+(R%?X% AND B%)
240    A%=A%/2
250    B%=B%*2
260    NEXT
270  !&A0A=&C53000AD
280  !&A13=&AD3000BD
290  CALL &A00
300  ENDPROC
310  :
320  DEFPROCassemble
330  FOR pass=0 TO 2 STEP 2
340    P%=&A00
350    [OPT pass
360    .loop
370    LDA &72
380    PHA
390    LDA &71
400    STA &72
410    PLA
420    STA &71
430    .screen
440    LDA &3000
450    CMP &70
460    BNE next
470    LDA &71
480    .store
490    STA &3000
500    .next
510    LDA screen+1
520    CLC
530    ADC #1
540    STA screen+1
550    STA store+1
560    LDA screen+2
570    ADC #0
580    STA screen+2
590    STA store+2
600    BPL loop
610    RTS
620    ]
630    NEXT
640  ENDPROC
650  :
660  REM Use PROCreplace(0,C1,C2) where
670  REM 0 is the colour to be replaced and
680  REM C1 and C2 are the colours to be mixed
```

Commodore 64 Jiffy Clock

by Jas & Kev

This program provides an interrupt-driven clock with timing in 1/10th-of-a-second intervals. It will be temporarily destroyed by certain machine code routines and screen-scrolling, but will return rapidly.

To change the time shown when the clock is running, reload the program and use RUN 700.

Follow the instructions given in the program exactly or it may crash.

```
  1 POKE53280,0:POKE53281,11:PRINT"■":C=0
  2 AP=25069:PA=2
  5 REM *** CHARACTERS FOR MAIN SCREEN ***
 10 DATA"■ JIFFY64 IS WRITTEN BY JAS & KEV 1985 "
 15 DATA"■ JIFFY IS AN INTERRUPT DRIVEN CLOCK..."
 16 DATA"■ SYS64738 & SYS8192:SYS33792 TO RUN.."
 18 REM *** READ IN CHARACTERS ***
 19 FORUY=1TO3
 20 READA$
 30 FORX=1TO38:L$=MID$(A$,X,1)
 40 PRINTTAB(X)L$"■■■■";:POKE646,15:FORT=1TO10 :NEXT:NEXT:NEXT
 41 REM *** M/CODE DATA ***
 42 DATA120,169,13,160,32,141,20,3
 43 DATA140,21,3,88,96,169,6,141
 44 DATA32,208,206,41,32,208,15,169
 45 DATA2,141,41,32,162,7,169,7
 46 DATA141,32,208,142,32,208,76,49
 47 DATA234,2,0
 48 FORI=0TO42:READA:POKEI+8192,A:NEXT
 49 SYS8192
 70 DATA173,166,2,240,10,169,128,13,14
 72 DATA221,141,14,221,48,8,169,127,45
 74 DATA14,221,141,14,221,169,127,45
 76 DATA15,221,141,15,221,173,208,195
 78 DATA41,128,141,208,195,173,209,195
 79 DATA32,28,197,13,208,195,141,11
 80 DATA221,173,210,195,32,28,197,141
 82 DATA10,221,173,211,195,32,28,197
 84 DATA141,9,221,169,0,141,8,221,120
 86 DATA173,20,3,141,214,195,173,21,3
```

PROGRAM FILE

```
 88 DATA141,215,195,169,76,141,20,3
 90 DATA169,196,141,21,3,88,96,120,173
 92 DATA214,195,141,20,3,173,215,195
 94 DATA141,21,3,88,96,173,216,195,201
 96 DATA6,240,3,76,8,197,169,255,141
 98 DATA216,195,173,213,195,240,243
100 DATA173,11,221,170,41,128,208,5
120 DATA169,1,76,111,196,169,16,141,38
140 DATA4,173,212,195,141,38,216,169
160 DATA13,141,39,4,173,212,195,141,39
180 DATA216,138,41,16,32,14,197,141,28
200 DATA4,173,212,195,141,28,216,138
220 DATA32,22,197,141,29,4,173,212,195
240 DATA141,29,216,169,58,141,30,4,173
260 DATA212,195,141,30,216,173,10,221
280 DATA170,32,14,197,141,31,4,173,212
300 DATA195,141,31,216,138,32,22,197
320 DATA141,32,4,173,212,195,141,32
340 DATA216,169,47,141,33,4,173,212
360 DATA195,141,33,216,173,9,221,170
380 DATA32,14,197,141,34,4,173,212,195
400 DATA141,34,216,138,32,22,197,141
420 DATA35,4,173,212,195,141,35,216
440 DATA169,46,141,36,4,173,212,195
460 DATA141,36,216,173,8,221,105,48
480 DATA141,37,4,173,212,195,141,37
500 DATA216,238,216,195,108,214,195,74
520 DATA74,74,74,24,105,48,96,41,15,24
540 DATA105,48,96,160,255,56,200,233
560 DATA10,176,251,105,10,141,217,195
580 DATA152,10,10,10,10,13,217,195,96
600 DATA42131:REM * DATA CHECK *
605 OP=0:L=AP*PA
606 REM *** INITIALIZE CLOCK & RUN ***
610 FORI=LTOL+343:READX:OP=OP+X:POKEI,X:NEXT
620 READX:IFOP<>XTHENPRINT"DATA ERROR!"OP
630 FORI=33792TO33792+2:READA:POKEI,A:NEXT
640 DATA76,218,195
700 PRINT" INPUT TIME "
710 INPUT" HOUR";HR
720 INPUT" SEC";SEC
730 INPUT" MIN";MIN
740 INPUT"COLOUR [illegible]";COL:NOP=50128
750 INPUT"AM/PM";A$
751 IFA$="AM"THENLOP=0:GOTO754
752 IFA$="PM"THENLOP=128:GOTO754
753 GOTO750
754 POKENOP,LOP
755 POKENOP+1,HR
756 POKENOP+2,MIN
757 POKENOP+3,SEC
758 POKENOP+4,COL
759 INPUT" DISPLAY Y/N?";P$
760 IFP$="Y"THENPOL=1:GOTO763
761 IFP$="N"THENPOL=0:GOTO763
762 GOTO760
763 POKENOP+5,POL
764 PRINT" SYS 33792 TO START CLOCK ":END

READY.
```

Atari IWDOS

by Paul Lay

This program will work on all 8-bit Atari computers with disk drives and 32k+ of memory. When typed in, the program should be saved as 'IWDOS'; it can then be executed by RUN 'D:IWDOS'. When run, the program displays six options that should be selected via the keys A through F. A roll-down menu will then appear, and an option can be selected from these using the cursor up and down keys but without using the control keys. The RETURN key will select an option.

All DOS commands are implemented, except for binary LOAD/SAVE and some of the duplicating options. Any option that requires a filename to be entered will accept the wildcards * and ?, and drive one will be assumed unless otherwise specified. As IWDOS sits above DOS and accesses DOS functions via the XIO command, it should be compatible with all versions of DOS.

Lines 10 — 330 contain the machine code routines to control the windows; these routines can be used in GRAPHICs mode 0. They are held in 642 bytes of memory located at the 30k boundary, and use the 29k to 30k area to store parts of the screen memory that become overlaid by a window. Three routines are available:

1) Open a window — this routine is located at address 30720 and takes the following form <var> = USR (30720,X,Y,A) where X and Y are the coordinates of the top left-hand corner of the window. The last parameter, A, is the address of a string containing the list of options to be presented in the window; this string should be in the form OPTION:OPTION:----::.

Different options are separated by the vertical bar character (SHIFT=) and the list is terminated by two of these. For example, A=ADR("Up:Down:Left:Right::")

I=USR(30720,5,5,A) will open a window at 5,5 with the given options. Note that this routine has no error detection, so make sure that the parameters you use make sense.

2) Select an option — this routine is located at address 31274 and takes the form <var> = USR(31274). It allows the

user to move the highlighted bar up and down, and make a selection from the previously opened window.

The option number selected will be returned in the variable <var> used to call the routine.

3) Close a window — this routine is located at address 31106 and takes the form <var> = USR(31106). It removes the open window from the screen and restores it to its previous state, as it was before the window was opened.

As the routines stand, only one window may be opened at a time, but the routines could be expanded to allow multiple open windows.

