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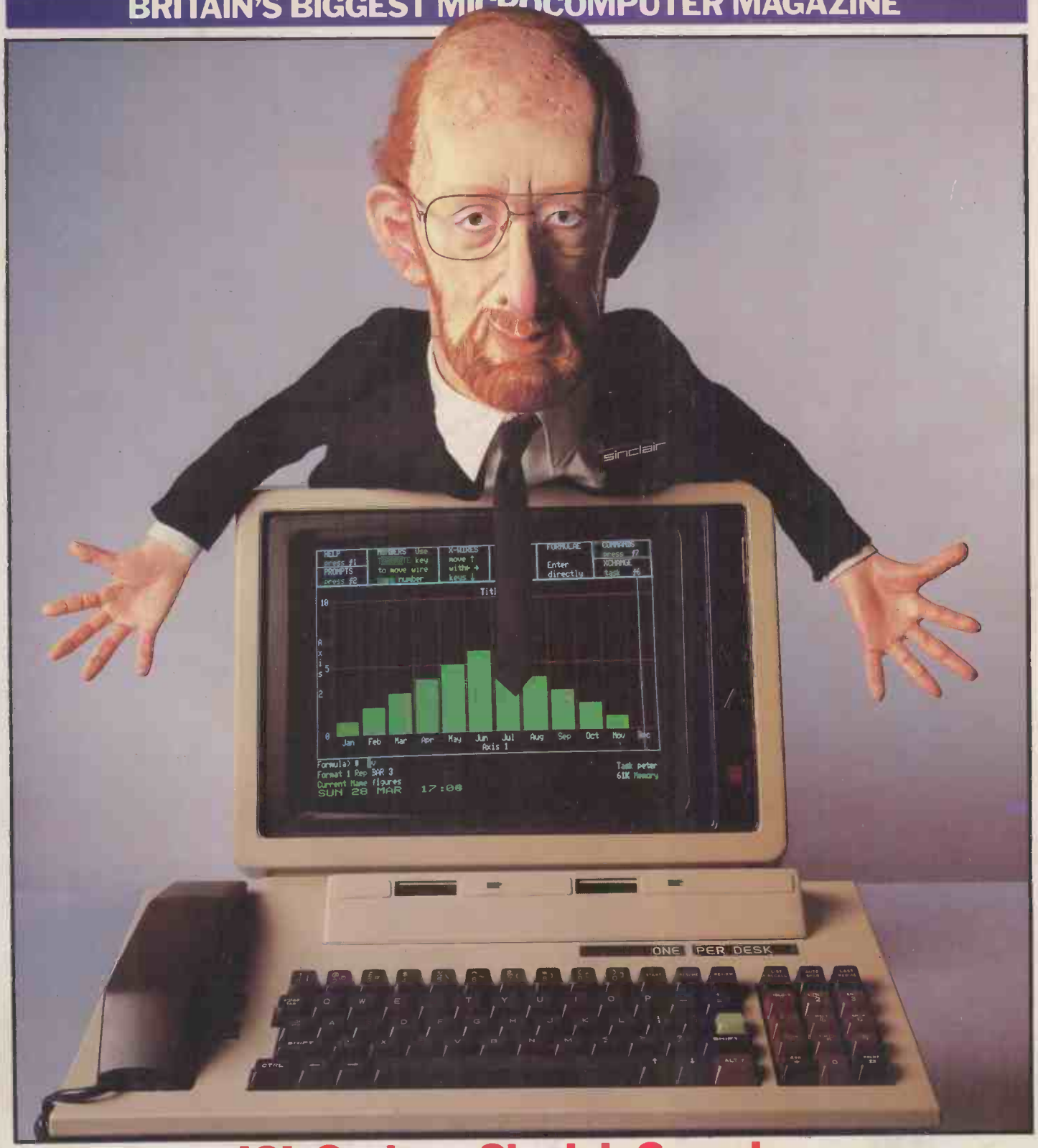


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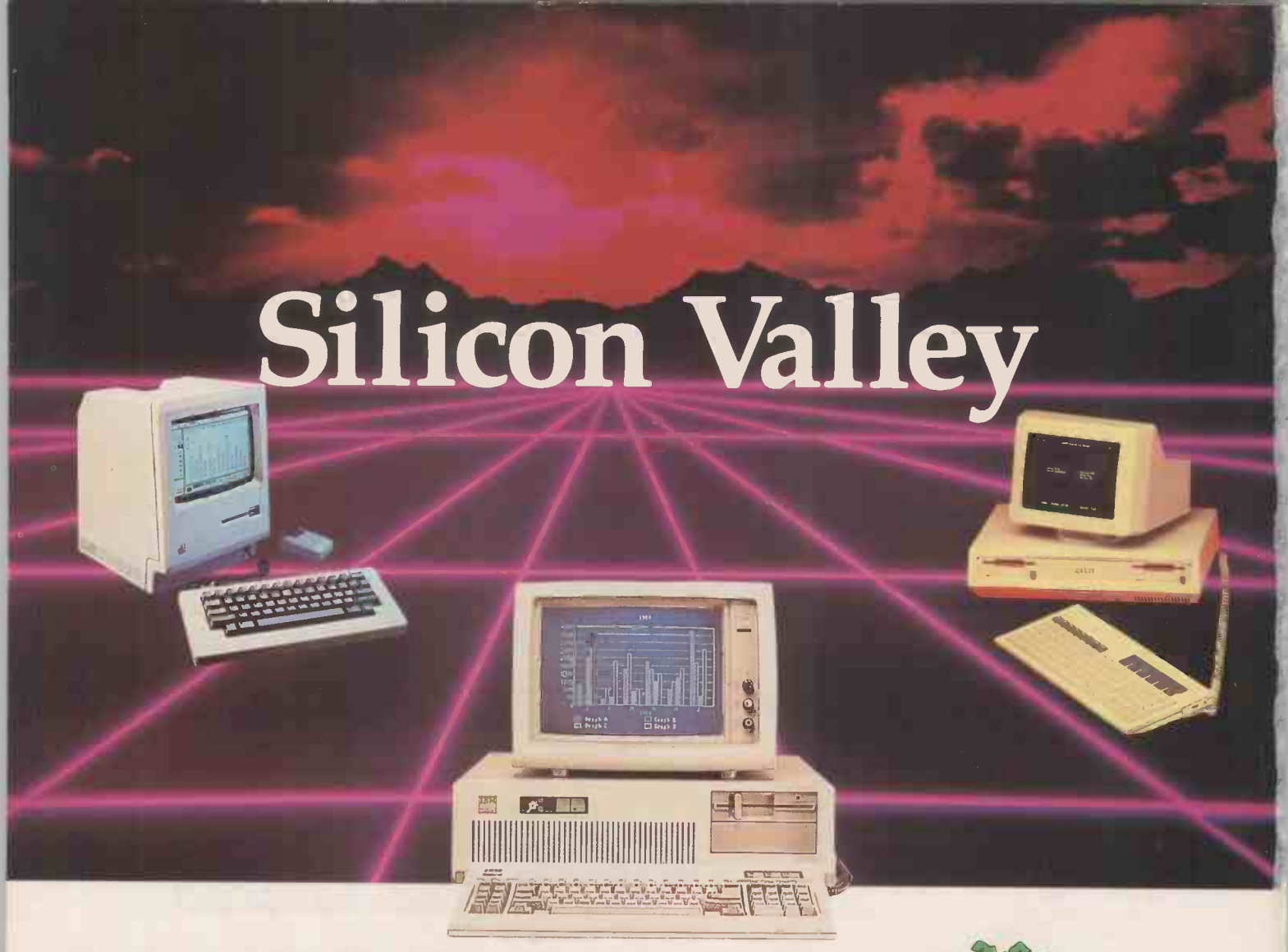


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*Model by Andy Geddes. Photograph by Crispin Thomas*

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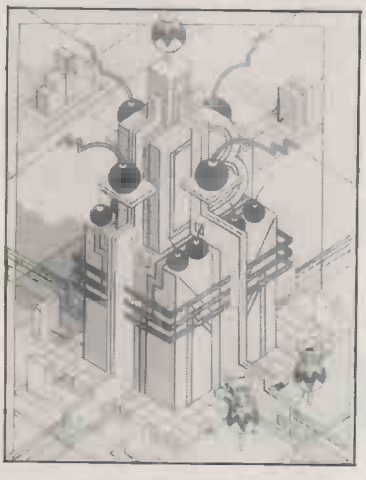

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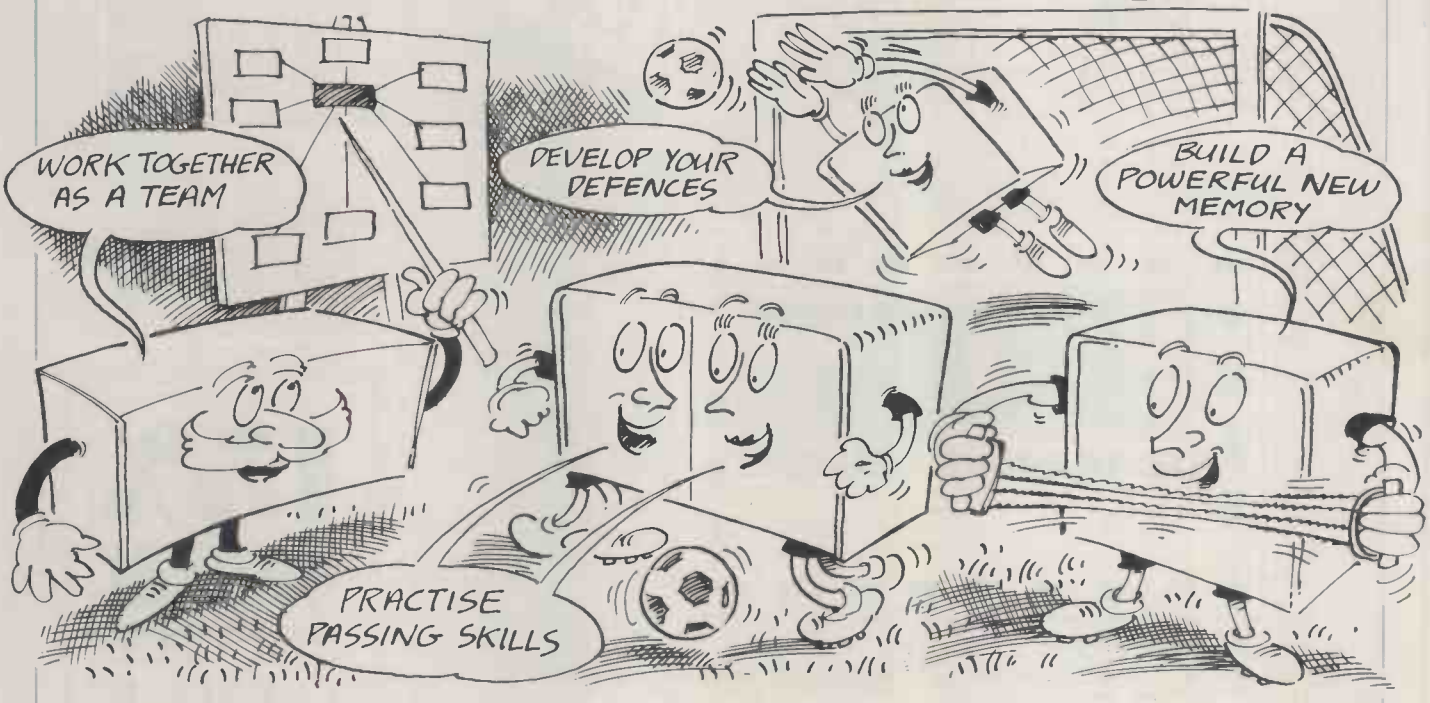


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Pressing any combination of the BREAK key does not affect the STARSTICK software and now by pressing TAB-BREAK REPLICA II is auto booted and is compatible with the STARSTICK ROM Version 2+.
The software patch provided in the ROM monitors O.S. calls and patches the Joystick to the Games programs, and so will work with most games programs even programs not meant to function with Joysticks (except those using illegal direct memory addressing).
The new command summary and description is:

| | |
|---|---|
| *STICK | enables the ROM. |
| *NSTICK | disables the ROM. |
| *SETSTICK | program joystick |
| *KSAVE | save protocols set by *SETSTICK. |
| *KLOAD | load protocols saved by *KSAVE. |
| *MAP | remap current keyboard definitions, play games using your favourite keys |
| *CLEVER | intelligent loading of software (ensuring ACORN/STARSTICK compatibility). |
| *PLONK | relocate area of work memory used. |
| *PROP1 | proportional joystick emulator 1. |
| *PROP2 | proportional joystick emulator 2. |
| *ANA | patches joysticks via the analogue port to games. |
| *KILL | ROM manager, disables troublesome ROMS. |
| *DOUBLE | replace up to two joysticks. |
| TAB-BREAK | Auto boots REPLICA II. |
| *PAUSE | define key to freeze game. |
| *NPAUSE | disable *PAUSE. |
| *NAME | predefined key protocols. |
| *HELP KEYS | display current key protocols. |
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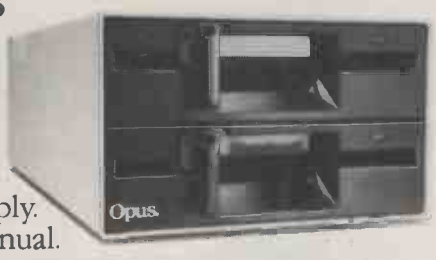


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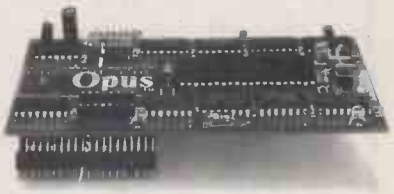


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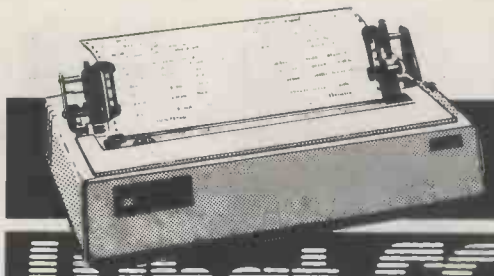

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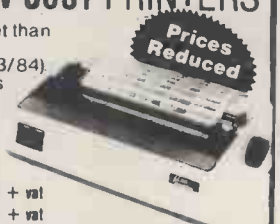


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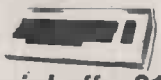

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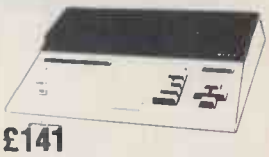

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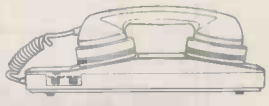

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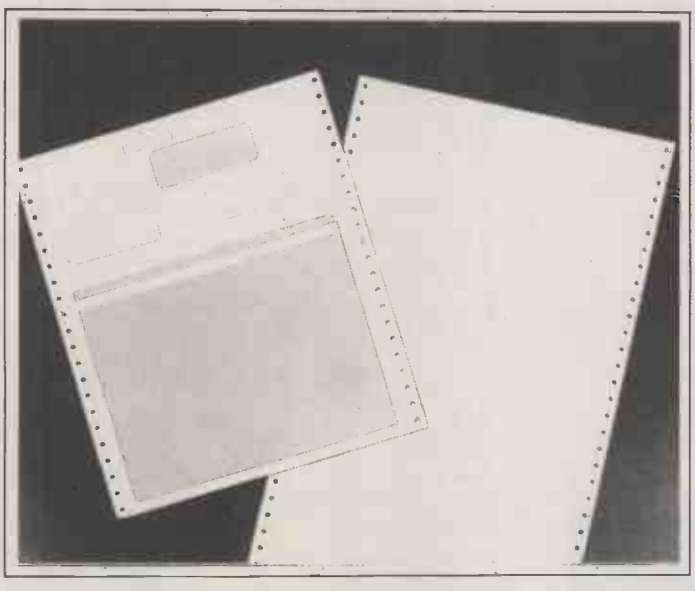

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All models have 16 character display, 10 different fault detection features and automatic self test, 16 bit programming capability and a selection of high speed programming algorithms:
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These monitors can receive TV programs thru a Video Recorder
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- STANDARD Centronics interface with 3 inputs
- EACH input port scanned every 5 secs to check for data. Switching between ports completely automatic.
- Data Input rate 4800 bytes/sec
- LED Bargraph indicates percentage memory used.
- COPY key allows current document to be reprinted.
- Internal check to prove the data integrity.
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| | Solder | IDC |
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PCB Mtg Skt
Ang. Pin 36 Way 750p 24 Way 700p

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Female to Female..... £10
Male to Female..... £10

### D CONNECTORS

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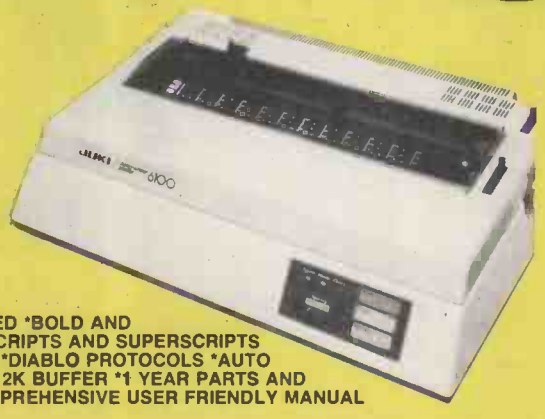

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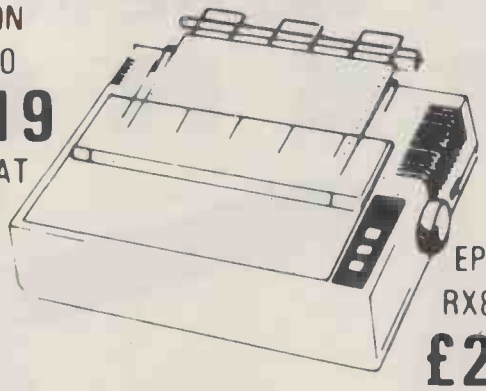

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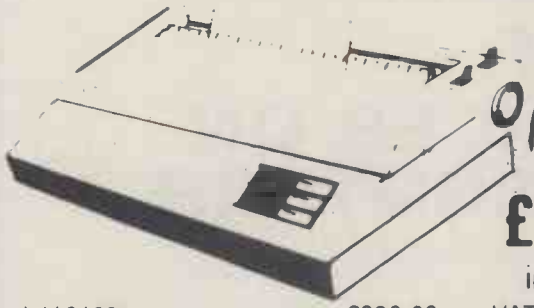

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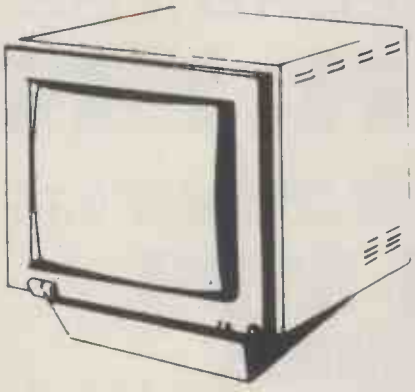

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| Sanyo DM2112 (15MHz) | £65.22 | + VAT = | £75 |
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| ISL 18 (18MHz) | £53.91 | + VAT = | £62 |
| ISL 20 swivel base/80col.) | £63.48 | + VAT = | £73 |
| Teco with Zoom facility | £91.30 | + VAT = | £105 |

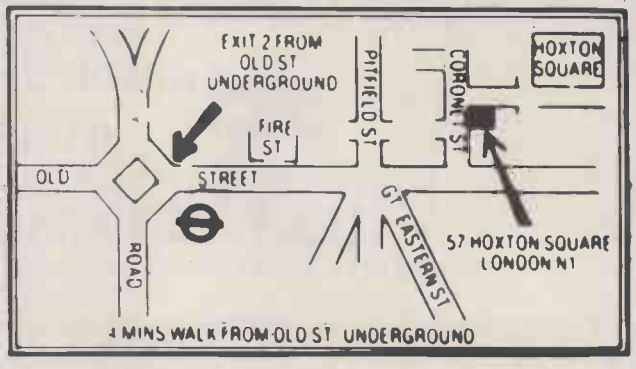
# microFAST

**The Experts**

57 Hoxton Square London N1

**01-729-1778**

Prices are for cash and carry sale and are correct at time of going to press in October.



# A HIGH RESOLUTION MONITOR FOR THE SINCLAIR QL AT A LOWLY £249.95 (INC. VAT).

This is the much acclaimed JVC colour monitor from Opus.

And it gives Sinclair QL owners a lot more than just excellent high resolution (580 x 470 Pixels).

As you know, the QL gives out information in 85 characters on the screen instead of the standard 80 characters.

And the loss of those five characters means that ordinary monitors simply can't show you the whole picture.

Opus, however, have overcome this problem by adapting the JVC, via a special interface and cable, so that the QL can now work 100% efficiently on it. And with no adjustments, it'll work with the BBC Micro just as well.

All for the lowly price of just £249.95 including VAT, carriage and, of course, a year's full guarantee.

You can order it by post by filling in the coupon below and sending it to: Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE. (You'll receive it within ten days by courier service.) Or you can telephone 01-701 8668 and pay by credit card.

Alternatively, you can buy at our showroom between 9.00–5.30pm. Monday to Friday, or 9.00–1.00pm Saturday.

**GUARANTEED 48 HOUR COURIER DELIVERY. NATIONWIDE.**

To: Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE.
Please send me:

_____ High Resolution Colour Monitor(s) at £249.95 each (inc. VAT).

I enclose a cheque for £_____ Or please debit my credit card account with the amount of £_____ My Access/Barclaycard (please tick) no. is_____

Name_____

Address_____

_____

_____

Telephone_____

PW23

Opus.
Opus Supplies Ltd.

# Micro Markets – Specialists in the new MSX System

MSX represents one of the most important advances in micro computing technology by introducing a compatible standard to micro computers. And Micro Markets, at the forefront of this new technology are pleased to be able to offer computers, peripherals and a full range of software for the new MSX Systems. MSX will offer the user a compatible programming language and therefore compatible software for all the MSX computers in the form of cassette, cartridge and disk. Visit your nearest Micro Market store soon.

## Toshiba HX-10 Computer including starter Pack Software £279.95

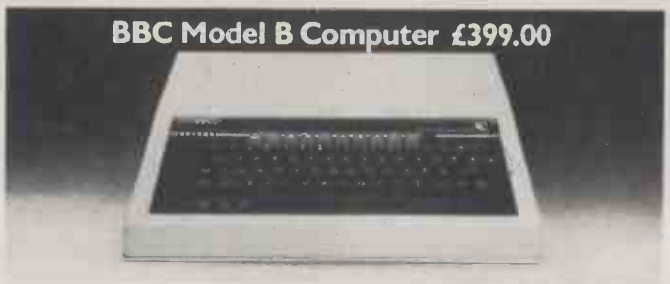
A powerful home computer designed to satisfy the first time user, enthusiast and businessman alike. Featuring MSX Basic operating language, a powerful 64K memory and 73 Key fullstroke keyboard, the HX-10 will produce high resolution graphics including graphs and charts in up to 16 colours and full 8 octave music generation.

## A selection from our extensive range of MSX software

| | | | | | |
|---|---|---|---|---|---|
| Coco in the Castle | £6.95 | Database | £19.95 | Footloose | £4.95 |
| Driller Tanks | £8.95 | Starting with the MSX | £5.95 | Peter Plumber | £4.95 |
| Binary Land | £8.95 | The MSX Red Book | £8.95 | Popeye | £4.95 |
| Fire Rescue | £7.95 | Maxima | £7.95 | Ant Attack | £7.95 |
| Eric the Floaters | £5.95 | Champ Assembler Monitor Package | £9.95 | Boogaboo | £7.95 |
| Dog Fighter | £6.95 | Time Bandits | £7.95 | Fred | £7.95 |
| Holdfast | £5.95 | Les Flics | £7.95 | Snowman | £7.95 |
| Spooks and Ladders | £6.95 | Hustler | £6.99 | Games Designer | £9.95 |
| Hyper Viper | £7.95 | Fuse Wars | £4.95 | French | £7.95 |
| Zen Machine Code Prog System | £19.95 | Devil Diver | £4.95 | German | £7.95 |
| WDPRO Word Processor | £29.95 | Maziacs | £4.95 | Spanish | £7.95 |
| | | | | Buzz-Off | £7.95 |
| | | | | Hot Shoe | £5.95 |
| | | | | Oh Mummy | £5.95 |
| | | | | Blagger | £7.95 |

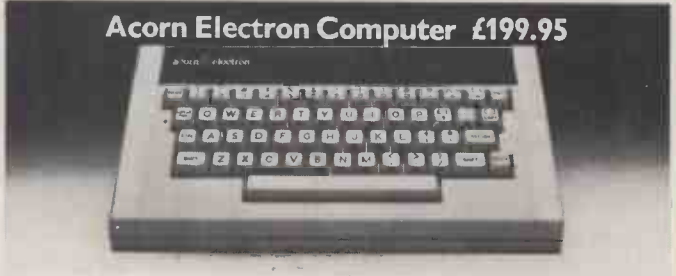
# Micro Markets offer a full range of leading brand computers

## BBC Model B Computer £399.00



Accepted as the standard in schools and colleges for learning computing. The BBC Model B features the powerful BBC Basic programming language, 32K memory, 73 key full stroke keyboard, 16 colour high resolution graphics and sound synthesizer. It has several interface parts for easy connection to many peripherals and there is a large range of business, home and games software available.

## Acorn Electron Computer £199.95



Built by the same company as the BBC computer and therefore uses the same widely used programming language. The ideal machine for learning about computers, the Electron features full stroke keyboard, 32K memory, full colour graphics and sound generation. It comes complete with 2 manuals: 'The User Guide' and 'Start Programming with the Electron'.

## Sinclair Spectrum 48K £129.95

With FREE Software 6 pack — worth £56.70 while stocks last

This very popular 48K colour computer offers excellent value for money. Featuring full colour high resolution graphics, 10 octave sound range and 44 key keyboard. There is a full range of peripherals and a massive selection of software.

## Interface 1 and ZX Microdrive. £99.95 per pair

For fast access to large amounts of data each microdrive is capable of holding up to 100K of memory on a single microfloppy disk. The Interface 1 will control up to 8 microdrives and also adds file handling and communication facilities to the Spectrum.

# MICRO MARKETS

# Amstrad CPC 464

## The complete system at an amazing price from Micro Markets

Amstrad's long awaited entry into the micro computer market is a low cost computer that provides the user with everything to just plug-in and get going, with applications ranging from arcade games to business and accounting. Its impressive features include: integral RGB colour monitor or Green Tube VDU, built-in 'speed load' data recorder, 64K memory, 74 key full stroke keyboard, high resolution graphics, 7 octave sound generation and a comprehensive range of software for business, educational and games from Amsoft.

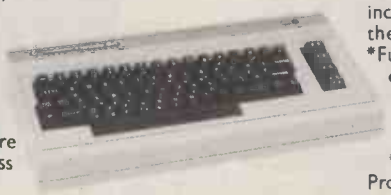
**With Green Screen Monitor £239.00**

**With Full Colour Monitor £349.00**

## Micro Markets for a full range of Commodore Computers

### Commodore 64 £229

The World's best selling home computer the CBM64 has a massive 64K memory, 66 key professional keyboard, 16 colour high resolution graphics and sound synthesizer. A full range of peripherals and extensive software for home and business is available.



### Commodore C16 £139.99

The perfect introduction to serious home computing. The complete starter kit includes everything for the beginner:

*Full size 16K computer
*Cassette Unit
*Introduction to Basic
*4 Games Programs

### Epson RX80FT Dot Matrix Printer Phone for Low Price

### Commodore Plus 4 £299

This latest computer bridges the gap between home and business computing with a powerful 64K memory and 4 integral software packages stored in the memory; Word Processing, Spreadsheet, Database and Business Graphics.

### Commodore 1701 14" Colour Monitor £229

Highest quality colour monitor excellent for high-resolution colour computer graphics and for video viewing. Input is either composite video or PAL chroma signal. Comes with 8 pin connecting lead.

### Opus 5401 40Tr 100K Disk Drive £149.00

**LONDON**
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**London N13**
SPI Sound Vision
359 Green Lanes, Palmers Green.
Tel: 01-882 5888
**London W2**
Kimberley Hi-Fi
376 Edgware Road. Tel: 01-724 0454
**LondonSE18**
Sevenoaks Hi-Fi & Video
162 Powis Street, Woolwich.
Tel: 01-855 8016
**AVON**
**Bristol**
Radford HI-Fi
52-54 Gloucester Road. Tel: 0272 428248
Absolute Sound
25 Queens Road, Clifton. Tel: 0272 24975
**BERKSHIRE**
**Maidenhead**
Hi-Fi Markets
18 King Street. Tel: 0628 73420
**BUCKINGHAMSHIRE**
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JCV Hi-FI & Video
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Bletchley. Tel: 0908 367341

**CLEVELAND**
**Middlesborough**
Mckenna and Brown
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Rush HI-Fi & Video Centre
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**Hornchurch**
Waters & Stanton Electronics
12 North Street. Tel: 04024 44765
**GLOUCESTERSHIRE**
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Absolute Sound & Video
42 Albion Street. Tel: 0242 583960
**HAMPSHIRE**
**Aldershot**
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81 High Street. Tel: 0252 20728
**Andover**
Andover Audio
105 High Street. Tel: 0264 58251
**HERTFORDSHIRE**
**Watford**
Hi-Fi Markets
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**KENT**
**Beckenham**
Sevenoaks HI-FI & Video
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**Bexley Heath**
Kimberley Hi-Fi
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Norman Audio
51 Fishergate.
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**NOTTINGHAMSHIRE**
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VISA

**Head Office:** Cousteau House, Greycaine Road, Watford, WD2 4SB. Tel: 0923 27737

All prices quoted in the Micro Markets advertisement are correct at time of going to press (26/10/84) but may be subject to change without notice due to fluctuations in Manufacturers' prices.

All Prices include VAT @ 15%. Not all the products featured in Micro Markets advertisement are available at all branches. Please check before travelling.

# MICRO MARKETS

Dysan

## DYSAN — FOR THE DISCERNING

With new lower prices, Dysans impeccable reputation is now a genuine bargain.

### 5¼ INCH DISKETTES

Certified for Single OR Double Density. 48 tpi with Hub Ring reinforcement.

| PRICES EXC VAT | | | | 10-40 | 50-90 | 100+ |
|---|---|---|---|---|---|---|
| 104/1D | S/S | 48 tpi | ... | 23.90 | 22.90 | 21.90 |
| 104/2D | D/S | 48 tpi | ... | 34.90 | 33.90 | 32.90 |
| 204/1D | S/S | 96 tpi | ... | 34.90 | 33.90 | 32.90 |
| 204/2D | D/S | 96 tpi | ... | 42.90 | 41.90 | 40.90 |

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation
10 and 16 Hard Sector available at same prices.

### 8 INCH DISKETTES

| PRICES EXC VAT | | | | 10-40 | 50-90 | 100+ |
|---|---|---|---|---|---|---|
| 3740/1D | S/S | D/Dens | ... | 32.90 | 31.90 | 30.90 |
| 3740/2D | D/S | D/Dens | ... | 40.90 | 39.90 | 38.90 |

32 Hard Sector available at same prices

maxell

## MAXELL — THE GOLD STANDARD

Maxell's very high quality control ensures all standards are met and surpassed.

### 5¼ INCH DISKETTES

Certified for Single OR Double Density. 48 tpi with hub ring reinforcement

| PRICES EXC VAT | | | | 10-40 | 50-90 | 100+ |
|---|---|---|---|---|---|---|
| MD1-D | S/S | 48 tpi | ... | 24.90 | 23.90 | 22.90 |
| MD2-D | D/S | 48 tpi | ... | 32.90 | 31.90 | 30.90 |
| MD1-DD | S/S | 96 tpi | ... | 32.90 | 31.90 | 30.90 |
| MD2-DD | D/S | 96 tpi | ... | 42.90 | 41.90 | 40.90 |
| MD2-HD | D/S | 1.6MByte | ... | 59.00 | 56.00 | 53.00 |

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

### 8 INCH DISKETTES

| PRICES EXC VAT | | | | 10-40 | 50-90 | 100+ |
|---|---|---|---|---|---|---|
| FD1-128 | S/S | S/Dens | ... | 29.90 | 28.90 | 27.90 |
| FD1-1XD | S/S | D/Dens | ... | 34.90 | 33.90 | 32.90 |
| FD2-XD | D/S | D/Dens | ... | 39.90 | 38.90 | 37.90 |

### 3 INCH DISKETTES

| PRICES EXC VAT | 10-40 | 50-90 | 100+ |
|---|---|---|---|
| CF2 Compact Floppy Disk | 39.90 | 38.90 | 37.90 |

Verbatim

## Verbatim® Datalife

Enter the World of Verbatim, with the latest range of Datalife diskettes. Not only their performance, but their new superior packaging makes them stand out from the rest. Further proof of their commitment to excellence. The world's brand leader, offers perfect data retention time after time — for a Lifetime.

## DATALIFE – FIVE YEAR WARRANTY

The world market leaders, with perfect data retention time after time – for a

### 5¼ INCH DISKETTES

Certified for single OR double density and with hub ring reinforcement.

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

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation
10 & 16 Hard Sector available at same prices

### 8 INCH DISKETTES

| PRICES EXC VAT | | | | 10-40 | 50-90 | 100+ |
|---|---|---|---|---|---|---|
| FD32-9000 | S/S | S/Dens | ... | 31.90 | 30.90 | 29.90 |
| FD34-8000 | S/S | D/Dens | ... | 31.90 | 30.90 | 29.90 |
| DD34-4001 | D/S | D/Dens | ... | 36.90 | 35.90 | 34.90 |

# New Memorex Cleaning Kits

Just arrived are the MEMOREX Computer Care range of cleaning kits. They represent fantastic value for money, and are available individually or with a discount if purchasing all three.

| Part No | Description | Price |
|---|---|---|
| MKEY | Case & Keyboard Cleaning Kit with one foam-clean aerosol, 20 Safebuds & 5 Safecloths | 4.90 |
| MTV | VDU/TV Screen Cleaning Kit with 20 Safeclean screen wipes & 5 Safecloths | 4.90 |
| MDD | Drive Head Cleaning Kit 5¼ withcleaning fluid, 10 cleaning disks, jacket and glove | 8.90 |

Buy all three Kits together and we will reduce the total price from £18.70 to £14.90 — A Bargain if ever we saw one!

DISKING INTERNATIONAL
FREEPOST
LIPHOOK, HAMPSHIRE GU30 7BR
UNITED KINGDOM

How to Contact DISKING:- By Telephone (0428) 722563
By Telex 858623 Telbur G

### OFFICIAL GOVERNMENT ORDERS WELCOME

We supply all Government bodies including Schools, Universities, Colleges, Hospitals, the Utilities, Research Establishments, Armed Forces, the Ministries and Local Authorities world-wide. We will despatch within 4 (YES 4) working hours from receipt of your official order number received either by post or by telephone, and all orders are handled in the strictest confidence and to the letter. All other customers cheques with order please payable to DISKING. If you are a large establishment, and cannot raise cheques without an invoice please post or telephone us your order and we will send a pro-forma Invoice by return, for your accounts department to pay against.