```
0 REM ** IWDOS (C)1985 By Paul Lay **
10 REM ** Window Routines M/C **
20 GRAPHICS 18:POKE 16,64:POKE 53774,64:POSITION 1,5:? #6;"o
ne moment please"
30 FOR I=30720 TO 31362:READ A:POKE I,A:NEXT I
40 DATA 104,104,104,141,127,121,104,104,141,126,121,165,88,1
41,129,122,165,89,141,130,122
50 DATA 162,40,173,129,122,24,109,126,121,141,129,122,144,3,
238,130,122,202,208,238,173
60 DATA 129,122,24,109,127,121,141,129,122,144,3,238,130,122
,104,141,125,121,104,141,124
70 DATA 121,169,0,133,207,169,108,133,208,172,124,121,132,20
3,172,125,121,132,204,160,0
80 DATA 140,126,121,140,127,121,140,128,121,177,203,230,203,
208,2,230,204,201,124,240,5
90 DATA 238,128,121,208,239,173,128,121,240,13,238,126,121,2
05,127,121,144,223,141,127,121
100 DATA 176,218,173,129,122,133,203,173,130,122,133,204,177
,203,32,207,121,169,81,145,203
110 DATA 200,162,0,177,203,32,207,121,169,82,145,203,200,232
,236,127,121,208,240,177,203
120 DATA 32,207,121,169,69,145,203,173,124,121,133,205,173,1
25,121,133,206,169,0,141,129
130 DATA 121,165,203,24,105,40,133,203,144,2,230,204,160,0,1
77,203,32,207,121,169,124
140 DATA 145,203,200,162,0,142,128,121,177,203,32,207,121,16
1,205,230,205,208,2,230,206
150 DATA 201,124,240,11,32,105,121,145,203,200,238,128,121,2
08,228,198,207,165,207,201,255
160 DATA 144,2,198,208,173,128,121,205,127,121,240,15,177,20
3,32,207,121,169,0,145,203
170 DATA 200,238,128,121,208,233,177,203,32,207,121,169,124,
145,203,238,129,121,173,129,121
180 DATA 205,126,121,240,3,76,190,120,165,203,24,105,40,133,
203,144,2,230,204,160,0
190 DATA 177,203,32,207,121,169,90,145,203,200,162,0,177,203
,32,207,121,169,82,145,203
200 DATA 200,232,236,127,121,208,240,177,203,32,207,121,169,
67,145,203,169,1,141,129,121
210 DATA 32,249,121,96,41,127,201,32,16,4,24,105,64,96,201,9
6,16,4,56,233,32,96,96,0,0,0,0,0
220 DATA 0,104,169,0,133,207,169,108,133,208,173,129,122,133
,203,173,130,122,133,204,169
230 DATA 0,141,129,121,160,0,32,229,121,145,203,200,162,0,32
,229,121,145,203,200,232
240 DATA 236,127,121,208,244,32,229,121,145,203,165,203,24,1
05,40,133,203,144,2,230,204
250 DATA 238,129,121,173,129,121,56,233,2,205,126,121,208,20
4,96,72,165,207,141,220,121
260 DATA 165,208,141,221,121,104,141,255,255,230,207,208,2,2
30,208,96,165,207,141,240,121
270 DATA 165,208,141,241,121,173,255,255,230,207,208,2,230,2
08,96,173,129,122,133,203,173
280 DATA 130,122,133,204,162,0,236,129,121,240,14,165,203,24
,105,40,133,203,144,2,230
290 DATA 204,232,208,237,162,0,160,1,177,203,73,128,145,203,
200,232,236,127,121,208,243
300 DATA 96,169,255,141,252,2,173,252,2,201,255,240,249,201,
12,240,55,201,14,240,6
310 DATA 201,15,240,22,208,230,32,249,121,206,129,121,208,6,
173,126,121,141,129,121,32
320 DATA 249,121,76,42,122,32,249,121,173,129,121,205,126,12
1,208,5,169,0,141,129,121
330 DATA 238,129,121,32,249,121,76,42,122,173,129,121,133,21
2,169,0,133,213,169,255,141,252,2,104,96,0,0
340 REM ** Draw Icons **
350 GRAPHICS 0:POKE 16,64:POKE 53774,64:POKE 709,0:POKE 710,
122:POKE 712,118:POKE 752,1:DIM F$(40),DIR$(300)
360 ? "  IWDOS Version 1.0 Copyright 1985"
370 FOR R=0 TO 1:FOR C=0 TO 2:COLOR 17:PLOT 2+12*C,1+6*R:COL
OR 5:PLOT 13+12*C,1+6*R:COLOR 3:PLOT 13+12*C,6+6*R
380 COLOR 26:PLOT 2+12*C,6+6*R:COLOR 18:PLOT 3+12*C,1+6*R:DR
AWTO 12+12*C,1+6*R:PLOT 3+12*C,6+6*R
390 DRAWTO 12+12*C,6+6*R:COLOR 124:PLOT 2+12*C,2+6*R:DRAWTO
2+12*C,5+6*R:PLOT 13+12*C,2+6*R:DRAWTO 13+12*C,5+6*R
400 FOR IR=0 TO 3:FOR IC=0 TO 2:READ A:COLOR A:PLOT 3+12*C+I
C,2+6*R+IR:NEXT IC:NEXT IR:FOR I=0 TO 2:READ F$
410 POSITION 7+12*C,3+6*R+I:? F$:NEXT I:POSITION 12+12*C,2+6
*R:? CHR$(193+C+3*R):NEXT C:NEXT R
420 DATA 160,160,160,160,148,174,160,252,160,13,13,13,Disc,M
enu,,17,18,5,124,160,124,124,149,124,11,149,12
430 DATA Cart,Contrl,,160,160,10,160,160,160,160,160,160,149
,149,149,File,Utils,,160,160,160,160,148,174,160
440 DATA 252,160,13,13,13,Disc,Utils,,8,149,10,32,8,136,32,1
49,32,32,149,32,Help,,,8,32
450 DATA 10,138,160,136,32,160,32,32,149,32,Copy,Utils,
460 REM ** Main Program **
470 GOSUB 1250:IF C<65 OR C>70 THEN 470
480 ON C-64 GOSUB 490,620,680,780,900,980:GOTO 470
490 REM ** Disc Menu **
500 A=ADR("Exit|Drive #1 Directory|Drive #2 Directory|Drive
#3 Directory|Drive #4 Directory||")
510 I=USR(30720,3,6,A)
520 N=USR(31274):IF N=1 THEN 580
530 F$="D?:*.*":F$(2,2)=STR$(N-1):TRAP 610:OPEN #2,6,0,F$:TR
AP 590
540 DIR$=" Disk Drive #? Directory| |":DIR$(14,14)=STR$(N-1)
:C=0:ERR=0
550 INPUT #2,F$:DIR$(LEN(DIR$)+1)=F$:DIR$(LEN(DIR$)+1)="|":C
=C+1:IF C<10 THEN 550
560 GOSUB 1340
570 I=USR(31106):I=USR(30720,3,6,ADR(DIR$)):GOSUB 1310:IF  N
OT ERR THEN 540
580 CLOSE #2:I=USR(31106):RETURN
```

PROGRAM FILE

```
590 IF C=0 THEN 580
600 ERR=1:GOTO 560
610 TRAP 520:CLOSE #2:GOTO 520
620 REM ** Cart Contrl **
630 A=ADR("Exit|Return To Basic|Atari Dos||"):I=USR(30720,9,
6,A):N=USR(31274):I=USR(31106)
640 ON N GOTO 650,660,670
650 RETURN
660 GRAPHICS 0:POP :NEW
670 POP :DOS
680 REM ** File Utils **
690 A=ADR("Exit|Delete File|Rename File|Protect File|Unprote
ct File||"):I=USR(30720,21,6,A)
700 N=USR(31274):IF N=1 THEN 760
710 POSITION 2,21:ON N-1 GOSUB 720,730,740,750:GOTO 760
720 ? "Delete, enter filename.":GOSUB 1100:GOSUB 1210:TRAP 7
70:XIO 33,#2,0,0,F$:GOSUB 1200:RETURN
730 ? "Rename, enter Dn:OLDNAME,NEWNAME.":GOSUB 1100:GOSUB 1
210:TRAP 770:XIO 32,#2,0,0,F$:GOSUB 1200:RETURN
740 ? "Protect, enter filename.":GOSUB 1100:GOSUB 1210:TRAP
770:XIO 35,#2,0,0,F$:GOSUB 1200:RETURN
750 ? "Unprotect, enter filename.":GOSUB 1100:GOSUB 1210:TRA
P 770:XIO 36,#2,0,0,F$:GOSUB 1200:RETURN
760 I=USR(31106):RETURN
770 GOSUB 1200:GOTO 700
780 REM ** Disc Utils **
790 A=ADR("Exit|Format Drive #1|Format Drive #2|Format Drive
#3|Format Drive #4|Save 'IWDOS'||")
800 I=USR(30720,3,12,A)
810 N=USR(31274):IF N=1 THEN 870
820 IF N=6 THEN 890
830 POSITION 2,21:? "Are you sure (y/n)?";? ">_";CHR$(30);
840 GOSUB 1250:IF C<>78 AND C<>89 THEN 840
850 ? CHR$(C);:IF C=78 THEN 880
860 F$="D?:":F$(2,2)=STR$(N-1):TRAP 880:XIO 254,#2,0,0,F$:GO
SUB 1200
870 I=USR(31106):RETURN
880 GOSUB 1200:GOTO 810
890 TRAP 810:SAVE "D:IWDOS":GOTO 870
900 REM ** Help **
910 DIR$="      Instructions| |Select an icon via the|A to F
keys and a window|will pull down with the|"
920 DIR$(94)="first option highlighted.|":GOSUB 1340
930 I=USR(30720,7,12,ADR(DIR$)):GOSUB 1310:DIR$(22)="Use the
? & ? keys to|move the highlighted||"
940 DIR$(65)="bar up & down through the|options available.|"
:DIR$(30,30)=CHR$(28):DIR$(34,34)=CHR$(29):GOSUB 1340
950 I=USR(31106):I=USR(30720,7,12,ADR(DIR$)):GOSUB 1310:DIR$
(22)="Finally,when your choice|is made,press the"
960 DIR$(64)=" RETURN|key to execute that|option.|":GOSUB 13
40
970 I=USR(31106):I=USR(30720,7,12,ADR(DIR$)):GOSUB 1310:I=US
R(31106):RETURN
980 REM ** Copy Utils **
990 A=ADR("Exit|Copy File||"):I=USR(30720,26,12,A)
1000 N=USR(31274):ON N GOTO 1070,1010
1010 POSITION 2,21:? "Copy File, enter SOURCE,DESTINATION.":
GOSUB 1100:GOSUB 1210
1020 TRAP 1080:OPEN #1,4,0,F$:N=0:FOR I=1 TO LEN(F$):IF N=0
AND F$(I,I)="," THEN N=I
1030 NEXT I:IF N=0 THEN 1080
1040 F$=F$(N+1):GOSUB 1210:TRAP 1090:OPEN #2,8,0,F$
1050 TRAP 1060:GET #1,C:PUT #2,C:GOTO 1050
1060 CLOSE #1:CLOSE #2:GOSUB 1200
1070 I=USR(31106):RETURN
1080 TRAP 1000:GOSUB 1200:CLOSE #1:GOTO 1000
1090 TRAP 1080:CLOSE #1:GOSUB 1200:CLOSE #2:GOTO 1000
1100 F$=""
1110 POSITION 2,22:? ">";F$;"  "
1120 GOSUB 1250:IF C=27 THEN 1190
1130 IF C=94 THEN 1170
1140 IF  NOT (C=42 OR C=44 OR C=46 OR C=63 OR (C>47 AND C<59
) OR (C>64 AND C<91)) THEN 1120
1150 IF LEN(F$)>32 THEN 1120
1160 F$(LEN(F$)+1)=CHR$(C):GOTO 1110
1170 IF LEN(F$)<2 THEN F$="":GOTO 1110
1180 F$=F$(1,LEN(F$)-1):GOTO 1110
1190 POSITION 3+LEN(F$),22:? " ":RETURN
1200 POSITION 2,21:? CHR$(156);CHR$(156):RETURN
1210 IF F$="" THEN F$="D:":RETURN
1220 IF LEN(F$)>1 THEN IF F$(1,2)="D:" THEN RETURN
1230 IF F$(1,1)="D" THEN IF LEN(F$)>2 THEN IF (F$(3,3)=":" A
ND ASC(F$(2))>48 AND ASC(F$(2))<53) THEN RETURN
1240 FOR I=LEN(F$) TO 1 STEP -1:F$(I+2,I+2)=F$(I,I):NEXT I:F
$(1,2)="D:":RETURN
1250 OPEN #1,4,0,"K:"
1260 TRAP 1260:GET #1,C:CLOSE #1
1270 IF C>128 THEN C=C-128
1280 IF C>96 THEN C=C-32
1290 IF C<27 THEN C=C+64
1300 RETURN
1310 POKE 764,255
1320 IF PEEK(764)=255 THEN 1320
1330 POKE 764,255:RETURN
1340 DIR$(LEN(DIR$)+1)="                    |Press any
key to continue||":RETURN
```

Dragon Graph Plotter

by Anthony Durrant

This program will work on both the Dragon 32 and 64. The main part of the program is in the first 24 lines; the remainder consists of 24 subroutines covering things such as menu generation, sorting, calculation, regression analysis, and control of the 51*24-character mixed text and graphics screen used in the program.

Type in the listing exactly as shown, but substitute # for £. If BREAK is pressed, the program can be restarted without loss of data by GOTO 70. When a graph is onscreen, pressing G will give

the gradient of the best-fit line and the y-intercept. Pressing G again restores the screen. Pressing the space bar returns you to the menu. Special characters can be used in labels by pressing !,",#,$,%, and', — try them to see what they do.

All graph-scaling is automatic, so any data may be entered and the graph will adjust itself.

```
0 PCLEAR8:CLEAR600
10 ' GRAPH PLOTTER (C) A DURRANT     1984
60 GOSUB2000:GOSUB1000
65 FORI=-25 TO25:N=N+1:X(I+26)=I+10:Y(I+26)=SIN((I+3.141)/8)*3:NEXTI:X$="Time":Y
$="Sine£ &time'"
70 PMODE4,5:PA=841:PI=0:PR$=STRING$(23,32):GOSUB16000:PR$="  Your choice ?":GOSU
B16000:SCREEN1,1:COLORO,5
80 VT=0:PA=857:GOSUB17000:T=INT(IN)
100 IFT<1 ORT>13 THENPR$="                ":GOSUB16000:GOTO80
120 IFT=1 THENGOSUB3000:GOSUB4000
130 IFT>5 ANDT<12 THENPA=841:PR$=STRING$(23,32):GOSUB16000:PA=848:PR$="Please we
it":GOSUB16000
140 IFT=2 THENGOSUB21000
150 IFT=3 THENGOSUB22000:GOSUB4000
170 IFT=4 THENGOSUB23000
180 IFT=5 THENGOSUB24000:GOSUB4000
190 IFT=6 THENGOSUB13000:GOSUB4000
200 IFT>=7 ANDT<=10 THENGOSUB5000:GOSUB6000
210 IFT=8 ORT=10 THENGOSUB7000:GOSUB14000
220 IFT>=7 ANDT<=10 THENGOSUB8000:GOSUB9000:GOSUB10000
230 IFT=9 ORT=10 THENGOSUB11000
240 IFT=8 OR T=10 THENGOSUB12000:GOSUB15000
245 IF(T=7 ORT=9)ANDINKEY$=""THEN245
250 IFT=11THENGOSUB5000:GOSUB6000:GOSUB7000:GOSUB18000
260 IFT=12THENGOSUB19000
270 IFT=13THENGOSUB20000
998 GOTO70
1000 ' **** MENU ****
1005 PMODE4,5:COLORO,5:PCLS
1010 LINE(2,0)-(255,30),PSET,B:LINE(0,2)-(2,32),PSET,BF:LINE-(253,30),PSET,BF
1020 PI=1:YP=8:PR$="GRAPH":DRAW"S8"
1030 FORXP=60 TO62:GOSUB16000:XP=XP+60:PR$="PLOTTER":GOSUB16000:XP=XP-60:PR$="GR
APH":NEXT
1040 XP=61
1050 FORYP=8 TO10:GOSUB16000:XP=XP+60:PR$="PLOTTER":GOSUB16000:XP=XP-60:PR$="GRA
PH":NEXT
1060 DRAW"S4"
1520 LINE(245,138)-(122,50),PSET,B
1530 LINE(132,50)-(132,42),PSET:LINE-(10,42),PSET:LINE-(10,130),PSET:LINE-(122,1
30),PSET
1540 LINE(8,44)-(10,132),PSET,BF:LINE-(122,130),PSET,BF
1550 LINE(121,51)-(121,130),PSET:LINE-(119,141),PSET,BF:LINE-(242,138),PSET,BF
1560 PI=0:PA=312:PR$="OPTIONS AVAILABLE":GOSUB16000:LINE(27,56)-(117,56),PSET
1570 PA=411:PR$="1. Input new data":GOSUB16000
1580 PA=482:PR$="2. List current data":GOSUB16000
1590 PA=513:PR$="3. Add extra data":GOSUB16000
1600 PA=564:PR$="4. Delete data":GOSUB16000
1605 PA=615:PR$="5. Change data":GOSUB16000
1610 PA=666:PR$="6. Swap x and y axes":GOSUB16000
1620 PA=717:PR$="7. Plot points only":GOSUB16000
1630 PA=768:PR$="8. Draw bestfit line":GOSUB16000
1640 PA=383:PR$="9. Join points with":GOSUB16000
1650 PA=437:PR$="straight lines":GOSUB16000
1660 PA=484:PR$="10. As "+CHR$(123)+"8"+CHR$(123)+" with best":GOSUB16000
1670 PA=539:PR$="fitting line":GOSUB16000
1680 PA=586:PR$="11. Obtain x,y pairs":GOSUB16000
1690 PA=641:PR$="(bestfit only)":GOSUB16000
1700 PA=688:PR$="12. Save data to tape":GOSUB16000
1710 PA=739:PR$="13. Load data from tape":GOSUB16000
1720 PA=843:PR$="Your choice ?":GOSUB16000
1800 LINE(2,156)-(255,186),PSET,B:LINE(0,158)-(2,188),PSET,BF:LINE-(253,186),PSE
T,BF
1810 PI=0:PA=1022:PR$="When a graph with bestfit line is on the screen":GOSUB160
00
1820 PI=0:PA=1079:PR$=CHR$(123)+"<spacebar>"+CHR$(123)+" returns to this menu":G
OSUB16000
1830 PI=0:PA=1129:PR$=CHR$(123)+"G"+CHR$(123)+" toggles gradient and y-intercept
":GOSUB16000
1840 RETURN
2000 ' **** INITIALISE ****
2010 DIMA(100),B(100),X(100),Y(100),O(100),R1(174),R2(174)
2020 DIMPR$(91)
2022 FORI=0 TO32:READPR$(I):NEXTI
2024 FORI=65TO91:READPR$(I):NEXTI
2026 FORI=59TO64:READPR$(I):NEXTI
2028 FORI=33TO58:READPR$(I):NEXTI
2040 RETURN
3000 ' **** INPUT NEW DATA ****
3005 PMODE4,1:COLORO,5:PCLS:SCREEN1,1
3010 PI=0:PA=0:PR$="This routine deletes all current data -":GOSUB16000:PA=68:PR
$="do you wish to continue (Y OR N)?":GOSUB16000
3020 I$=INKEY$:IFI$=""THEN3020
3030 IFI$<>"Y"ANDI$<>"y"THEN3370
3035 FORM=1TO100:X(M)=0:Y(M)=0:NEXTM
3040 PCLS:LINE(2,0)-(255,43),PSET,B:LINE(0,2)-(2,45),PSET,BF:LINE-(253,43),PSET,
BF
3050 LINE(2,50)-(255,189),PSET,B:LINE(0,52)-(2,191),PSET,BF:LINE-(253,189),PSET,
BF
3060 XP=106:YP=3:PI=1:PR$="NEW DATA":GOSUB16000:LINE(102,11)-(148,11),PSET
3070 PA=103:PI=0:PR$="How many data sets to be entered ?":GOSUB16000
3080 VT=0:PA=139:GOSUB17000:N=INT(IN)
3090 IFN>2 ANDN<101THEN3100
3095 FORI=1 TOLEN(IN$):DRAW"C5L07U7L07U7L07U7C0":NEXTI:GOTO3080
3100 PA=154:PR$="Label for x-axis :  ":GOSUB16000
3110 VT=1:PA=173:GOSUB17000:XS=IN$:IFLEN(XS)>20THENXS=LEFT$(XS,20)
3120 PA=205:PR$="Label for y-axis :  ":GOSUB16000
3130 PA=224:GOSUB17000:YS=IN$:IFLEN(YS)>15THENYS=LEFT$(YS,15)
3140 I=1
3150 XP=5:YP=54:PI=1:PR$="X-COORDINATES :  "+X$:GOSUB16000
3160 FORS=0 TO14
3170 M=S+I:PI=0:PA=51*(S+8)+1:PR$="   X("+RIGHT$(STR$(M),LEN(STR$(M))-1)+") = ":
PR$=RIGHT$(PR$,LEN(PR$)-LEN(STR$(M))+2):GOSUB16000:VT=0:PA=PA+LEN(PR$):GOSUB1700
0:X(M)=IN
3180 IFM=N THEN3230
3190 NEXTS
3200 PMODE0,4:PCLS5:PCOPY4TO3:PCOPY4TO2:PMODE4,1:COLORO,5
3210 LINE(2,50)-(255,189),PSET,B:LINE(0,52)-(2,191),PSET,BF:LINE-(253,189),PSET,
BF
3220 I=I+15:GOTO3150
3230 I=1
3235 PMODE0,4:PCLS5:PCOPY4TO3:PCOPY4TO2:PMODE4,1:COLORO,5
3240 LINE(2,50)-(255,189),PSET,B:LINE(0,52)-(2,191),PSET,BF:LINE-(253,189),PSET,
BF
3250 XP=5:YP=54:PI=1:PR$="Y-COORDINATES :  "+Y$:GOSUB16000
3260 FORS=0TO14
3270 M=S+I:PI=0:PA=51*(S+8)+1:PR$="   Y("+RIGHT$(STR$(M),LEN(STR$(M))-1)+") = ":
PR$=RIGHT$(PR$,LEN(PR$)-LEN(STR$(M))+2):GOSUB16000:VT=0:PA=PA+LEN(PR$):GOSUB1700
0:Y(M)=IN
3280 IFM=N THEN3330
3290 NEXTS
3300 I=I+15:GOTO3235
3330 LINE(158,91)-(231,123),PSET,B:LINE(156,93)-(158,125),PSET,BF:LINE-(229,123)
,PSET,BF
3340 PA=645:PI=0:PR$="PLEASE  WAIT":GOSUB16000
3350 PA=697:PR$="data being":GOSUB16000
3360 PA=750:PR$="sorted":GOSUB16000
3370 RETURN
4000 ' **** SORT ****
4010 FORS=1TO(N-1)
4020 M=0
4030 FORI=1 TO(N-S)
4040 IFX(I)<=X(I+1)THEN4090
4050 XC=X(I):YC=Y(I)
4060 X(I)=X(I+1):Y(I)=Y(I+1)
4070 X(I+1)=XC:Y(I+1)=YC
4080 M=1
4090 NEXTI
4100 IFM=0THEN4120
4110 NEXTS
4120 RETURN
5000 ' **** CALCULATE PLOTTING POSITIONS ****
5010 XL=1E30:XH=-1E30:YL=1E30:YH=-1E30
5020 FORM=1TON
5030 IFX(M)>XH THENXH=X(M)
5040 IFX(M)<XL THENXL=X(M)
5050 IFY(M)>YH THENYH=Y(M)
5060 IFY(M)<YL THENYL=Y(M)
5070 NEXTM
5080 FORM=1TON
5090 A(M)=(X(M)-XL)/(XH-XL)*245+5
5100 B(M)=186-(Y(M)-YL)/(YH-YL)*181
5130 NEXTM
5140 RETURN
6000 ' **** CALCULATE POSITION OF AXES ****
6010 IFXH<=0 THENX1=250
6020 IFXL>=0 THENX1=5
6030 IFYH<=0 THENY1=5
6040 IFYL>=0 THENY1=186
6050 IFXH>0 ANDXL<0 THENX1=ABS(XL)/(ABS(XL)+ABS(XH))*245+5
6060 IFYH>0 ANDYL<0 THENY1=ABS(YH)/(ABS(YL)+ABS(YH))*181+5
6070 RETURN
7000 ' **** REGRESSION CALCULATIONS ****
7010 S1=0:S2=0:S3=0:S4=0:S5=0
7020 FORM=1TON
7030 S1=S1+X(M):S2=S2+Y(M):S3=S3+X(M)*Y(M):S4=S4+X(M)*X(M):
7040 NEXTM
```

PROGRAM FILE

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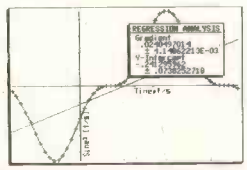
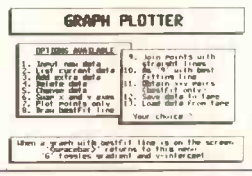
7050 A=(N*S3-S1*S2)/(N*S4-S1*S1)
7060 B=(S4*S2-S1*S3)/(N*S4-S1*S1)
7070 FORM=1TON
7080 D(M)=A*X(M)+B-Y(M)
7090 S5=S5+D(M)*D(M)
7100 NEXTM
7110 DD=SQR(S5/(N-2))
7120 SA=SQR((N*DD*DD)/(N*S4-S1*S1))
7130 SB=SQR((DD*DD*S4)/(N*S4-S1*S1))
7140 R1=X(1)
7150 R2=A*R1+B
7160 R5=186-(R2-YL)/(YH-YL)*181
7170 IFR6<5 ORR6>186 THENR1=R1+.004*(XH-XL):GOTO7150
7180 R5=(R1-XL)/(XH-XL)*245+5
7190 R3=X(N)
7200 R4=A*R3+B
7210 R8=186-(R4-YL)/(YH-YL)*181
7220 IFR8<5 ORR8>186 THENR3=R3-.004*(XH-XL):GOTO7200
7230 R7=(R3-XL)/(XH-XL)*245+5
7240 RETURN
8000 ' **** DRAW AXES ****
8005 PMODE4,1:COLORO,1:PCLS:SCREEN1,0:LINE(2,0)-(255,189),PSET,B:LINE(0,2)-(1,19
1),PSET,BF:LINE-(253,189),PSET,BF
8010 LINE(5,Y1)-(250,Y1),PSET
8020 LINE(X1,5)-(X1,186),PSET
8030 FORM=X1 TO250STEP20:PSET(M,Y1+1):NEXTM
8040 FORM=X1 TO5 STEP-20:PSET(M,Y1+1):NEXTM
8050 FORM=Y1 TO186STEP20:PSET(X1-1,M):NEXTM
8060 FORM=Y1 TO5 STEP-20:PSET(X1-1,M):NEXTM
8070 RETURN
9000 ' **** LABEL AXES ****
9020 IFX1<128 THENXP=138ELSEXP=15
9030 IFY1<96 THENYP=Y1+3ELSEYP=Y1-9
9040 PI=1:PR$=X$:GOSUB16000
9080 IFY1>96 THENYP=90ELSEYP=180
9090 IFX1<128 THENXP=X1+3 ELSEXP=X1-9
9110 PR$=Y$:DRAW"A3":GOSUB16000:DRAW"A0"
9130 RETURN
10000 ' **** PLOT POINTS ****
10010 FORM=1TON
10020 DRAW"BM"+STR$(INT(A(M)))+","+STR$(INT(B(M)))
10030 DRAW"U2D4U2R2L4"
10040 NEXTM
10050 RETURN
11000 ' **** JOIN POINTS ****
11010 FORM=1TO(N-1)
11020 LINE(A(M),B(M))-(A(M+1),B(M+1)),PSET
11030 NEXTM
11040 RETURN
12000 ' **** DRAW REGRESSION LINE ****
12010 LINE(R5,R6)-(R7,R8),PSET
12020 RETURN
13000 ' **** SWAP AXES ****
13010 FORM=1TON
13020 XC=X(M)
13030 X(M)=Y(M)
13040 Y(M)=XC
13050 NEXTM
13055 XX$=X$:X$=Y$:Y$=XX$
13060 RETURN
14000 ' **** REGRESSION 'WINDOWS' ****
14010 PMODE4,1:COLORO,1:PCLS:PI=1:XP=7:YP=13:PR$="REGRESSION ANALYSIS":GOSUB1600
0
14020 LINE(5,21)-(102,21),PSET
14030 PI=0:PA=155:PR$="Gradient":GOSUB16000
14040 PA=206:PR$=STR$(A):GOSUB16000:PA=260:PR$=STR$(SA):GOSUB16000:DRAW"BM20,40;
BR2D4U2R2L4BD4R4"
14050 PA=308:PR$="Y-Intercept":GOSUB16000
14060 PA=359:PR$=STR$(B):GOSUB16000:PA=413:PR$=STR$(SB):GOSUB16000:DRAW"BM20,64;
BR2D4U2R2L4BD4R4"
14070 LINE(3,10)-(105,73),PSET,B:LINE(1,12)-(2,75),PSET,BF:LINE-(103,74),PSET,BF
14080 GET(1,10)-(105,75),R1,G
14090 RETURN
15000 ' **** TOGGLES FOR REGRESSION DATA ****
15010 GET(131,20)-(235,85),R2,G
15020 TC=0
15030 D$=INKEY$:IFD$<>"" "ANDD$<>"G"ANDD$<>"g"THEN15030
15035 IFD$="" "THEN15080
15037 TC=TC+1
15040 IFTC=1 THENPUT(131,20)-(235,85),R1,PSET
15050 IFTC=2 THENPUT(131,20)-(235,85),R2,PSET
15070 IFTC=2 THEN15020 ELSE15030
15080 RETURN
16000 ' **** HIRES TEXT ROUTINE ****
16010 IFPI=1 THEN16040
16020 XP=INT((PA/S1-INT(PA/S1))*S1+.5)*5
16030 YP=INT(PA/S1)*8
16040 DRAW"BM"+STR$(INT(XP))+","+STR$(INT(YP))
16050 FORMM=1 TOLEN(PR$)
16060 IFPR$<>""THENDRAWPR$(ASC(MID$(PR$,MM,1))-32)
16070 NEXTMM
16080 RETURN
16500 DATA C5D7RU7RD7RU7RD7U7RCO,BD6R3L2U3R4L2R2E2FHBR3,R2D2L2D2R2L8E4,R2D2LRD2L2
BUHBR5,BD2R8R2D2HU4BR2
16510 DATA D8D5U2E3UBD5DBR2BU6,RLD6R8R4BU6,BR2R2D6LBR3BU6,BR2D2D2F2BR3BU6,BRF2D2G
2BR4BU6
16520 DATA BDF2D2BU2R3BD2H2E2BUBR2,BFD2LR2LD2UBE4,BD6BREU2LDBE4,BD3R3BR2BU3,BD6B
RURDBR3BU6
16530 DATA BD5E3BE2,BDD4FREU4NLBR4,BRDLRD5LR2BUGBR3,BDERFDG3DR3BU6BR2,BDERFDGFDG
LHBU5BR5
16540 DATA BR3G3R3D3U6BR2,BD5FREU2HL2U2R3BR2,BD3REFDGLHU3E2BR3,BRRD2G2D2BR4BU6,
BDDFDGFREUHEUHLBR4
16550 DATA BR2BD3LHUERFD3G2BR4BU6,BFD8D2DBR4BU5,BFDBD2DGBR5BU6,BR3G3F3BR2BU6,BD2
R3BD2L3BU4BR5
16560 DATA F3G3BR5BU6,BDERFDGDBD2DDBR3BU6,BDERFD4GLHUERBE3,BD2R3D4L3U2R3BR2BU4,D
6R3U4L3U2BR5
16570 DATA BD2R3L3D4R3BR2BU6,BD2R3L3D4R3U6BR2,BD2R3D2L3UD3R3BR2BU6,BD6U3R2L2U2ER
FHBR3,BD6BRR2U4L3U2R3BR2BU4
16580 DATA D6U4R3D4BR2BU6,BRDDBD2D4BR4BU6,BR2DDBD2D4LBR4BU6,D6U2RE2GF2BR2BU6,BR
D6BR4BU6
16590 DATA BD2D4U3R3D3U4BE2,BD6U4RFD3BR2BU6,BD3D2FREU2HLBU2BR4,BD6U4R3D2L2BU4BR
4,BD3ER2D4U2L2BE4
16600 DATA BD6U4R2BR3BU2,BD6R3U2L3U2R3BU2BR2,BRD6U4LRELU2BR4,BD2D3FREU3BU2BR2,BD
2D2FDRUEU2BU2BR2
16610 DATA BD2D4UR3DU4BU2BR2,BD2F2G2BR3HU2EBU2BR2,BD2DFBD2RU2EUBU2BR2,BD2R3DG3R3
BR2BU6,BR2DUBR3,""
16620 DATA "",",BDERFHBR3,",",NR3D2G2DR3BR2BU6
16630 DATA BRRLDGD4U2R3D2U4HU3R3,DGR2EUHLREUHLBR4,BDD4FREBU4HLBR4,R2FD4GL2RUGBR4
,BR3BDEL3U3R2L2U3R3BR2
16640 DATA D6U3R2L2U3R3BR2,BR2BD3RD3L2HU4ER2BR2,DGU3R3DJU6BR2,BR3BDGL2RU6LR2BR2,
BD5FREU5BR2
16650 DATA D6BR3H2U2E2BR2,D6BR2BU6,D6U5R3D5U6BR2,D6U5RDRBD2DFU6BR2,D6R3U6L3BR
5
16660 DATA D6U3R3U3L3BR5,BDD3FRFBU2U3HLBR4,D6BR3H2UREUHL2BR5,BD5FREUHLHUERFHBR3,
R2D6U6RBR2
16670 DATA D5FREU5BR2,D4FDRUEU4BR2,D6UR3DU6BR2,DF2GDBR3UHU2EUBR2,D2FRD3U3EU2BR2
,R3DGD62R3BR2BU6
17000 ' **** HIRES INPUT ROUTINE ****
17010 IFPI=1 THEN17040
17020 XP=INT((PA/S1-INT(PA/S1))*S1+0.5)*5
17030 YP=INT(PA/S1)*8
17035 IN$=""
17040 DRAW"BM"+STR$(XP)+","+STR$(YP)
17050 P$=INKEY$:IFP$=""THEN17050
17055 P=ASC(P$):IFP=13 THEN17200
17060 IFP<96 OR P>122 OR (P>8 AND P<32) THEN17050
17070 IN$=IN$+P$:IFP=8 ANDLEN(IN$)=1 THEN17035
17080 IFP=8 THENDRAW"BSLD7LU7LD7LU7LD7U7CO":IN$=LEFT$(IN$,LEN(IN$)-2):ELSEDRAWPR
$(P-32)
17090 GOTO17050
17200 IFUT=1 THEN17500
17210 WRONG=0
17220 IN=VAL(IN$):IFIN<>0 THEN17500
17230 FORMM=1 TOLEN(IN$):IFMID$(IN$,MM,1)="0"ORMID$(IN$,MM,1)=". "THENWR=WR+1:NEX
TMM
17240 IFLEFT$(IN$,1)="-"THENWR=WR+1
17250 IFWRONG=LEN(IN$)THEN17500
17260 DRAW"BM"+STR$(XP)+","+STR$(YP)
17270 FORMM=1TOLEN(IN$):DRAWPR$(D):NEXTMM
17280 GOTO17035
17500 RETURN
18000 ' **** OBTAIN X,Y PAIRS ****
18010 PMODE4,1:PCLS5:COLORO,5:PCOPY81O1:LINE(2,156)-(255,186),PSET,B:LINE(0,158)
-(2,186),PSET,BF:LINE-(253,186),PSET,BF:PI=0:PA=1022:PR$="OBTAIN X,Y-PAIRS : do
you want x or y ?":GOSUB16000:PMODE4,5:PCOPY4TO8:COLORO,5
18020 A$=INKEY$:IFA$<>"X"ANDA$<>"x"ANDA$<>"Y"ANDA$<>"y"THEN18020
18030 IFA$="X"ORA$="x"THEN18070
18040 PA=1074:PR$="X-":GOSUB16000:PA=1076:UT=0:GOSUB17000:XO=IN
18050 YO=A*XO+B:PA=1096:PR$="Y-"+STR$(YO):GOSUB16000
18060 GOTO18090
18070 PA=1074:PR$="Y=":GOSUB16000:PA=1076:GOSUB17000:YO=IN
18080 XO=(YO-B)/A:PA=1096:PR$="X-"+STR$(XO):GOSUB16000
18090 PA=1150:PR$="More ?":GOSUB16000
18100 A$=INKEY$:IFA$=""THEN18100
18110 IFA$="N"ORA$="n"THENPCOPY1TO8:GOTO18140
18120 IFA$="Y"ORA$="y"THENPCOPY4TO8:GOTO18020
18130 GOTO18100
18140 RETURN
19000 ' **** SAVE TO TAPE *****
19010 PA=841:PI=0:PR$=STRING$(23,32):GOSUB16000
19020 PR$=" Filename: ":GOSUB16000:UT=1:PA=851:GOSUB17000:F$=IN$
19030 MOTORON:FORI=1TO2000:NEXTI
19040 OPEN"O",£-1,F$
19045 PRINT£-1,X$,Y$
19050 FORM=1TON:PRINT£-1,X(M),Y(M):NEXTM
19060 CLOSE£-1
19070 RETURN
20000 ' **** LOAD FROM TAPE ****
20010 PA=841:PI=0:PR$=STRING$(23,32):GOSUB16000
20020 PR$=" Filename: ":GOSUB16000:UT=1:PA=851:GOSUB17000:F$=IN$
20030 OPEN"I",£-1,F$
```