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**You may leave the rest to US!!**

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If you're posting your order, omit the word FREEPOST from our address, and use our normal post code GU30 7EJ and do not forget to stamp it First Class. If you are telephoning your order please make it clear that you wish to pay for your goods to be sent to you by First Class Post.

### FIRST CLASS RATES

| EXC VAT | 5¼" | 8" |
|---|---|---|
| First Ten-Pack | 2.00 | 2.50 |
| 2nd and subsequent Ten-Pack | 1.50 | 2.00 |

## TRADE CORNER
## FREE AEROPLANE

Our latest aeroplanes now have sound! Ideal missiles for throwing across the office at sleeping software engineers. Call and ask for your flier, and we'll send you our latest trade pack with prices, special offers and sample unlabelled diskette. We'll also enclose a DPC application form telling you how to buy at our 10,000 prices yet order in 50's.

## BARGAIN CORNER

5¼" Diskettes supplied in a FREE SEE 10 library box

| Prices Exc VAT | 10-40 | 50-90 | 100- |
|---|---|---|---|
| UL/1D S/S 48 tpi Diskettes | 13.90 | 12.90 | 11.9 |
| UL/2D D/S 48 tpi Diskettes | 20.90 | 19.90 | 18.9 |
| UL/1DD S/S 96 tpi Diskettes | 20.90 | 19.90 | 18.9 |
| UL/2DD D/S 96 tpi Diskettes | 24.90 | 23.90 | 22.9 |

Don't be fooled — fully warranted, new and individuall certified AND with a FREE SEE 10 library box an Disking Colour Coders!! They are unlabelled non-hu ring diskettes, and are manufactured by one of our fou major suppliers. At these prices you can't lose. Don forget you even get the superb DISKING clock with ever two ten-packs.

To: DISKING FREEPOST, Liphook, Hants, GU30 7BR, U.K Tel: (0428) 722563

| Qty | Description | Price exc VAT |
|---|---|---|
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| | | |
| | | |

Total Goods Value exc VAT
Total Delivery and insurance
Sub Total exc VAT
VAT
Value of cheque payable to Disking

NAME:
ADDRESS:
TEL NO:
Or please charge my credit card No

Access, VISA & Diners Cards Welcome

PCW/12/84

# DISKING NEWS

Business is not created between companies but between PEOPLE.

"Everyone wants responsibility, but nobody wants accountability."

Well, when we accept your order we're ACCOUNTABLE and we accept FULL responsibility for getting YOU your ORDER, and we will not rest until you've got it. That's what we're here for. Someone has to work in this country, after all we'll be in the minority soon!

**FREE with EVERY ten-pack of diskettes from DISKING. SEE 10 LIBRARY BOX**

Also available individually for £2.50 exc VAT either for 5¼" (SEE 10) or any 3"/3½" microdisks (SEE 10-3)

## PLUS
## Disking Colour Coders

A multicoloured pack of ten fibre tipped pens for colour coding your diskette labels available individually at 49p per pack of ten exc VAT.

If you work hard caring for your customers too, write to us and we'll start a club for the silent majority — we're fed up with the noise from all the grafitti writers, window smashers etc. We'll start publishing a list of the companies who are trying to keep Great Britain GREAT. We've got everything going for us and we're only just hanging on the cliff's edge by our fingernails. Let's climb up — wouldn't it be nice to see this country regain the respect it once had for its industry. As they say in their adverts for Austin Rover cars — GO FOR IT. They should know!

*Send all correspondence to:*

"The Real Working Class" C/O Disking International, Liphook, Hants, GU30 7EJ

We could even call it CAMREAP (Campaign for real people)

## *DISKING SUPER PROMOTION Free Clock Value £8.95*

With every TWO Ten-Packs* of ANY 3½", 5¼" or 8" disks by Verbatim, Memorex, Dysan or Maxell purchased at these prices, we will pack a Super Disking Calendar Clock worth £8.95 absolutely FREE.

Order four Ten-Packs, and you will receive two Calendar Clocks and so on.

*Excluding diskettes purchased from bargain corner. All FREE offers are subject to availability.

**OFFER ENDS 28th FEBRUARY 1985**

# MEMOREX

## MEMORY EXCELLENCE

Memorex diskettes are everyones favourite, and work well in ALL computer systems.

### 5¼ INCH DISKETTES

Certified for single OR double density and with hub ring reinforcement.

| PRICES EXC VAT | | | | 10-40 | 50-90 | 100+ |
|---|---|---|---|---|---|---|
| 3481 | S/S | 48 tpi | ... | 21.90 | 20.90 | 19.90 |
| 3491 | D/S | 48 tpi | ... | 27.90 | 26.90 | 25.90 |
| 3504 | S/S | 96 tpi | ... | 27.90 | 26.90 | 25.90 |
| 3501 | D/S | 96 tpi | ... | 35.90 | 34.90 | 33.90 |

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation
10 and 16 Hard Sector available at same prices

### MEMOREX 3½" MICRODISKS — HERE AT LAST!

| PRICES EXC VAT | | | 10-40 | 50-90 | 100+ |
|---|---|---|---|---|---|
| 6100 | S/Sided | ... | 42.90 | 41.90 | 40.90 |

0.5M Byte rating auto shutter
3½" library boxes coming soon

**UK Shipping Rates inc. ins. but exc VAT**

**5¼" DISKS OR MICRODISKS**
1-2 packs each pack @ 95p
3-5 packs each pack @ 75p
6-9 packs each pack @ 60p
10+ packs POST FREE
ALL SEE 10 library boxes

DISKING COLOUR CODERS
25p each — 5+ POST FREE

ALL MEMOREX CLEANING KITS
1 off 60p each
2-7 off 40p each
8+ off POST FREE

# DISKING *Means Business*

## Budget Micro

30 Microdisk capacity (or 12 compact 3" disks) stored in 3 compartments. Smart two tone beige/brown with strong steel Hinges.

**BUY 3** and get the fourth one **FREE**

## Budget 50

50 Minidisk capacity in smart two tone brown, complete with four dividers and no scratch rubber feet.

| Part No: | Description | Price EXC VAT |
|---|---|---|
| BM | 30 Microdisk capacity | 6.90 |
| B50 | 50 Minidisk capacity | 8.90 |

If buying 3 to get one FREE, P&P at the four unit rate please

## Diskette Storage

**Executive Mini 100 & Executive Micro 50**

The ultimate in quality, these beautiful Austrian made storage boxes in luxurious two tone dark brown come with everything one could ever want. The lids not only swing open and shut, but are also removable if shelf space is prohibitive. They come with ingenious dividers where even the tabs are adjustable and protected from dirty finger marks. The wonderfully engineered locking mechanism comes with 2 keys and a master filing tab. Buy 3 and STEAL one FREE.

| Part No. | Description | 1-3 |
|---|---|---|
| EM100 | 100 Minidisk capacity | 22.90 |
| EM50 | 50 Microdisk capacity | 19.90 |

Buy 3 and STEAL one FREE. P&P at the 4 unit rate please.

**Jumbo Swinger**

A massive 120 Minidisk capacity! With adjustable arms to compensate for less diskettes, keys and carrying handle. Buy 3 and STEAL one FREE.

| Part No. | Description | 1-3 |
|---|---|---|
| JUMBO | 120 Minidisk capacity | 18.90 |

Buy 3 and STEAL one FREE. P&P at the four unit rate please.

**Budget 30**

30 Minidisk capacity, smart beige/brown with strong steel hinges complete with 5 coloured dividers. Buy 3 and STEAL one FREE.

| Part No. | Description | 1-3 |
|---|---|---|
| B30 | 30 Minidisk capacity | 5.90 |

Buy 3 and STEAL one FREE. P&P at the four unit rate please.

**Disking Swing-lid Lockable Box**

60 Minidisk capacity, complete with keys, dividers, tags and even built in carrying handles. Buy 3 and STEAL one FREE.

| Part No. | Description | 1-3 |
|---|---|---|
| DSLB | 60 Minidisk capacity | 17.90 |

Buy 3 and STEAL one FREE. P&P at the 4 unit rate please.

# UNBELIEVABLE SAVINGS

## ** COMPUTERS **

| | | EX VAT |
|---|---|---|
| APRICOT | F1 - from | £675.00 |
| APRICOT | Point 7 from | £2950.00 |
| APRICOT | PORTABLE from | £1445.00 |
| APRICOT | 256K 315Kx2 MONITOR | £1395.00 |
| APRICOT | 256K 720Kx2 MONITOR | £1545.00 |
| APRICOT | Xi 256k 10MB MONITOR | £2195.00 |
| BBC | B | £320.00 |
| CIFER | 9000 Multi User 21MB | £5095.00 |
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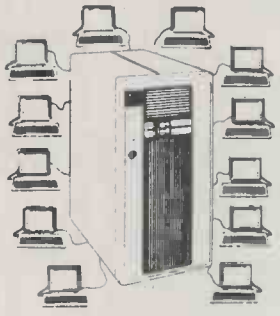

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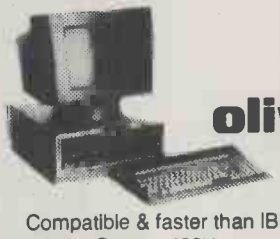

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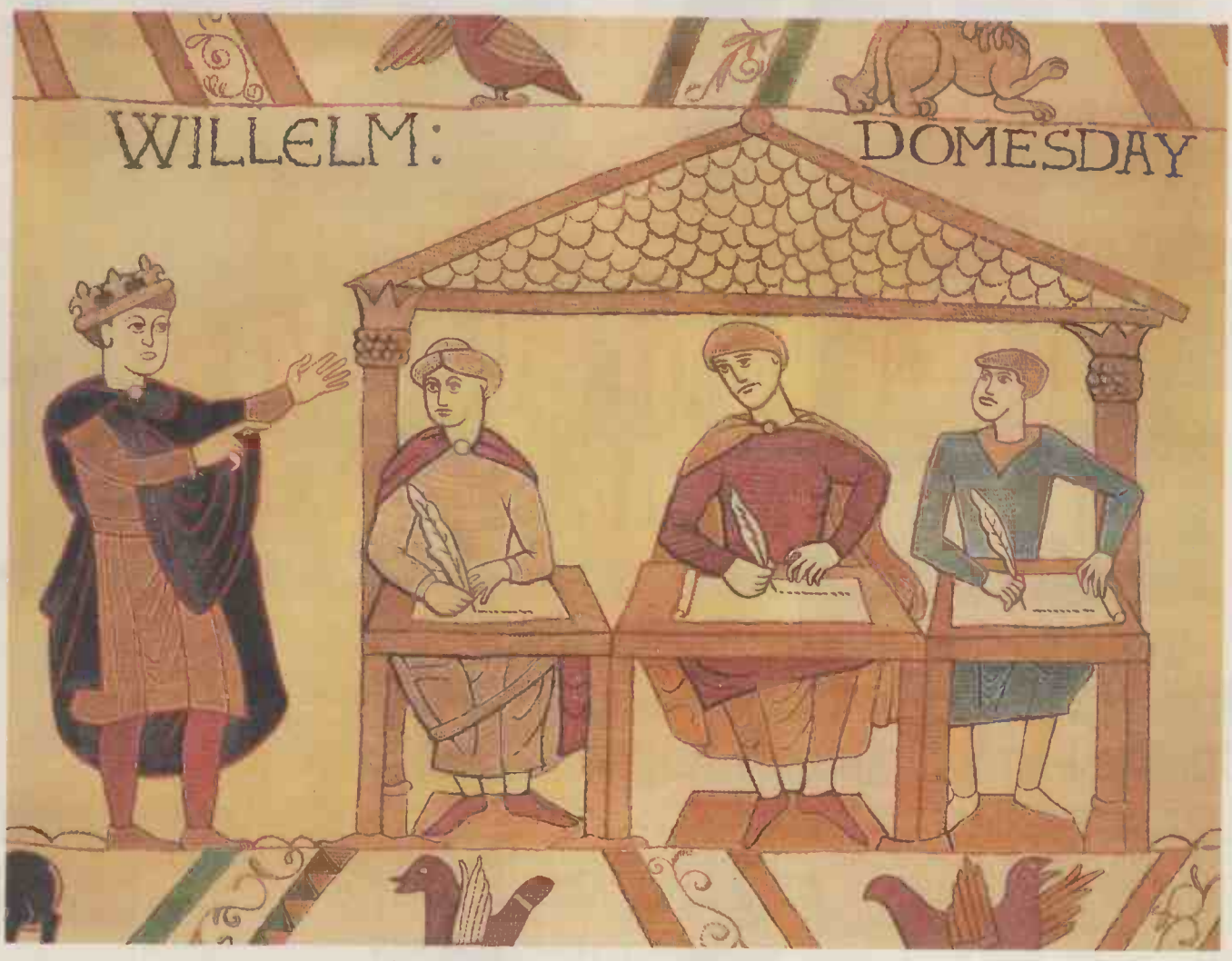


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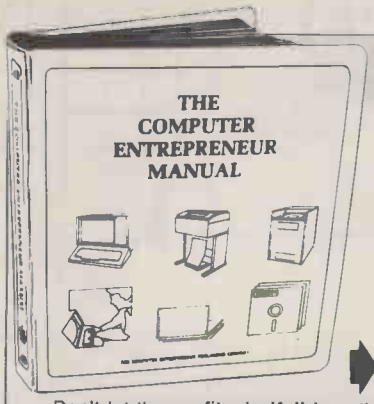


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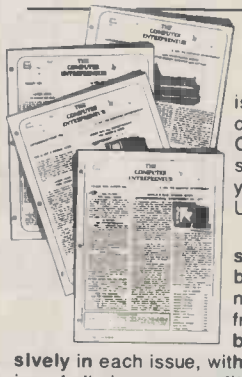

## The **COMPUTER ENTREPRENEUR JOURNAL**

**The Computer Entrepreneur Journal** and **Newsletter** will keep you up with the latest exciting computer opportunities. In each issue features such as **Dealer Hot Sheet** tip you off on the best suppliers and special deals (like a recent sale where our readers could get **Winchester disk drives** and **high speed printers** for **less than £150** and **Apple II compatible computers** for £30!). **The Computer Market Newswire** column covers new products, industry "inside" info, moneymaking tips and where to get **free books, software & magazines** and **free on-line data bases.** US franchise chains are becoming **extremely profitable** in Europe. We give you the facts on the up-and-coming US franchises like the **lucrative software stores** and **repair franchises,** still unknown in the UK, and which you can enter for considerably less than Computerland and other already UK-established chains.

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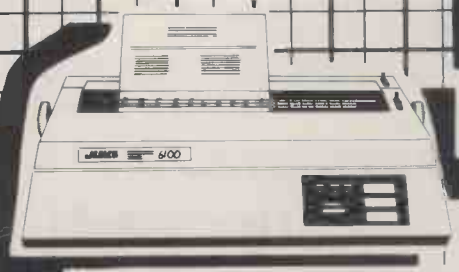

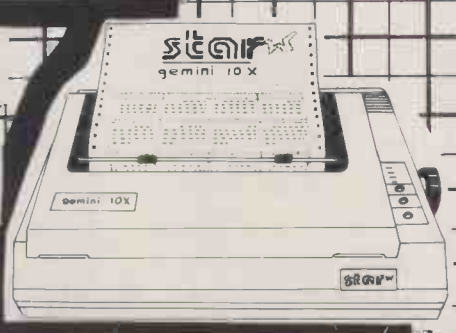


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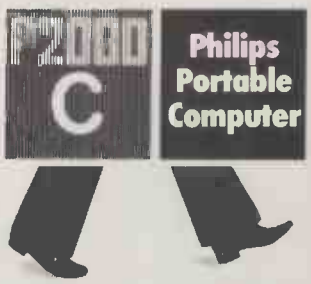


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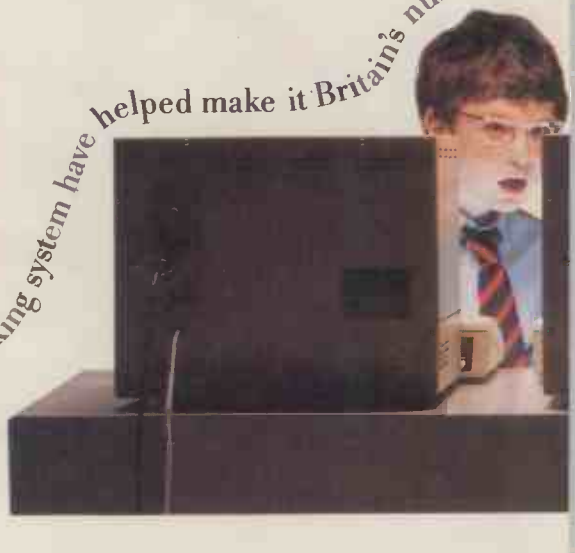

It's down at the doctor's, helping run the practice thanks to an ingenious program designed by two GPs.

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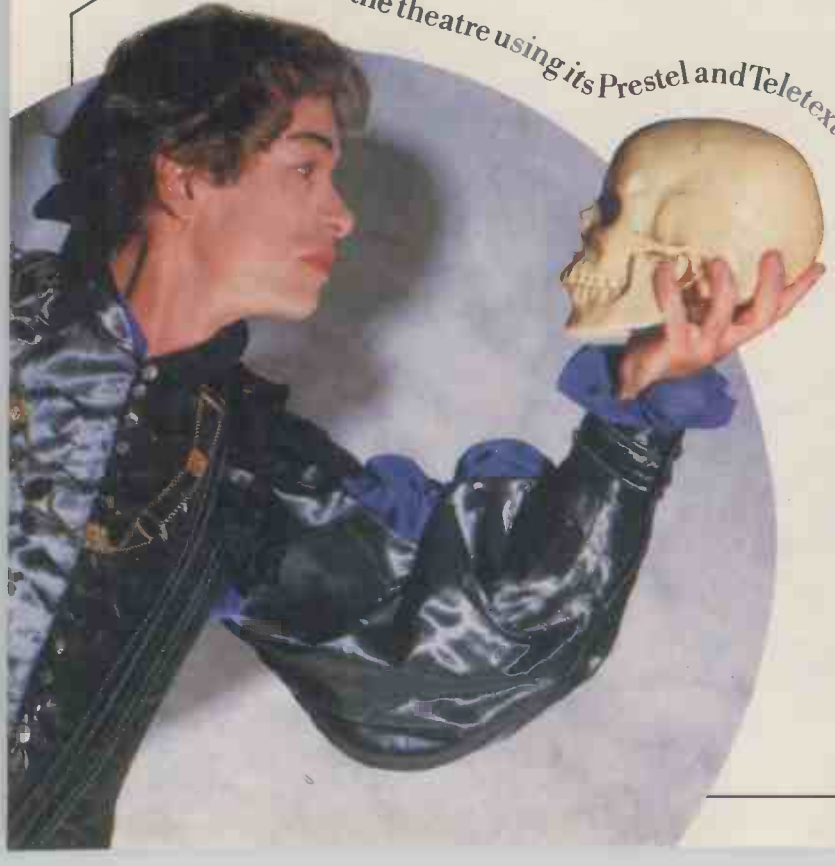

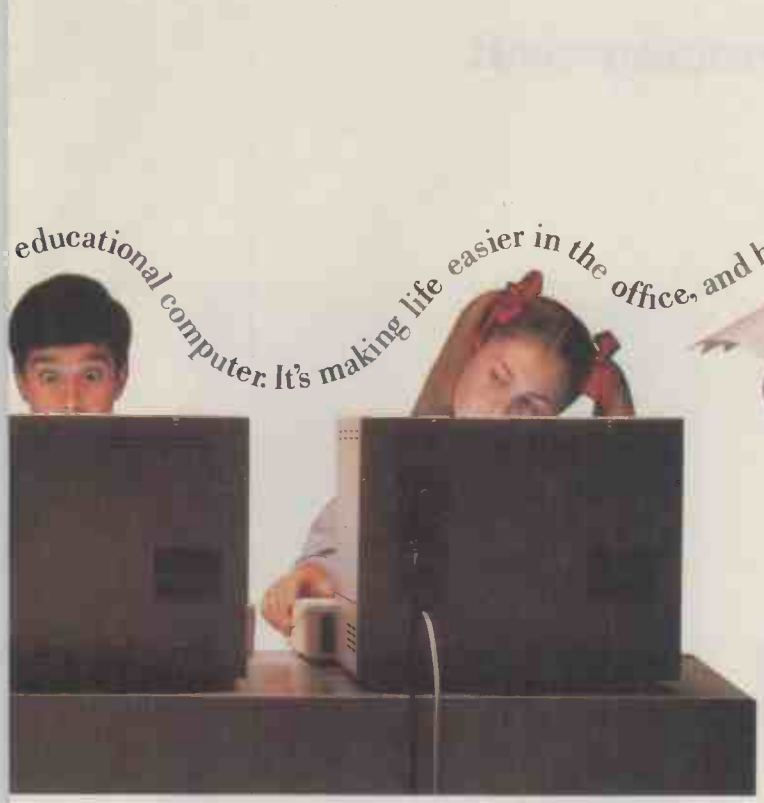

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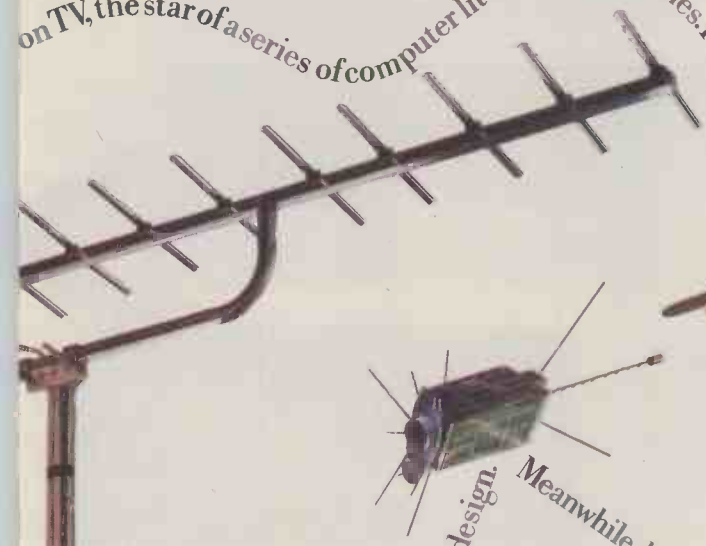

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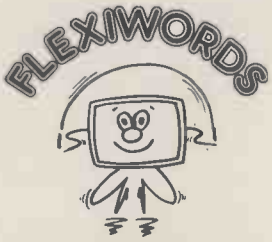


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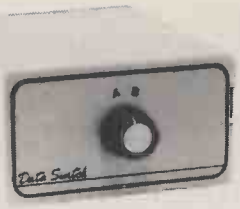

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- Model G400 – Single, double sided, high density disc drive (320K formatted)
- Model G800 – Twin, double sided, high density disc drives (640K formatted)
- Integral stabilised power supply
- 2 IBM PC compatible hardware expansion buses
- Software compatibility allows Lotus 1-2-3 and all popular IBM PC business programs to run without modification, subject to the constraints of the BBC keyboard and display
- Disc interface is not required

Keyboard text and graphics supplied by BBC Model B

**• THE GRADUATE •**

## More data storage

A step up from the G400 is the G800 which offers twin, double sided 320K disc drives for extra data storage. Both the G400 and the G800 provide the possibility of further expansion for networking, modems, etc., via the IBM compatible hardware slots provided by the Graduate models. Each model comes complete with a well written user/technical manual and connecting leads.

## Just plug it in

Unlike other add-ons there is no need to open the BBC to make the connection. The compact and tidy Graduate models simply plug in to the 1MgHz bus on the Model B. Within minutes you can be up and running with an IBM PC compatible system that really means business.

## The range

Add 256K RAM, 640K disc storage and IBM PC compatibility to the BBC Micro for less than £1000 ex.VAT.

Graduate G400 (128K) £764 inc.VAT
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# BYTE SHOP News

## INTRODUCING BYTE SHOP TRAINING COURSES

As part of our plans to offer the very finest all-round service to business microcomputer users, we're pleased to be able to announce the introduction during 1985 of a series of Byte Shop Training Courses. These vary in complexity from 'Understanding Computers – A Jargon Breakdown' to Programmers Courses on Pascal and Cobol. Initially the courses will operate in London, Birmingham and Glasgow. If you would like details 'phone Ian James on 0480 218812.

## IT'S NOT BY ACCIDENT THAT THE COMMUNICATOR KEEPS MGTS OVERHEADS DOWN

Concerned that not enough was being done to make people aware of the dangers at work, the Mercia Group Training Scheme was set up by like minded companies in the Midlands to train staff in aspects of safety at work. The MGTS also offers a range of job training programmes in what has unfortunately become a major unemployment black spot.

As a non-commercial enterprise, clearly overheads need to be rigorously controlled and a Comart Communicator 520MP multi-processing system was acquired from Byte Shop, Birmingham.

Running WORDSTAR and dBASEII, the Communicator handles a variety of administrative jobs including word-processing for reports and minutes etc. Benefits to date cover reduced overheads and faster and more efficient generation of information. Mercia Group were pleased with the 'genuine interest' shown by Byte Shop staff in their application and the subsequent level of support.

## Getting the right computer

At the Byte Shops we've helped countless companies of all sizes improve their efficiency by the introduction of microcomputers. Generally these are required to perform routine business tasks – but, however similar the application, we invariably find that no two customers have *exactly* the same requirements. When you come to the Byte Shop, you'll find that we are far more interested in finding out what jobs you require the computer to do both now and in the future. We then tailor a complete system including not only the hardware but the software, and the peripherals to meet your individual needs. We believe this is the only sensible way to sell computers. On this spread you'll find a number of 'Typical Ready To Run' systems. However we won't sell one to you – unless you force us – without asking a few questions first.

### WHERE TO FIND US: SOUTHAMPTON

By utilising their considerable expertise and talents for improvisation, the staff at Byte Shop Southampton have been busy of late providing the technology to enable customers to link their IBM PC's together in a networking or true PC DOS multi-user system. If you want more of your staff to have access to IBM PC's, Byte Shop Southampton could provide the answers.

### PROGRAMMERS CORNER

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

### CLEARANCE BARGAINS SOUTHAMPTON

The following are 'one-offs' and available on a first-come first-served basis

**Apricot** double sided disk system with 9" monitor (1995.00) ..... **ONLY 1350.00**

**Apricot** Xi 10Mb hard disk, 315Kb floppy (2995.00) ..... **ONLY 2200.00**

**Tecmar** 5Mb expansion for IBM PC (2235.00) ..... **ONLY 700.00**

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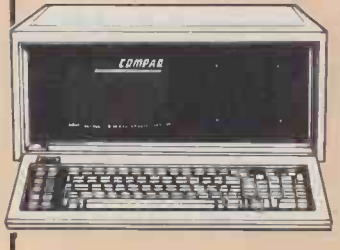
### STANDARD & PLUS




Following phenomenal success in America, you can now find the portable, fully IBM PC compatible, Compaq micros at your local Byte Shop. Spec. for the Standard model includes 256Kb RAM, twin 360Kb floppy disk drives, high resolution screen and tough carry case ..... **2195.00**

'Plus' models as above but with single 360Kb floppy and 10Mb hard disk drives ..... **3945.00**

**ALL PRICES EX. VAT**

### DESKPRO

Four new PC/XT compatible models from Compaq fully complementing the now established 'Standard' and 'Plus' models. By incorporating the high-speed 8086 microprocessor, Deskpros can offer 2-3 times faster processing speeds than standard PCs while running virtually all PC/XT software without modification.

The Deskpro models start with an entry level system ideal for first-time computer users and progress to the top of the line Model 4 which has claims to being the most powerful high performance personal computer on the market. Lower level models are capable of being upgraded should the need arise.

Common to all models are dual-mode monitor, full keyboard and PC/XT compatible expansion slots.

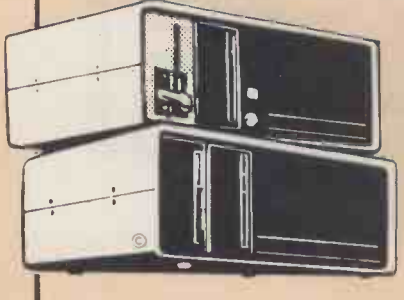
**Model 1**; 128Kb RAM: single 360Kb disk drive ..... **2195.00**

**Model 2**; 256Kb RAM; dual 360Kb disk drives ..... **2595.00**

**Model 3**; 256Kb RAM; single 360Kb & 10Mb fixed disk drive ..... **3995.00**

**Model 4**; 640Kb RAM; single 360Kb, 10Mb fixed disk drive plus an internal 10Mb fixed disk drive back-up .. **5595.00**

# COMART COMMUNICATOR



Comart Communicator multi-user systems have expandability built in and are the most cost-effective way of sharing computer power amongst your staff. You can start with a Communicator system to suit your current requirements – up to 15 people can share – and simply add new terminals as you grow. A considerable saving over buying a complete new computer each time.

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**Communicator CP1525M** with M-BOS operating system, including 5 display terminals, dot matrix printer and cables ..... **10595.00**

### NEW COMMUNICATOR CP2000 SERIES

Featuring the new 'powerhouse' Intel 286/287 processors, the three models in the CP2000 series have at least double the speed and processing capacity of most conventional multi-user systems. The big performance and excellent value of the CP2000, means that it can comfortably support up to 12 users for as little as £2995. Importantly, the CP2000 series runs two industry standard operating systems, BOS and the latest version of the concurrent CP/M, allowing you to switch from up to four programmes simultaneously without clearing the screen.

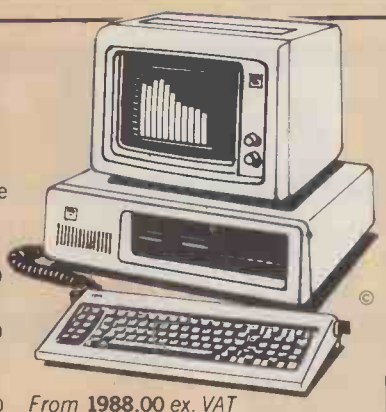
# IBM/PC

The IBM PC/XT's versatility means that it's equally at home in a small business or as a stand alone desk top in a large corporate company linked to a mainframe.

**IBM PC**; dual 320Kb disk drives; 64Kb RAM; UK keyboard and screen ..... **1988.00**

**IBM PC**; dual 320Kb disk drives; 128Kb RAM; DOS 2.1; UK keyboard and screen..... **2149.00**

**IBM PC XT**; 1 × 320Kb floppy disk plus 1 × 10Mb hard disk; 128Kb RAM; ASYNCH COMMS; DOS 2.1; UK keyboard and screen..... **3432.00**



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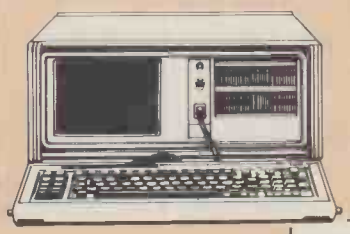

**IBM PORTABLE PC**

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# SYSTEM SPOTLIGHT

## IBM PC AT

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Basic ..... from **3374.00**
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## *At a glance Computer Checklist*

| | IBM AT | IBM PC/XT | Comart | Compaq |
|---|---|---|---|---|
| Colour graphics | ● | ● | | ● |
| Multi-user | ● | | ● | |
| Hard disk storage | ● | ● | ● | ● |
| Upgradeable | ● | ● | ● | ● |
| Expandable | ● | ● | ● | ● |
| Communications | ● | ● | ● | ● |
| Transportable | | | | ● |
| Networking | ● | ● | ● | |

# TOP 20 SELLING SOFTWARE

1. **Lotus 1-2-3** – Remarkable integrated spreadsheet and information management package incorporating colour graphics for the IBM PC..... **375.00**
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3. **Symphony** – Complementary follow-up to 1-2-3 from Lotus including word processing, integrated spreadsheet, communications, database and colour graphics..**550.00**
4. **SuperCalc 3** – Latest SuperCalc version with colour graphics rivalling Lotus 1-2-3..... **295.00**
5. **WordStar** – Most popular wordprocessing program, easily integrated with MailMerge, SpellStar, Star index and SuperSort enhancements..... **295.00**
6. **Pulsar Accounts** – Complete integrated business accounting system includes sales, purchase, nominal ledgers, data analysis, stock control, invoicing and payroll – for Apricot and IBM PC..... per module **195.00**
7. **Open Access** – Exciting new integrated business package rivalling Lotus 1-2-3 with WP, Database, comms and 3-D graphics..... **450.00**
8. **Multi-Mate** – New standard in fast, easy to use, function key driven wordprocessing for the IBM PC ..... **330.00**
9. **SuperCalc 2** – Sophisticated, easy to use financial spreadsheet for in depth analysis, modelling and forecasting ..... **195.00**
10. **Framework** – Integrated package featuring word processing, spreadsheet, graphics, data management .... **495.00**
11. **Friday** – Personal file management package for the novice with quick custom reporting..... **195.00**
12. **dBASE III** – Powerful easy to use database with enhanced reporting facilities and ability to print mailing labels from files..... **495.00**
13. **Cardbox** – Simple to use data retrieval and information management tool..... **155.00**
14. **Level II Cobol** – Mainframe level II compiler, well suited for new applications development: tools and utilities available..... **965.00**
15. **GraphStat** – Up and coming statistics and colour graphics package for the IBM PC..... **195.00**
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18. **BSTAM** – Communications package for sending and receiving CP/M files over telephone lines. **133.00**
19. **Flight simulator** – Full colour game for both the novice and the potential fighter pilot on the IBM PC ..... **45.00**
20. **Pascal MT+** – Comprehensive integrated language for developing production quality software ..... **292.00** (CP/M86.500.00)

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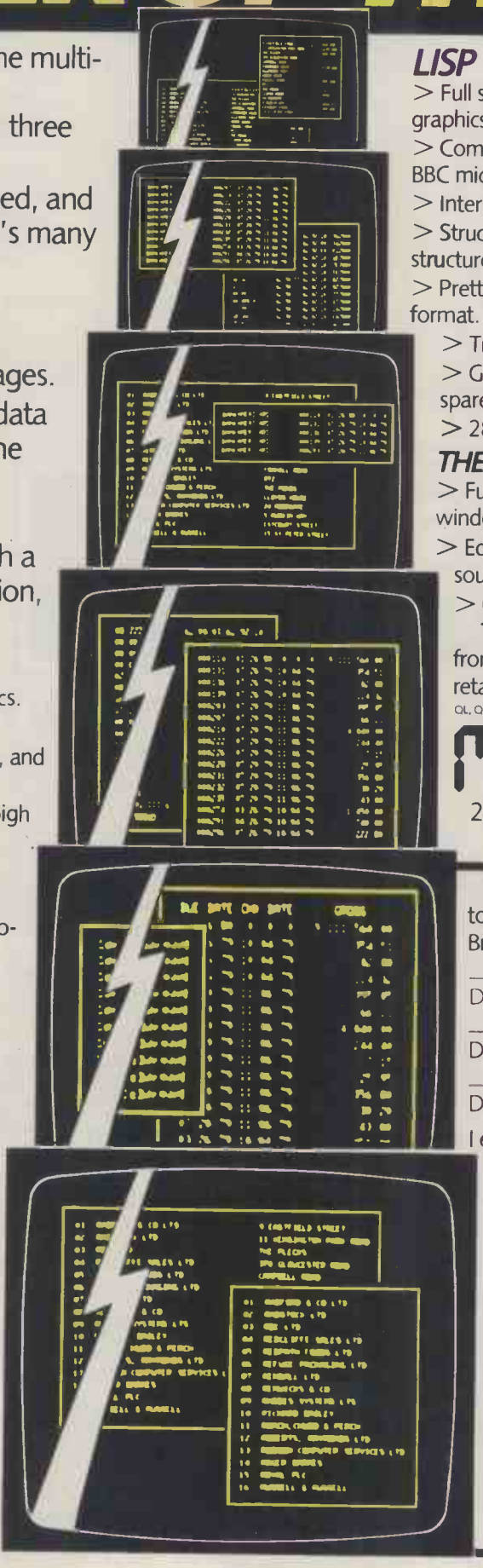
> Use **LISP** for manipulating data structures, and for exploring the world of artificial intelligence.