PROGRAM FILE

```
20035 INPUT#-1,XS,YS
20040 N=0
20050 N=N+1
20060 INPUT#-1,X(N),Y(N):IFNOTEOF(-1)THEN20050
20070 CLOSE#-1
20080 RETURN
21000 ' **** LIST CURRENT DATA ****
21005 I=1
21010 PMODE4,1:COLOR0,5:PCLS:SCREEN1,1
21020 LINE(2,0)-(255,189),PSET,B:LINE(0,2)-(2,191),PSET,BF:LINE-(253,189),PSET,B
F
21030 PI=1:XP=98:YP=5:PRS="CURRENT DATA":GOSUB16000:LINE(95,13)-(160,13),PSET:LI
NE(128,24)-(128,172),PSET
21040 PA=104:PI=0:PRS="X-VALUES                    Y-VALUES":GOSUB16000
21050 FORS=0 TO18
21060 N=S+1
21070 PRS="   X("+RIGHT$(STR$(N),LEN(STR$(N))-1)+")-":PRS=RIGHT$(PRS,LEN(PRS)-LE
N(STR$(N))+2)+STR$(X(N)):PA=(S+3)*5+1:GOSUB16000
21080 PRS="   Y("+RIGHT$(STR$(N),LEN(STR$(N))-1)+")-":PRS=RIGHT$(PRS,LEN(PRS)-LEN
(STR$(N))+2)+STR$(Y(N)):PA=(S+3)*51+27:GOSUB16000
21090 IFN=N THEN21120
21100 NEXTS:I=I+19:PA=1130:PRS="<Spacebar> for more":GOSUB16000
21110 IFINKEY$=" "THEN21010ELSE2110
21120 PA=1133:PRS="<Spacebar> to return to menu":GOSUB16000
21130 IFINKEY$<>" "THEN2113O
21140 RETURN
22000 ' **** ADD DATA ****
22005 IFN=100 THEN22070
22010 PMODE4,1:PCLS5:COLOR0,5:PCOPY8TO1:LINE(2,156)-(255,186),PSET,B:LINE(0,158)
-(2,188),PSET,BF:LINE-(253,186),PSET,BF:PI=0:PA=1022:PRS="ADD EXTRA DATA":GOSUB1
6000:PMODE4,5:PCOPY4TO8:COLOR0,5
22020 N=N+1:PRS="X-";PA=1074:GOSUB16000:VI=0:PA=1076:GOSUB17000:X(N)=IN:PRS="Y-"
:PA=1096:GOSUB16000:PA=1098:GOSUB17000:Y(N)=IN
22030 PA=1160:PRS="More ?":GOSUB16000
22040 A$=INKEY$:IFA$=""THEN22040
22050 IFA$="Y"ORA$="y"THENPCOPY4TO8:GOTO22020
22060 PCOPY1TO8
22070 RETURN
23000 ' **** DELETE DATA ****
23005 IFN=3 THEN23040
23010 PA=941:PI=0:PRS=STRING$(23,32):GOSUB16000
23020 PRS="  Set No.?":GOSUB16000:VI=0:PA=853:GOSUB17000
23030 FORM=IN TO(N-1):X(M)=X(M+1):NEXTM:N=N-1
23040 RETURN
24000 ' **** CHANGE DATA ****
24010 PMODE4,1:PCLS5:PCOPY8TO1:COLOR0,5:LINE(2,156)-(255,186),PSET,B:LINE(0,158)
-(2,188),PSET,BF:LINE-(253,186),PSET,BF:PI=0:PA=1022:PRS="CHANGE DATA : Set No.?
":GOSUB16000:PMODE4,5:COLOR0,5
24020 PCOPY4TO8
24030 VI=0:PA=1046:GOSUB17000:SN=INT(IN)
24040 IFSN<1 ORSN>N THEN24095
24050 PA=1074:PRS="Old:  X-"+STR$(X(SN)):GOSUB16000
24060 PA=1096:PRS="Y-"+STR$(Y(SN)):GOSUB16000
24070 PA=1125:PRS="New:  X-":GOSUB16000:PA=1132:GOSUB17000:X(SN)=IN:PA=1147:PRS="
Y-":GOSUB16000:PA=1149:GOSUB17000:Y(SN)=IN
24080 PA=1165:PRS="More ?":GOSUB16000
24085 A$=INKEY$:IFA$=""THEN24085
24090 IFA$="Y"ORA$="y"THENPCOPY4TO8:GOTO24020
24095 PCOPY1TO8
24100 RETURN
```





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Casio	fx-9000p	Feb82
Casio	fx-900p	Feb83
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Hewlett-Packard	HP86	Oct82
Hewlett-Packard	HP-125	March82
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IBM	PC	Nov81
ICL	OPD	Dec84
LSI	M-Four	April83
MAD	MAD 1	Sept84
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SMT	Goupil-3	Dec83
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Victor	Sirius 1	Feb82
Xerox	820	Jan82
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Microwriter	Microwriter	Sept82
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Acorn	BBC Micro	Jan82
Acorn	Electron	Oct83
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Amstrad	Amstrad 6128	Sept85
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Coleco	Adam	April82
Commodore	64	May83
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Commodore	Plus/4	Oct84
Commodore	Vic 20	Sept81
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Accountancy Round-up	Various	June83
Financial Director	Financial Director	June83
Home Accounts	Diamondsoft	Jan84
Microtax	Tax Planning	July83
Sage 400	Sage	Oct83
Communications		
Datatalk	Datasoft	Jan85
Perfect Link	Perfect Software	July84
Vicom	AM Technology	Sept85
Database		
1982 Database Round-up	Various	Dec82
1983 Database Round-up	Various	Dec83
1984 Database Round-up	Various	Jan84
Aquila	Kent Barlow Assocs	Sept82
Aspect	Microft Technology	Oct84
Beta	Ormskirk Computers	Aug83
Busifile	European Information	Jan84
Busipost	Busipost	Feb83
Cardbox	Caxton Software	Aug82
Complete Manager	Pipeline software	March85
Condor Database	Condor Corp	Nov82
Dataflex	Equinox	Aug85
Dataplan	Personal Software	Aug83
Dataprism	Bonsai	March83
Dbase II	Ashton Tate	May82
Dbase III	Ashton Tate	Nov84
DBMS 2	GW Computers	June82
Delta	Compsoft	Oct83
Everyman	Vector International	Feb84
File (Macintosh)	Microsoft	July85
Files & Folders	ACT Pulsar	Dec84
Filevision	Telos Software	Dec84
Friday!	Ashton Tate	July84
Information Management	BPI	April84
Infostar	MicroPro	Sept83
Knowledgeman	Data Base Experts	Feb85
Omnis	Blyth Computers	July83
Optimum	Uveon	Nov83
Pearl	Pearl Software	Oct82
Perfect II	Thorn EMI	May85
Personal Database	Supersoft	March84
Power Base	Accent Computers	April85
Rescue	MBS	April83
Retrieve II	Derwent Datasysems	Jan85
RMS	Dragon Data	June84
Search & Find	Hitan Systems	Dec83
Secect	Bonsai	Sept82
Sensible Solution	O'Hanlon Systems	Sept84
Silicon Office	Bristol Software	July82
Superfile	Southdata	Jan83
Sycero	System C	July85
TIM IV	Paradigm	Sept85
Tomorrow's Office	Stage One Software	June83
Desk organiser		
QED +	Quantec	March85
Sidekick	Borland	March85
Spotlight	Software Arts	March85
Entertainment		
Hitch-Hiker's Guide	Infocom	Jan85