Each language comes as a complete development kit with a screen editor and documentation, for only £59.95.



## THE ASSEMBLER

> Standard Motorola 68000 mnemonics.
> English error messages.
> Produces code which can be EXECed, and run as a concurrent job.
> External references allow linkage to high level languages and other assembler modules.
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> Position independent, absolute or relocatable code can be produced.
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> Large range of directives.
> Fully formatted listings.
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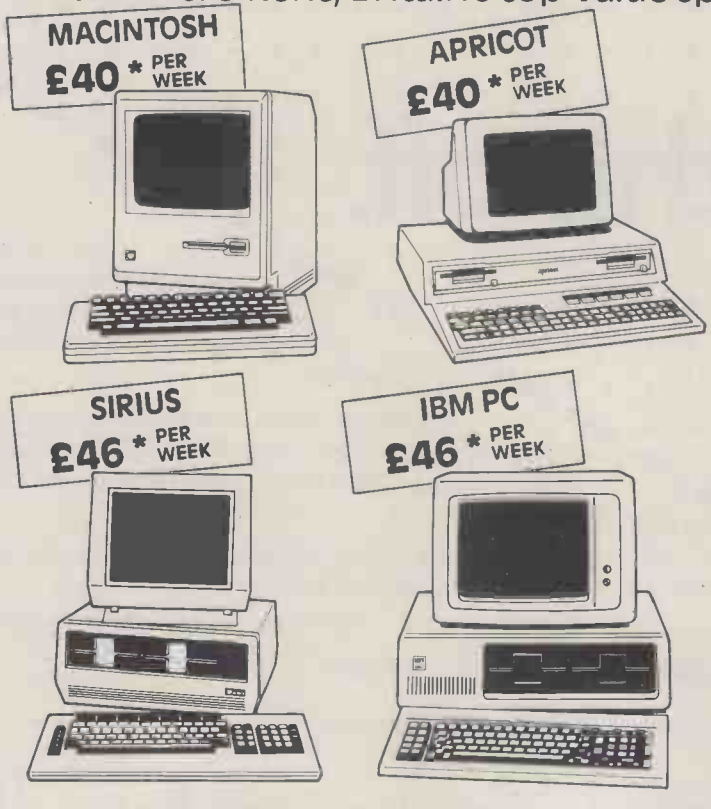


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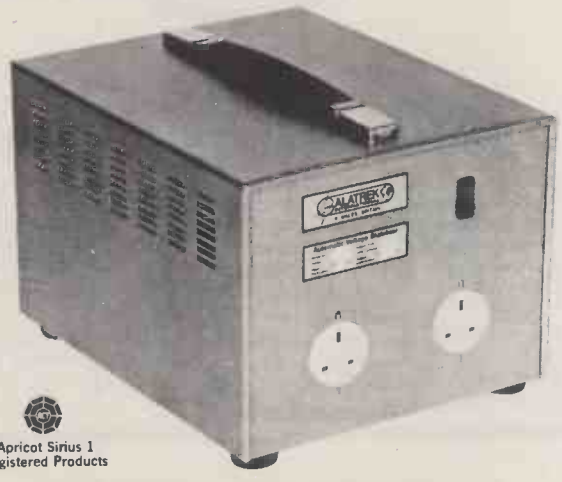

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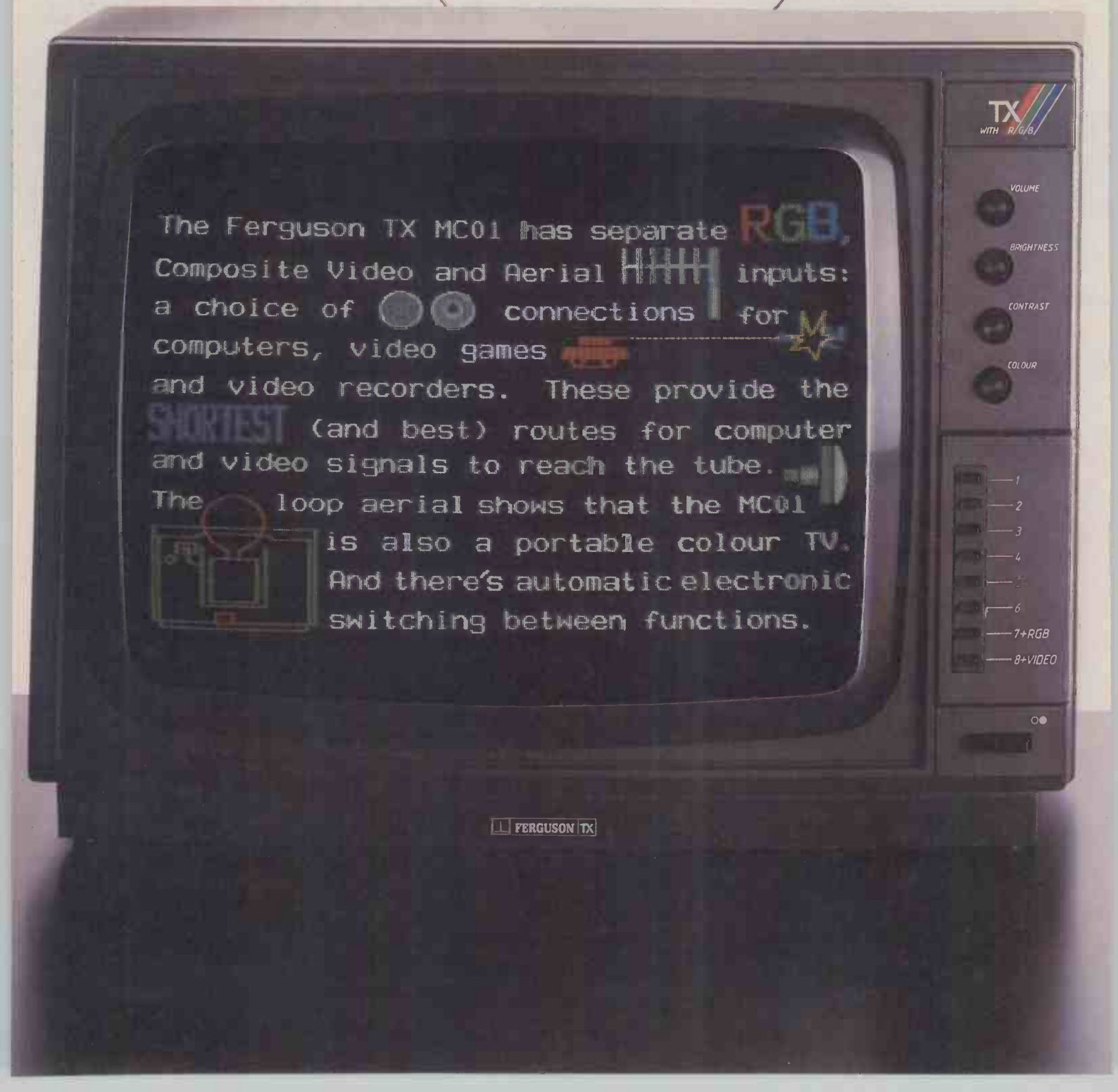

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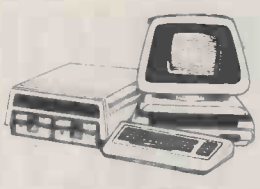

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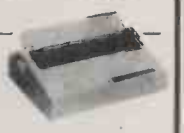

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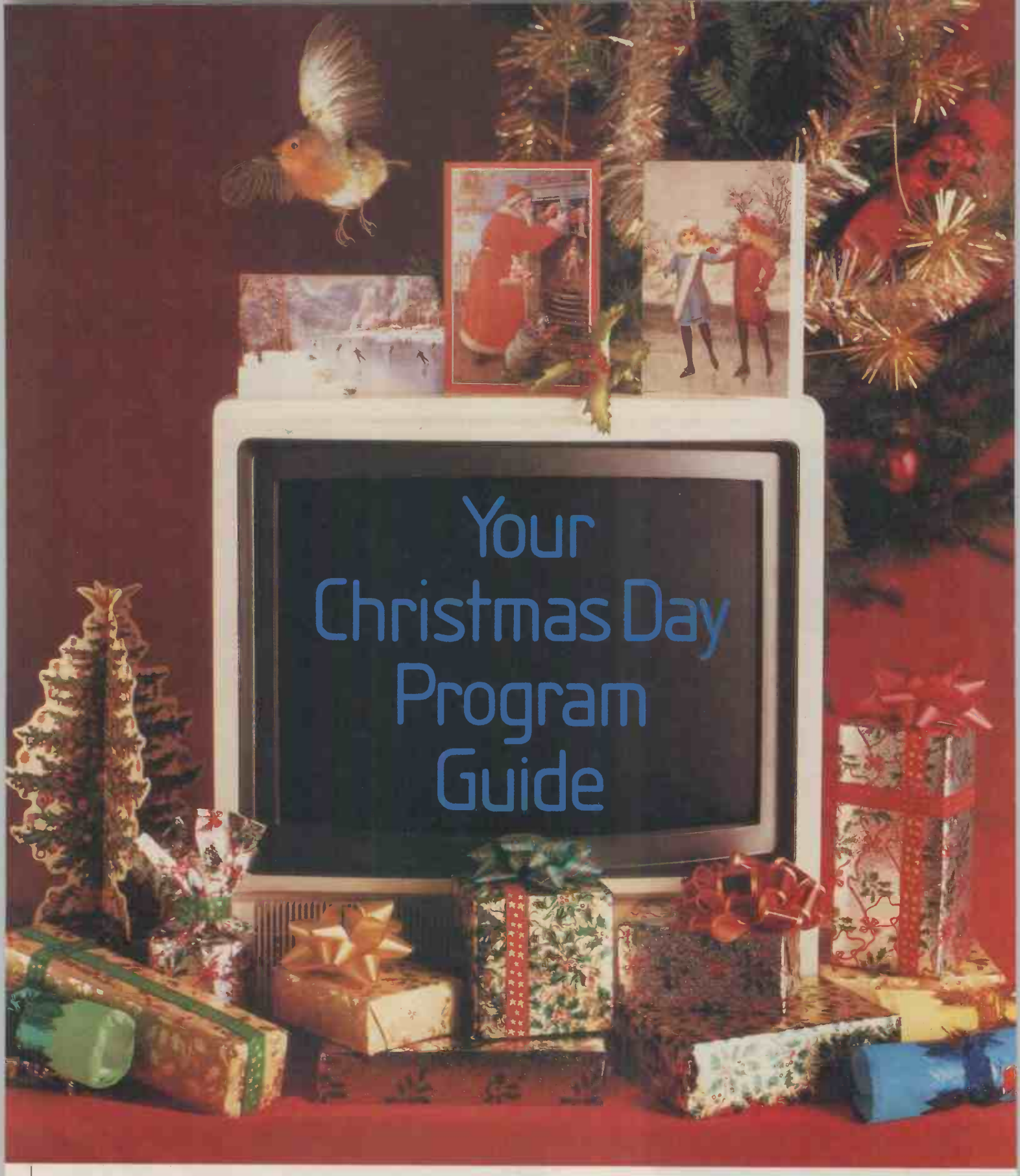


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Our highly successful Advanced User Guide for the BBC has now been joined by the Advanced Basic ROM User Guide, which delves deep into the BBC micro BASIC 1 and BASIC 2 ROMs. At **£7.95**, it's essential for the serious user. We have also introduced hard-back ring-binders for the Acorn User Guide and our Advanced User Guide: available at **£4.50** each, plus £1 postage.

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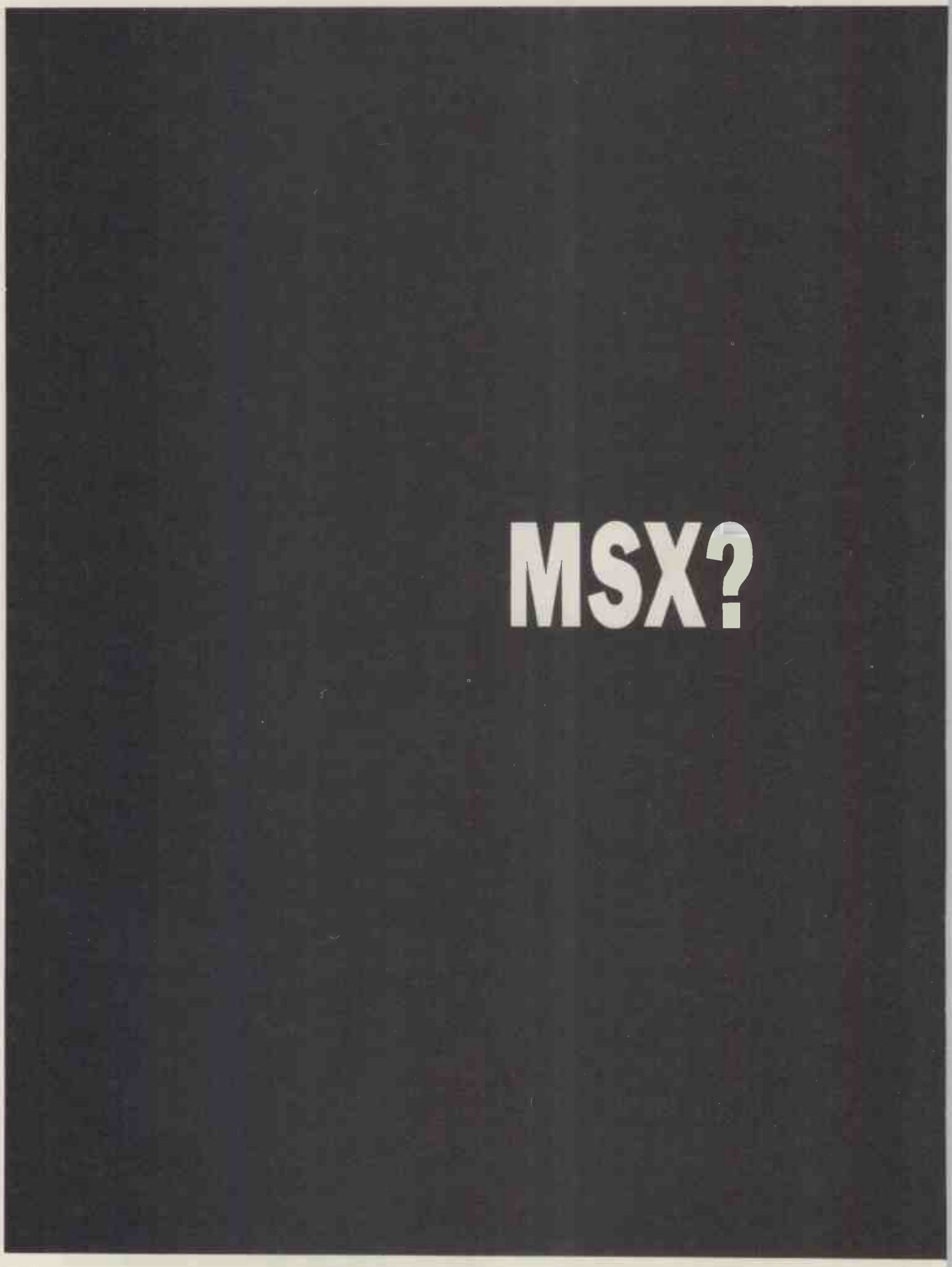


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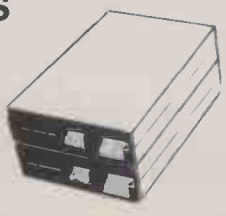

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# New from Xebec —

## The 9710H Slimline Disk Subsystem

The 9710H disk subsystem — slimline in form factor, but filled with system features:

- 10 Megabyte formatted capacity using half high 5¼-inch Winchester disk unit.
- Universal SASI interface for system connection to wide range of popular microcomputers.
- Available selection of Xebec host adaptor cards to allow easy add on to existing microsystems.
- Automatic data error detection and correction to give high data integrity.
- Small 'footprint' to minimise work space required.
- No fan convection cooling for low acoustic noise — ideal for office environment.
- Professional I/O connectors with provision for easy daisy chaining of additional box on SASI bus.
- Includes widely used and industry proven Xebec controller technology.

Good looks combined with good features make the 9710H a very attractive box.

The Xebec 'Xero D' signature that appears on this page is the quality mark of the company. It identifies zero defect quality as the goal on every program and product within Xebec. This commitment to quality and a major continuing investment in both product and manufacturing technology are earning Xebec its position as a major supplier of advanced technology product for microcomputer systems.

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# The new Mitsubis

## For those in the know

Anyone conversant with home computers will know precisely why MSX was worth waiting for.

The sheer proliferation of computer and software systems flooding the market loudly underlined the need for a unified standard.

So the major companies jointly developed a single computer and software system. The result – MSX – the format that will be standard for all time.

And those in the know will not be surprised that Mitsubishi are in the vanguard of the MSX movement. For, with the F-series, Mitsubishi offers everything that MSX is and more.

### GRAPHICS

Maximum resolution of 256 x 192 pixels with all 16 colours available on the screen at the same time. 32 sprites in two sizes and two magnifications allowing easy creation of '3D' graphics. 255 pre-defined characters all of which can be used as straight text or easily mixed with graphics.



JOYSTICK AND CASSETTE PORTS



EXPANSION BUS | PRINTER PORT | MONITOR OUTPORT

### SOUND

Three independent channels which can be output through the TV loudspeakers at any volume, individually or simultaneously, at any of the available 8 octaves. All three channels can use the 'noise' generator for stunning sound effects.

### KEYBOARD

73 moving keys, ergonomically designed for many hours of fatigue free use. Large cursor control keys which are excellent for both programme editing and game playing. 5 function keys giving 10 pre-defined functions which can easily be redefined from 'BASIC' using the 'KEY' command.

### BASIC

MSX BASIC is possibly the most comprehensive version of the original language. There is a complete set of commands for creating graphics and sounds, manipulating text and moving sprites. In addition to this there are 'built-in' interrupt routines for detecting sprite collisions, function key selections and joy-stick fire buttons.

### EXPANSION

The Mitsubishi 64k ML-F80 and 32k ML-F48 are both equipped with 2 cartridge ports, 2 joy-stick ports and a centronics compatible parallel interface. It is through these devices that the MSX system can be expanded for use with disc-drives, printers, serial interfaces, modems and other peripherals.

### SOFTWARE ON CASSETTE

The MSX system can load and save data onto cassette at 1200 or 2400 baud and unlike certain other home computers, the Mitsubishi F-series can be used with a normal domestic tape recorder for this purpose.

When you put all of these features together, with the knowledge that Mitsubishi is the largest manufacturer of Mainframe computers in Japan, those in the know will immediately recognise the true potential of the Mitsubishi F-series.

# i MSX Computers

## For those who aren't

The Mitsubishi MSX family computer is everything you wanted to know about computers, but didn't know who to ask.

It's friendly, it's fun and so simple, a grown man can use it. Yet so versatile even his computer-versed children would be hard-stretched to over-tax it.

It operates with any colour TV set. Just plug it in, and the full power of the computer is instantly at your fingertips.

### FOR FATHER

The Mitsubishi MSX can do many things, from keeping a simple check on the bank balance to running a complete business with customer account files, stock control programmes and word processing. It is just as much at home keeping control of your record or stamp collection or playing 'strategy' games such as chess, othello or contract bridge.

### FOR MOTHER

There is the opportunity to store recipes and other household information or keeping record of the children's progress at school. Household accounts can also be recorded so that savings can be planned for holidays and other seasonal expenses.

### FOR THE CHILDREN

There is education, particularly computer education. In a world where computer literacy is now of foremost importance, MSX offers a broad base of educational software. With simple programmes for the very young through to complex programmes for older students like language learning.

Also, the graphics system of the Mitsubishi computer ensures that the MSX versions of your favourite games are reproduced with incredible speed and accuracy.

Undoubtedly, MSX is the format for the future, and will become the byword for computer education and entertainment.

And you can be secure in the knowledge that regardless of future developments, any investments made in MSX hardware, software and peripherals today will always be compatable with the Mitsubishi F-series.

So if you've waited until now to buy a computer, you couldn't have timed it more perfectly. Get to know one today.

**MITSUBISHI COMPUTERS**

Mitsubishi Electric (UK) Ltd., Hertford Place, Denham Way, Rickmansworth, Herts WD3 2BJ. Tel: 0923 770000.

**SPECIFICATIONS**

**CPU:**
Z80A (3.6 MHz)
**Memory:**
ROM: 32 KB
RAM: 64 KB (F80)
RAM: 32 KB (F48)
Video Ram: 16 KB
**Screen Displays:**
*Text Mode:
40 columns x24 lines
*Graphics:
256 x 192 pixels
Colours: 16 (15+transparent)
Sprites: 32
Output: RF, Composite Video
**Keyboard:**
73 moving-key keyboard
5 function keys
Cursor control keys
Special keys for screen editing
**Sound:**
8 octaves
3 channels for sound or 'noise'
Output by TV sound or External Audio Amplifier
**Cassette Interface:**
1200-2400 baud
Motor controlled by CPU
**Parallel Interface:**
Centronics
**Joy-Stick:**
2 x 9 pin connectors
**Rom-Cartridge:**
2 x 50 pin connector

*Subject to Scan of Monitor

# THE UNIQUE MSX SYSTEM Complete

In the confused world of computer technology the unique MSX System has been adopted as a common standard for computer production by at least 16 of the biggest and best names in home electronics. This major breakthrough in the development of

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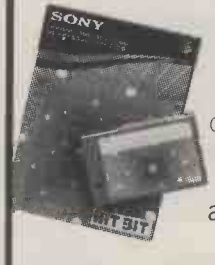


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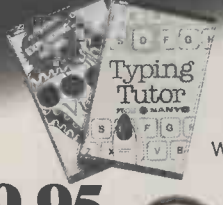


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# compatibility...

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TOSHIBA

## The Star Value TOSHIBA HX10

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Offering superb facilities and outstanding value for the first time user or enthusiast. 64K Ram, 16 colour graphics, RF, video and audio connectors, plus ports for printer, disk drive and data recorder. *(Including starter pack software).*

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SONY **£249.95**

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# versatility

drives, light pens, plotters, joysticks, data recorders and RAM cartridges from many top name manufacturers in the home electronics field.

Their performance offers you unrivalled graphic and sound quality together with outstanding simplicity of use.

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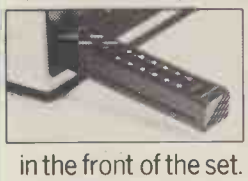

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## SANYO DR201 DATA RECORDER

An AC only recorder styled for computer use with all controls conveniently placed on top of the machine for ease of use. **£34.95**

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Specifically designed for use with personal computers, with phase shift switch, speaker monitor and AC/DC operation. **£34.95**

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The stylishly designed HC-R105 data recorder is an example of a machine produced to offer superb user convenience, exceptional performance parameters and reliable data transfer. The HC-R105 is a high speed machine giving very short access times to data. **£89.00**

# SOFTWARE

TOSHIBA

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Eat the men but don't bite your tail.

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Modify existing or write your own games.

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The "CHESHIRE CAT EDUCATIONAL SERIES" of programs will be made available to MSX users.

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DON'T FORGET TO ASK YOUR DEALER FOR DETAILS OF CREDIT FACILITIES, EXTENDED GUARANTEES, ETC. AVAILABLE ON CERTAIN ITEMS.

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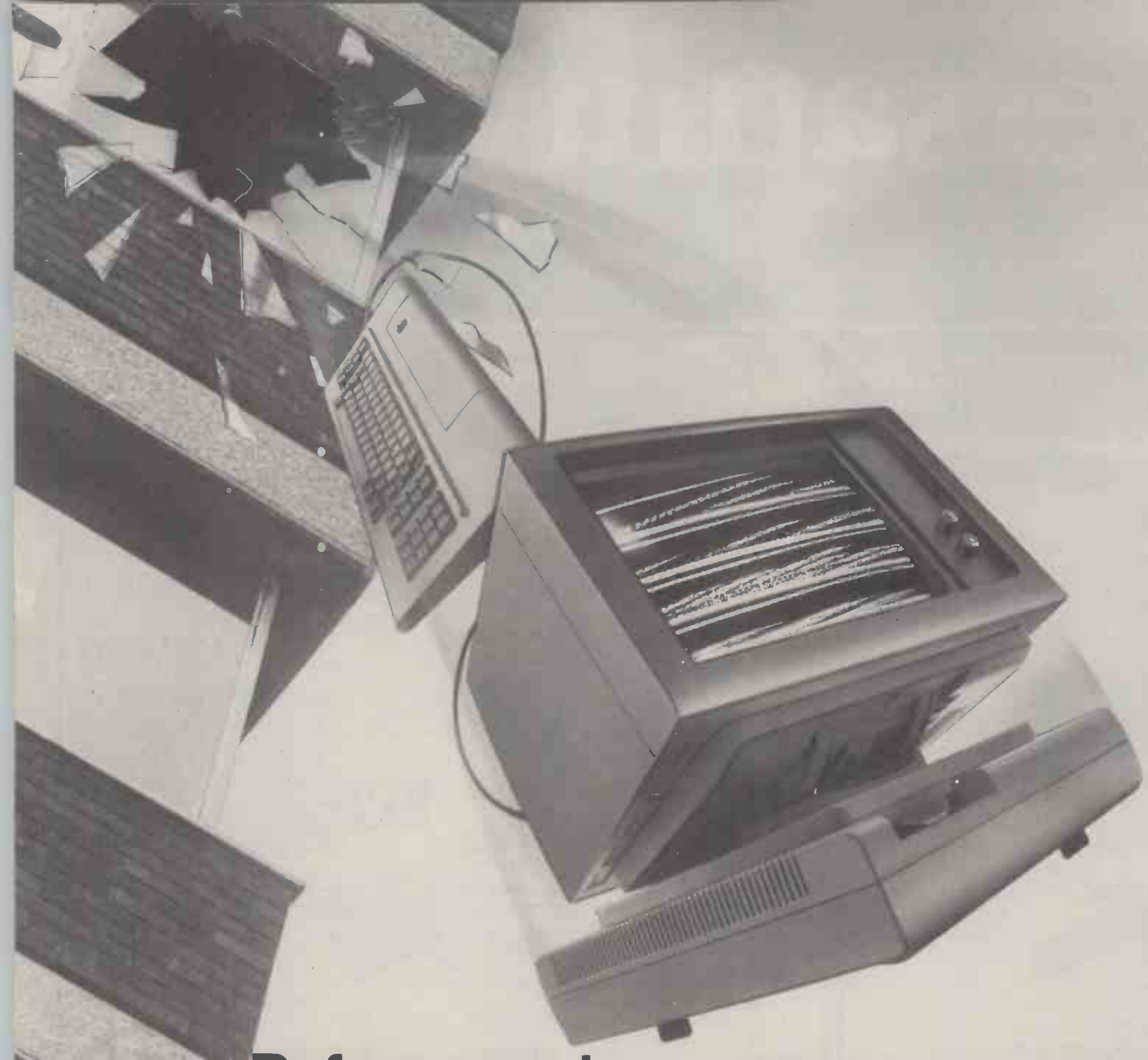

# Before you give up on your system, check for static damage.

When you come up against a memory loss, find an inexplicable information error, an unaccountable action or experience a system crash for no apparent reason, there could be a perfectly logical diagnosis.

Static build up.

Static electricity is generated by all of us. Touch a computer keyboard, word processor or any electronic terminal and you transfer static which can result in expensive and sometimes irreparable harm.

Fortunately the 3M 'First Touch' protection mat provides a solution. Simple and unobtrusive it just slips under your system and with the minimum fuss is ready to work.

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If you use an Apple, IBM, BBC or ACT micro then you could be missing out on the information revolution of the decade. Today there are literally hundreds of databases worldwide, which can be accessed by a microcomputer fitted with a Nightingale modem and using appropriate software. These data bases include Prestel, Micronet, Homelink, Telecom Gold, various 'Bulletin Boards' and massive American Databases such as 'DIALOG' and 'The Source'. Micros can also be used to send telex messages.

A world of information is available to you now when you install the Nightingale modem from Pace. There are hundreds of thousands of 'pages' of data available on Prestel, free computer software on Micronet, homebanking facilities available with Homelink, Company facts, Educational information, magazine and news articles available with Knowledge Index and the ability to communicate with other micro users direct, or via 'bulletin boards'.

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By far the most versatile modem available, at the price, for either home or business use, Nightingale will enable your micro computer to send and receive data utilising an ordinary P.O. Telephone Line. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) alongside 300/300 baud full duplex for communication between computers.

The state-of-the-art modem chip technology employed in Nightingale requires minimum support circuitry resulting in low power consumption, low cost, high quality and extreme reliability. It also features a simple self test facility for easy installation.

Nightingale complies with the vigorous specifications laid down by British Telecom and is fully BABT approved.

"INFORMATION SHEETS AVAILABLE ON REQUEST"

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This remarkable collection of databases includes over 22,000,000 items covering Agriculture, Books, Business, Electronics and Computing, Corporate and Company News, Education, Engineering, Government Publications, Legal Information, Magazine Articles, Mathematics, Medicine and News/Current Affairs (The enrolment fee also includes 2 hours of free access time).

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One to one is an electronic message service designed to give you the communications capabilities of a telex at much lower cost. By using your micro fitted with a Nightingale modem you can produce telexes, letters, reports and contracts, and send them in seconds to any destination. Courier delivery, priority mail and radio paging are also included in this highly efficient communications service.

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# Ask an expert why the Electron's the best micro in its class.

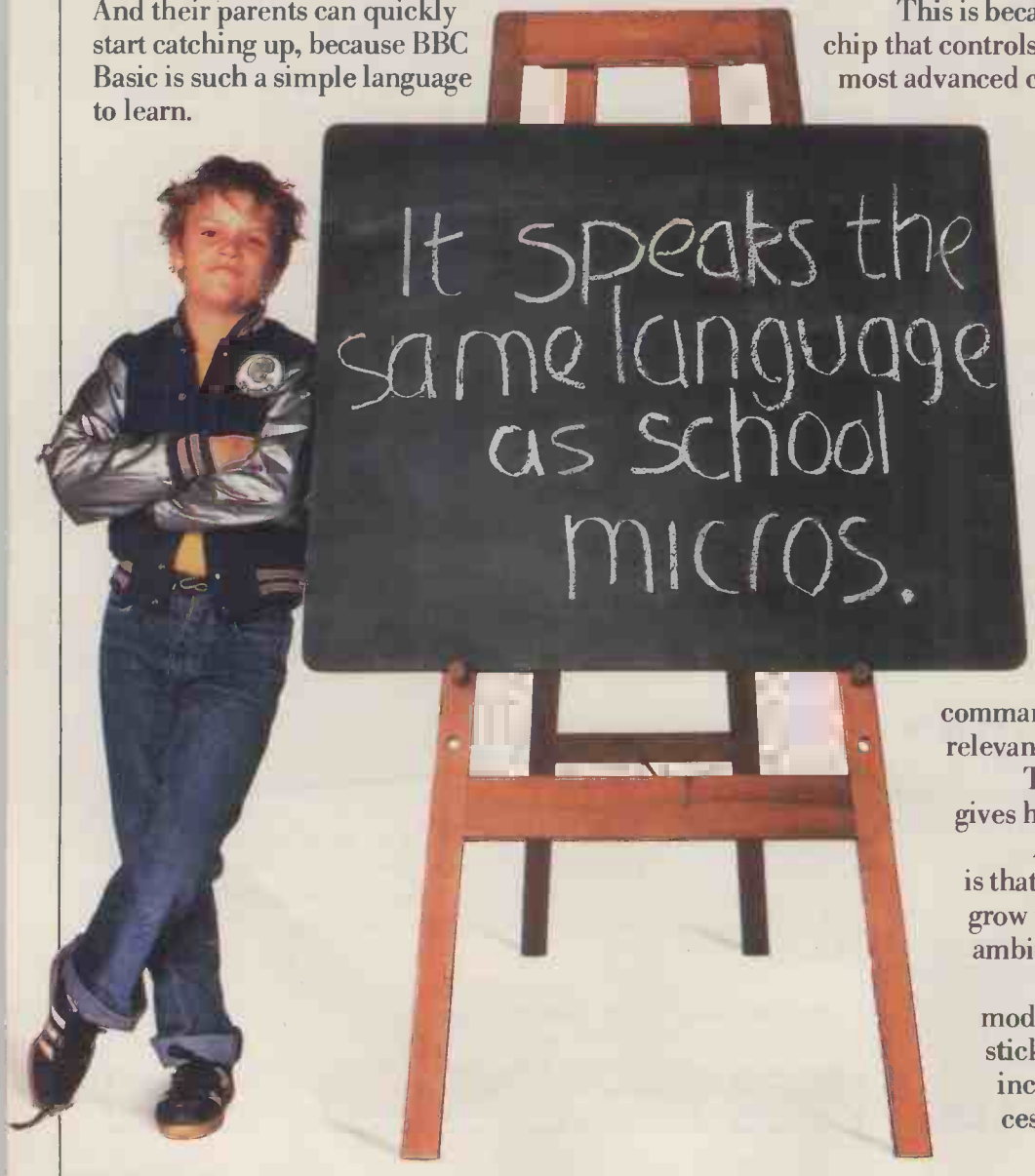
Most schoolchildren will tell you that one computer prevails in British classrooms today. Acorn's BBC Micro.

With a hint of pride, they'll also tell you that they're fluent in the computer language which Acorn developed for the BBC Micro. It's called BBC Basic.

And if you ask their advice on choosing a home computer for around £200, they're likely to tell you that there's really only one sensible choice.

The £199 Acorn Electron.

Like its £399 stablemate, but unlike any other micro, the Electron speaks BBC Basic. Which means that children can easily carry on with their computer studies at home. And their parents can quickly start catching up, because BBC Basic is such a simple language to learn.




However, language isn't the only thing which makes the Electron outstanding among every other micro in its price range.

A powerful choice.

The Electron is a 64K microcomputer which has 32K of RAM, combined with another 32K ROM.

This simply means that it has more power than most people ever need from a home computer.

Nevertheless, it has been designed to help you make the fullest use of its power.

For example, its graphics have the highest resolution of any home computer bar none.

This is because Acorn specially designed the chip that controls the graphics. And it's among the most advanced chips of its kind.