Music Master	Supersoft	Jan 85
Music Typewriter	Romantic Robot	Jan 85
Musicalc	Paradox Group	Jan 85
Expert system		
ES/P Advisor	Expert Systems	Sept 84
ExpertEase	Expert Software	June 84
Integrated system		
Appleworks	Apple	July 84
Framework	Ashton Tate	Aug 84
Jane	Arktronics	July 84
Jazz	Microsoft	Aug 85
Open Access	SPI	June 84
Smart	Innovative Software	Sept 84
Symphony	Lotus	Aug 84
Hchange	Psion	Oct 84
Language		
Basic (Macintosh)	Apple	Feb 85
Basic 2 (Macintosh)	Microsoft	May 85
BCPL (BBC)	Acornsoft	June 85
BCPL (QL)	Metacomco	June 85
C (Spectrum)	HiSoft	Nov 84
Lisp (QL)	Metacomco	Feb 85
Logo (BBC)	Acornsoft	Feb 85
Logo (BBC)	Logotron	Feb 85
Logo (BBC)	Open University	Feb 85
Logo (Spectrum)	Sinclair	Oct 84
Modula 2 (PC)	Volition Systems	Feb 85
Pascal (Amstrad)	Amsoft	Feb 85
Pascal (QL)	Computer One	Feb 85
Pascal, ISO (BBC)	Acornsoft	Feb 85
Pascal, ISO (QL)	Metacomco	July 85
Pascal, Turbo (PC)	Borland	April 85
Miscellaneous		
Brainstorm	Caxton Software	Feb 84
Codewriter	Codewriter	April 85
Entrepreneur	Tryptych	March 85
Micro Cat	Software Connection	Dec 84
TK! Solver	Software Arts	Feb 84
Operating environment		
Desq	Quarterdeck	Dec 83
GEM	Digital Research	Feb 85
Top View	IBM	Aug 85
Visi-On	Visicorp	Nov 83
Visuall	Trillian	Jan 84
Windows	Microsoft	Aug 85
Operating system		
CP/M-86	Digital Research	Oct 82
MS-DOS	Microsoft	Oct 82
MS-DOS version 2	Microsoft	May 83
Revelation	Cosmos Inc	April 84
Spreadsheet		
1-2-3	Lotus	Nov 83
1983 Spreadsheet Round-up	Various	Dec 83
1984 Spreadsheet Round-up	Various	Dec 84
Dynacalc	Dragon Data	June 84
Ecalc	Epson	July 83
Fcalc	Sord	Jan 84
Financial Planner	Ashton Tate	Dec 83
Masterplanner	Comshare	April 84
Mathemagic	ISM	Aug 83
Micro FCS	EPS Consultants	Oct 83
Multiplan	Microsoft	April 83
Peachcalc	Peachtree	March 84
Perfect Calc	Perfect Software	Oct 83
Perfect II	Thorn EMI	May 85
Plannercalc	Comshare	May 83
Planstar	MicroPro	July 84
Prophet II	Busi-computers	March 83
The Spreadsheet	Microl	Sept 83
Viewsheet	Acorn	Jan 85
Visicalc	Visicorp	June 83
Vu-Calc	Psion	Sept 83
Utility		
E40	Keel Codes	Sept 82
PC Automator	Direct Technology	July 85
Word processor		
Homeword	Sierra On-Line	Feb 84
HP41C Text Editor	Hesselberg	Nov 82
Lisawrite	Apple	Aug 83
Micropen	Intelligence Ireland	May 83
Microscript	Intelligence Ireland	May 85
Paperback Writer	Paperback Software	Aug 85
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Samna +	Thorn EMI	July 85
Scred	Stable Software	Aug 83
Scripsit 2	Tandy	Feb 82
Spellbinder	Lexisoft	Aug 81
View	Acornsoft	Aug 83
Word (IBM PC)	Microsoft	June 84
Word (Macintosh)	Microsoft	June 85
Word Handler II	Sillicon Valley	March 83
Wordspell	Griffin Software	March 84
Wordstar 2000	MicroPro	Feb 85
Workwriter	Data Applications	Nov 84

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Compunet	Compunet	Dec 84
Demon modem	Demon Products	July 85
Homelink	NBS	March 84
Knowledge Index	Dialog	Sept 85
Portman modem	Interlekt	Oct 84
Teletext adapter	Vector Marketing	April 84
WSS2000 modem	Minor Miracles	May 84
Expansion		
Graduate	Torch	June 85
McMill 68008 card	Stellation Two	July 85
Graphics		
Bit Stick	Robocom	Nov 82
Koala Pad	Audiogenic	Jan 85
Penpad	Kode	Oct 84
Stack lightpen	Stack	March 84
Mass storage		
AMS drive	AMS	Jan 84
Discovery 1	Opus Supplies	May 85
Hobbit	Ikon	Jan 84
Microdrive	Sinclair	Oct 83
TCCR530	Tandberg	July 84
Miscellaneous		
Music 500	Acorn	May 85
Omni-Reader	Oberon	May 85
RGB televisions	Various	March 85
Telesketch	Gamma	June 85
The Ferret	GCS	June 84
Printer/plotter		
Alphacom 81	Alphacom	Sept 84
EP44	Brother	April 84
Epson	FX-80	July 83
HR-5	Brother	Sept 84
Juki 6100	Micro Peripherals	Dec 84
MT160L	Mannesmann Tally	Aug 83
Penman	Penman	Feb 85
TC6000	Brother	April 85
Speech		
Acorn speech system	Acorn	Jan 84
Adman synthesiser	Adman	Jan 84
Amstrad SSA-1	Amstrad	Sept 85
BBC Speech Chips	Acorn	April 83
Chatterbox	WSS	Jan 84
Microspeech	Currah	Jan 84
TI Speech Command	Texas Instruments	Nov 84
Voicedrive	Supersoft	Aug 84
Votan VPC 2000	Voice Input	May 85
Vision		
Microsight 1	Digithurst	Oct 83
Snap	Micro Robotics	Nov 84

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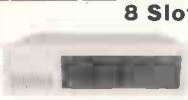

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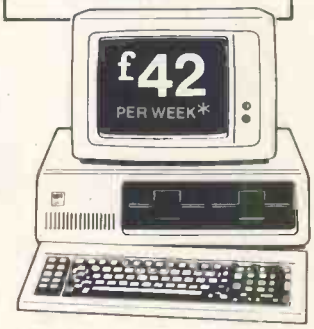

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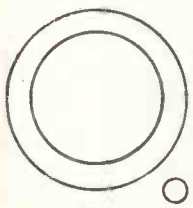

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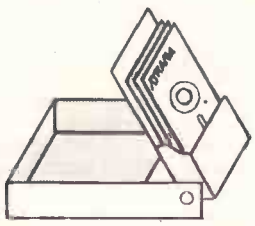

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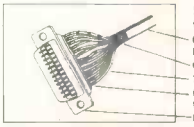

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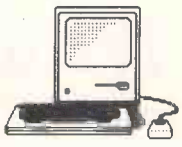

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- Making the Most of Multiplan

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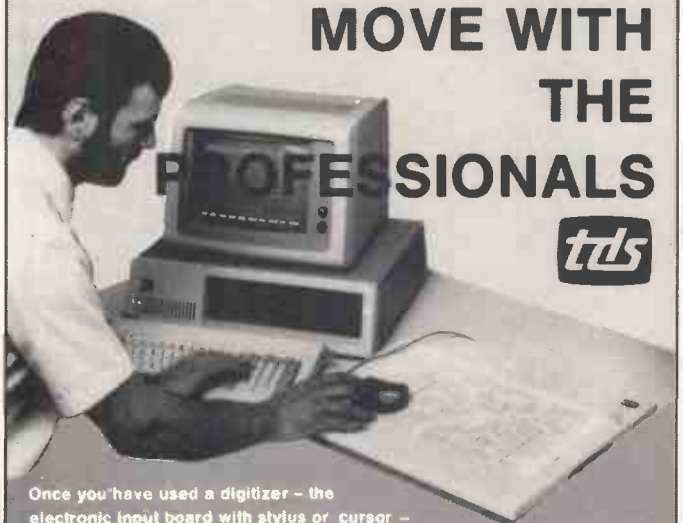

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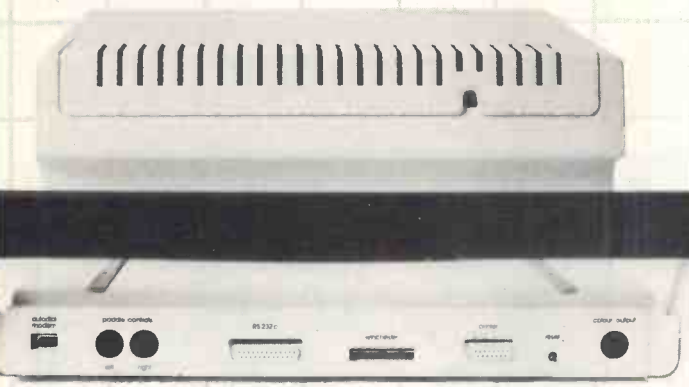
The Wren's Quantec Executive Desktop system provides a unique range of everyday aids – electronic diary, notebook, address and telephone directory, clock, calculator, even a typewriter mode for that urgent memo.

Considering how much we managed to pack into this transportable marvel you might think we also got carried away on the price – **but the Wren Executive costs only £995 + VAT.**

You can learn more about the Wren by calling Opus Supplies on 0737-65080 or simply post the coupon below.



Add more than £600 worth of free Perfect business software offering word processing, spreadsheet and file management applications, BBC Basic and compatability with all graphics modes of the BBC micro in full colour without the loss of user memory, and you begin to see why the Wren is such an impressive package.

In fact together with its sheer good looks and ingenious design, the Wren's specification makes impressive reading:

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Interactive Authoring System for IBM® PC, XT and Compatibles

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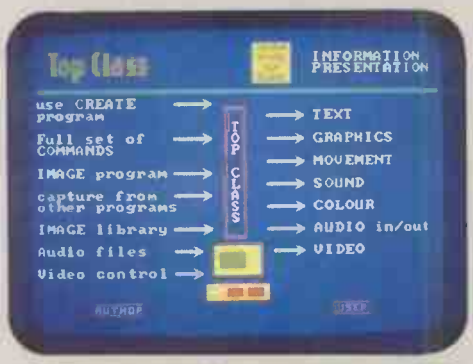
Present information using an exciting combination of text, colour, graphics, sound and movement. Audio cassette recorder adds an extra dimension to output **AND** input.



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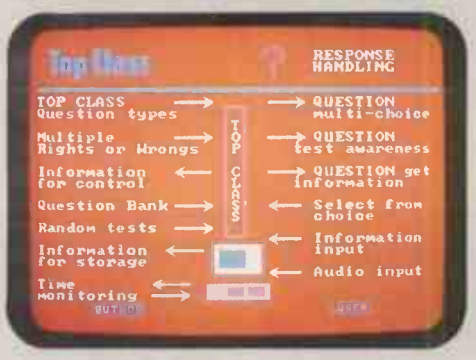

Extensive question/ response handling facilities ensure that the correct style of interaction may be specified for each part of a presentation or tutorial.