Indeed, it delivers twice as many characters across the screen as the Electron's nearest rival.

It expands into a system.

With the Electron, even total newcomers have been surprised at how quickly they can find their way into the complex world of computing.

Where many computers have keyboards which are confusing and clumsy to operate, it has a keyboard just like an ordinary electric typewriter's.

And for issuing main commands, there are single entry keys. Instead of literally spelling out the command, letter by letter, you just push the relevant key and it's issued.

There's also a built-in loudspeaker which gives high quality sound.

And what is perhaps most exciting is that the Electron has the capacity to grow with your knowledge and ambition.

With Acorn's Plus 1 expansion module, it can link up with a printer, joy sticks and fast-load cartridge software including View and Viewsheet word processing and spread sheet programs.

With the Plus 3 module, which will soon be available, you'll have a disc drive system and will be able to enjoy all the speed and convenience of 3.5 inch discs.

But let's not get carried away too quickly. You can start using and enjoying your Electron as soon as you get it home.

All you need is your television set and a cassette recorder.

## The speed of a business micro.

Some home computers respond pretty slowly to your commands. After you've pressed the keys, they leave you twiddling your thumbs for more than a mere few seconds.

The plodders, however, are a very long way behind the Electron.

In fact, on processing speed, a recent bench test survey ranked

the Electron up with such high fliers as the IBM PC and the Apple III. Both are machines which cost well over £1,000.

It's an astonishing accolade when the Electron makes no greater claim than to be a micro which is designed to become part of the family.

## Your starter for free.

With your Electron, you'll receive a free introductory cassette.

It will give you a taste of the exceptional colour graphics. It will show you how the Electron can play and notate music.

And when it's given you some new ideas about home accounting, it will challenge you to a few games and even spend a few seconds doing your whole family's biorhythms for you.

But remember, although it holds 15 programs, the cassette will only give you a glimpse of the Electron's full potential.

Because the potential is as infinite as your own imagination.

## No shortage of software.

Although the Electron is still a relative newcomer to the market, the range of software available for it is considerable.

Besides plenty of games, there are many educational programs for children of all ages, from playschool to A Level.

There's a great deal to keep adults occupied, too. From money management to helpful domestic programs, even a range of foreign language programs, teaching the basics of French, German, Italian and Spanish.

And of course, with its simplicity and flexibility, the Electron could soon be

processing programs created and written by none other than yourself.

You can find the Acorn Electron with its full complement of accessories and software at local Acorn dealers and major high street stores.

For the address of your nearest supplier, ring 0933 79300.

# The Acorn Electron.

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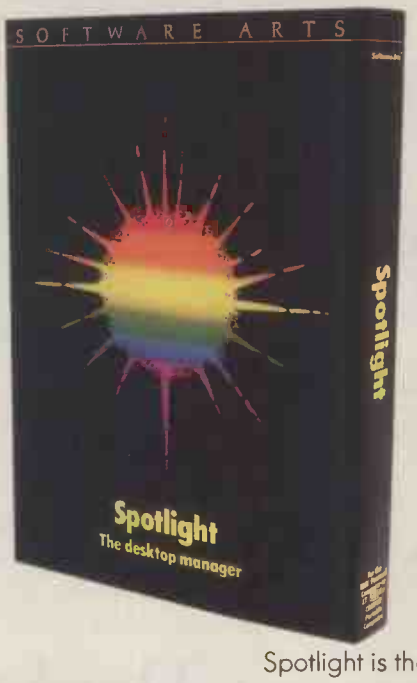


The Spotlight™ program is a set of convenient desktop accessories all in one package. No matter which application program you're working in—including VisiCalc,® 1-2-3,™ WordStar,® dBase II,® pfs:File,® MultiMate,® MicroSoft Word,™ TK!Solver,® and Symphony™—Spotlight gives you instant access to six essential functions.

Just a keystroke suspends your application program and gives you a window into Spotlight. Another keystroke gets you back to where you were just as fast. It's that easy.

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**Appointment Book**—schedule daily and weekly meetings or display monthly calendar. Set a sound alarm to remind you of appointments, even if you're using another program.

**DOS Filer**—perform operating system tasks without leaving your program. List, create, delete, copy, and sort files and directories. Even format disks.

**Phone Book**—find and instantly display any name, address and phone number from 36 available lists. Each list can hold 500 different entries.

**Note Pad**—jot a note or write and edit messages up to eight pages long.

**Index Card File**—search up to 36 separate files, each of which contains 500 cards. Cards are alphabetically sorted.

**Calculator**—calculate any problems and insert the answers into the program you're using.

Spotlight is the great program behind any great program you use.

*System requirements:* IBM® PC or XT™, or COMPAQ® portable computers, one disk drive, 75K memory for RAM resident portion, DOS 2.0 or higher. Printer optional. Can be installed on hard disk. Runs with most IBM PC software packages.

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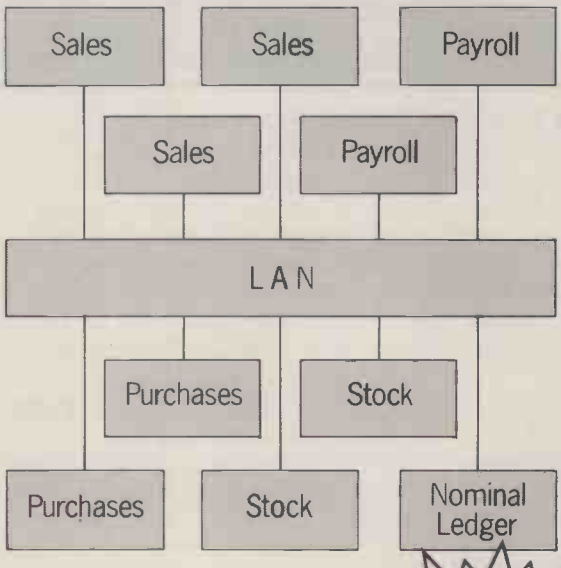


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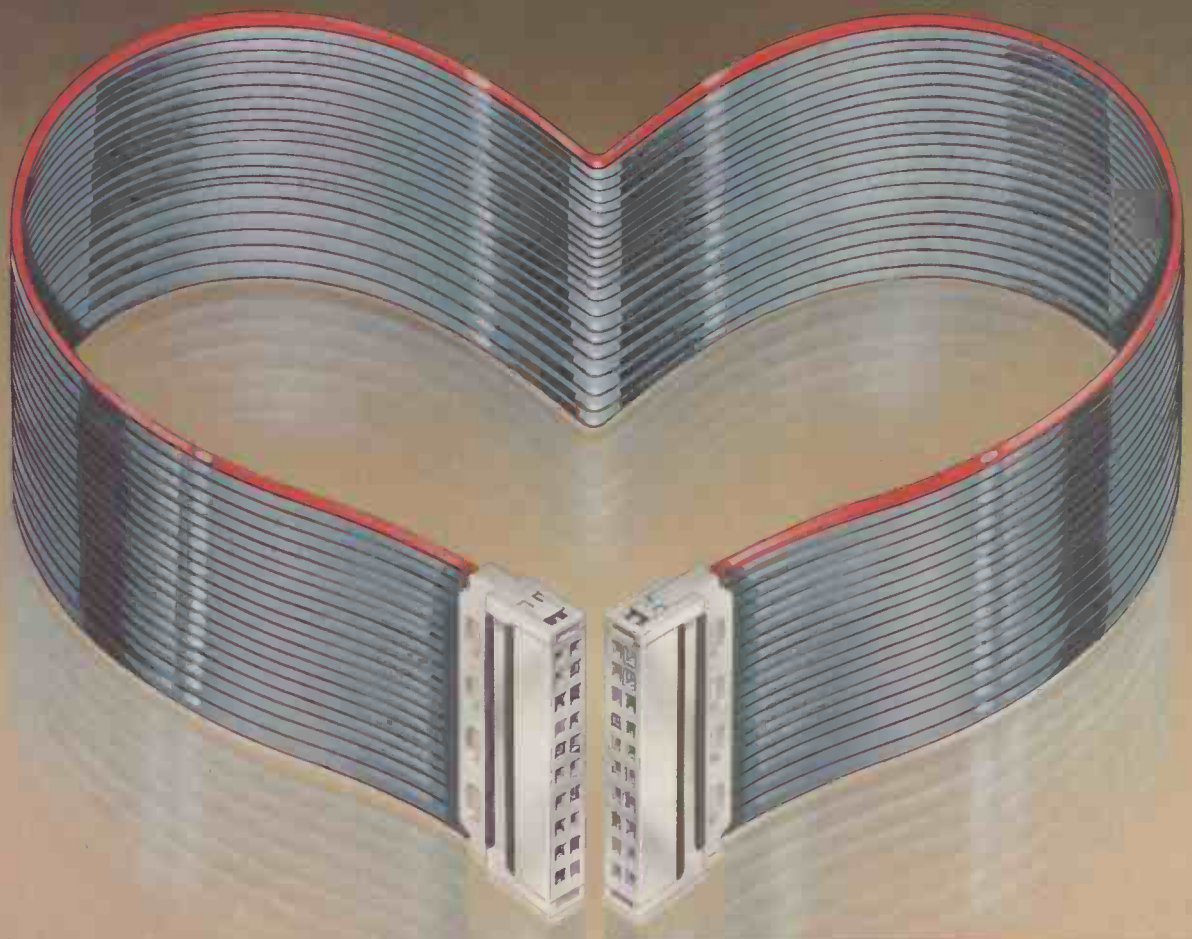

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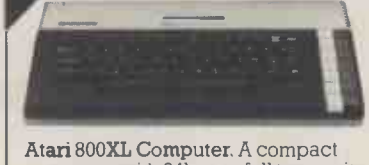

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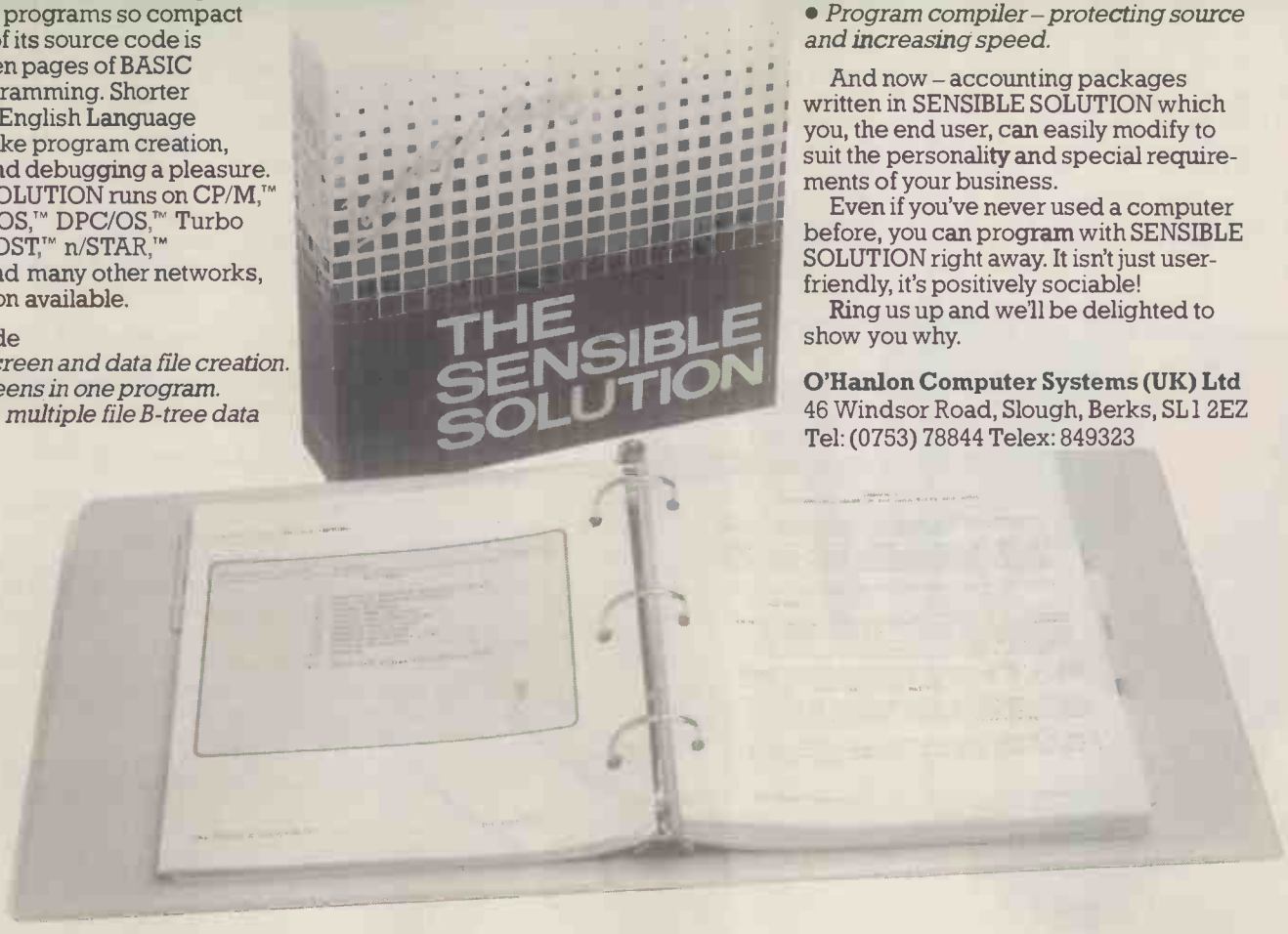


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# NEWSPRINT

*Guy Kewney gets all the latest micro news. This month there's talk of prize sceptres, French micros, disappointing summers and optimistic winters, plus a look at Sinclair's new version of its best-selling home micro, the Spectrum +.*

## PC passé

So the question is: will IBM drop the PC in 1985? A great many people are telling me that the answer is, *YES*.

It isn't as exciting as it sounds. All it means is that systems with two floppy disk drives are beginning to look old fashioned, and are making the IBM look ordinary.

As from next year, my sources suggest, the only IBM micros without at least one hard disk will be the PC Junior, and the new machine to be launched in Japan, with Sony-style 3½in drives, as on the Apricot and Macintosh.

The IBM PC AT and PC XT are both being priced into a more interesting position, suggesting that IBM is well aware of the limitations of its basic design.

The limitations are simple: they are those of the Apple II. There is no fundamental difference between an IBM PC and an Apple II. Those who doubt that need only study *Flight Simulator*, the game which is normally regarded as the ultimate proof of whether an IBM-like micro is really an accurate fake.

The Apple and IBM processors, for all the hype, run at similar speeds. The computers are simple boxes with space for plug-in cards, and the only real advantage that the IBM has is its larger memory area. To give an Apple II a full megabyte takes trickery, which is beyond the comprehension ability of most software.

However, with a RAM disk (as now available on the Junior) or a hard disk, it becomes possible to load much bigger programs onto the IBM, and run them *fast*. Without those aids to quick loading (especially in loading program overlays), the user really doesn't notice any speed advantage over '16-bit technology'.

My editor tells me that needs explanation.

The Apricot is the first cheap micro to arrive at its buyer's desk with 256k of memory. Most others have the option of arriving with only 64k. Even the IBM, for some time, had 64k as the standard memory.

Naturally, if there is a chance that most users have only 64k, software writers make sure that their programs will fit on those machines, and there is a simple way of doing this — you use the disk for the overflow.

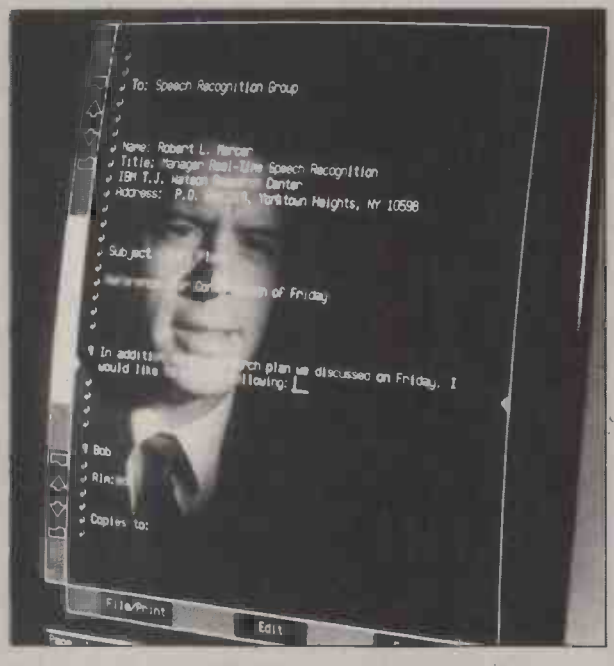
Suppose you have a word processing program. Call in WordStar, and write it. You will find (on a 16-bit computer like the Apricot) that WordStar itself occupies some 22k. But to run WordStar, you need WSOVLY!.COM, which is around 40k. And you need the messages file WSMSGS.OVR, which is around 28k.

Load all that into memory, and bingo — 90k of memory. Now, where will you keep the document you are writing?

WordStar, like most programs originally written for 64k of memory, stays mostly on disk. Type the right command, and bits of the extra are called in, and fed into sections of memory which are no longer needed, because they used to contain functions which aren't being used for the moment.

People who buy IBM XT computers tend to get them with 256k, and quite often with 512k — half a megabyte. These days, that's not much money on top of the basic price of a working system.

If IBM could arrange things so that every customer had a 256k computer with a hard disk, two things would follow: firstly, programs like WordStar, if written today, wouldn't be split up. You'd have your 100k of instructions, and there'd still be plenty of space for the text. There'd also be lots of space for another program, in memory, running (or ready to run) to do other things like dial the phone, count the number of words typed so far, look for the account number of somebody who just phoned with a query, and play *Scrabble* when the supervisor




***IBM is very impressed with its own cleverness in producing a machine which 'will recognise spoken English sentences,' but others are less convinced that this really is a 'major advance in computer speech recognition.'***

***The subject always grabs me by the throat, because of my report, a few years back, that Government agencies had a device capable of partial speech transcription.***

***The IBM device is pretty sophisticated, being designed as a computerised dictating machine. It understands some 5000 words, and although it requires the speaker to leave a gap between each word, it can recognise something like 95 per cent of them. It can even distinguish, from the context, between homonyms like 'to' and 'two' and 'too,' says IBM.***

***There will be many who will look at the formidable array of powerful, specialist electronics which IBM has harnessed to this task who will say: 'That proves the Government couldn't have been doing it a few years back, doesn't it?'***

***Well, no!***

***The equipment supposedly used by security department eavesdroppers was designed to do no more than 30 per cent of telephone speech, and to produce, not an accurate analysis of possible homonyms, but a simple phonetic transcript. Many times, all it produced was garbage.***

***What it did (my sources assure me) was to save a lot of work on the occasions when it did work. It gave surveillance workers a way of scanning through a phone conversation at a glance, to see if the content was likely to be of interest. If it was, standard earphone transcriptions would be made.***

***The difference between a 30 per cent success rate and a 95 per cent success rate, with intelligence enough to recognise individual words, rather than just print a phonetic transcript, is phenomenal.***

***IBM reckons that it is a 'reasonable goal' to expect its machine to transcribe continuous speech 'ultimately'.***

isn't looking.

And secondly, people would start writing 400k programs, and overlay them. Maybe they'd overlay 64k at a time. They'd be much more powerful (do more things) — and much faster. Consider how much time is wasted, between pressing a key on the keyboard, and the moment when the machine has found the overlay on the disk, loaded it, and started executing. It's typically four seconds, but often 10.

Loading off a hard disk is very, very much faster than loading off a floppy, and anybody proposing to try Concurrent CP/M without a hard disk is not going to grasp its potential. With Concurrent operating and a hard disk, it's like having four computers at once, each running a different program, without the need to load each program before running.

So, the advantages of a computer of this sort are obvious — and if all IBM computers were configured that way, they would all be much faster and nicer than their rivals.

The other big improvement that could be made, would be to use the 80286 chip, instead of the 8088 chip.

The big 286 will run all 8088 programs, but offers several advantages.

For a start, it can offer four megabytes, not just one. You really could have that much memory plugged in all at the same time, and programs that *big* loaded.

Secondly, it has a 'protect mode' which allows software like Concurrent DOS to be really foolproof. It would be better if it had demand paging, so that no memory was wasted — but it hasn't. Never mind.

Thirdly, the 286 runs at about three times the speed of the 8088. Even with two floppy disks, you'd notice the speed. With one hard disk and extra internal memory, you'd never have to wait for the computer.

That's why IBM has launched the PC AT (see the Benchtest on page 160).

The same reasons underlie Acorn's choice of the 286 chip for the ABC range (see below) and the result in both cases will be that better software gets written for the machines.

Unless, of course, some twit carries on selling a machine with two floppies and 64k. As long as that sort of machine is on the market, all software will be hobbled so that, in an emergency, it will run on the simplest system.

Now do you believe that IBM might drop the PC next year?

If any last evidence is needed, look at ACT. It sells the Sirius, which came out in Britain before the IBM. Today, the company which builds it is bust. Nobody in America writes software for it. ACT itself no longer encourages people to buy it — the company would rather you paid money for an Apricot.

But even today, ACT still sells the Sirius with hard disks, because for people with ordinary business Sirius computers, the changeover is worthwhile.

If ACT can drop (virtually) its dual floppy version, why should IBM be shy?

## Blood out of stone?

Gavilan, a US computer company which announced a lap-held portable eighteen months ago, is bankrupt. Vector, a famous big-micro company, also American, is losing money. Oric has virtually pulled out of the UK market, and Dragon has disappeared.

Is this the beginning of the end of the micro business?

Maybe not. Something which I'd suspected for some time was confirmed by a buyer at WH Smith last month — that is, computing is not a sunshine sport.

Smiths was talking to me about its winter software marketing plans, which it has put into the hands of two distributors, Terry Blood and Thorn EMI. The question arose: is WH Smith expecting business to pick up this Christmas?

'Business has been bad,' commented George Bradbury, a buyer, 'but no worse than we anticipated. Now we're looking for some upturn and growth, as the nights get longer and the days get darker, and kids play less football.'

For those of us who actually have computers, the sort of summer we had was no encouragement to polish off that last sort routine, or get our disks into alphabetical order, or find the advert which promised automatic updates of text file indexes — or any of the hundred other little activities and chores which waited for our next spare moment.

But for those who didn't have a computer, the thought of buying one must have been the furthest possible idea from their minds. Beer, yes; swimming, sunbathing, picnicking, or otherwise disporting oneself in the sunshine, yes. Go into a shop and look for a micro? When they'll soon be down in price? You must be joking.

Naturally, this simple interpretation of the slow summer hasn't found favour with the financial pundits.

Almost without exception, observers in the City pages are claiming that the micro business boom is over. So are the big market research companies. Their analysis is simple: everybody who wanted a micro, has one.

One prediction, typical of many, came from IDC, a well-known market research company specialising in micros and computers generally.

'The breathtaking growth of the home/hobby markets,' it says, 'which the Western European countries have experienced, is predicted by IDC to subside into relative stability.'

The report goes on to talk about 'the decline in growth potential' which 'will require vendors to sharpen their competitive edge, as awareness dawns that consumer demand is not a bottomless pool.'

In 'Visions of the future' you'll find a similar analysis.

Nobody should quarrel seriously with IDC's predictions of slow-down, and the report (costing a bargain £2000, less the odd fiver) no doubt gives chapter and verse for its predictions for market size, including the suggestion that true 16-bit designs will revitalise the home market, when they arrive.

I'd put it a different way, however. I'd say that the micro industry has been behaving for far too long, as though there was nothing to progress beyond the interesting job of price reduction.

In fact, home computers with serious home potential, for £400, are quite attainable with today's technology, and the reason the market is slowing down is that nobody has bothered to build them.

When a design like the Amstrad, thrown together inside six months with available parts, can become the glamour machine of 1984, all it shows is that manufacturers generally have gone to sleep.

***What sort of robot do you think you'd get for £24? Go to CGL and find George. He can 'teach you to program.' (He can what?) 'He has up to 48 programmable steps — he can go forwards, back, hold, turn left and right, curve left and right, and even retrace his steps.'***

***Details on (01) 508 5600, but don't apply for a job as an experienced hacker on the basis of having used George. Not even (especially?) if George was GEneral ORGanisEr — a 1970 ICL system for 1900 mainframes.***

## Oric's renewed lease of life

Oric, not having gone bust, its creditors are called 'suppliers' — and those suppliers are principally Jermyn (semiconductor components), Hitachi (similar) and Stackpole. They may be short some £3.5 million.

In a meeting with Oric, called to explain the shortage of cash, and of UK sales, they were told of promising sales

in Europe, and have agreed to support the company for at least another three months.

Oric described the meeting as follows: 'The confidence and support shown in Oric by our major suppliers allows us to forge ahead with our market penetration both overseas and in the United Kingdom.'

The agreed statement by the suppliers, for some unfathomable reason, didn't harp on the UK, where Oric Atmos sales have been impressive only by the rate at which they have dropped. They announced that the 'future of Oric deserves our total support, particularly in French, German, Austrian Swiss and Italian markets.'

The company is still playing at lawsuits, threatening its former distributor with an action covering some £300,000. Let us hope for a big revival of Oric sales over Christmas.

## Competitive edge

Slightly higher up Tandy's range (see picture story below), the company has announced a rival to the IBM XT — in the US only, so far. It does sell a rival to the PC, which is a great deal faster — that is the Tandy 2000 — but the new one is just an imitation at a lower price, $3000.

You therefore have the extraordinary sight of Tandy producing a super-powered, dual-floppy system, and an ordinary-powered, hard disk system both to run roughly the same software. I know it sounds strange, but friends who have used them assure me they are nice machines.

## On the US trail

Gavilan looked like the cleverest portable computer ever, when I saw it working (in prototype form) at the 1983 NCC in California. It had an 80-column LCD screen, a disk, and lots of integral software, plus a scratch-mouse.

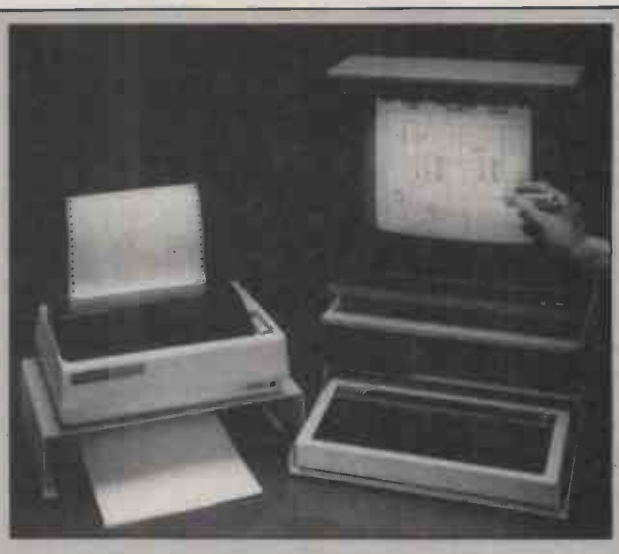
Five months later, at Comdex, I was even more impressed with the new version, which had a 16-line LCD, not just eight as in the original. It also had MS-DOS, and would run IBM software. I saw it doing this (in prototype).

In January, on a visit to Gavilan's enormous premises in San Jose, I saw new versions, with both sets of operating software, and telephone links, all working (in prototype) with a promise of delivery inside two months.

In May, at Atlanta Comdex, there it was again, complete with jamboree announcements of sales to the military, orders from dealers. It was a little overshadowed, true, by the announcement of the HP 115 portable, but that didn't include a disk.

In October, still not having built one microcomputer, and claiming that it had orders worth $100 million, the company went bust. It had got through $30 million worth of venture capital, and owed its suppliers $10 million.

Apparently the company hopes to find a buyer.



***It was a bit galling to watch BBC Micro designers boasting of how they used the machine to design the internal logic chips, when you and I can't even lay out five chips on a board. Until, that is, Datapen launched Cirkwik, which is a computer-aided Schematic (circuit) drawing program, which uses a light pen. With an 80-column printer, you can even design the boards . . . and the program costs only £20. Details on (0256) 770488.***

***It would be ungrateful to greet Tandy's announcement of a price cut, to £99.95 on its Colour Computer 2, with the cry 'that's roughly twice what it's worth' — so, I'll content myself with the observation that this is not the real colour computer, but its baby brother.***

***The 64k version with extended basic costs £170, which is a £30 drop, but still not enough to make me run round to Walsall demanding one for my office. The real colour computer is being phased out. I suppose Tandy must be selling these cut-down versions, or it wouldn't make them. I know it sounds ungrateful, I'm sorry, but I just don't like the things.***

## As simple as 'ABC'

Acorn took a lot of scorn at the *PCW* Show for its new family of business computers, the ABC range. Most people derided the size of the box, others asked what was the point of something that looked like a Macintosh but wouldn't run Mac software, and still others said it looked pretty slow.

In fact, the two top-of-the-range machines in the ABC series are pretty impressive — far more so than they seemed, at the Show.

What could go wrong, and badly wrong, would be the price, and the obligatory Acorn cockup. As stated in our Show Report (see 'The Party's Over', November *PCW*) Acorn is planning to produce the top two, '32-bit' machines, for around £3500 — and that really is going to be too much, by the time the company gets them out. And the question of when it gets them out is one which worries me a lot.

The bottom machine, the Personal Assistant, is — to all intents and purposes — a BBC Micro in a box. It's a big box, because Acorn has to squeeze an Intel 80286 chip, half a megabyte or more of memory, a hard disk and a floppy disk into it with a colour monitor. Alternatively, it'll have the National Semiconductor 32016 chip (yes, it used to be called the 16032, but that sounded like a 16-bit chip, and Nat Semi wanted it to sound grander) which is arguably more powerful than the 286.

The point about the 286 chip, as mentioned above (see 'PC passé'), is that it runs 'protected' mode software.

Acorn is working with Digital Research on the main operating system for the big 286 machine, and it is a version of Concurrent DOS. Digital Research won't say much about this operating system, other than to confirm — cautiously — that it will be 'portable'.

Ah, portable. Onto what? What other machines use the 80286? Well, there's a board from Macrotech, which fits into any S100 bus machine, and also has a Z80 on it (details on (0621) 828763 from Fulcrum). There's the machine from Comart, too. And, just in passing, a company called IBM has launched something called a PC AT, which seems to use that chip. Is this, perhaps, the machine onto which Digital

Research hopes to 'port' its new operating system?

The company's not saying, but yes, it is. It's also hoping that IBM will announce this product as an IBM label product, and that, at last, it'll have something which absolutely does away with the need for any IBM owner to use PC DOS.

The way Acorn has set up the ABC 310, it uses the BBC Micro circuits inside it for display, and gets all its instructions down the Tube from the 286 chip. Its native 6502 processor actually runs four tasks simultaneously, to fetch display details from the possible four tasks which can be running on the 286.

Using a very great deal of memory, the ABC gets round most of the problems of running original IBM software, because of the clever 'protected' mode of the 80286 chip. Its memory can be 'marked' into protected sections, and into sections which automatically produce an alarm to the system when a program tries to use them, and this means that many problems which normally face Concurrent DOS in noticing screen handling, can be picked up by the chip itself.

The trouble with a very great deal of memory is that it costs money.

It doesn't cost so much that it breaks the bank of Acorn, but the danger, from my talks with Acorn, is very much that Acorn will be so pleased with its cleverness in producing this system, that it will ask a price of rather more than £3500 for the hard disk system, instead of quite a bit less.

In the opinion of many people, close to the project and also close to the IBM project (secret, of course) to offer the same operating system, Acorn won't sell more than a few dozen unless it picks a price under £3000.

I doubt that it will. And, on past performance, I have absolutely no faith in Acorn's ability to actually get this machine built by March — which is the date unofficial sources are offering for its appearance. The 32016 machine, for example, has been coming 'tomorrow' for two years now. The Z80 machine, out only three months ago, was due even before the 32-bit one. And the Electron took 15 months longer than expected.

It's a real pity, because with the Desktop Manager that Acorn has put on the system, it really does offer all the joys of using a Macintosh, plus the ability to use four concurrent programs. And it *should be* very reliable, because of the protect mode operation of the chip.

It's a nice machine, which deserves the chance of success. Let's hope it gets it.

# Grand Prix micro

Whitechapel Computer Works' new supermicro, the MG-1, costs a half to a quarter the price of its rivals, things like the Apollo, Sun and Perq.

But since the MG-1 costs £5500, and uses the same 32016 as supplied in Acorn's forthcoming 210 ABC micro, you can bet Acorn will quote this as evidence of the excellent value for money of its ABC range, at around £3500 including hard disk.

The MG-1, however, is not a general purpose micro, but a graphics oriented desktop mini. No doubt it is very good value compared with the Perq, which is so wonderful that everybody weeps over it, but so expensive that nobody even writes software for it except the couple of dozen hopefuls who bought it to write software for.

The MG-1 is for computer-aided design freaks, and those people should contact the Works on (01) 377 8680. Anybody else, keep your nose out of what doesn't concern you, and for goodness sake don't let the people in Cherry Hinton (a little village near Cambridge, where Acorn works) know anything about it.

Did you know, by the way, that some bright marketing expert wrote a letter to Ms Cherry Hinton, c/o Acorn, offering consultancy services?

# Good news from Warrington

Bill Unsworth, Warrington-based maker of bits and pieces for the Apple, has designed his own '32-bit supermicro'.

At £2500 with a Motorola 68000 chip (as used in the Macintosh, Lisa, Sage and so on) plus two disks of 800k each, the system is unusual mainly in that it is single-user only.

According to Bill Unsworth, it's actually a dual processor design, with 192k of memory, and 64k of that dedicated to the display chip, a Motorola 6809 (as used in the Dragon and Tandy Colour computer).

So, in hardware terms, it really is quite a powerful machine. It has two serial ports, a centronics port, a general purpose 16-bit parallel port, a 10-bit analogue to digital slot, clock and calendar, speech synthesiser, and sound generator. It also has monochrome and RGB colour output ports.

The operating system at launch is CP/M 68k. There will also be the Pascal P-system, which Unsworth says he expects to be almost totally compatible with the Apple II version. And when Digital Research announces the concurrent version of CP/M in January (I think), that will be supported too.

The box has a four slot expansion system, which consists of sets of inline connectors. One is Apple II compatible, and the others have 68000 expansion signals as well.

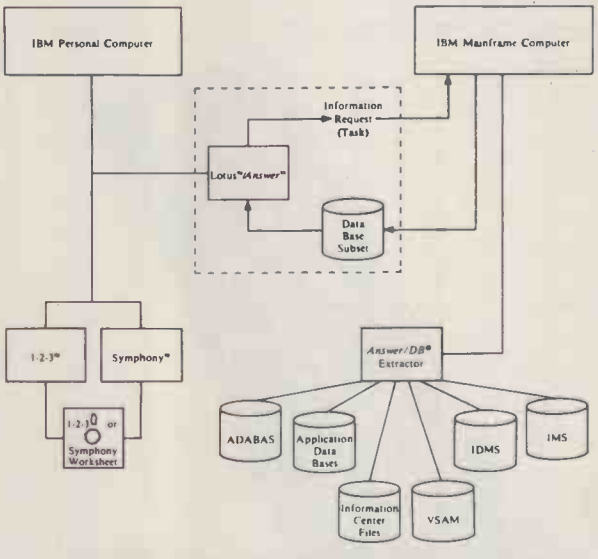
Memory can also be 256 or 512k, or one megabyte. This month U-Microcomputers will add a memory board to it, and eventually versions with internal memory of up to 10 megabytes.

'We are using an Apple compatible hard disk controller in standard slots, with 10, 20 and 40 megabytes, with the 10 megabyte costing an extra £1000 in place of one floppy,' said Unsworth.

With the P-system, the company hopes that people will be able to take programs without making any changes, even compiled. But they may have to recompile to take advantage of 800k drives. On CP/M 68k, with compilers for CBasic and MT Plus, programs are supposed to be source-compatible.

The disk format will be programmable. That means that it is possible to read IBM data disks — users will need utilities to read IBM disks, but drives are compatible for data file reads. An Apple to U-man serial link will be available soon, for £20-30 plus the Apple serial link.

The system should be fast: 'It is a 10 megabyte 68000 with no wait states,' said Unsworth. 'The two processors swap information 2k at a time, without




***It's possible to get quite enthusiastic about Informatics' new 'Lotus/Answer' software package — especially if you are the firm's database manager, in charge of the mainframe.***

***The package is designed to get information out of the mainframe, and into either of the Lotus integrated products, 1-2-3 or Symphony.***

***Normally, the theory that micros make life easier for the mainframe manager falls down, when top executives come into his office with the casual suggestion that they should be able to 'download' information.***

***For a start, the poor information manager has to find spare channel capacity on his mainframe where he can attach another remote terminal. Then he has to work out what to do with the data, to make it acceptable to the micro and, finally, he has to help the top executive to perfect the complex series of steps involved in transferring it.***

***Lotus/Answer does all that, with the exception of finding the channel capacity. You can't have everything done for you, now, can you?***

***Details in London on (01) 242 0770, and be gentle with the company, because this micro business is still a bit frightening for nice mainframe people . . .***

processor intervention.'

At the price, with no bundled applications, my initial reaction is that it's expensive. But since there is very little software available to bundle, that's not the end of the story, and when it does start appearing, no doubt the U-man will get some of it wrapped up in its price.

Availability is expected before Christmas, the company says.

## Pascal's forward stride?

It seems to have taken a long time, but the Pascal language is at last starting to be genuinely available on most micros. The test of 'most' means not just Apple II and IBM, but less world-famous machines — and in the last few weeks both Sirius owners and BBC Micro users have had announcements from the custodians of the p-system, Softech.

In this country, the distribution of the p-system is through TDI, and the TDI/Acornsoft version is the latest announcement. Just to prove how obscure this version really is, you thousands of BBC Micro owners out there can forget it. For better news, try this month's review of ISO-Pascal.

The TDI version, costing £300 odd, requires a BBC with DFS — plus a 6502 second processor, and 800k dual drives. Not quite as obscure as Bill Unsworth's new supermicro, but not far off.

Special features listed for this implementation ('the latest and most complete, version IV.1') include filer, editor, utilities and compilers for both UCSD Pascal, and Fortran 77.

## Pick an agent

I am delighted to report that Climax Computers is undertaking a particularly strenuously searching evaluation of potential agents for its multi-user system.

'Perhaps if I begin by telling you that our multi-user incorporates the Pick Operating System,' says a recruiting letter, 'you will appreciate that this is a rather important letter — the reaction of the press to Pick has been almost as dramatic as the system itself.'

The letter was addressed to me. 'A study of the market has identified your organisation as one company likely to be interested in an agency agreement on our multi-user computer,' said Bruce Skelton, rather unconvincingly.

At £12,000 a shot? I don't know — can I have a dozen on a sale or return basis, on credit?

## Vision of the future

It's a potent thought, that software distributors take around 20 per cent of the money we spend on games in the shops. The question is, can anything be done to reduce this? — and the answer, according to Rediffusion, is: 'yes.'

After all the excitement a year ago, the idea of distributing our favourite games to the shops down phone lines — telesoftware — seems to be going stale.

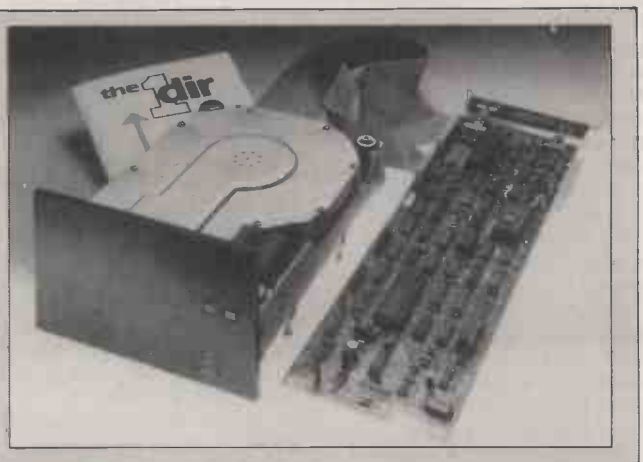
Prism has quietly let it be known that it has dropped the idea of using the Romox machine, and is looking instead to an experiment with video disk equipment. Those machines have suddenly become available for pennies, with Hitachi dumping its stock of video disk players at £99 including 20 films, which gave Prism the idea of making a special disk demonstrating its top 100 games, and giving a player to each shop.

That sounds like a dream to me, but apparently the company is 'actively considering it.' Perhaps — but even supposing it tries, it still won't be a way of distributing the software by putting the code on the disk, because it doesn't have any way of getting it off.

Strangely, while the tide of scepticism rises, Rediffusion has just announced that telesoftware is 'the writing on the wall for computer shops.'

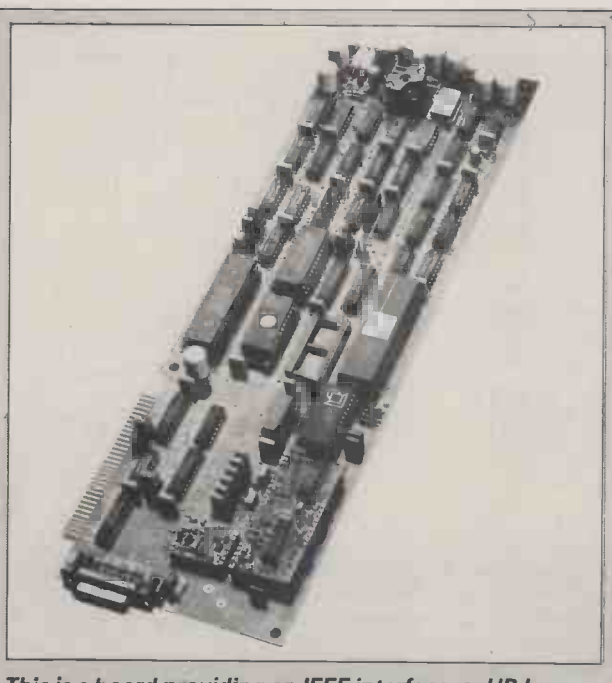
Mike Aldrich, head of Rediffusion Computers, recently analysed the way our software cash is split up — with 30 to 40p going to the retailer, 15-20p going to the distributor, a thumping 35p to 45p going to the publisher, and a mere 5p or at most 20p going to the author.

Aldrich reckons that what will end this bonanza for the middlemen is a simple invention — the modem. But instead of using the modem on the end of a phone line in a shop, he reckons that users will keep their own modems in their homes, and will dial up software. 'The growing sales of comms equipment with home micros is the




***I know this is just a hard disk for the IBM micro, but it's the name which gets it the special mention here. It's called 1-DIR — pronounced 'wonder'. Actually, 1-DIR is the name of a piece of software which comes free with the Qubie PC10 hard disk, and gives a 'user-friendly front end shell' which stands between the ignorant users and PC DOS, handling files, commands, and so on.***

***Demos arranged through Roger Harvey or Peter Dignam on (01) 228 8822.***



***This is a board providing an IEEE interface, or HP-bus interface, or IEE 488 bus interface, for the IBM PC.***

***Anybody involved in connecting computers to instruments will recognise the importance of this at once. The same interface is used for connecting Commodore business machines to printers and disks, but don't rush out and buy one just to connect your old Commodore disk up to your PC, because there is a very great deal more work involved than that.***

***Details from BICC Data Networks on (0442) 218383.***

***For owners of a BBC Micro and an old Commodore 8250 disk, there is hope, however, in the Intelligent Interfaces Syscon 6, which does make the link. It now covers the whole range from 2040 upwards. And another version of the Syscon 6 will let BBC owners connect the Mator Shark hard disk up, giving 10 megabytes — though what you do with 10 megabytes when you can only store 31 files is beyond me.***

***Details on (0789) 296879.***

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ASPECT is available from Microft Technology Limited, 45a Radnor Walk, London SW3, and costs £400 + VAT, or £40 + VAT for a limited record evaluation version. For further information telephone 01-352 7876. Dealer enquiries welcome.

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*ASPECT is a Trade Mark of Microft Technology Limited, and is a British product.*

PCW 103

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**£359**
**Computer complete with colour monitor (CTM640)**

**CPC 464 complete with monitor and datacorder**

The first low-cost personal computer to be approved by the British Electrotechnical Approvals Board.

It's eight in the evening. The weekly soap is about to start on the box. And you're in the middle of a program.

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The new CPC464 gets round the problem very neatly.

It comes complete with its own colour monitor or green screen VDU. Yet it costs around half the price of a comparable home micro system.

That's not all. As well as the monitor, the CPC464 includes a built-in cassette data recorder, 64K of RAM (42K available), 32K of ROM, typewriter style keyboard and a very fast extended BASIC.

And it comes complete and ready-to-go. Just plug it in.

## High resolution graphics. Stereo sound.

The quality of the graphics on the CPC464 screen beats the micro/domestic TV combination out of sight.

That's because our monitor drives each colour on the screen directly from the computer. Nothing gets in the way of the best possible picture. And you won't have tuning problems.

It sounds good, too. Especially when you feed the 3-voice, 7-octave stereo output through a hi-fi amplifier and speakers.

## 64K RAM.

With 64K of RAM there's plenty of room for sophisticated and complex programs.

Over 42K is available to users, thanks to the implementation of ROM overlay techniques.

Pound for pound, other micros simply can't match the CPC464's memory.

## Amsoft. Exciting software range.

Arcade games, educational programs and business applications are all designed to utilise the CPC464's impressive graphics, sound and processing abilities.

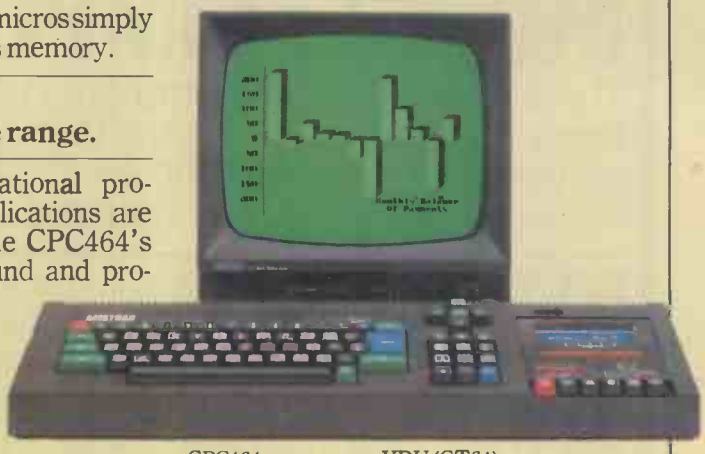
A rapidly expanding range of programs is already available. High quality software that takes advantage of the CPC464's high specification and speed-loading capability. Which means even complex programs can be loaded quickly.

## Amstrad. Join the Club.

The CPC464 User Club is run by Amsoft, our software division, which provides software, peripherals and publications for members.

As a member, you'll enjoy immediate benefits like the privilege card, Club binder, regular magazine, competitions for valuable prizes and contact with other Amstrad users.

Whether you're a games fanatic or interested in serious commercial applications, you'll want to join the Club.



CPC464 green screen VDU (GT64)

## Green screen VDU.

Perfect for data management with high resolution screen, 80 column text display and up to 8 text windows.

An optional power supply and modulator (MP-1) is available for use with a colour TV.

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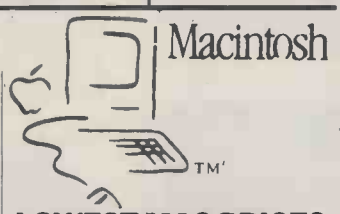


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| Sharp MZ80A list £477 | **175.00** |
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| C64 CalcResult | **25.00** |
| Vic 20 Starter pack, new | **90.00** |
| VIC 20 brand new, from | **70.00** |
| VIC 20 3K RAM pack | **10.00** |
| VIC 20 8K RAM pack | **20.00** |
| Atari 400 New | **50.00** |
| Atari 16K RAM | **22.00** |
| Atari thermal printer, new | **70.00** |
| **Used** | |
| Epson FX80 (almost new) | **320.00** |
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| BBC Model B | **275.00** |

**Many more too numerous to mention. Sorry - no mail order on surplus items - available to callers only. All Morse prices exclusive of VAT at 15%**

# MORSE

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

writing on the wall for the software retailer,' he said.

Aldrich doesn't see the writing on the wall as saying 'Next year no more software shops' — he sees it as more like 'By 1999, no more software shops.'

However Micronet 800, the Prestel club, sees the future as being a little closer.

The Micronet analysis of next year goes: 'People have finished their mad rush to buy micros, and now they are looking for ways of using them and enhancing them.'

Enhancing them, Micronet reckons, means buying a modem, and using them means dialling up Micronet and downloading software. Micro Power has just given Micronet its entire catalogue, and the list of titles is quite impressive.

The plan to boost Micronet will be visible in shops, because it is going to offer a free access number. The password is ten fours, the user identity is four fours, and anybody with a Prestel modem can try it out — and shops will be encouraged to let people roam about the restricted pages of this demo area, instead of talking.

Intriguingly, Compunet (reviewed in this issue on page 134) reckons much the same thing, but with a catch — it announced Compunet at the *PCW* Show, and revealed that nobody would be able to keep the software they downloaded.

The Compunet modem works like a 'dongle' and the programs won't run unless it is in place. An interesting experiment, which I don't think is worth betting too highly on. Phone calls are costly enough, without the need to dial up each time you want to load as an added irritant, to say nothing of the network charges.

Compunet did impress me at the Show, by putting up the Multi-User Dungeon.

MUD got a mention in the magazine's August issue but normally you can't share in its delights, because it is very restricted on the Essex University computer. Century Communications has got the marketing rights, however, and Compunet just happens to run on a DEC 10 mainframe, exactly right for the software.

By the way, the original MUD at Essex has a new wizard. An arch-wizard friend of mine showed me the list of all the players, and one of them wears the title of 'Gnot the Wizard' — and any Micronet users who have played with the Viewfax database will at once recognise the signature of the Micrognome, who, despite everything you may hear, is *not me*.

A final observation in this long list of networking stories — there appears to be a growing problem in getting hold of modems.

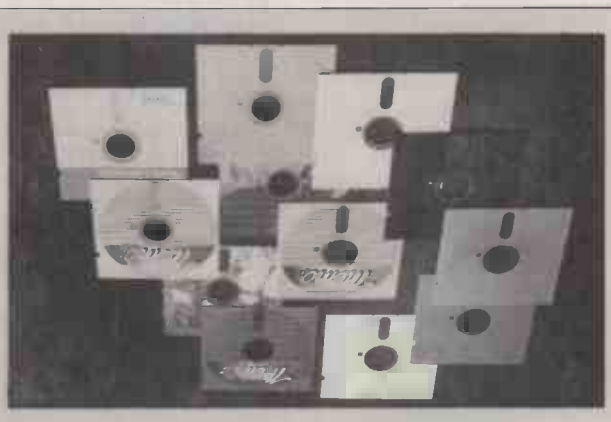
One networking company told me that there was no real problem 'on the contrary, there are more people making modems now than ever before.' True, but not all the modems are any good. And even fewer are approved for legal connection to the phone. And one way to tell if a modem is any good, sad to say, is whether it is available — because it is almost true that all the good ones are sold out.

The modem market is booming the way the micro market used to boom.

In the US, latest figures from market researchers Frost and Sullivan show that the modem market 'will have a four billion dollar value in 1988, up from the 1.18 billion dollars of 1984' — and predicts that by 1990, communications and computing industries 'will have melted into one.'

Very interesting, but not helpful when it comes to buying your Christmas modem.

***Yes, it's a Lady Mayor. Behind her, the headless Mayor of Barking, Councillor Fairbrass, expresses his delight at seeing 'the first Hewlett-Packard model 110 in a dealer's premisis' (sic). The machine is 'a very useful machine,' says the dealer concerned. I won't shame the company by naming it. And I don't know the lady's first name, or naturally I should quote it. But totally unreliable sources attribute to her the following comment: 'I'm getting a message from the Other Side . . .'***



***After the personalised notepaper, the personalised diskettes. It's not a silly idea, because you can get these Memron disks in different colours, using (say) red for text disks, (say) green for spreadsheets, and (say) yellow for programs. Or in companies where there are both Apple and IBM disks, they could be distinguished by colour, thus saving people from accidentally formatting important Apple disks because the IBM says they're blank.***

***Naturally the more established diskette producers will give you awful warnings about the quality of anything that isn't one of theirs. My own experience shows that this warning can be ignored — the only package of disks I ever had problems with was one I paid £90 for, warranted double-sided, double-density. Anyway, you can get details on (01) 900 0255, from a company called Sternstat.***

## Diary of a nobody

You can only feel sorry for James Minotto.

He set up Computerland in Europe, and got neither fame nor riches. Then he left to set up his own chain of franchised computer stores, Interface.

Now Interface has asked him to leave. Not only has the company issued a press statement referring tactlessly to his 'required resignation' but it has actually cut him out of history — an examination of company documents shows that he just doesn't exist any more.

The background information on how the company was set up doesn't mention Minotto. And to his distress, while he was still in the building, between handing in his 'required' resignation, and his departure, he found that callers were informed he'd already gone.

Apparently he isn't going to say anything for a while, while he makes up his mind what to do. In the circumstances, it's hard to suggest anything other than silence — baffled, for choice.

## An offer you can refuse

I have managed to refuse an 'irresistible' offer of checking to see if hidden rules prevail in my database, for two reasons.

Firstly, my database has no rules, hidden or otherwise, being only 100 records long. Secondly, I can't afford the £150 he'd charge.

However, for people who have more complex data, Southdata has developed something called an Automatic Rule Finding System, which it will use on your data for you, reporting

on hidden constants and correlations.

Details on (01) 727 7564.

## A vixen's wrath

It isn't fair to have a laugh at my old friends inside Osborne, but just this once they have surpassed themselves with a new ultra-luggable machine called the Vixen.

This machine was delivered to me at the *PCW* Show. It is in almost every respect an ordinary Osborne 1, with three important differences. Firstly, it is a very great deal smaller, being even smaller than a Wren. Secondly, it has a bigger screen. And thirdly, it has 400k capacity on each diskette.

So far, so good. Because of my known fondness for the Osborne, I suppose, I was offered the chance to review the machine for *PCW*. Because I'd seen the machine two years earlier, in prototype, and had agreed to keep quiet about it until it was ready, I felt entitled to have first crack at it.

The beast arrived. With it came instructions for secrecy until January.

To my disappointment, on loading the first system diskette, it turned out to be, in all respects, an Osborne.

The Osborne has faults, and the worst of them is its 'dead' keyboard. Let it take it into its head to examine a diskette, and you can thump the keys with a hammer, and it will just ignore you. Similarly, should it be busy processing a signal from a modem, it will ignore you.

The result has been irritating, and on occasion catastrophic, with commands lost down the line, and programs aborted, until I learned to keep my fingers off the keyboard when it was busy.

To my even greater disappointment, however, the first thing it did was to write garbage over the directory track of the system disk. Examination with CP/M utilities proved that the programs were intact, but the directory unreadable.

Embarrassed at not having had a chance to even load and run the disk backup program, I rang Osborne's UK distributor, and asked for a replacement. Embarrassed beyond belief, it admitted to having sent me the only machine in the country, with the only system disk, of which it hadn't made a copy.

The story had a sad ending.

The machine went off for upgrade (a new ROM, and a new disk) and was due to be returned later that week (two weeks ago, now).

But while it was there, enquiries were discreetly made: what did I think of it?

I must have failed to sound sufficiently enthusiastic, because all I've heard since then is Osborne's American announcement, that the machine has been launched.

It's nice when people tell a journalist they value his judgment. It's nicer, though, when they mean it.

## Savage blow

As predicted in this column, people are now selling programs written in the 'language' Lotus 1-2-3.

The Systembuild 'spreadsheet library' apparently includes over 40 titles, covering areas such as finance (no, really?) sales and marketing, statistics, payroll, stock control, sales forecasting, invoicing and production scheduling.

Typical prices of these applications seems to be between £60-90, but for users who aren't sure, demo disks are available at a cost of a fiver — good value, especially if you can reformat the disk and use it afterwards, if you don't like the thing.

Details from Phil Savage on (0778) 344388.

## Hunting for real treasure

The fashion for games where the treasure you collect is real, not just a message on the screen, has spread to Softek's Quo Vadis. It has designed a real silver sceptre, which the first person to find in the game will win. The company's cool was rather spoilt by the claim of one journalist who reviewed the game, to have won — and could he ask them to keep his claim in the hat until everybody else had taken as long as he did, or less?

Well, the company says that he didn't have the real game, and anyway it's changing it, and anyway he didn't really finish it, and the arguments run on like that, but what really fascinated me was the sceptre itself.

It's made of silver, and is worth £10,000.

Never mind why anybody in their right mind would want

***For a piffling £40, Pete and Pam of P&P Microcomputer Distributors will solve the problem of making your nice new Macintosh dump its pretty pictures and fancy fonts to an ordinary Epson (or equivalent) serial printer. The product is called Epstart, and it runs itself. Details on (0706) 217744.***

***Anybody who can think of a reason to save a paltry £25 by not buying The Music System had better phone me quick, because as soon as Island Logic gets started, I shall be ringing up for one.***

***The program makes music on the BBC, and is the joint brainchild of Island Records and System, a Sheffield educational software house. The new company is called Island Logic, and the features it lists for its products (all five products included in the price) make mouth-watering reading.***

***The control screen is the sixth module, controlling all the other five. It looks like a Macintosh ikon-based screen, and calls up: the Editor, which is a musician's word processor. 'It allows you to write notes on musical staves, to store compositions, and even to modify existing tunes as supplied on the Library disk, or on the b-side of the cassette. The disk version includes percussion voices, and all versions include 15 sound envelopes, automatic transposition, numeric or Italian tempo notation, and automatic barline creation.'***

***The Music System isn't just a thing for writing. There is also: the Keyboard. 'It has built-in multi-track record and playback, 15 sound envelopes, and a metronome;' the Linker (on disk only) 'lets you make up large compositions from numerous single files, which can be played back as one whole piece of music;' and there is the Printout, which uses a dot-matrix printer to generate four-part manuscript. And there is, of course, the Synthesiser.***

***The product should do wonders for those people who make links from BBC Micro to hi-fi amplifiers. Details on (01) 741 1511.***

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| IBM EQUIPMENT AVAILABLE | POA |
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***Sinclair Research's new version of its best-selling Spectrum home micro features a new typewriter-style keyboard, a reset switch, two pop-up feet and six bundled home software packages. It sells for £179.95 including VAT. That's the good news.***

***The bad news is that in many ways, the 'old' Spectrum (which is still being sold) is better value.***

***The styling of the new machine, the Spectrum +, is reminiscent of the QL. The casing is big, black and square to the point of looking like a slab of black plastic. It's also much larger than the old Spectrum, even though it houses exactly the same electronics (the ROM even displays 'copyright 1982' when you switch on the machine!).***

***The keyboard tries hard not to be better than that on the old Spectrum. Although it has more of a typewriter layout with a proper space bar and ENTER key, the keys feel just like those on the QL — dead and sticky.***

***The keys all have between one and four functions — so do the Spectrum's. The only trouble is that while the old Spectrum uses colour keying to help you identify the keys, the Spectrum + has the Basic keywords printed in white which makes it very difficult to find the right key.***

***On the plus side, certain functions such as the cursor keys and ENTER get a key all to themselves.***

***All in all, for your £179.95 you get a Spectrum in a cut-down QL case with a cut-down QL keyboard, a reset switch and two little pop-up feet. You also get six free software packages which a lot of dealers are already giving away with the standard Spectrum.***

a silver sceptre (what do you do with it? Who would you sell it to? What would *they* do with it?) — the fascinating question is: where do you go to have one made?

Apparently you go to the local sceptre-making outfit, and you discover it will be happy to do it, as long as it's an order worth £50,000 — but there's a couple of other sceptre-makers down the road who might handle smaller stuff, and do you want their addresses?

What sort of world is this, where there's a flourishing market for sceptres worth over £50,000? Who wrote this awful script? Can we all leave the stage now? Cut!

## Locked in the vaults

Vault Corporation has announced a new version of its wonderful Prolok method of software anti-piracy protection.

The wonderful thing about this version, Prolok Plus, is that it is virtually uncopyable. Not only that, but if you do make a copy, it can detect the traces left by 'nibble copy' programs. Especially the nibble copiers which did such a fine job of copying the original Prolok disks . . .

Details, if you think it's worth it, on (805) 496 6602 in California.

## Spreading your losses

Visicorp, the company which called itself after its famous VisiCalc product, has lost the rights to sell VisiCalc, and has also lost the rights to the term — wait for it — Calc.

Its spreadsheet for use under VisiOn was called VisiOn Calc, and now it has to be called VisiOn Plan.

The lawsuit which decided this was settled out of court. It left Visicorp owing half a million dollars to Software Arts, the company where the software was originally written. If it all sounds mad, console yourself that both companies actually went to court with suits claiming many millions of dollars from each other. So all's well, I suppose, as long as both companies don't end well before the next financial year.

Vault obviously doesn't really think it's all that important, because in the same announcement, it has given details of its activities to get anti-piracy legislation passed. Not only does it have the cake, but it has enormously enjoyed every slice, and expects to make a killing selling the thing, too.

## Playing the ace

My picture of Jupiter Ace owners being adept at DIY got me a bit carried away in the October issue.

Only one of Boldfield Limited Computing's range of accessories for the Forth-based micro comes uncased — the joystick interface. And only one comes in kit form, its ZX81 adaptor kit, with an alternative device being available pre-built, so Ace users without a soldering iron should have no problems.

Boldfield is selling the Ace for £26 after tracking down various sources of supply for the machine, and reckons that 'people who are lucky enough to obtain one before we sell out have done well. After all, at £26 the price is less than the value of its components, and cheaper than just a Forth language software package for other makes.'

For a free brochure, phone Boldfield on (0487) 840740 or write to Sussex House, Hobson St, Cambridge.

## Vive la difference

While I was glued to my desk in London, another *PCW* writer got the chance to sample the delights of the Vidcom trade show in Cannes, highlight of which was a French micro set to cross the Channel in the New Year.

Tony Hetherington took the trip — and he reports that for £250 UK users will be offered a main processing unit housing a built-in modem, an infra-red linked professional keyboard and two infra-red joysticks.

The machine is called the Exelvision EXL 100 and it's said to have sold 500 units in its first week in France. It is driven by two Texas Instruments' 8-bit processors, supported by a speech synthesis chip, providing sound as well as speech, and a video chip with eight colours and 80,000 addressable pixels.

There is only 8k of ROM and 34k of RAM (with 32k available to the user), but both can be expanded by 32k cartridges. Exel Basic is such a cartridge.

Other expansions include 16k of CMOS RAM for about £50 which will store data for up to 20 months, a 3½in disk system, and a printer. Exelvision reckons that these add-ons will enable it to offer a business system for under £1000. We'll find out when the machine does arrive over here. END

## Break into print

***We're offering readers a 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 to us 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 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 as well.***

***Finally, we do pay for published work — the rate is £65 per 1000 words, and payment usually follows about four-six weeks after publication.***

# Home computers.

# The report you've been waiting for: simple, factual, honest, comprehensive and 100% biased.

ALL you need to know about computers can be summed up in one word: Commodore. (Well, we did tell you this would be biased).

We make everything you'll ever need to get the most out of home computing: all the *hardware* and all the software. (And if you don't understand what that means, simply look under "H").

That's what these three pages are all about: explaining what computers are (without the scientific jargon), how they work (without any technical mumbo-jumbo), and how you can get more enjoyment out of them (without much difficulty).

BASIC. Most home computers speak the same language. It's called BASIC. This is a more friendly way of saying "Beginners All-Purpose Symbolic Instruction Code."

There are different kinds of BASIC and, like languages, some are a little easier to understand than others. Like, BASIC 3.5 in the *Commodore Plus/4* and *Commodore 16*.

BOOKS you can read: "Teach Yourself Computer Programming With The Commodore 64" and "Programmers Reference Guide."

CASSETTE. Just as you keep your favourite music on cassette, so you can also keep your favourite computer programs on cassette.

You can either buy pre-recorded programs in a shop, or you can write them yourself. Cassettes are just one form of program storage and playback – see also *Cartridges* and *Disk Drive*.

To play cassette software you need a cassette unit. The Commodore 1530 and 1531 cassette units have been specifically designed to get the very best out of our computers, and provide consistently reliable results.

CARTRIDGES. These are programs that plug directly into the back of the computer itself.

CPU stands for Central Processing Unit. This is the computer's "brain," and as such it's what does all the hard work.

CHIP: silicon. A very complex electrical circuit miniaturised in silicon. It carries out the functions in the computer. Unlike other home computer companies, we make our own chips, so maintaining quality.

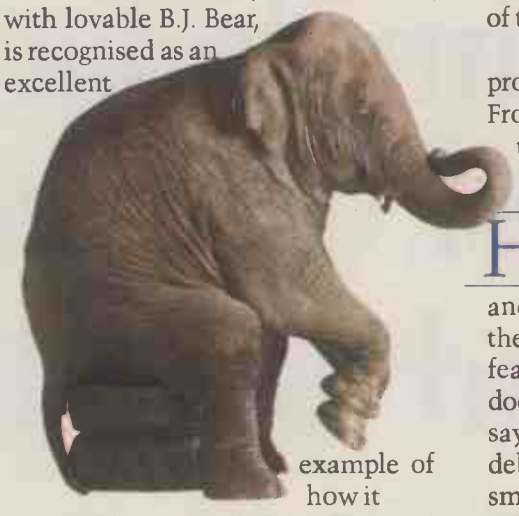
DISK drive. A program and data storage system, just like *cassettes*, but much faster. You can find and load the program you're looking for in seconds instead of minutes.

Diskettes, which can be used repeatedly for recording or re-recording programs, transfer information or instructions to and from the computer.

EDUCATION software from Commodore. We work non-stop with educationalists, improving our range of programs for the pre-school to "O" level age groups and beyond.

Computers are an invaluable educational tool – versatile, patient and able to present information in an exciting way.

Our "Get Ready to Read" series, with lovable B.J. Bear, is recognised as an excellent



example of how it is possible to develop reading and writing skills in pre-school children.

ELEPHANT: well-known symbol of the *Commodore 64's* enormous 64K memory. And don't you forget it!

FOUR is for Commodore Plus/4, our very latest home computer with four, very popular built-in programs: wordprocessing, spread-sheet (financial planning), database (filing), and graphics.

It has an extensive 64K memory, with an exceptionally large 60K available for use. The Plus/4 comes equipped with the Commodore BASIC 3.5 with over 75 programming commands.

Other features include sound facilities, comprehensive graphics and 121 colours.

GORTEK and the Microchips is a unique programming course, for children of all ages, that links learning exercises with a space adventure story.

GRAPHICS.

The pictures and diagrams on a *monitor* or TV screen, either high or low resolution.

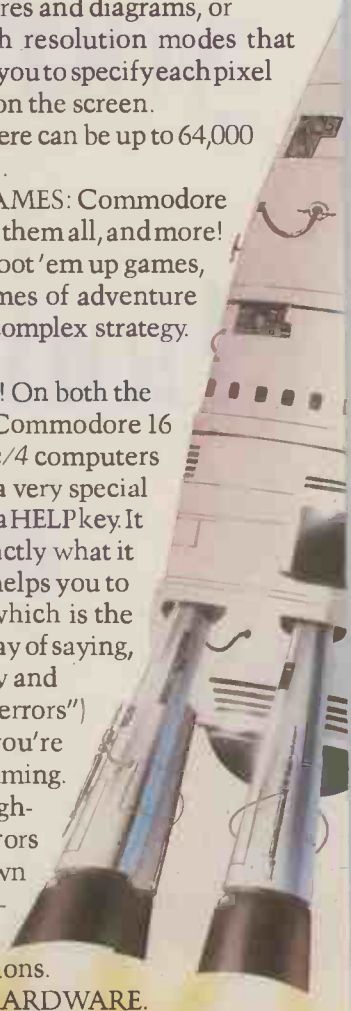
All Commodore home computers have 62 graphic symbols to create low resolution pictures and diagrams, or high resolution modes that allow you to specify each pixel (or dot) on the screen.

(There can be up to 64,000 of these).

GAMES: Commodore produce them all, and more! From shoot 'em up games, to games of adventure and complex strategy.

HELP! On both the Commodore 16 and *Plus/4* computers there is a very special feature: a HELP key. It does exactly what it says: it helps you to debug (which is the smart way of saying, "identify and correct errors") when you're programming.

It highlights errors right down to individual instructions.



HARDWARE. The computer itself – you can touch it. Whereas software's a program you can only see or hear (on the monitor) when it's running in the computer.

INTEGRAL software is software that is actually built into the computer, as on the Commodore *Plus/4*, the very latest in home computing.

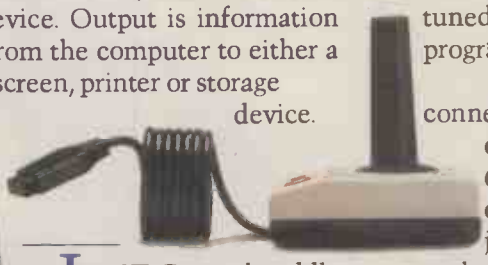
INTRODUCTION to BASIC. Just as you don't need to understand how a car works to be able to drive it, you don't have to understand how a computer works to be able to use one.

But you will definitely get more enjoyment out of it if you do have a basic knowledge of programming.

Which is why "Introduction to BASIC" has become the most popular software tutorial.

It comprises 2 cassettes and an easy-to-follow, step-by-step manual.

INPUT/output: Input is information put into the computer from either the keyboard or a storage device. Output is information from the computer to either a screen, printer or storage device.



JOYSTICK and paddles. As well as improving speed and accuracy, these make games more real by putting the control of whatever it is on the screen directly into your hands.

KILOBYTE is 1,024 bytes. So "K" stands for a unit of 1,024 or $2^{10}$. A 64K byte memory unit contains 64 x $2^{10}$, or 65,536 bytes of memory. And if you don't understand all that, don't worry.

All that's important is knowing you can run more complex programs through a computer with a large memory, than one with a small memory.

LANGUAGE. This is a system of coding that can be understood by a computer. It allows you to "speak" to the computer, and for the computer to "speak" to you. Most home computers speak *BASIC*, but there are also other languages available for Commodore computers that have been designed for specific uses. For example, LOGO and PILOT in *education*.