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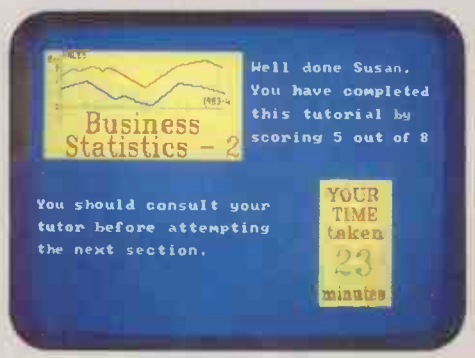

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- Sophisticated response handling
- Monitor and use time information
- Arithmetic capability within program
- Question bank
- Communications facility

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Telephone: (0773) 820011 Telex: 377532 (Format G)

Hard Disk Power: Removable Media

A new concept in mass storage systems

The Excelsior Mass Storage System is available for a wide range of computers in capacities ranging from 12 to 200 megabytes. This innovative design, combining Winchester disk and removable media technology, is ideal for single or multiple computer environments. The Excelsior system provides far superior speed for the single user, as well as increased price/performance in multiple computer installations. Speed, flexibility, RAM caching, shared storage, and removable media combine to make Excelsior a uniquely powerful solution for microcomputer applications.

The latest in storage technology

With the Excelsior range of products, customers receive both the speed and capacity of traditional Winchester disk systems, as well as the security and unlimited backup capability of removable media.

Available for a wide range of computers

Excelsior products are available for a wide range of computers, including:

IBM PC, XT and AT
Victor/Sirius
Apricot PC, XI and F1
Apple
NEC APC
Epson QX-10
Sanyo MBC 1100
PC Compatibles
And others to come...

Shared storage... even between different operating systems!

The speedy single-user Excelsior system is easily and inexpensively upgraded to allow multiple users to share a common disk, at little cost to performance. Any combination of the above computers may be connected to the system, providing a common storage area where data created by one user may be retrieved by another. This sharing feature gives Excelsior the highest price/performance ratio in the market.

The unique high performance controller

The Excelsior RAM cache disk controller incorporates 256k of RAM memory and an ingenious disk caching algorithm. This unique combination stores the most frequently used information in RAM memory on the controller. In most cases, subsequent disk read and write requests will be found in RAM memory so that data is transferred at RAM speeds rather than disk speeds. By keeping frequently accessed information in the cache buffer, the intelligent caching algorithm provides higher performance in both single user and disk intensive environments.

All the versatility of removable media

The implementation of removable media in the Excelsior system provides security in sensitive corporate and government environments, as well as unlimited primary or backup capability. Data on removable media may be secured in safes or vaults, making it impossible for unauthorized users to access private files. Further more, Excelsior allows each disk to be treated as primary or backup storage. Simply use the removable disk as one would any Winchester disk system in primary mode, or for backup in the archive mode. And with removable cartridges, capacity is virtually unlimited.

Configurations to meet any requirement

The Excelsior Mass Storage

COMPUTER PRODUCTS INTERNATIONAL, INC.

Flexibility. Backup Assurance.

EXCELSIOR!

System offers from 24 to 200 megabytes of Winchester capacity, as well as 12 to 48 megabytes of removable media capacity. This combination gives customers the speed and power of standard Winchester disk subsystems, as well as the transportability, security and unlimited backup capability of removable media systems. Excelsior's flexibility of configurations allows users to choose a total system which most ideally satisfies their needs.

Upgrading is easy and economical

Excelsior allows users to expand their system by either adding disks or attaching inexpensive slave units. As user requirements grow, additional computers may be added to the Excelsior to provide a shared resource. This upgradeability feature lets Excelsior grow in power as the demands on the system increase.

Unlimited backup capability

The Excelsior system incorporates the use of removable media disk drives, providing unlimited backup capability. Backup/Archiving may be accomplished in either a file-by-file or dump mode as required. As additional insurance in the event your Winchester disk should fail, the removable media disk would guarantee continuous operation with little degradation in speed or performance.

Now recruiting qualified distributors

Representatives of Computer Products International soon will be embarking upon an aggressive promotional campaign to sign quality distributors to market the Excelsior System. For further information, please contact:

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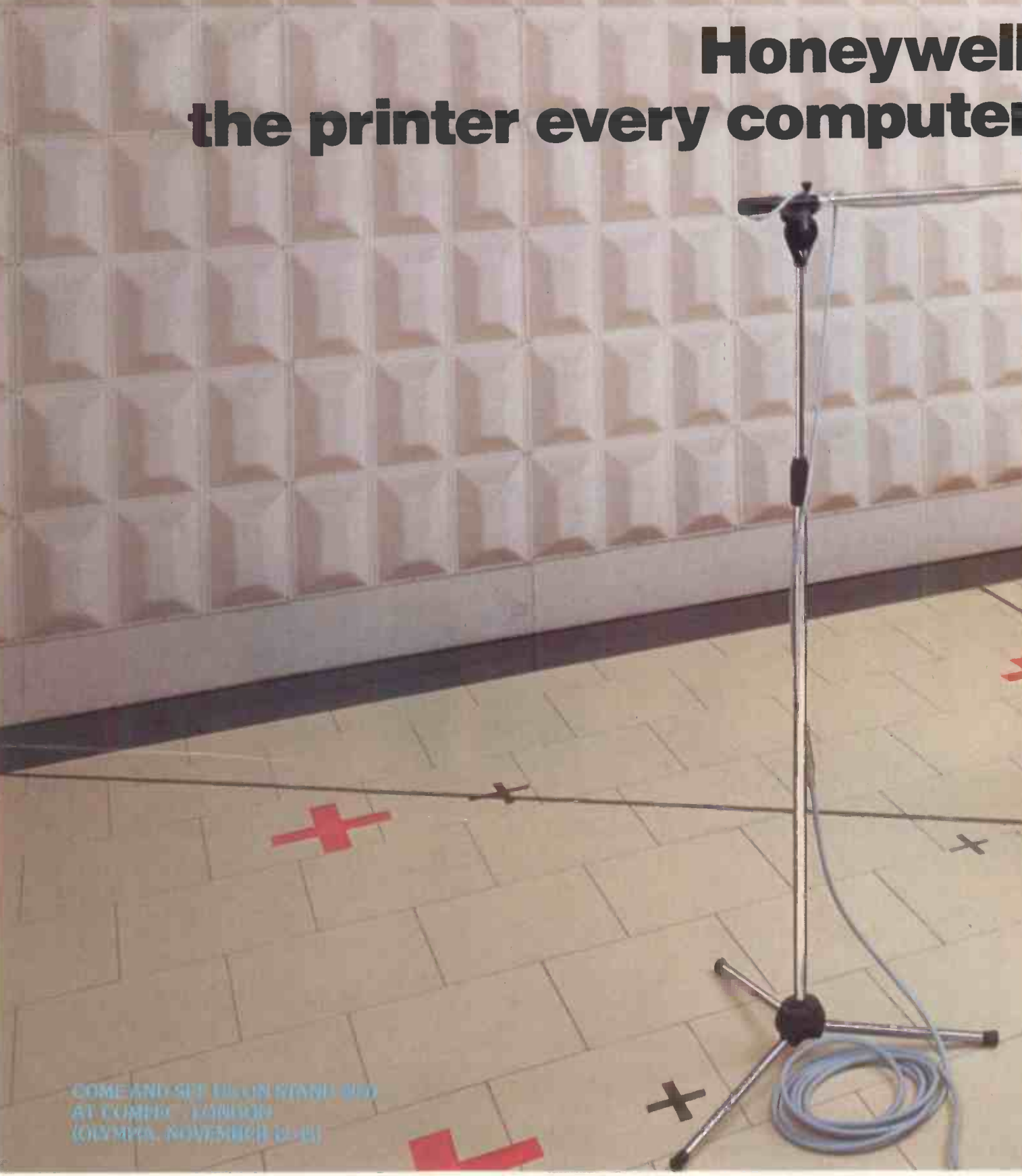
USA
Telephone: (408) 945-0100
Telex: 9106860036

See us at Fall Comdex in Las Vegas! Booth #R8630

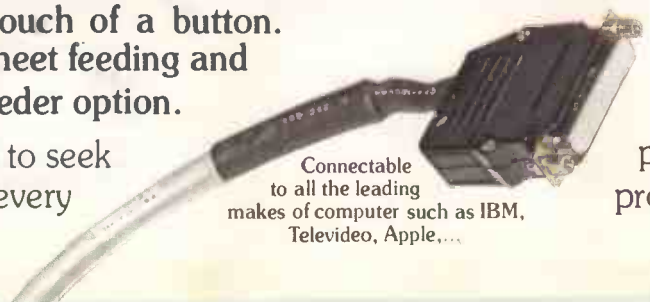
CPI

Honeywell
the printer every computer



34 CQ Printer: standard serial and parallel interfaces. IBM, Epson and Diablo protocols. Fast draft speeds (up to 270 cps) and superior correspondence quality printing selectable at the touch of a button. Integrated single sheet feeding and automatic sheet feeder option.

Everyone has a right to seek out perfection. And every Honeywell Compuprint 34 CQ, in concept and design, has been subjected to the most severe technological evaluation in the search for perfection. High speed and quality in printing can be taken for granted. And the printer itself has experienced every stress possible to confirm its durability, product quality and reliability.



Connectable to all the leading makes of computer such as IBM, Televideo, Apple,...

Compuprint: would love to have.

It goes without saying that a Compuprint 34 CQ can print in different fonts and characters and can produce "high quality print" to a high standard of definition. The most demanding tests have proved its flexibility and quiet operation and its compatibility with any computer.
That's why everyone would love to have such a printer, since perfection is everyone's goal. For further information please contact: Honeywell Information Systems Italia Maxted Road, Hemel Hempstead, Herts HP2 7DZ Tel. 0442/42291 (ext.4546-4320-4547) Tlx 82413

Together, we can find the answers.

Honeywell

Honeywell Information Systems Italia

ADVERTISERS INDEX

MICROMART ADVERTISERS INDEX

THE C LANGUAGE

Several new libraries, a few version changes on compilers, and many lower prices notably RUN/C & Microsoft C.

C COMPILERS

8-bit	Aztec C Personal v1.06	£150
	Aztec Commercial v1.06	£250
	BDS C v1.50a	£110
	Toolworks C/80 v3.1	£ 45
	Eco-C v3.1	£140
16-bit	Aztec C86 Personal v3.2	£150
	Aztec C86 Commercl.v3.2	£325
	CI Optimizing C86 v2.3	£270
	C-Systems C v2.0	£210
	De Smet C88 v2.4	£145
	Digital Research C v1.1	£270
	Lattice C v2.15	£325
	Mark Williams MWC86 2.0	£360
	Microsoft C v3.0	£325
	Toolworks C/86 v3.1	£ 45
	Wizard C v2.1	£350

C INTERPRETERS

	Instant-C v1.27	£375
	RUN/C v1.1	£ 99
	C-terp	£250
	Introducing C	£125

C LIBRARIES

Data base	C-tree (source)	£295
	Multikey	£170
	db-VISTA (source)	£375
	Btrieve	£245
	C-to-dBase (source)	£120
	SoftFocus Btree(source)	£ 70
	Softfocus ISAM (source)	£ 40
	dBC (dBASE III)	£195
Graphics	Multi-HALO	£195
	GraphiC v2.1	£225
	MetaWINDOWS	£140
Screen	Panel	£245
	Lattice Windows	£195
	Windows for C	£185
	C Power Windows	£ 95
Misc	Greenleaf Functions,sce	£155
	C Food Smorgasbord	£120
	Plink-86	£295
	Pfix Plus	£295
	C Helper, source	£135
	C Refiner	£145
	Basic C	£150
	Bastoc	£295

More libraries not listed here.