MONITOR: this is the screen on which you can see what you've typed into the computer, and also what the computer is saying back to you. You can use an ordinary TV screen, but more preferable is a colour video monitor, like the Commodore 1701.

This is a special device that produces much higher resolution than a TV, and so offers superb reproduction and clarity.

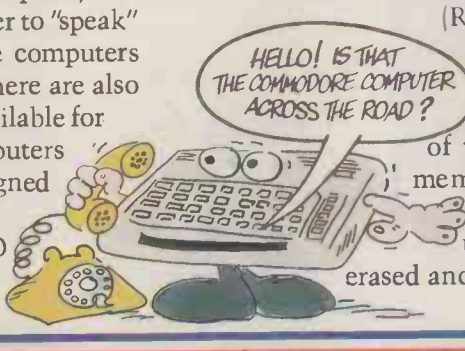
On top of which it allows the rest of the family to stay tuned-in to their favourite TV programme while you're tuned-in to your favourite computer program.

MODEMS allow computers to connect via a telephone line to other computer systems. Commodore 64 modem owners can communicate with other owners, join systems like Prestel/Micronet and an exciting new system called Compunet, where quality software is available cheaply or even free.

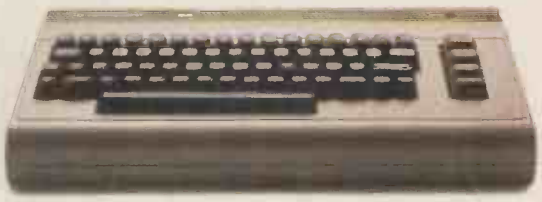
MEMORY. There are two basic types of memory: ROM and RAM.

Read Only Memory (ROM) is the computer's permanent built-in memory which tells the computer what to do. It doesn't disappear when the computer's switched off.

Random Access Memory (RAM), however, is for temporary storage. It is the part of the computer's memory that's free for you to use. It can be erased and used over and over again. It stores both data and instructions during the execution of a computer program. These are lost when you switch the machine off – unless, of course you store them on *cassette* or *diskette*.




NUMBER ONE. In the whole wide world, Commodore is No. 1 in microcomputers, and the Commodore 64 is the No. 1 best seller.



ORIGIN of the computer. In the 19th Century an Englishman, Charles Babbage, invented the first true computer. But his "Analytical Engine," was so ahead of its time, it turned out to be impossible to build!

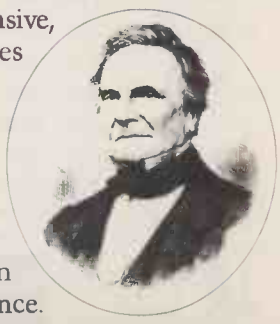
The modern computer first appeared around the time of World War II. Britain's "Colossus" was vast, consumed vast amounts of electricity, required its own air-conditioned room, was unreliable and difficult to operate.

It had its limitations.

Then came the amazing transistor... integrated circuits... and microcomputer.

The first desk top microcomputer in the world was the Commodore PET (this was a friendly name for Personal Electronic Transactor), in 1977.

In effect Commodore had taken hitherto huge, expensive, mysterious machines accessable only to eggheads, reduced the size and price, and put them into the hands of ordinary mortals in ordinary offices. An extraordinary advance.



PERIPHERALS. These are separate add-ons that will extend your computer's capabilities. Like our printers, storage devices and monitor.

PRINTER: One of the ways a computer can "speak" to us.

It means you can produce charts, letters, documents, pictures on paper.

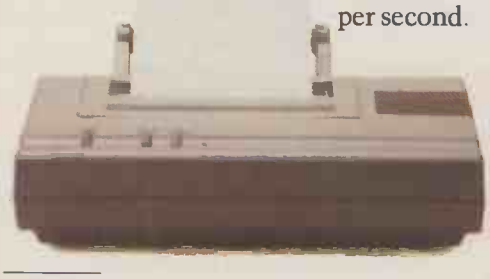
The Commodore range includes four printers and one printer plotter.

The MPS 801 dot matrix printer (so called because its characters are made up of dots) has a print speed of 50 characters per second, about five times as fast as the fastest secretary.

The MPS 802 dot matrix friction feed printer has a print speed of 60 characters per second and uses either single sheets or continuous stationery.

The DPS1101 daisy wheel printer (called that because, surprise, surprise, the print wheel looks a bit like a daisy), produces superb quality print on all letters, reports and documents (the kind of quality one desperately requires on a letter to the bank manager). There's a range of alternative type faces available on additional print wheels. Speed: 18 characters per second.

And the 1520 printer plotter (illustrated). This has 4 colours, and opens up a whole new world of graphic print-out ability. You can draw pictures, create graphic designs, plot graphs or construct bar and pie charts. Speed: 14 characters per second.



QWERTY – the 6 keys at the top left hand side of a standard typewriter. Unlike lesser machines, all Commodore computers have full-size, professional typewriter keyboards.

They have a solid, responsive feel to them. (The problem with rubber or membrane keyboards is they have a soft, spongy feel to them: you press a key, then wonder if the message got through).

RANGE. The range of Commodore software is enormous. There is something, as they say, for everyone: educational, business, home and games.

STARTER PACK. The Commodore 16 Starter Pack has been specially designed to introduce you to computing.

It contains everything you need to start home computing, complete in one box: a 16K computer, *cassette* unit, four superb software programs, and Introduction to *BASIC* Part 1.

It has a *Help* key in case you get into difficulties, and incorporates advanced *BASIC*, which has been specifically designed to simplify the programming process.

Other features include: 4 cursor keys, 2 *joystick* ports, an astonishing 121 colours, plus excellent sound and *graphics* capabilities.

TUNES. Commodore make software to help you compose your very own music.

All our home computers have great sound and music capabilities.

USER friendly. This is a program that explains itself as it goes along, or a computer that people can easily operate.

Every computer manufacturer now claims its products are "user friendly," but only Commodore really demonstrates it. For example, our *Help* key and use of Advanced *BASIC*.

VERTICAL integration is not as complicated as it sounds. All it means is that Commodore make everything to do with computers, from the silicon *chip* to the computer casing.

So we have complete control over everything, from design to manufacture.

It also means, of course, that we can design everything so you're able to get the very best out of your Commodore computer system.

WOMEN also are discovering computers – and not just in offices, but at home. Computers aren't sexist.

They were invented for everyone, and the fact that they're fun, exciting, educational, practical and time-saving are benefits that apply to women just as much as to men.

XMAS. There is no better time to give or receive a Commodore present.

YIPPEE! Yes, now you know (or should do) that computers are really interesting. They're not just about space games with horrendous monsters. Nor are they horrendously complicated machines that you need a maths degree to understand.

Computers are the future, and it's important that you and, even more so, your children don't get left behind in the past.

With a Commodore computer and a *peripheral* or two (and we now know what those are, don't we?) whole new leisure and business opportunities will immediately be opened to you.

Make the choice now and (just so long as it's Commodore) we promise you will never regret it.

ZIP us a line if you'd like more even more biased information on any Commodore products.

Write or telephone: Commodore Information Centre, 1 Hunters Road, Weldon, Corby, Northampton NN17 1QX. Tel: Corby (0536) 205252.

commodore

BY APPOINTMENT TO HIS MAJESTY THE QUEEN, MANUFACTURERS OF COMPUTER BUSINESS SYSTEMS, COMMODORE BUSINESS MACHINES (UK) LIMITED

# YANKEE DOODLES

*David Ahl has some good news for isolated business micro users in the form of companionship and price cuts.*

## Let's join together

The increasing number of small computers in offices means that users who are unable to share common data often find themselves in isolated, single-user islands. But all that is changing.

Today there's a major move towards local area networks. Ethernet, the first industry-standard local area network, was announced in 1980 by Xerox, DEC and Intel; and there are now more than 5000 Ethernet systems in operation supported by more than 200 vendors. Initially, Ethernet was hampered by a relatively high cost per node, but today the cost is down to about $600 per hook-up and experts expect this to decline even further.

Since 1980, many other local area networks have been announced and it's estimated that there are about 16,000 currently in operation.

These include offerings from Wang, Apple, Corvus, Datapoint and IBM. Consultant Architecture Technology Corp estimates that network sales will grow from about $300 million this year to $1.5 billion by 1988.

IBM is expected to be an important player. Its first offering is the recently announced PC Network which links up IBM Personal Computers.

Expected soon is an announcement of a factory floor 'industrial network' designed to tie together factory automation systems.

And two or three years away is the 'token ring' network, which will allow IBM computers of all sizes (and perhaps those of other manufacturers) to communicate with one another.

## Eat your words

In 1950, a study by Univac indicated that five computers would meet the total worldwide demand for the foreseeable future.

In 1976, Ken Olsen, president of Digital Equipment Corp, told a World Future Society meeting in Boston that he couldn't see any reason for an individual ever to need his own computer.

In 1982, Future Computing, a market research firm, predicted that Commodore, Texas Instruments and Atari would be the leading three vendors of home computers for the following three years.

## Soft in the head

The new software packages being issued by third-party vendors for three leading computers, the Commodore 64, Apple II, and IBM PC tell an interesting story. In the last six months, more business packages have been issued than anything else, followed by educational and games packages. However, the proportions vary widely for the different machines: IBM leads in business, Apple in education, and Commodore in games.

But, of course, not all the new packages will be successful. Furthermore, business packages tend to be priced considerably higher than games and educational ones, thus vendors of business software need fewer unit sales to break even.

## If the price is right . . .

Typical of companies in the personal computer market, Tandy assumed that prices of home computers might fall as fast as 30 per cent per year, but the prices of business systems would fall more slowly, say, 15 per cent a year. However, in recent months Tandy, along with many other manufacturers, has had to face the realities of price declines of mid-and upper-end systems by as much as 40 per cent. In response, Tandy has cut the price of its bread-and-butter Model 4 by 40 per cent to $1299 (with two drives).

Also fuelling the price competition is a new PC compatible from Tandy itself, the Model 1000, priced well below $2000.

Seemingly a competitor for the sluggish PCJr, in reality the 1000 is more of a competitor for the IBM PC. It has a 16-bit 8088 CPU, 128k (expandable to 640k), monochrome and colour graphics adaptors (640 × 240 pixel resolution), single or dual floppy disk drives (360k each), a full-stroke detached keyboard, three-voice sound circuit, a parallel printer interface, two joystick interfaces, and a light pen interface. The CPU operates at the same clock rate as the IBM PC (4.77MHz) and almost twice as fast as the PCJr.

The expansion bus is completely compatible and has three expansion slots, so third-party peripherals can be used directly on the Model 1000. Software compatibility with the IBM PC is very high: the two 'test' programs, Lotus 1-2-3 and Microsoft Flight Simulator, run without a glitch.

According to Tandy, the machine is being aimed at home and small business users, so the initial 40 software releases include such packages as Lotus 1-2-3, Multiplan, MS-Word, DR Graph, Friday!, the PFS: series, Knoware, Micro Illustrator, and a nifty group of games.

Best of all, the pricing on the Model 1000 is 35 per cent to 40 per cent under that of the IBM PC. The base price of the Model 1000 is $1199; an entire system with 256k, a colour monitor, and two disk drives costs $2348 compared with $3578 for the corresponding IBM PC configuration.

## Random bits

As well as announcing the 512k Macintosh ($3195) about four months earlier than expected, Apple lowered the price of the 128k Mac by 12 per cent and lowered the prices of the IIc and IIe by $100 each. Is this an indication that Apple is in trouble, or is the company just trying to get a bigger piece of the holiday season business while other mid- and low-end manufacturers are in disarray? . . . Jobs at Japanese computer companies in the US continue to be revolving doors: Sanyo, Sharp, and Panasonic have all had recent shake-ups . . . The shakeout of computer magazines continues to increase with well-established titles such as *Microcomputing*, *Softalk*, *Microsystems*, and *Commander* biting the dust along with newer entries such as *Compute's Gazette*, *Personal Software*, *Color Computer*, *PCJr*, and *Jr*. Experts expect the failure rate to rise to four or five a month leaving perhaps 20 healthy titles . . . Although universities have settled the question of who owns the copyright on a textbook (the professor who wrote it) and who owns a patent (the university — although a professor may share in the profits), the question of the rights to computer software is very much up in the air. In a 1979 case at Carnegie-Mellon University over the rights to Scribe, a document production system, the creators of the program won, but there are still bitter feelings on both sides. Faculty committees have convened every year since in an effort to establish a fair policy and have yet to succeed . . . A study by Communispond, a New York management consulting firm, found that most business executives preferred pencils to computers for composing their correspondence: 89 per cent chose pad and pencil, 10 per cent opted for dictation, and only one per cent used computers . . . Most software companies are reluctant to commit themselves to developing packages for the Coleco Adam, citing doubts about Coleco's long-term intention to stay in the market. Sierra On-Line had cartridges ready to burn in and decided to hold up and eat the costs itself. Other vendors are also taking a wait and see attitude . . . Future Computing projects that 67 per cent of all US households will have a computer by 1990 (presently 10 per cent). END

# COMMUNICATIONS

*This is the chance to air your views — send your letters to Communications, Personal Computer World, 62 Oxford Street, London W1A 1HG. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.*

## Doubtful pleasure

These days everyone is obsessed with the cult of calling everything by its initials, and in your October issue you refer, in three places, to Artificial Intelligence as 'AI'. On page 136, Michael Stevens tells us that AI is concerned with choosing which particular event 'has more value (or gives greater pleasure?) than others.' Beware!

For decades the farming community has used the initials AI for Artificial Insemination. It needs no computer to tell you that this brings very little pleasure to the bulls (who prefer the old-fashioned methods), and none whatsoever to the cows. The community itself will derive little pleasure in seeing its abbreviation hijacked by the upstart electronics industry. That industry bellyaches enough about 'program piracy', but does not itself seem to be above abbreviation piracy.

There could well be misunderstanding were an enthusiastic computer salesman to assure a farmer that within a few years the whole of his administration will be handled by AI!

**Jeffery English, Brockenhurst, Hants**

## 'Lack of understanding'

The review of Spectrum Logo in the September issue of *PCW* would have been more welcome if it had been written with a greater understanding of Logo. To take up two important issues. Firstly, the reviewer, Mike Liardet, mentions the lack of a primitive to raise a number to a power. The point is that Logo is extensible. You create your own toolkit of procedures and functions. For example:

```
TO EXPONENT :NUMBER
  :POWER
IF :POWER = 0 [OUTPUT 1]
OUTPUT :NUMBER *
  (EXPONENT :NUMBER
    :POWER – 1)
END
```

which raises any number to an integer power >= 0. PRINT EXPONENT 4 3, for example, returns 64. EXPONENT becomes another prefix operator like QUOTIENT or PRODUCT.

The same is true of Lisp systems. A good system comes with plenty of built-in functions, but every user creates a further library of his own. The relationship between Logo and Lisp is far closer than your reviewer has apparently realised.

Secondly, where the reviewer compares the assignment statements in Logo and Basic, he uses as an example:

Logo: MAKE "X : Y + 3
BASIC: LET X = Y + 3

and claims the latter to be 'more intuitive' than the former.

How about the far more frequent

LET X = X + 1

which I find downright counter-intuitive. It makes me think of

LET 2 = 3

The problem is that you are giving the = sign a specialised meaning, which contradicts its familiar mathematical usage. This contradictory usage, derived from Fortran, led the Algol committee in 1958 to use

X := X + 1

and to use the word 'becomes' rather than 'equals' as the spoken variant of :=. If the reviewer had said 'familiar' rather than 'intuitive', I might have felt less indignant.

Using MAKE for assignment in Logo is consistent with the philosophy of the language, placing explicit control and responsiblity in the hands of the user. MAKE "X 3 seems to me completely unambiguous and clear, or do I mean familiar?

I'm sure other readers will have written to you about your Benchmarks. An error which led to a difference of an order of magnitude in Basic's favour will, I'm sure, be corrected.

**Christopher Roper, Belton, Leics**

*Mike Liardet replies: with regard to the exponent function, Mr Roper would probably also defend a language lacking multiplication on the grounds that a procedure can be written using repeated addition.*

*The point is that Spectrum Logo does not have an exponent function. Moreover, Mr Roper's procedure is not a replacement for one, since it doesn't cope with negative or non-integral powers. Of course I know that the correct procedure can be written, but it's hardly an appropriate task for most beginners.*

*Secondly, since Logo does not permit extensions to the syntax (as do languages like POP-2 and Prolog), even a correct exponent function can't be used in the more familiar infix position. Thus, in Logo we are forced to use:*
*EXPONENT 2 –3.5*
*whereas in most other languages we can use:*
*2 ^ –3.5.*

*Thirdly, Logo user-defined procedures are executed at the speed of the interpreter — slowly. So a user-defined exponent will be many times slower than a machine-coded procedure provided as part of the language.*

*As for Logo assignment, I find*
*MAKE "X :X + 1 (Logo)*
*less clear than*
*LET X = X + 1 (Basic)*
*which in turn is slightly less clear than*
*X := X + 1 (Algol)*

*This is obviously a matter of taste, but we both prefer Algol's assignment at any rate. Whatever did happen to Algol, by the way? (Don't answer — I know.)*

*According to my watch the Benchmarks are correct.*

## GOTO a deep discussion

*PCW* articles are invariably informative and thought-provoking, but David Bradnack's presentation in 'GOTO, Thou Sluggard' (August *PCW*) was excellent. If articles were rated as to the pleasure they gave the reader simply through style and wit, this masterpiece would rate 100 per cent every time.

I still haven't read it in its entirety (I'm going to cheat and load it into my micro as a series of PRINT statements with appropriate GOSUBs) and Mr Bradnack even caught me on the hop with statement 180.

I have to confess to being a proponent of the modular approach to programming, and I do write many routines in the manner which has been so cuttingly presented. Yes, Mr Bradnack, you *have* made your point, and very cleverly too.

I take issue with the association between GOSUB and structured programming; along with the popular BBC Micro, my much-maligned TI-99/4A is capable of producing programs using the procedural approach. The procedures are called 'sub-programs' and are, I believe, slightly more powerful than the BBC PROC. Without going into deep discussion of either the merits of the TI-99/4A (there are very few) or of the structure of sub-programs, there's one highly important difference between a subroutine and a procedure.

Whether your programs are peppered with GOTOs or laced with GOSUBs, if an error is encountered, the computer will (usually) stop and issue a report of some description together with the statement number at which the error became evident. Your task is then to decipher the route taken by the interpreter from the start to the point in question. After even a few minutes processing, this can be an impossible task.

While I can't speak for the PROC function, the use of sub-programs on the TI-99/4A provides an 'audit trail' which is presented to you automatically whenever it encounters an error. The kind of horrendous error generated while nesting subroutines causes no problem with nested sub-programs, as all steps are detailed for you. The typical TI screen presentation might be:

```
*BAD VALUE IN 4010
```

IN HEXDUMP
CALLED FROM ASSIGN
CALLED FROM SPLIT
CALLED FROM GETCHAR
CALLED FROM SCRCHK
CALLED FROM INTRO

From this you know exactly the route that the interpreter took and can follow at a leisurely pace with pencil and paper. The use of GOSUB does mean that any route can be followed provided that you can: (a) retrieve all the unresolved RETURN addresses from the GOSUB stack *and* relate them to your program; and (b) be sure that no overflow of the stack occurs, losing some of the unresolved RETURNs. GOTO gives you none of this information.

While I do not accept the near-hysterical outbursts from some academics with respect to GOTO, Basic and brain damage, I am equally cautious about accepting Mr Bradnack's contention that selective use of GOTO in place of GOSUB is a preferable approach.

Finally, whatever your views on GOSUB, GOTO, Life, The Universe, and Everything, you have to admit that Mr Bradnack would have an excellent future as a politician!

**Peter GQ Brooks, Oxon TI Users, Oxford**

# On the defence

I would like to clarify the situation concerning the NEC PC8201 (not the PC 8012A as quoted in your article 'Laphelds down in price', P107 November issue). I believe Bill Barham's remarks may have been misinterpreted and I would like to make it clear that NEC has no need to reduce the price of its PC8201 lapheld as it believes its product offer is far superior to that of their competitors.

This is the situation that Bill Barham had originally implied and I would be grateful if you could inform your readers accordingly as I feel they might otherwise be misled.

**Judith Knight, NEC, London**

# Sensible inaccuracies

I read Kathy Lang's review of the Sensible Solution database (September *PCW*) which was most complimentary, but I feel that a number of points were missed or inaccurately represented.

(1) Sensible Solution is intended not only for networked systems, such as the SIG/NET, but for many micro operating systems. We currently support CP/M, MP/M, DPC/OS, TurboDOS, McNOS, MS-DOS, CP/M-86, Concurrent-DOS, Novell and any compatible operating system. Furthermore, all screens, programs and data files are transportable from system to system without modification.

(2) Although we use 128-byte records which could be wasteful of space if not carefully planned, most operating systems lock records of this size as the minimum.

(3) Using multiple linked screens does not introduce any overheads.

(4) Another date format not mentioned is DD/MM/CCYY where CC is the century. Most database management systems only allow YY which precludes dates ranging into the 21st century.

(5) Fields can be created with the same parameter values but only the field name varying by using the 'ARRAY' program supplied with the package. This allows the fields defined to be accessed as an array, like Basic, which is an extremely powerful feature, as is pointed out.

(6) If a data field is full, the cursor will usually drop into the next field on the screen. This explains why Kathy couldn't get the find command to always work. Pressing RETURN to end a field can be made compulsory on installation and changed at any time. Thus, at the main menu, you would have to press RETURN whether you type 1 or 10 into the two character field.

(7) There's a 'clean' way to end a program. Use the 'execute' command to start another program or any COM file.

(8) Describing the procedural programming language as 'somewhat crude' is like calling a COBOL compiler an ISAM file-handler with a somewhat crude programming language!

(9) Creating programs on a question-and-answer basis has the advantage that *no* syntax errors occur, and at every stage all options are displayed for you. Other systems need 'command assistants' to be specifically invoked — very tedious.

(10) The manual has since been revised to include a more comprehensive contents page.

Overall, I thought the review to be well presented for such a flexible product. However, with such a specification and the wide range of systems we run on, where's the competition?

**Steve Leven, European Technical Support Manager, O'Hanlon Computer Systems, Slough, Berkshire**

*Kathy Lang replies:*

*(1) My Summary box has a line missing — it should include 'Systems Supported' showing CP/M-80 and 86, MS-DOS and PC-DOS, and several networked multi-user micro systems. My apologies.*

*(3) Good — but that in turn may have implications for security against breaks such as power cuts.*

*(5,6,7,10) I'm grateful to Mr Leven for making these points — but if the manual had been less opaque I might have found 5, 6 and 7 for myself (nor did the array utility come with my version). A more detailed contents page may help but a proper introduction to Sensible's approach and, even more important, an index would be better still.*

*(8) I strongly disagree. Sensible has only two ways of controlling execution: GOTO line number (optionally preceded by IF and a condition) and GOSUB line number. These control structures are, I repeat, very primitive: even the simplest Basics have FOR . . . NEXT, good ones have a proper IF . . . THEN . . . ELSE (without the necessity for branching) and a DO . . . WHILE, and some even (gosh!) permit procedures with variable parameters. Among Sensible's competitors in the data management market are several which have some or all of these features.*

*(9) I agree — but this approach does nothing to help avoid logical program errors, which tend to be much harder to find than syntax errors.*

# The great American disaster?

I own a QL (AH ROM), but some facets of the machine's performance have proved disappointing.

These are:

(1) Quill is painfully slow and as such prevents it from being used as a serious word processor.

(2) Microdrive access times are slow compared to ZX drives, and even slower when loading Quill files.

(3) 80-column mode overscans when using an industry-standard monitor, which is very tough on those who bought one expecting it to work. Nothing was ever said to the contrary.

A word of warning: to foist the QL on the great American public in its present state would be to commit commercial suicide. They are not a patient, laid-back lot like us. The special relationship between Uncle Clive and the British public doesn't exist over there. If it's not right first time it will, as our transatlantic cousins would say, 'go down the toilet.'

If the necessary improvements are made in time, the QL could still be a world beater. It has the potential. The line between success and failure has always been thin, and never more so than with the QL.

**Roy Barrett, Hatherleigh, Devon**

# BLUDNERS

*PCW*'s printer interface has been playing up on Spectrum programs. 'SP-Easel' from September's Program File and 'Crib Player' in November are the two programs affected — throughout both, the hash character (#) has been printed as a cross between a single quote and a closing bracket.

Neil Anyon and Philip Jones have written in with some corrections to the Spectrum 'Keywords' program in September's issue.

The hex loader routine (Fig 1) contains a number of errors, not least the inclusion of a MID$ function (unavailable in Sinclair Basic) at line 60. Also, the LET statements, compulsory in Sinclair Basic, have been omitted throughout the program.

To enable the program to run, replace line 60 with:
60 LET P=CODE (H$(B))–48
and add
35 IF LEN H$<>2 THEN GO TO 30 which prevents the program stopping due to the lack of a two-digit hexadecimal number. Finally, precede all variable assignments with a LET statement.

Nick Ryman-Tubb's October article, 'One Step at a Time', also had problems with Sinclair Basic. We're trying to produce correct listings, and any reader requiring copies should write in and we'll forward them.

## BANKS' STATEMENT

# The biggest slice

*Would software manufacturers have more financial success if they tailored their products towards a well-defined market? Martin Banks crossed a few palms to find out.*

A few weeks ago, a friend of mine in the computer industry came up with a fascinating but inconsequential fact. In 1983, IBM made $2.50 profit for every second of my 80-year-old uncle's life. At first I thought that this was the most irrelevant piece of information I had ever heard (unless I was IBM's bank manager, of course), but I played with some numbers and found that in the first quarter's trading this year, the jolly blue giant had made around $1 profit for every second he has been alive.

This is all quite stunning, but so what? Then I thought: 'Billions of dollars' just sounds like a hell of a lot of money when you say it out loud. Consider it in terms of an equivalent, such as seconds of life, and you realise just *how* much of a hell of a lot it really is.

If, therefore, IBM can make that much money out of the computer business, why are so many other companies going under?

There are, of course, significant reasons why IBM is such a success. It started by being in the right place at the right time when the computer industry first took off. It pursued its sales and marketing objectives with a zeal that still borders on religious mania. It became *the* name in computers: for many people computing means IBM, and that includes other computer manufacturers.

But why has it succeeded while others have failed? One possible reason for such success was recently brought to my attention. I visited a software company that had done well out of addressing a vertical slice of the software market place, and was due to launch its latest product. Its target was the legal profession, a business well-known — in folklore if not always fact — to be one of the most remunerative ways of earning a living.

The package was introduced and explained, and the price was mentioned in passing; at which point I felt the urge to seek a little clarification on the indelicate point of the price tag. What, I wondered, did one get for the £2000-plus that had been mentioned? If it was an all-up price, including the hardware, then it looked like a reasonable deal.

'Ah, no,' I was informed. 'That's just the price of the software package.'

Just the price of the software package? Good God. There are companies up and down the country who could — probably are — writing programs as complex for under £500.

It was then that the thought struck me. I've seen several software product catalogues from distributors and individual product announcements from software companies that reveal a great divide in the software business. Place your company in a nicely defined vertical market and you can charge what you like for the product. If the punters want it, they'll beat a path to your door, no matter what the price.

If, however, your product is of a more general nature with potential applicability across a wide range of user sectors, then the price must be low, competitive and aggressive. The related logic is quite straightforward: general-purpose applications packages will theoretically be sellable to a wide range of customers across a wide range of user sectors.

*'You may not become a millionaire or reach IBM's enviable financial status but there's good money to be had making the icing for The Big Blue One's extremely fulsome cake.'*

There is, therefore, the potential for high volume sales which justify an aggressive price. Such a price will also be needed to generate sales in the first place, because other software companies will be fighting for the same general-purpose data processing markets. They will all be selling word processors, database managers, spreadsheets *et al*. What will primarily distinguish the various packages will be price, unless the features of one are so stupendous as to be unbelievable, or so appalling as to be laughable.

Even the prices will be broadly similar, with each new entrant to the market attempting to provide more facilities than the current leading product in any sector at a lower price.

Yet, as has been found many times before (the latest being the home computer hardware market), there's only ever room for two or three successful products in any category and, once these market leaders are, by whatever process, defined, the other contenders are doomed to either struggle or suffer an ignominious failure. That is unless they can offer the user something different, or better.

Then they find that they can even charge for it. They may not sell as many units as the market leaders, but their profitability will often be greater in percentage terms. Such companies are now making the transition towards addressing vertical markets, where they may well find that the pressures are slightly more bearable and the problems slightly less.

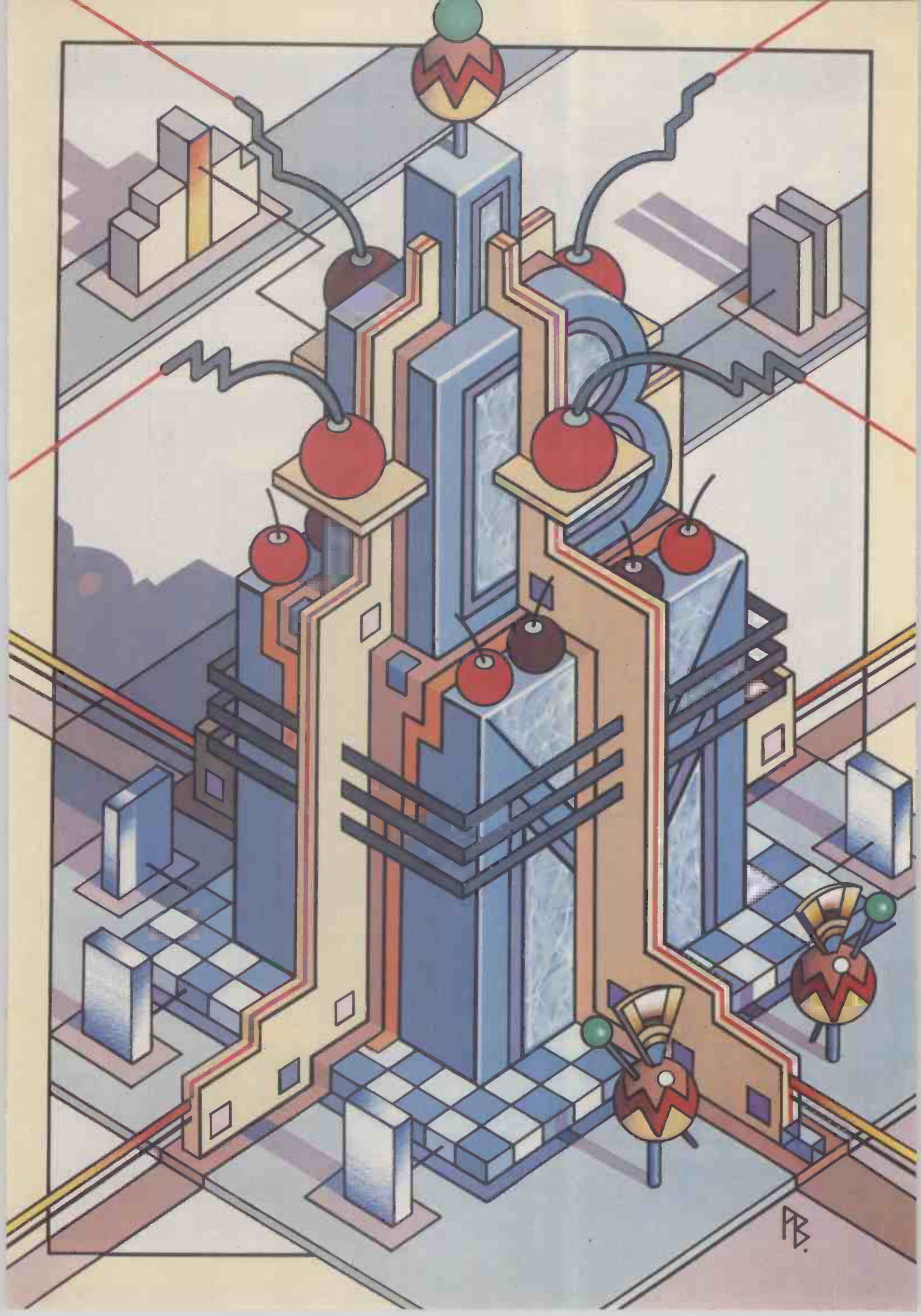
As can be seen from the catalogue of software distributors, pick the right vertical market and you can name your own price. Something for the legal profession perhaps, or the building trade — anywhere that's used to shelling out money in large dollops for its product purchases. These are the markets to go for.

You could spend less time and effort developing a package in those fields than in developing a word processor. You could come up with a package that had seventeen times more the power of WordStar, could run immediately on any machine with more than 16k of memory and cost just £25 and it still wouldn't sell. With a well-defined vertical market product you're almost guaranteed business. I've heard of customers buying such products, often several copies, just for evaluation purposes, to 'find out what it's capable of.'

At vertical market prices, that can be good business; in the general purpose applications business, it can mean bankruptcy.

You may not become a millionaire or reach IBM's enviable financial status but there's good money to be had making the icing for The Big Blue One's extremely fulsome cake. END

*Illustration by Peter Bentley*



# ICL OPD

*The OPD could be the busy executive's dream come true. It allows several applications to run simultaneously, talks to telephone callers and features Sinclair hardware and microdrives — to name just a few of its impressive capabilities. David Tebbutt takes an exclusive look at the latest concept from ICL.*

What does your average busy professional do all day long? I'll tell you. He dives from task to task, taking phone calls, dashing off letters or memos, calling people and generally looking totally disorganised.

In fact, such a person is well in control and is capable of responding rapidly to changing circumstances and altering priorities accordingly. Unfortunately, most computers can't keep up with such a person. They prefer to grab you for an application and hold you there until the job is finished. Integrated programs like Symphony or Framework help considerably and the more recent development of background tasks (calculator, calendar, notebook, and so on) such as Sidekick, Spotlight and QED will bring computers much closer to an executive's needs.

Imagine a computer that lets you run several different applications 'at the same time', takes up less space on your desk than the average personal computer, replaces your telephone for both voice and data calls without interfering with other applications, and chats to your callers when you're out. Interested? I certainly was when ICL's OPD landed on my desk.

The amazing thing about this project is that it's been kept so quiet despite numerous mentions a couple of years ago. Here's a quote from a 1982 Sinclair press release: 'In December 1981, ICL announced that it was to develop with Sinclair Research an ultra low-cost integrated terminal/digital telephone workstation employing Sinclair's flat tube technology and Sinclair Basic. At the time it was christened the "One Per Desk IT Work Station".' The Basic and the name (OPD = One Per Desk) survived, but the flat screen was discarded somewhere along the way. The microdrives used for backing up the memory are a visible reminder of Sinclair's involvement, but the predominant influence is clearly ICL's.