DISK COPYING SERVICE

Moving data and program files from one machine to another is often made difficult because different manufacturers have adopted different disk format standards.

We can copy your files to and from over 400 disk formats including CP/M, CP/M-86, MS-DOS, PC-DOS, ISIS, APPLE, SIRIUS, TORCH, APRICOT, HP150, TRSDOS, DEC RT-11, and IBM BEF.

Disks are normally despatched on the day they are received.

Our charge is £10.00 + disk + VAT. Special prices for quantities.

For more information call us.

FORTRAN COMPILERS

A new version 3.3 from Microsoft this month. We also stock a variety of Fortran subroutine libraries.

8-bit	Nevada Fortran	£ 35
	Pro-Fortran	£199
	Microsoft Fortran	£335
16-bit	Microsoft Fortran v3.2	£ 95
	Microsoft Fortran v3.3	£235
	DR Fortran 77	£270
	Pro-Fortran	£290
	Lahey Fortran F77L	£435
	RM/FORTRAN 77	£450

For advice or information call us.

HIGH-LEVEL LANGUAGES

If you need more than a conventional 'procedural' language to solve your problem then we can advise which of these languages might suit you.

PROLOG

8-bit	micro-PROLOG	£ 75
	PROLOG-1	£225
16-bit	PROLOG-86	£135
	micro-PROLOG v3.1	£150
	micro-PROLOG Prof.	£265
	PROLOG-1	£299

LISP

8-bit	Toolworks LISP/80	£ 45
	iLisp	£ 75
	Waltz Lisp	£165
16-bit	Toolworks LISP/86	£ 45
	IQ Lisp	£195
	muLisp-86	£240
	Gold Common Lisp	£550
	Waltz Lisp	£165
	TLC Lisp	£225

NIAL, SNOBOL, muMATH

muMath/muSimp	£200
Q'Nial (IBM PC)	£350
SNOBOL4+	£115

EXPERT SYSTEM SHELLS

Micro Expert	£475
APES	£150
ES/P ADVISOR	£595
Insight 1	£ 80
Insight 2	£395

SMALLTALK

Methods (PC-DOS)	£195

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Prices do not include VAT or other local taxes but do include delivery in UK & Europe. Please check prices at time of order, ads are prepared some weeks before publication.

We have many other programming tools for which there is no space here.

We welcome payment by credit cards including telephone orders.

MODULA-2 & ADA

Janus C-Pack is a bargain and the Zurich compiler is gaining friends.

MODULA-2 COMPILERS

Modula Corp	(MS-DOS)	£120
Zurich Compiler	(Z80 CPM)	£140
Volition	(various)	from £265
Logitech	(MS-DOS,CP/M-86)	£380
Interface SDS-XP	(PC-DOS)	£195
Interface SDS	(PC-DOS)	£ 99

ADA (subset) COMPILERS

Augusta	(CP/M-80)	£ 80
Supersoft	(CP/M-80)	£250
Janus D-Pack	(CP/M-86,MS-DOS)	£750
Janus C-Pack	(CP/M-86,MS-DOS)	£ 99

For information or advice call us.

THE BASIC LANGUAGE

New is multi-tasking MTBASIC, and price changes both up and down.

8-bit	CBASIC	£125
	CBASIC Compiler	£385
	MBASIC Interpreter	£ 80
	MBASIC Compiler(BASCOM)	£260
	BBC BASIC Interpreter	£ 95
	S-BASIC Compiler	£185
	ALCOR multi-BASIC	£ 95
	MTBASIC v2.6a	£ 65
16-bit	GW-BASIC 2.0 Interpreter	£ 95
	GW-BASIC Compiler	£125
	MS-BASIC Interpreter	£235
	MS-BASIC Compiler	£260
	MS Bus.Basic Compiler	£325
	CBASIC	£250
	CBASIC Compiler	£450
	Applications BASIC	£395
	Better BASIC	£195
	MEGABASIC	£375
	Professional BASIC	£ 99
	ALCOR Multi-BASIC	£ 95
	MTBASIC v2.6b	£ 65

For advice or information call us.

PASCAL COMPILERS

The new version from Microsoft is in stock and some new libraries.

8-bit	Turbo Pascal v3.0	£ 55
	DR Pascal/MT+	£ 99
	Pro Pascal	£199
16-bit	Turbo Pascal v3.0	£ 55
	Microsoft Pascal 3.2	£ 95
	Microsoft Pascal 3.3	£195
	SBB Personal	£160
	SBB Professional	£395
	Practical Pascal	£145
	Pro Pascal	£290
	DR Pascal/MT+86	£295

PASCAL LIBRARIES

Turbo Toolbox	Turbo Graphix
Paragon Supertools	Blaise Tools
Turbo Tutor	Asynch Manager
Btrieve	Shark
MetaWINDOWS	Multi-Halo
Prospect	Panel
View Manager	Turbo Screen

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CHIP CHAT

When is a clone not a clone?: Guy Kewney mocked Digital Research last month for having the less than bright idea of releasing different versions of GEM for IBM's PC and each of various clones. Infuriatingly, we hear that only one three-character instruction needs changing on the PC version to make it run on the clones.
Redeployment: in Sweden, they're moving people suffering from mental illness out of institutions and back into society. So what happens to the mental institutions? We have the answer — or at least a press release has given us the answer. Its headline states baldly: 'Swedish Science Park to replace Mental Institution'. It doesn't say whether any job losses are involved.
Idiot-proof: perhaps Apple is going too far in its efforts to make its products easy to use. For example, if you wait too long before feeding your original into the LaserWriter, the beast springs into action on its own. It prints out a nice document telling you how to feed it. Step one, wait for the yellow light; step two, insert your paper; step three, 'repeat steps one and two until your document is completed'. Step 4, throw this instruction sheet in the bin?
What a winner: if you were presented with a photograph of cows being diverted from chewing the cud by having a micro thrust before them, what would you suggest for the caption? That was what we asked in July, and Neil Thraves of Barkingside wins £10 for his answer — '*Sun* editorial staff being instructed on the use of the word processor in modern journalism'.
Logically speaking: one microcomputer dictionary offers an interesting definition of ambiguity. It explains that 'I'm leaving' means that someone is announcing his departure — 'or, if spoken by a tree, means Spring is near'. Hard to argue with that really.
Sign of the times: Acorn's directors were spotted leaving a recent press conference huddled together in an old Cortina. Our reporter didn't notice whether there was a nodding dog in the rear window.
Careering along: a careers bookshop in Sheffield has decided to go back to handling orders manually. 'This decision,' it explains, 'has been made because the computer system, as most of you are aware, is far too slow.' We tried to explain to them that a ZX81 wasn't up to the task, but they wouldn't listen. Or could this be another case of an over-eager salesman misrepresenting the benefits of new technology?

The cult dungeons and dragons game, Multi-User Dungeon (MUD), is to be presented to the whole world by British Telecom. The part of Telecom which launched the Firebird range of games (it has Elite rights) announced the MUD 'standalone' version at the *PCW* Show.

Normally, you have to stay up after midnight to play MUD on Essex University's mainframe, and you have to be quick to dial in if you want a game. The new version runs on the DEC Vax mini, model 750 (no, you can't afford one) and will give more than 100 players simultaneous access when it is fully operational.

To celebrate the arrival of this new version of the game, British Telecom is running a knockout challenge (The First MUD Spectacular) between 10 MUD champions — one of whom could be you.

In advance of the final, each champion receives online tuition from an Arch-wizard and a free MUD pack (no, that's not a beauty treatment, it's the £20 kit you need which gives you instructions on playing the game and three hours of playing time). You'll need the right modem and terminal software to participate — call (01) 608 1171 for more details. When trained, you'll then have an expenses-paid trip to the MUD Spectacular at the London Dungeon on 5 November where you'll take on the nine other challengers. If you defeat them you'll win 100 hours of playing time and £100 in cash, with free MUD time for two runners-up.

To become *PCW*'s champion and representative in the finals (what honour could be higher?), all you have to do is read the following story (imagine it's an extract from JRR Tolkien's great unfinished novel) and then write 50 words on how you think Diron met his end.

Send your suggestions (along with your name, address and phone number) to the Great MUD Challenge, *Personal Computer World*, 32-34 Broadwick Street, London W1A 2HG (only one entry each, please). We're looking for the most imaginative and closely argued solution to arrive here by 4 October, and we'll contact the winner by post to sort out the training details. The solution and winner will be announced in the December issue of *PCW*.

And now, on with the story. . .

It's a long way between the towns of Mollidor and Herewhorm, but at least you can be sure of rest and refreshment along the way at the home of your old friend Diron. Diron's a shy, retiring halfling shunned by his native village of Longhollows because of his fascination with black magic and other matters that don't appeal to the village's close-knit community, so on his coming of age Diron moved out of Longhollows and found himself a nice little home in the Bright Woods where he has lived alone for the last 20 years. But even now, 20 years on, the halflings of Longhollows blame him for any mysterious and untoward happening in their village, regardless of the fact that Diron now lives over a day's journey away. Although his home is quite near the main road running north through the woods, few travellers know of its existence and Diron keeps himself to himself, preferring to watch the travellers from a distance rather than announce his presence.

Indeed, if it wasn't for that day when you were hiding from the Dark Guardians, you probably would never have met Diron yourself. But over the years he has become a great friend and, although a little eccentric, he's really quite harmless and his so-called interest in black magic extends no further than the collection of unusual black magic curios that adorn the walls of his house.

So, as the night drew in on October the 31st, you approached Diron's house looking forward to his usual hospitality. Today's journey had been particularly tiring. With all the strangers currently travelling north, you have had to be particularly alert. Today alone you have seen a mischievous band of elves and, even more worrying, a bunch of brigands, each wielding a new-fangled blunderbuss — those things create havoc wherever they're seen.

Just after leaving the main road you hear two explosions, followed by a series of unearthly shrieks coming from the direction of Diron's house. Fearing the worst you run towards the house, but it is too late — at the bottom of the steps leading down to the house lies Diron.

On closer examination you find the following scattered over the steps: the hats of three wizards, a number of firecrackers, a blood-stained dagger and cloth, Diron's favourite housecoat (unstained), a witch's broom and a single live frog. Diron's body is unscathed and, given his nervous disposition, it seems likely that he died of heart failure. After surveying the scene, you soon come to a conclusion on how Diron met his death.

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