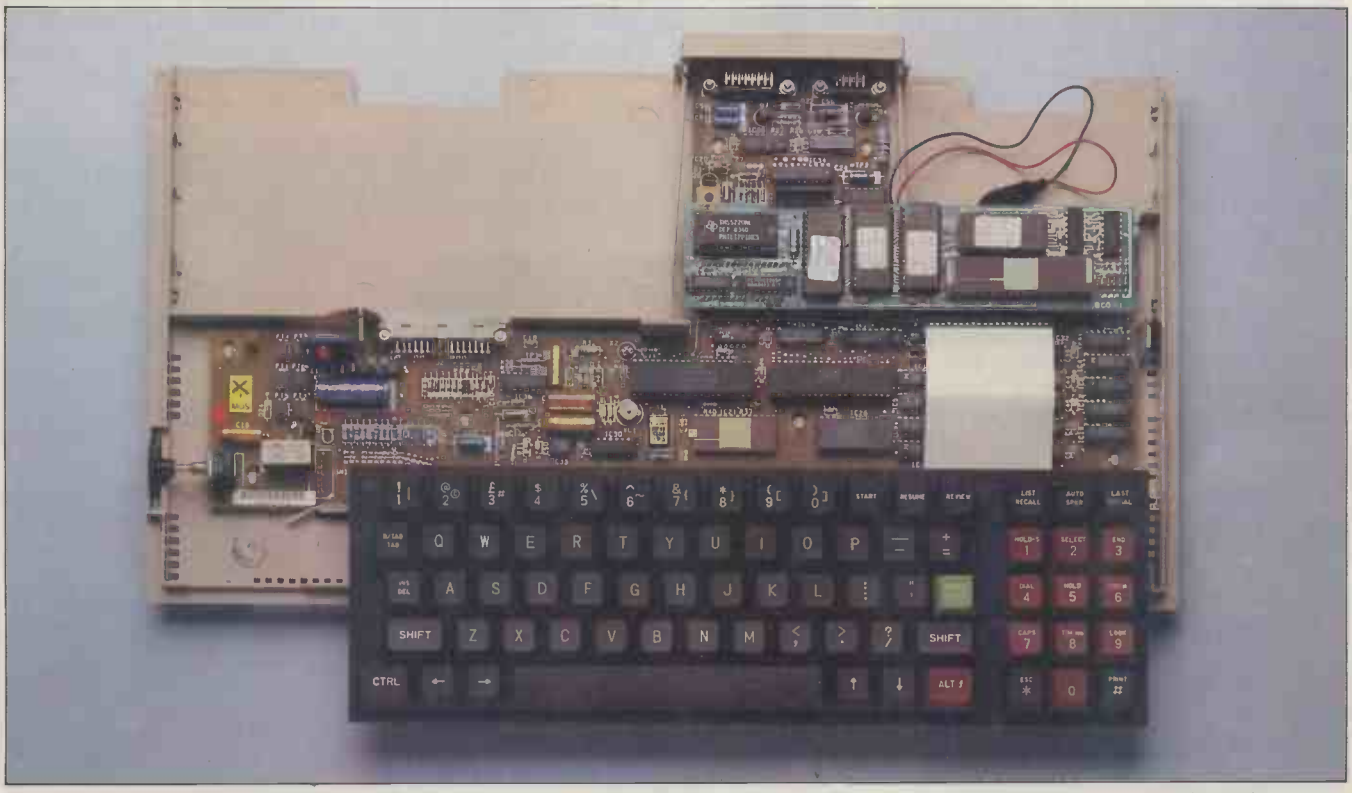
*Side view: the monitor is adjustable and fits snugly to the machine*

## Hardware

The OPD comprises two units — a monitor and a keyboard unit incorporating a pair of microdrives and a telephone handset. To avoid the need for a cooling fan and to allow continuous operation for up to five years, ICL has tucked the power supply away in the back of the monitor unit. A single lead connects the units together, and this carries both power and control signals. A second socket at the back of the keyboard unit allows the attachment of an RS432 printer.

The colour scheme is chocolate and cream with burgundy telephone control keys and a lime green ENTER key. This is a good idea because the ENTER key is quite puny: it's been made the same size as the letter keys to help make room for ICL's special control keys. Six LED windows indicate whether power and the screen are on, which telephone lines are active and which microdrives are in use.

The OPD has no power switch but, in view of its continuous use, has a screen on/off switch to preserve the tube's life. In addition, the screen will blank after



*Two Sinclair chips sit on the main PCB with the processor, ROMs and speech synthesiser chip on a smaller board*

*The standard qwerty keyboard incorporates a pair of microdrives and a telephone handset*

five minutes of inactivity in order to protect the phosphor coating. A loudspeaker permits call monitoring without lifting the handset. The handset must be used if you wish to speak — there's no microphone in the OPD itself.

The keyboard, or control unit, comprises three modules — the main unit, the telephony module and the ROM module. The main unit contains the processor, memory, operating system ROMs, most of the control circuitry, the microdrives, the keyboard and a numeric keypad. The telephony module plugs into the rear left of the main unit, and has two telephone leads and the handset trailing out of it (the handset is a variant of British Telecom's 'Sceptre').

The ROM module slides into the rear right of the OPD and contains two sockets into which you may plug applications software: for example, ICL's own messaging software will be supplied in this form. Optionally, the ROM pack may also contain Psion's Xchange suite of programs which are tucked away inside the pack on five ROMs of its own. When faster one-megabit ROMs are available, the number of ROMs needed for Xchange will be reduced and the ROM pack will allow the addition of up to four additional plug-in applications. Plug-in modules can be 8-, 16- or 32k each.

The OPD is the easiest machine I've ever taken to pieces. The only screw was in the telephony module and I'm not entirely clear what it was doing there anyway. The top of the main unit is held to the base by nine concealed plastic clips; a slot allows you to insert a screwdriver and lever off each clip. It takes seconds and is designed for rapid replacement of damaged or faulty components.

The connections between the upper and lower parts of the assembly are the 14-pin microdrive connecter, the handset switch leads and the loudspeaker leads. The keyboard lies over the front part of an oddly-shaped main PCB (at least, I'm calling it the main one because it's the largest). In fact, the processor, four ICL system software ROMs (32k each) and the TI TMS5220 speech synthesiser are on a separate smaller board 'piggy-backed' onto the first. Two Sinclair-designed chips sit on the main board (sounds like a business machine, doesn't it?) and, of course, the microdrive ULAs are Sinclair's too. The three Sinclair chips and the Motorola 68008 processor are the same as those used in the QL. The main board contains 128k of main memory on 16 chips. An additional 2k of static RAM contains essential system parameter information, and is backed by a lithium battery designed to last at least five years. A further ROM contains the vocabulary for the speech synthesiser. Apart from such things as a volume control and a piezo electric speaker, that just about covers the main ingredients.

*Choice of monitors: a 14in Microvitec colour or a 9in monochrome*

The upper part of the assembly contains the loudspeaker, the handset on/off switch and the microdrives mounted on their own separate assembly. I must confess that I approached the microdrives with some trepidation, but they worked reliably.

The OPD's keys are well laid out and of normal pitch. The keytops are dished and have a slightly bumpy surface which makes them pleasant to touch. The technology underlying the keyboard is not a million miles from its much-hated rubber membrane relative: each key rests on a rubberised plastic 'bubble'. The bubble is securely trapped by a plastic surround attached to the keyboard PCB. This bubble doubles as a spring and, presumably, as a connecter. The keys automatically repeat after a short pause and a hefty 128k Basic keyboard buffer is provided. This keyboard is designed for low to medium use over the product's lifetime.

The qwerty keyboard is standard but there are a few differences. For example, the numerics on the top row each have three characters inscribed on the key top; the third is accessed by holding down the ALT key while pressing the numeric. INS and DEL are provided on a single key: they open a gap in the current line and delete the character preceding the cursor respectively. If you press CTRL with this key, it deletes characters to the right of the cursor and closes up the gap. TAB and BACK TAB are provided on the same key and are used to move between 'boxes' on data entry screens. The cursor keys are to either side of the space bar, just like the QL.

Now for some new keys: START, RESUME and REVIEW are specific to the OPD. Because the OPD lets you run several tasks at the same time these keys, in conjunction with ICL's firmware, allow you to get out of something (START), get back into whatever you left last if it's still there (RESUME), and find out what tasks are going on at the same time (REVIEW). This last function gives a menu of all active tasks and you can elect to go into any one.

Over on the right is the numeric pad which comprises fifteen keys and works in conjunction with SHIFT and ALT. In this context ALT turns the numeric keys into function keys and, as a reminder of this, has a lower case 'f' inscribed on it. I have always thought that separate function key pads are an irritation, just something else to learn, but ICL's answer is so simple I'm astonished that I've not come across it before.

The numbers are laid out in the same way as a touch-tone telephone: that is, with 123 at the top. Since this computer is so closely linked with the telephone system, ICL has made the right decision. Two keys on either side of the zero contain the Prestel special characters, asterisk and hash; the shift position of these keys contain ESC and PRINT respectively. The first we know, the second performs a screendump to your printer (ICL supplies an OKI printer for use with the OPD).

The remaining keys all have some function connected with the telephone system. Here's the top row: LIST shows your important phone numbers; RECALL has the same effect as RECALL fitted to some telephones; AUTO lets you switch a data call from the handset to the modem; SPKR initiates a 'hands off' call or transfers a call to the loudspeaker; LAST displays the last six numbers dialled and redials your choice; and REDIAL redials the last number dialled. Of the remaining seven, HOLD-S holds a call and transfers you to the other line; SELECT switches your preferred line; END ends a call and starts a new one, or connects you to a call on the other line; DIAL connects/disconnects the numeric pad from the telephone (presumably so you can use it in a program); HOLD holds a call; CAPS (what's that doing *here*?) locks the keyboard in upper case; and TIMING starts timing a call or lets you enter a charge band code.

The screen has a maximum resolution of 256 x 512 pixels, which gives a choice of four colours (or shades of grey) — black, white, green and red. Using a 256 x 256 resolution, the number of colours is doubled to eight and you can make the pixels flash too. In normal use the screen is laid out as 26 lines each of 80 characters (alternatively, each line can contain 40 characters). The top 24 lines form the main display area and the bottom two are referred to as the 'Noticeboard', where the system status messages appear. Since many things may be happening at the same time, these last two lines are essential.

The machine I tested had the standard 9in monochrome monitor (not unlike the one on the Apricot on which I wrote this review), but a 14in Microvitec colour monitor is also available. The OPD monitor has a two-position pair of legs at the front. One position has the monitor lying almost flat on the desk but it's all still visible behind the sloping main unit; the other position raises the monitor so that it may be pulled in close to the main unit where it fits snugly just behind the microdrives. This latter position also tilts the screen backwards and makes it more natural to use. Apart from the screen protection facilities (on/off and auto-blanking after five minutes), the monitor has a slider control for brightness and two LEDs — one to show that the tube is still powered, the other to show that the mains power is still connected.

The telephone module is controlled by a Frequency Shift Key (FSK) modem and can handle 1200/75 baud for Viewdata connections, 1200/1200 half-duplex and 300 baud full duplex. It can also handle two telephone lines at once, and with only one modem and one handset, these will normally be a data line and a speech line. However, it's possible to put one voice call on hold while dealing with another. The board is designed for analogue communication, but a digital board is under development to be ready when digital communication becomes more established. Auto-dialling and auto-answering facilities are also provided.

The speech synthesiser and its associated vocabulary is used to construct messages which can then be broadcast through the telephony module when set in auto-answer voice mode. Auto-answer data mode allows the reception and storage of data without any user intervention.

## *System software*

The QL has an operating system called QDOS which is intimately related to QL Basic. In fact, I think they may even occupy the same ROM on that machine. ICL has written its own operating system software and accordingly has had to prise the Sinclair Basic away from QDOS prior to building it into OPD. This process is ongoing and several features were missing at the time of this review. In particular I felt the need for high resolution graphics, which are oddly missing from this machine.

ICL is aware that a large amount of third party software will be written for the QL, and will therefore be trying to make the two languages as compatible as possible. ICL will also want to make its own operating system resources available to Basic programmers, so I expect the final version of Basic to be completely compatible with QL Basic.

The OPD user will be very taken with the 'operating system' provided with the OPD. To call the ICL software an operating system is rather insulting. ICL calls it the Base Functional Software as it not only controls the essential functions of the machine, but also provides services which the user can invoke in order to access the various applications available. Briefly, the elements of this system are as follows: Kernel, Director, telephone handler, telephone directories, calculator, screen image printing and field editor.

The Kernel is what we normally call an operating system: it manages the nuts and bolts and provides a logical map of the hardware devices. Input, output, memory allocation, device control and interrupt handling are the main tasks of the Kernel and everything is, of course, invisible to the OPD user.

The Director is a higher-level piece of software which comprises two elements — the applications handler and the telephone handler. The Director schedules activities so that they don't trip over each other in their bids for machine resources. Guidelines exist for software authors and, providing they obey the rules, the Director and the Kernel will make sure that no contention problems arise. The Director takes care of those strange keys I mentioned earlier, START, RESUME and REVIEW, and is always in control of what application is where, what resources it's using, and what state it was in

when it was last active.

The telephone handler part of Director keeps track of the calls which have been requested by the various applications, the status of each line and the management of voice and data calls through those lines. Auto-dialling, line switching and connection of the speech synthesiser are handled by this part of the software, as is the reporting of the telephone system status to the Noticeboard at the foot of the screen.

OPD contains two telephone directories — one for computer services and the other for voice calls. The directories can be searched by keyword or part-word, browsed, used to automatically dial a number and saved to microdrive. The user can create and amend directory entries, and load and merge directories from microdrive. All these facilities are directly available to the user from a series of menus.

A simple calculator is provided which handles up to 16 digits (plus decimal point and sign). Calculations are to eight decimal places and the normal +, −, *, /, = and % facilities are provided. In addition, a number of memory commands are included but, frankly, the calculator is nothing to write home about. It's on a par with a credit card calculator, with the additional benefit that you can see the details of earlier calculation scrolling up the screen as if they were on paper.

The screen image printer literally freezes the screen when the button is pressed and dumps the image to the printer, and is obviously useful if you've encountered an interesting Prestel or electronic mail page.

The field editor provides cursor positioning and text editing controls, giving the user a consistent approach to data entry and amendment tasks.

All the foregoing functions are built-in to enable applications programmers to provide a consistent user image in their programs.

For the ordinary user, all the system's facilities and supplied programs are presented through a series of menus. Although you may lose track of yourself from time to time, you can always get back to the main menu by pressing OPD's panic button — the START key. The main menu comprises the following options: Telephone Directory, Telephone Control, Messaging, Applications, Computer Access, Calculator, Basic, and Housekeeping.

The Telephone Directory option conceals a lower menu which allows you to create and amend directory entries, save and load them via microdrives, search for an entry by keyword or part-word, display the current entry, and make automatic calls. You can store two numbers for each person — one data, the other voice. Extension numbers may follow the telephone number for display onscreen while the call is being put through. The only trouble is that when you lift the handset to ask for the extension, it disappears from the screen; you need to use your own short-term memory.

The Telephone Control option allows you to examine the status of your telephone lines (free, ringing, answering, and so on) and the last number called. The fun starts when you want to set the OPD to automatically answer voice calls with its built-in speech synthesiser.

A selection of some two hundred words is offered and to create a message, you simply type it using these words. If a word is unrecognisable to OPD it will highlight the wrong word so that you can change it. Endings such as -s, -ing and -ed may be appended to words and the letters, numbers and dates (1st to 31st) may be included. A sentence like: 'I am sorry, I am out. Please call my secretary on extension "328". Thank you.' is quite feasible. If you're the imaginative sort you could cook up something like: 'I have gone for a we-we. Back soon.' Full stops, spaces and commas provide pauses of varying lengths and the end result sounds rather like a well-educated Dalek. It works, it's fun and you can't be in any doubt that you're being answered by a computer.

You can set a time window for auto-answer and automatically switch to an alternative message outside that window; a repertoire of up to sixteen messages may be stored in the OPD. If you want the phone to ring for 14 seconds before your Dalek answers, then that can be arranged too; this gives people a chance to ring off when they realise you're not there. Other features of Telephone Control allow you to time calls and let OPD work out approximate call charges.

The plug-in ROM capsule covering Messaging wasn't finished at the time of this review. It's a kind of electronic mail facility which lets you create memos, messages or whatever in a 'notebook' on your OPD. You pop it into OPD's electronic 'out tray' where it waits to be transmitted to its destination. Transmissions take place without your intervention and, when you arrive in the morning, you may well find a stack of messages in your electronic 'in tray' which can be transferred to your notebook, printed out or simply destroyed.

The Applications option clearly depends on what you have plugged into your OPD. On the review machine it offered a cartridge menu which told me which programs were available from the microdrive, statistics relating to the microdrive's performance and access to Xchange, Psion's suite of applications programs.

Computer Access lets you maintain a file of computer phone numbers and access details in a similar way to the voice Telephone Directory mentioned earlier. It allows automatic or manual connection using Viewdata or Glass Teletype conventions. Pages of data may be stored for later printing and protocols can be tucked away in its Profile Store. I tried Telecom Gold but was denied access — someone at ICL may have changed the password. The auto-dialling, the connection and the sign on worked perfectly though.

I had more success with Prestel and suffered the usual experience of profound disappointment with what was there. I saved pages and displayed them after I had disconnected, and it pleased me to think that I was cutting down on my phone bills by using the facilities in this way.

## *Technical specifications*

| | |
|---|---|
| Processor: | 68008, 7.5MHz |
| ROM: | 128k integral<br>208k ROM pack |
| RAM: | 128k dynamic<br>2k static (lithium battery-backed) |
| Mass storage: | Two microdrives, minimum 95k each |
| Keyboard: | 73 keys, qwerty plus telephone-style numeric pad |
| Monitor: | 9in monochrome |
| Size: | Control unit, 95mm × 440mm × 250mm<br>Monitor 250mm × 280mm × 280mm |
| Weight: | Control unit, 3kg<br>Monitor, 4.75kg |
| I/O: | Nine-way RS432 serial connecter |
| Modem: | 1200/1200 half-duplex, 75/1200 and 300/300 full duplex |
| DOS: | Proprietary |
| Bundled software: | Telephone directories, control, communications, utilities, calculator, Basic |
| Peripherals: | OKI printer, Microvitec 14in colour monitor |
| ROM pack: | Psion's Xchange suite (Easel, Archive, Abacus and Quill) |

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```
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2  Wordstar
3  Lotus 123
4  Disk formatting menu
5  Exit to operating system

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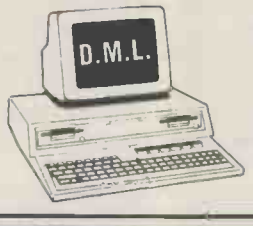


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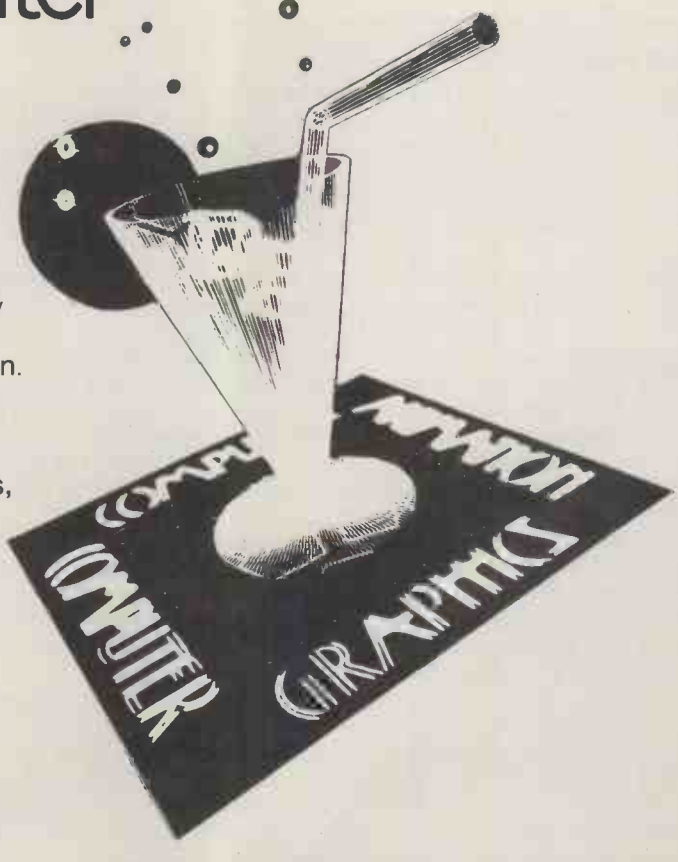



**Cambridge University Press**

Finally, the Housekeeping option allows you to check the battery charge, set the time and date, save and load important bits of store and mess around with the microdrives. Format, copy, rename, display and delete are among the utilities provided.

## Applications software

An option with the OPD is the Psion Xchange suite of programs. This comprises the four most popular applications — spreadsheet, business graphics, word processor and database. Called Abacus, Easel, Quill and Archive respectively, they are similar to the versions offered on the QL and the popular MS-DOS machines. Xchange was reviewed in *PCW*'s October issue and, as is so often the case, I was working with development versions.

Once the programs are fully debugged they offer a perfectly adequate set of facilities, and any minor niggles (especially the need to type Archive commands in full) are overcome by the splendidly low price. Because the Xchange applications are held in ROM and treat RAM as if it were a microdrive, the loading of programs and exchange of information is impressively fast. You can, of course, specify the microdrives for data storage when things do slow down; the trick is to make your telephone calls while the drives are busy. You can get into other activities but, sooner or later, they suspend the microdrive activity.

ICL is looking for other software but, at the time of writing, it either hadn't found what it was looking for or was keeping quiet about its plans. As I mentioned earlier, the company is aiming for compatibility with software offerings destined for the Sinclair QL.

## Documentation

The OPD is supplied with the following manuals: *OPD Installation; OPD Handbook; OPD Basic; OPD Messaging;* and *OPD Welcome Package*. I was given draft copies of all except *OPD Messaging*.

The manuals are well laid out and well written, although I did feel the need for a road map from time to time. The problem lies less in the manuals than in the complexity of the subject being tackled. The OPD is a very sophisticated piece of kit and ICL has tried very hard (and very successfully) to hide this from the user. Because the manuals have to cover the subject thoroughly there's a danger of getting bogged down, so my advice is to read as little as possible and use the machine as much as you can. As you run into gaps and apparent inconsistencies, that's the time to study the manuals.

The *Installation* manual is approximately 25 pages which tell you clearly what to do to get your OPD going. Read it — you must. It's a model of clarity and about 50 per cent pictorial.

The *Welcome Package* runs you through a series of 'typical' OPD activities using both a microdrive cartridge and the *Welcome* book. The cartridge is the easiest way to get a feel for the OPD software if you'd like a little theoretical learning before properly using the machine. The accompanying manual is thorough but makes machine operation look a lot more complicated than it actually is.

The *Handbook* tells you everything you're likely to need to know about the OPD, but is a book to be dipped into rather than read straight through. It's clearly written but once or twice I found it guilty of 'forward referencing' — it mentions things before it's explained what they are.

The *Basic* manual is utterly comprehensive and can be used equally well by a novice or an expert.

## Prices

The basic OPD costs £1150 including the 9in monitor, and Xchange is a further £150. My guess is that the Messaging software will be cheap, around £25. Discounts will be available for bulk orders, say more than ten units, and all prices exclude VAT. At the time of writing printer and colour monitor prices were still to be fixed.

## Conclusion

The ICL OPD is an excellent concept. It grabs a corner of the desk and, with the Xchange software, takes care of most of the professional's data processing and telephone needs. By allowing several tasks to be operational at once, OPD comes very close to matching a user's rather erratic way of working.

The price is simply amazing coming from ICL — I haven't seen anything like this machine at that price level and I suspect that, for a few months at least, ICL will have the field to itself. I do hope that the company introduces a version of OPD which performs simple switchboard operations, rather like the Herald system that's so popular.

The microdrives behaved faultlessly all the time I was using the ICL software but let me down when using Xchange. Exhaustive tests followed and I couldn't avoid the conclusion that the pre-release software contributed to this problem. ICL has modified the electronics and the system software to maximise the realiability of the microdrives and I understand that, even at the time of the review, it still has some further improvements to make.

In view of the fact that ICL's Robb Wilmot would like to see a quarter of a million OPDs shifted next year, it's very much in the company's interests to make the machine as reliable as it can.

*No Benchmarks were run on the ICL OPD as the Basic wasn't ready at the time of review.* END

## In perspective

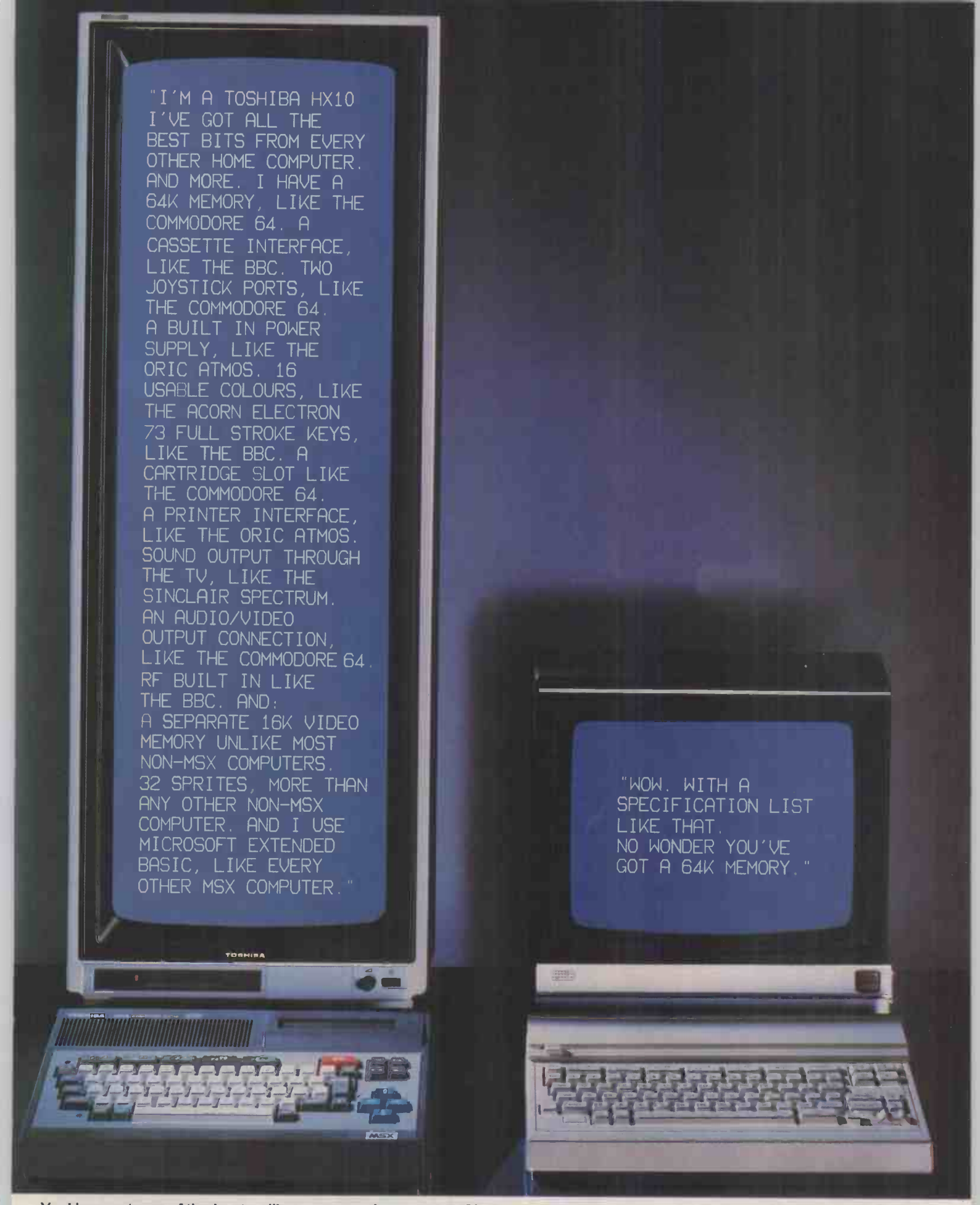
A single glance at ICL's OPD betrays its pedigree. The Sinclair microdrives peer at you over the top of the keyboard. Inside you'll find three Sinclair-designed chips and the Basic is adapted from Sinclair SuperBasic. Having said all that, the rest of the design is definitely ICL's. The system software has been written by ICL to handle a wide range of tasks concurrently — exactly what the busy professional needs; access to these facilities is through a series of simple menus.

With its built-in voice and data telephony system, ICL has clearly distanced itself from the run-of-the-mill desktop computers. I read somewhere that the few square inches on the top of the executive's desk are the most valuable piece of real estate in the world. The race is on for that space and I think that ICL is in with a very good chance of leading in the first lap. At £1150, or £1300 if you include the Psion packages, this product represents remarkable value. Looking around the market-place I had problems deciding which machines to compare it with; because there's nothing like it my choice is limited. Most people will need two telephones, a modem, a personal computer and a pile of software packages to match the OPD's facilities.

An IBM PC plus RS232 board, modem and integrated package such as 1-2-3 or Symphony would certainly be more than a match for the OPD. But at what cost? The microdrives put a limit on the OPD's data storage, but many users wouldn't notice this. The QL is a much closer match but once again, by the time you've added the extras — two phones, modem, special software and monitor — you're talking about an expensive and untidy system.

Sir Clive Sinclair clearly sees them as machines aimed for two different markets; either that or he's spreading his risk, which is unlikely. I have seen a Macintosh with a phone glued to the side . . . it's desperate, isn't it?

There isn't anything available in our part of the market which compares with the OPD. You're on your own with this one. Go out and cobble together these facilities around any personal computer and I think you'll find that when you price it you'll wonder why you bothered.

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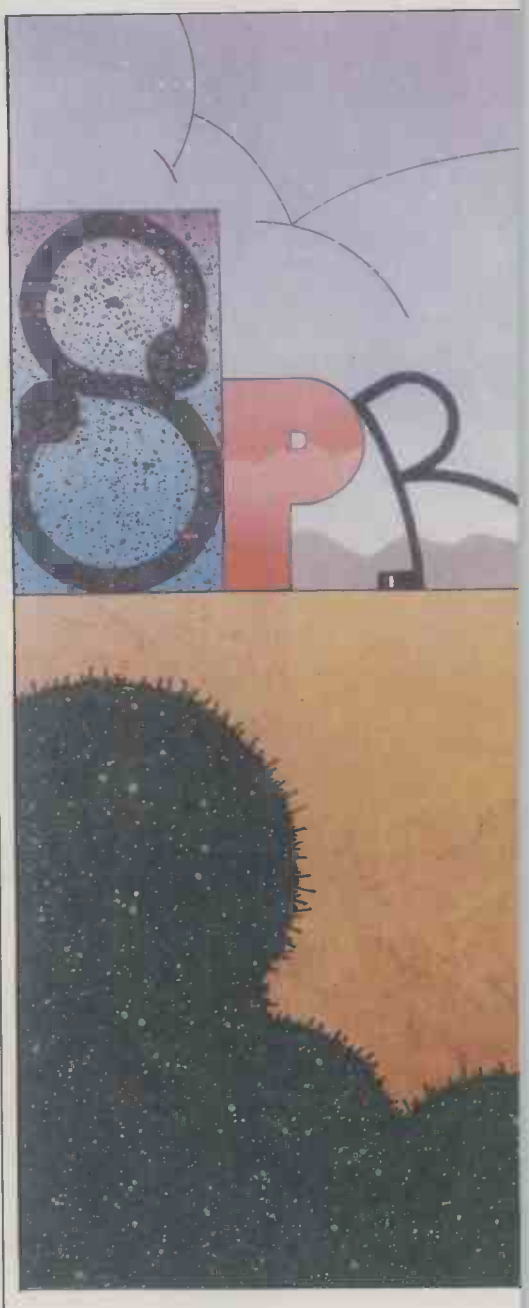
IN BUSINESS

# Spoilt for choice

*Mike Liardet guides the prospective spreadsheet buyer through the bewildering choice of available systems, and gives hints on what, and how, to choose.*



A couple of years ago spreadsheets were still something of a rarity. In those days there was VisiCalc — the world's first spreadsheet program, and a handful of early imitators. Whereas the would-be database or word processor user could look down a long list of products before making a selection, the budding spreadsheet user was invariably faced with Hobson's choice or, worse still, no choice at all.

A couple of years is a long time in the world of micros, and the situation is quite different today. Most of the major software suppliers, together with a host of newcomers, have plugged this gap in the market. All personal computer users, from the humble Spectrum to the world-beating IBM PC, can mull over the pros and cons of a wide range of spreadsheet software.

Paradoxically, this has made the situation more difficult, since most prospective spreadsheet purchasers can easily become confused by the myriad claims and counter-claims of rival products.

## History

Unlike most micro software, spreadsheets have no mainframe ancestry: they only became feasible with the advent of machines with cheap processor power and high-speed displays, otherwise known as micros.

The spreadsheet appeared as recently as the late seventies by courtesy of two young Harvard Business School graduates, Dan Bricklin and Bob Frankston. Their program, called VisiCalc, was an instant success. Unfortunately (for them) they were unable to copyright or patent the spreadsheet concept, and in the intervening years a wide range of rival companies launched their own spreadsheet systems.

Today the spreadsheet is widely recognised as one of the software cornerstones for personal computing, along with word processing, database and graphics. Since many micro users need more than one of these fundamental packages, a number of manufacturers have attempted to combine them in one 'integrated system'. The theory is that a single integrated package is cheaper and easier to learn, with benefits becoming apparent when data needs to be transferred from one type of application to another (for example, spreadsheet results to generate a graphics display).

Much of the more recent spreadsheet software does not exist as a stand-alone package, but is just one of five or six applications in an integrated system. It has yet to be demonstrated that the public really does want this type of mega-software, but the success of graphics-spreadsheet integration (in the form of Lotus 1-2-3) is undeniable. However, at the present time there is still a good chance of stand-alone spreadsheets.

## What is a spreadsheet?

When a spreadsheet system is running, the VDU screen acts like a window on a large sheet of numbers interspersed with text headings, neatly laid out in rows and columns. As the sheet is much larger than the screen, only a part of it can be shown at any one time.

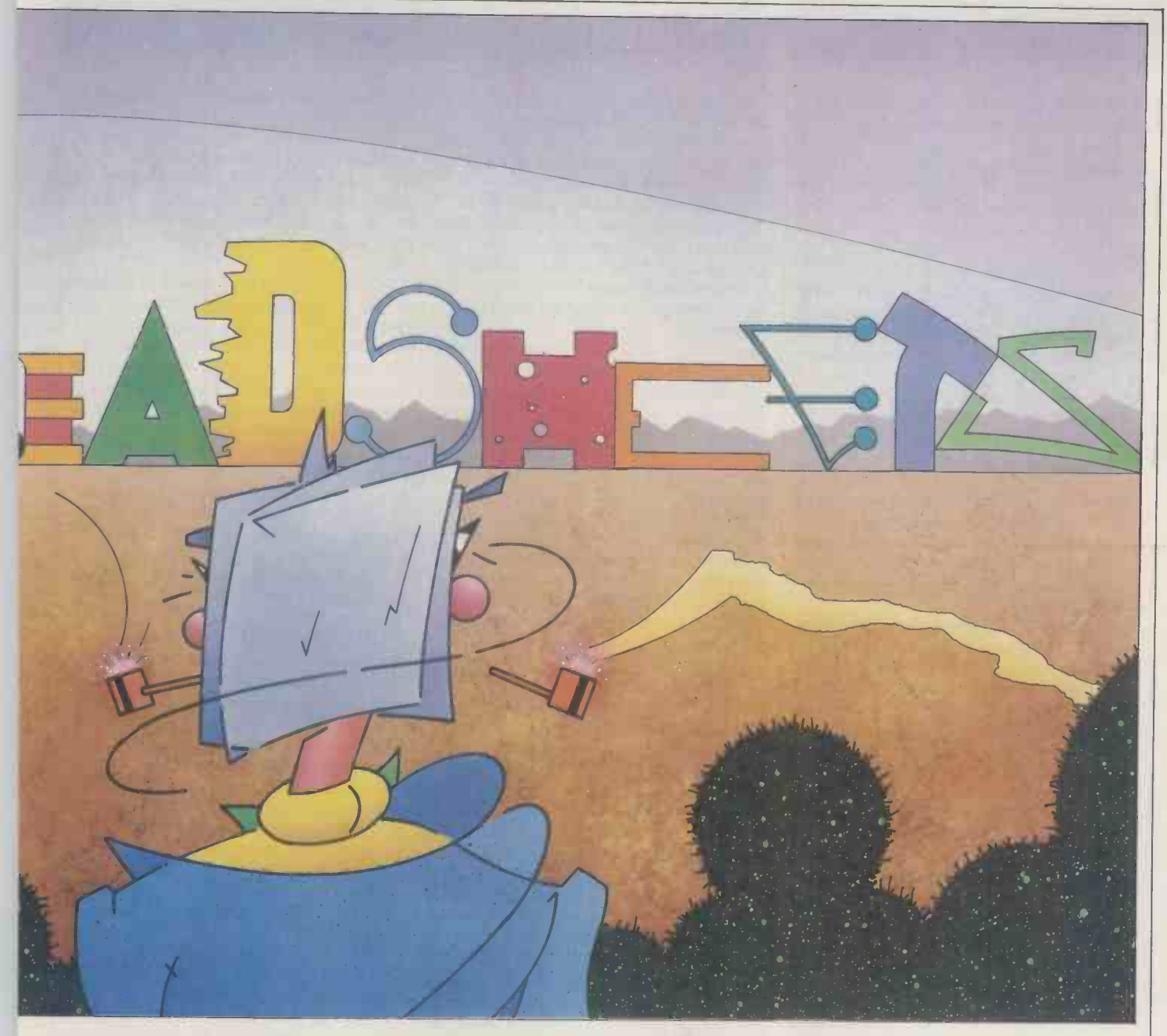
The spreadsheet rows are usually numbered and the columns identified by letters, so the coordinates of any cell can be ascertained; for example, the top left-hand cell is at A1, whereas Z99 will be further down and to the right.

A single cell is marked by the cursor, and is highlighted or distinguished in some way. By using a few keystrokes it's possible to shift the cursor to a new cell. Attempts to move the cursor off the edge of the screen cause a rapid redraw so that its destination can be displayed. If the redraw is fast enough, it's as though the window has been 'pulled' into a new position by the cursor.

At the cursor it's possible to enter text, a number or formula. A typical formula could be A1 — 10 * C2. If the values displayed at A1 and C2 are 76.5 and 6.7, this will cause the cell containing that formula to display 9.5. In practice, formulae can be very complex calculations using a variety of maths functions and referring to many other positions on the sheet. The result of a formula's calculation is displayed immediately the formula is entered, but if a change is subsequently made at a position referred to by the formula (at A1 or C2 in the above example), then a recalculation is made automatically so that the display remains consistent. This recalculation can have a knock-on effect to other formulae, which must also be recalculated, and so on. Frequently, an alteration on the top line of a spreadsheet can change everything from top to bottom.

Fast, automatic recalculation is the whole *raison d'etre* of spreadsheets:

*Illustration by Andrew MacConville*



the equivalent exercise on paper might take several hours, even using a calculator. A spreadsheet saves time and produces error-free results (assuming the correct formulae have been used), which in turn encourages more experimentation with figures, or 'what-if' analysis, as it is termed.

The classic spreadsheet implementation is in financial planning, where 12 columns are used to represent the 12 months and the rows are used for profits, sales, overheads, and so on. But spreadsheets can also be useful as a laboratory tool, for statisticians, or in any area demanding repetitive calculator work. 'What-if' analysis can be especially useful in financial planning, where there's no certainty about the future, and a range of possibilities can be quickly explored; for example, effect on profits if next year's sales are good, average or bad. Once a set of formulae have been built up in a spreadsheet, it's easy to experiment with a range of possible scenarios, as the recalculation effort can be performed quickly and accurately by the computer.

## Requirements

To distinguish between a good and bad spreadsheet, you'll need a clear idea of your requirements. Most spreadsheet software will only run on a limited range of machines (IBM PC, CP/M systems, Apple II, and so on), so your choice will immediately be limited by the available hardware. You may insist on graphics or a link with other software, which will further limit the choice. There's also a major division between pure spreadsheet software and financial planning systems (based on older mainframe interactive techniques) which incorporate only some spreadsheet facilities.

When you have narrowed down the field, a demonstration of the more likely candidates is desirable to give you a chance to see the system's key features in action. Study the documentation and look for simplicity of style.

A popular approach is for documentation to be divided into tutorial and reference material. The tutorial sections should be readable and lightly entertaining; some of the later spreadsheet systems have tutorial material built into the software and you may prefer to learn this way. The reference material should provide the answers to fairly detailed questions that might arise once you are familiar with the basics. For example, whether the trig functions work with radians or degrees, or how to switch off automatic recalculation. The spreadsheet should be well-indexed for quick reference.

The most common problem encountered by spreadsheet users is lack of memory. A typical system might claim to handle a spreadsheet of, say, 256 rows by 64 columns, but run out of memory long before all 16,000 cells have been used. Spreadsheet size is limited by the amount of available RAM in the machine, thus 16-bit micros can accommodate larger spreadsheets than older 8-bit micros.

Once models become very large, the recalculation time, following a modification, becomes significant. To avoid irritating pauses after every modification, it's useful to be able to switch off the automatic recalculation facility: the faster calculations can be performed, the better.

Apart from the basics (documentation, reliability, speed and size), most spreadsheet systems differ from one another with respect to the facilities they offer. Generally, users only require a few available facilities, and here are the major options:

*Integrated software*: if the system is, or can be, integrated with graphics software, it's a definite bonus.

*Maths function*: everyone needs plus, minus, times and divide, but some may need trig and logs, and other advanced maths functions. Statistics and special spreadsheet functions (like row-sum, or minimum value in a column) are also very useful.

*Spreadsheet editing*: most systems offer special facilities for inserting or deleting rows and columns, or editing formulae. It's particularly important that a good replication facility is provided. This will enable a model to be developed for just one column and quickly copied across several — which saves a considerable amount of typing.

*Display facilities*: there are a number of possible enhancements to a basic spreadsheet display — multiple windows, where the screen can window on two or more areas of the spreadsheet, variable column widths, and so on. It's possible to manage without these facilities, but they are useful in certain spreadsheeting methods.

*Sorting*: some applications need data to be sorted, and there are spreadsheet systems to provide this facility. For some applications (ranking students' exam results, for example), it's important that the sorting not only affects the column being sorted, but that data in other columns is moved simultaneously as a result.

*Consolidation*: if an organisation is split into several divisions. It's often necessary to sum key data into one global report — this is consolidation.

*Goal seeking*: you know which result you want — but how do you get it? Goal seeking enables you to reverse the normal logic flow in your model. For example, what sales (at the top of the model) will give a specified profit (at the bottom)?

*Sensitivity analysis*: say, you've formed a reasonably plausible plan, but how drastically will it change if some of your assumptions (for example, next year's inflation rate) are wrong? Sensitivity analysis shows how sensitive the plan is to variations from your initial guesses.

*Programmability*: if you're already a programmer, you might appreciate the ability to use the spreadsheet as a rather novel programming language. Unless you're a *very* sophisticated user, you're unlikely to want to stray into this territory.

## Home computer systems

It's naive to expect a £200 home computer to support serious business applications. Principally, home computers lack fast, reliable permanent storage facilities and have a reduced display capacity, which rules out any serious use of database, word processing or accounting systems.

But spreadsheet software does not make high demands on permanent storage facilities. Once the spreadsheet software and a saved model have been loaded, all further manipulation affects only the internal memory of the machine. As a home computer's internal memory and processor is identical to that of many business micros, spreadsheet performance should not be seriously downgraded on a home computer. Of course, loading and saving models to cassette tape does take longer, but this is only done occasionally during an average spreadsheet session.

Good spreadsheet software for home computers recently reviewed in *PCW* includes Psion's Vu-Calc for the Sinclair Spectrum (September 1983), Abacus for the Sinclair QL (September 1984) and Falc for the Sord M5 (January 1984).

Psion's Abacus is in a class of its own in the home computer market. Some people claim that the QL is a little pricey for a home computer, but it only costs the same as the BBC Micro which doesn't come with bundled-in software. Abacus is included in the QL's price along with three other Psion packages (graphics, database and word processing). The four packages can exchange data between each other but must be run separately. Psion, sufficiently confident of the software's sophistication, is releasing MS-DOS versions under the name of Xchange (see review October *PCW*).

## Integrated systems

Following the enormous success of Lotus 1-2-3, an integrated spreadsheet-graphics-database which deposed VisiCalc as the leading spreadsheet system, several integrated systems have been released in the last year.

It should be remembered that most integrated systems are not strictly spreadsheets at all, but provide a highly sophisticated and versatile software environment that can resemble a spreadsheet, a word processor or a database as the need arises (1-2-3 is an exception).

Lotus 1-2-3 was originally available solely for the IBM PC, but is slowly migrating onto other MS-DOS machines. The 1-2-3 environment is primarily a spreadsheet, and the database facility is accommodated when rows of the spreadsheet are used to represent records with the columns being the fields. 1-2-3 has various sort and selection facilities to provide a

| Product name | Tested on | Max Rows | Max Cols | Capacity £ rows | Recalc rows/sec | Scroll rows/sec | Scroll cols/sec | Text £ rows | Numbers £ rows |
|---|---|---|---|---|---|---|---|---|---|
| Abacus | Sinclair QL 128k | 256 | 64 | 56 | 2.8 | 2.5 | 2.0 | 58 | 57 |
| Falc | Sord M5 | 100 | 100 | | | 6.0 | 4.0 | 34 | 30 |
| Framework | IBM PC 512k RAM | | | | 2.08 | 1.6 | 2.2 | | |
| MasterPlanner | 56k CP/M 2MHz Z80 | 1000 | 1000 | 70 | 2.12 | 0.3 | 0.5 | | |
| Multiplan | Apple II 64k RAM | 255 | 63 | 95 | 1.58 | 6.0 | 4.0 | 190 | 190 |
| | Sirius 128k RAM | 255 | 63 | 235 | 4.27 | 6.0 | 4.0 | | |
| Peachcalc | IBM PC 576k RAM | 255 | 63 | 892 | 1.82 | 0.5 | 0.5 | 1230 | 1230 |
| PerfectCalc | 56k CP/M 2MHz Z80 | 255 | 52 | | 0.30 | | | | |
| PlannerCalc | 56k CP/M 2MHz Z80 | | 128 | | 0.74 | 0.4 | 0.5 | | 61 |
| PlanStar | IBM PC 256k RAM | 5000 | 5000 | | 0.16 | 2.0 | 1.3 | | |
| Symphony | IBM PC 458k RAM | 8192 | 256 | 247 | 7.48 | 3.6 | 1.9 | 820 | 967 |
| VisiCalc | Apple II 64k RAM | 255 | 63 | 82 | 1.91 | 10.0 | 6.0 | 148 | 254 |
| | + 128k RAM | 255 | 63 | 320 | 1.81 | 1.3 | 2.5 | large | large |
| Vu-calc | Spectrum 48k RAM | 60 | 60 | 240 | 1.00 | 4.0 | 3.0 | 240 | 240 |
| 1-2-3 | IBM PC 320k RAM | 2048 | 256 | 370 | 6.85 | 6.3 | 3.8 | 1210 | 1380 |

*Fig 1 Benchtest results*

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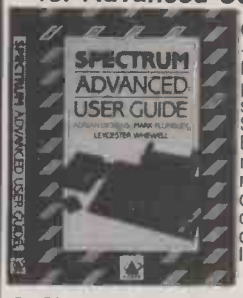


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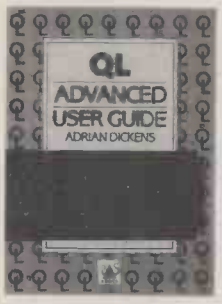


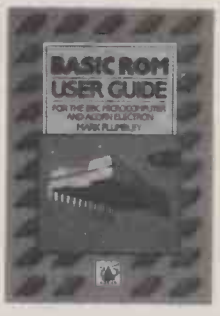


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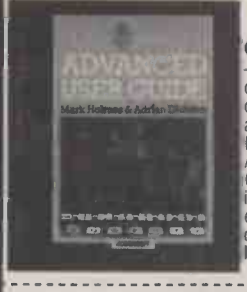


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crude but effective facility for handling small databases arranged in this manner. Its main selling points are its superb spreadsheet and graphics facilities, providing very fast calculations, plus pie charts and bar graphs.

Ashton-Tate, developers of dBasell, launched Framework as a rival to Lotus 1-2-3. Framework fully integrates spreadsheets, graphics, databases, word processing, ideas processing and communications. Each application type is held in a 'frame', of which there can be several of the same type. This means that several spreadsheet applications can be active at one time. If it's a spreadsheet frame it acts as a window on the spreadsheet in the normal way. All the frames can access each other's data, so data in a frame can be used to draw graphs in a graphics frame, or several spreadsheets can be totalled into a 'consolidation frame'. It's also possible to program Framework, so that highly complex spreadsheet manipulations can be performed at the touch of a button.

Having produced 1-2-3, Lotus didn't rest on its laurels but set about improving it. The result was Symphony, an integrated system launched at the same time as Framework, but with a specification so similar that one suspects that both companies were working as hard at market intelligence as at developing the software.

Symphony's user interface is closer to Lotus 1-2-3 than to Framework. All Framework's applications are offered, but the underlying data is stored in one huge spreadsheet which is viewed through different windows (*cf* frames above).

Some of 1-2-3's best features have been transplanted into Symphony — the impressive calculating power and graphics, in particular. But a number of new features have been added: an increased spreadsheet size, special word processing and communications facilities, and improved database facilities. Like Framework, Symphony offers multiple windows simultaneously onscreen, so more than one application can be viewed at once.

Of the three systems, and purely from a spreadsheet viewpoint, my preferred integrated system is Lotus 1-2-3. It offers everything you could reasonably expect from a spreadsheet system but very little else. The other systems are very much clogged up with word processing *et al* — not of much interest to the dedicated financial modeller. Lotus offers a trade-in for 1-2-3 to Symphony, so you can always opt for Symphony at a later date, which will handle anything you created with 1-2-3. However, if your prime interest is databases then you might plump for Framework, as it's also compatible with Ashton-Tate's dBase II.

## *Stand-alone systems*

Most of the spreadsheet software currently on the market is of the stand-alone variety: that is, a single function software package. Although the software is single function, this doesn't always preclude it linking with other applications.

A popular ploy, predating integrated software, is to offer a range of packages all capable of exchanging data with each other. Apart from Psion's comparatively recent Xchange software, but following Micropro's original Star series (WordStar, CalcStar, and so on) there have been a number of others, including the Perfect range of software (with PerfectCalc spreadsheet), and the Peach software (including Peachcalc).

Another stand-alone spreadsheet strategy is to implement just the spreadsheet software, but provide a standard format for data transfer to be adopted by other software developers when implementing add-on facilities. Both VisiCalc and Multiplan do this: VisiCalc has the DIF data interchange format, and Multiplan offers SYLK. Some developers do offer software that can read these formats.

Of these stand-alone systems, I would opt first for Multiplan. I would tie VisiCalc and Multiplan, but relations between Software Arts (Visicalc's writers) and Visicorp (the publishers) have turned sour of late. This has held up any enhancements to VisiCalc, and it now looks like Software Arts is turning its energies to its later product, TK!Solver.

## *Financial planning*

Before spreadsheets existed, mainframe users expended a great deal of time and money on financial planning systems. A financial planning system is a programming language in which the program manipulates rows and columns in a matrix, and generates reports from it. Financial planning systems have found their way onto micros and borrowed some spreadsheet technology on the way. Although the programming language approach is still used, it's also possible for the VDU screen to act as a window onto the matrix.

These systems offer very sophisticated facilities for financial work, but would not appeal to technicians with more mathematically complex models. They are also slower in use, lacking the immediacy of the spreadsheet automatic recalculation facility.

Comshare, a company with a long history of mainframe financial planning, was quick to recognise the spreadsheet threat. It launched two micro packages, PlannerCalc and MasterPlanner, both amalgamating traditional financial planning with the new spreadsheet techniques. PlannerCalc is offered as an inexpensive introduction to financial planning, and is compatible with its bigger stable-mate.

After enjoying little success with the spreadsheet system CalcStar, Micropro waited some time before introducing the financial planning system PlanStar, my favourite of the three. This system is packed with facilities not generally available in everyday spreadsheet software. Notable features include sensitivity analysis, consolidation and goal seeking.

Any user who has been spoilt by contact with some of the high-quality user-friendly micro packages will notice some considerable difference with financial planning systems. Although the concept of a programmable matrix is a good one, most of the financial planning systems have inherited too much of the old-fashioned mainframe approach to computing. You need to work quite hard to get these systems working for you, but it must be said that once they are in operation they offer some very powerful facilities.

Fig 1 shows the Benchtest results for the systems mentioned here. Note that the results are reprinted from the original reviews, and do not take into account manufacturers' enhancements. Note also that not all versions of the products are covered by these tests, and in several instances the software is available on more than one operating system. END

| Name of package | Producer | Issue of *PCW* |
|---|---|---|
| Abacus | Psion | September 1984 |
| Falc | Sord | January 1984 |
| Framework | Ashton-Tate | August 1984 |
| MasterPlanner | Comshare | April 1984 |
| Multiplan | Microsoft | April 1983 |
| PeachCalc | Peachtree | March 1984 |
| PerfectCalc | Perfect Software | October 1983 |
| PlannerCalc | Comshare | April 1984 |
| PlanStar | Micropro | July 1984 |
| Symphony | Lotus | August 1984 |
| VisiCalc | Software Arts | June 1983 |
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*Fig 2 References*

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# Compunet

*Compunet is the new two-way network for Commodore 64 users. Tony Hetherington looked at its wide range of services and is convinced that the system has some major advantages over its rivals.*

Compunet is the new home micro network from Commodore aimed initially at the Commodore 64 user, but services for other micros may follow.

For an annual subscription of £30, Compunet offers its users an impressive array of services ranging from home banking to the ability to upload quickly and sell home-produced programs.

One of the service's star attractions is Essex University's adventure game Multi-User Dungeons (or MUD for short — see 'Real, Live MUD', August *PCW*), but more serious users will appreciate the electronic mail facilities and the ability to form closed user groups.

## Hardware

In order to use Compunet, you'll need a modem. I was provided with Commodore's own modem which was, at the time of writing, the only one to allow full use of the Compunet system.

The modem is housed in an undistinguished black plastic box which plugs into the Commodore 64's cartridge slot. It is connected into the phone system via a three-metre-long cable to a BT jack socket.

Removing the two screws which hold the two parts of the modem's case together reveals the normal array of communications circuitry together with a serialised EPROM. This EPROM is Commodore's 'ace in the hole' in its bid to combat software piracy — you can't buy protected software unless you have registered your serial number with Compunet. Once this is done, your modem acts as a dongle and your bought software will only run with this modem. Obviously, if you *don't* have a Commodore modem then you *won't* have a serial number to register, so you *won't* be able to buy any commercial software!

But the modem also has other advantages. It contains useful routines with which you can keep track of your time on Compunet and, consequently, keep your phone bill to a minimum.

The modem and Compunet operate at a rather slow baud rate of 1200/75, but it's obvious that Commodore has sacrificed the transfer speed for quality; quality both in the success of transmitted data, and the fact that the system uses standard Commodore graphics rather than the more usual but limiting teletext block graphics.

Screens of data which you may wish to upload into Compunet can be created using the screen editor in the modem and saved to tape or disk.

## Getting started

Logging on to Compunet is a simple if time-consuming process, and is instigated by typing CONNECT followed by one of the phone numbers for a Compunet access point. At the time of writing there are 12 such numbers spread throughout the UK, so many people will only pay for a local call. The procedure is straightforward. Sit back and wait while your modem dials the number, input your user ID and password, and wait again; only this time you will be waiting for Compunet to download communications software which you need in order to talk to Compunet. According to Compunet this is downloaded every time you log on, so that Commodore can easily introduce new systems and services.

As this process takes several minutes to complete, you can save yourself time and money by storing this software on tape or disk using the modem's CNSAVE routine, and loading it back into your machine before you log on via CNLOAD. You'll only need to download this software again when it has been updated.

Once you are logged on, you are presented with a screen consisting of a menu of options and a command strip along the bottom affectionately known as the 'duckshoot'.

As with other network systems such as Micronet and Prestel, Compunet consists of a number of pages arranged in a tree-like structure. You start at the top of the tree working down through a number of branches, at the end of which are either leaves (of information) or more branches, or both.

The titles of these branches and leaves are displayed in an options menu on the screen and are selected using the up/down cursor controls. When you have selected the entry you want, use the left/right cursor controls to move the duckshoot until the action you wish to perform is highlighted in the centre. Press ENTER and the action will be carried out.

These actions include DIR to move down the tree and display the entries at that level, BACK to move up the tree, and SHOW to download the information into the machine where it can be PUT (saved) to disk to be read when you aren't online to the system.

Each branch and leaf in the system has a specific code number, and you can jump to a specific entry via the GOTO command. You can also LEAVE the system whenever you wish, and should you get stuck you can ask for HELP.

But it's unlikely that you'll ever get completely stuck as each section of Compunet is fully supported by pages of instructions (very fortunate — I received scant written instructions). The philosophy behind this is that once Compunet has told you how to log on, it's up to you to find and use the parts of interest to you.

According to Compunet's John Clarke, users will receive a full user guide at registration. This will contain step-by-step instructions on how to use the various parts of the system.

## Range of services

When it comes to the crunch, the success or failure of Compunet will

depend not on its ease of use, but on the range of facilities and services on offer. It's in the latter case that Compunet presently scores over its rivals as it offers users full two-way communication in a free-for-all section, appropriately called 'the jungle'.

Among the usual mix of users' hints and tips are two areas which are sure to attract a lot of attention: the user noticeboard and user software. On selecting UPLD from the duckshoot, it's as easy to upload information and programs from your computer to Compunet as it is to download other people's—simply give your entry a title and a few moments later you're on the system.

If you're about to upload a program that has taken you months to complete and you feel you deserve some reimbursement for your hard work, then you can set your own price; a price which is only restricted by the fact that Compunet demands its share by setting its own commission rate at 40 per cent with a minimum of 50p. This shouldn't be too much of a worry as I imagine that the average user will sell enough of his own software to pay for what he buys.

You can also charge a fee for public viewing of your messages on the noticeboard, but it's unlikely that anyone will want to pay for them. For example, should you wish to comment on a program, you can do so by giving it a vote between 1 and 9. These votes are then averaged and displayed alongside the program to give users an indication of its worth.

Once the system has been up and running for a while, I envisage this area getting packed with 'It's my dog's birthday' type of messages. Undoubtedly, the more serious user will want to move elsewhere.

Courier is the name given to the electronic mail service through which you can send messages to specific users without being overheard. If secrecy *is* a requirement, you can set up your own closed user group and give read and write access to as many or as few people as you wish.

For really private conversations, you can download software so that two Commodore 64s can talk directly to each other. You could argue that you can use the telephone for such a confidential exchange of words, but via Compunet you can have a long distance call for the cost of two local calls.

The Software Park is the section to head for if you want to buy professional software from software houses. You should be able to pick up some bargains but remember, the software sold to you will only work with your modem. Trying it without the modem or on another machine may produce different effects ranging from not working to the drastic wiping out of your disk. As Commodore's Gail Wellington explained recently on *Chip Shop*, you might download international soccer and watch the players run out of the tunnel — only to see them turn round and run back up the tunnel.

At the time of writing only Commodore and Talent Software were offering any programs for sale, but other software houses should join in as the system gets going. Similarly, the number of free programs will increase from the presently available five pre-school programs to a whole range of 53 educational programs.

Other sections such as the Marketplace are for hardware and software small ads; Money Matters offers home banking facilities; and MUD will no doubt be played by intrepid explorers into the early hours. Until then Compunet is little more than a series of headings and a lot of speculation.

## Prices

The Commodore modem used to review the system costs £99.99, but included in this price is your first year's subscription of £30.

You should also choose carefully the times you plan to use the system. If you use it during office hours there's a connection fee of £6.50 an hour on top of the charge of the phone call. Space in the user noticeboard and software areas will also cost you money, but these areas are the most reasonably priced parts of the system as the cost is calculated as a penny per page per day. Similarly, for a program the charge is a penny per 1000 words per day.

Sending messages via the Courier is cheaper than using the postal service at 10p for one page per user, with a charge of 7p for each additional user receiving the same message.

Finally, Compunet has instigated a system to make payment as easy and painless as possible. Each registered user is given a credit limit of £50 from which money spent on sales is deducted; money earned from sales is credited to your account, with the balance being deducted from your bank account by direct debit. You can keep a track of your account via the ACNT option on the duckshoot.

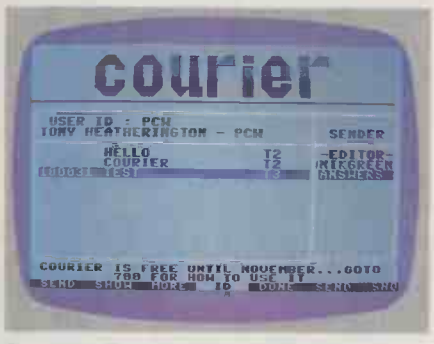
## Conclusion

It's difficult to evaluate a system such as Compunet before all its services have been fully implemented. However I have seen enough to state that Compunet is offering more than the average network. Micronet is the rival service most readers are likely to have heard of; this offers commercial software and a range of information services — but you can't upload easily. Also, it's easier to find your way around Compunet due to its better structure and ease of use.

Compunet's major advantage is the ease with which users can upload their own information and programs at a reasonable cost, making Compunet a good transition between electronic magazine and user market-place. But there are inherent problems in success; over-use might result in a heavy access rate at peak evening times which could seriously degrade the *already* slow access times.

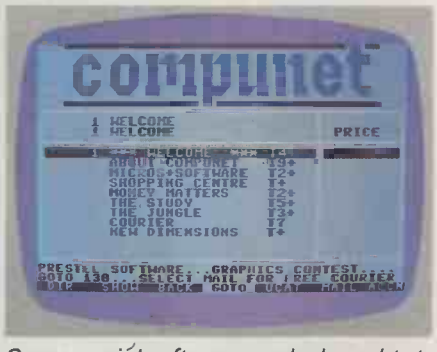
You'll need a Commodore modem to get the most out of Compunet, in order to buy and upload software or prepare documents offline. But if you view the modem and Compunet as a single package it represents a very good buy, particularly since Compunet is offering downloaded software to allow access to both Micronet and Prestel. **END**

*The opening menu of options with the duckshoot along the bottom.*




*Courier offers an electronic mail service as well as closed user groups.*

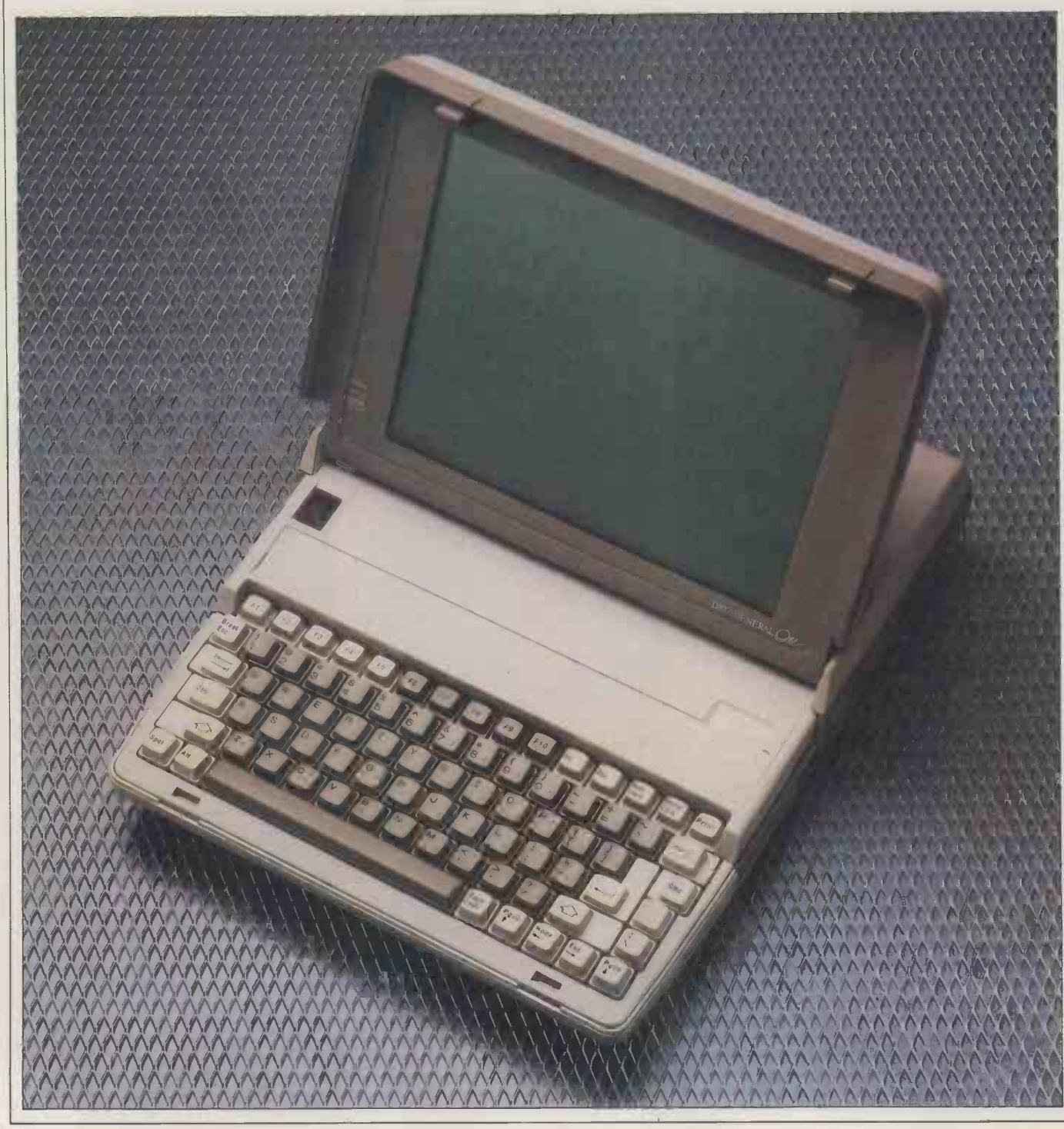
*Users can easily upload and sell their own programs in the Jungle.*




*Commercial software can be bought at discount prices in the Software Park.*

# Data General One

*Well-known minicomputer maker Data General has taken a courageous step in launching a portable micro in an already crowded market-place. But a machine which offers IBM compatibility and a 25-line LCD could attract the 'mobile' executive — and such is the company's aspiration. Peter Bright gives it the once-over.*



*The keyboard is very cramped: 79 keys are squeezed together tightly*

Picture the scene. A couple of hundred dealers and journalists from all over Europe waiting restlessly in a theatre half-way up the Eiffel Tower for the show to begin.

The lights dim — the audience put on their headphones and tune into the appropriate language. Dry ice starts to choke the people in the front row.

Then the laser show starts, a cardboard cut-out wobbles across the stage and someone starts wittering on in French — another dealer l(a)unch.

The object of all this effort and no small expense is a new lapheld micro from Data General (DG), better known for its minis. The new machine offers a 25-line LCD display, up to two built-in disk drives, IBM compatibility and up to 512k for RAM all running from rechargeable batteries in a lapheld package.

## Hardware

From the side the DG One looks like a small toboggan: the bottom is flat but gradually slopes up towards the front. I'm sure that if anyone ever made any decent-sized replicas, you could get up quite a speed riding one on a good snow-lined hillside.

The machine is finished in two-tone light and dark brown. When closed up it measures just 13.7×11.7×2.8ins, which is just about small enough to fit into the *PCW*-standard briefcase. It was, however, a very tight fit and there wasn't even room for a couple of 3½in disks. According to the specification the whole unit weighs nine pounds — it felt much heavier when I was carrying it home and the scales in the office put it at 12 pounds.

When the unit is closed up it looks very secure. There are no holes or ventilation slots, and the only visible means of entry is the slot (or slots) for the internal disk drive(s). The only thing it lacks is a carrying handle; Epson got it right with the PX8 which has a nifty little handle built-in.

To start the machine you press in two catches on the front and hinge the lid up: this lifts to reveal the keyboard, LCD and the on/off rocker switch. One of its nice features is a hi-tech auto power off device built into the lid. When you close the lid, a lump of plastic hits the on/off switch and rocks it to the off position. Heath Robinson lives!

There are two other covers on the machine. One is on top just behind the lid and hides the battery compartment. The basic machine runs on Duracell-type batteries, but the review machine came with the optional extra rechargeable batteries.

The other cover is at the back and hinges down to form a foot which lifts up the rear of the machine. It also reveals the I/O and external power ports. This cover is the worst-designed piece of plastic I've seen in a long time — I've got the cuts on my fingers to prove it. It had a nasty habit of collapsing when I least expected it (usually when I was plugging in a cable) and then not closing when I wanted it to.

I/O is fairly limited on the DG One. Along the back panel from left to right we have: internal modem output (not yet approved by BT), two RS232 ports (one printer, one external modem), the system expansion bus, and two power inputs.

It's odd that there should be two power inputs. One is for running the system and the other is for the battery charger, but I don't know why DG couldn't charge the batteries from the system power input. The result is that the machine is supplied with two separate power transformers — one for the batteries, one for the system.

Getting inside the machine is difficult. I tried but gave up admitting defeat, which isn't surprising as CMOS chips are notoriously sensitive and DG doesn't want people poking around inside the unit.

There are no ventilation slots in the casing — they aren't necessary. Most of the DG One's electronics are CMOS which not only means that it uses much less power than normal machines, but also that it runs much cooler. The casing didn't even get warm on the test machine.

The main processor in the DG One is an 80C88, the CMOS version of the popular Intel 8088 processor used in the IBM. One of the DG One's major advantages is that it's compatible to a large extent with the IBM PC, thus giving it access to a large range of hardware and software.

The basic DG One is supplied with 128k of RAM; the review machine was the fully expanded 512k model. The chips used are CMOS 64k static RAM chips. Interestingly, although the RAM is CMOS, it isn't battery-backed. This means that when you switch off the machine, you lose all the data in the RAM. According to DG, battery-backing a 512k machine would write off your batteries too quickly.

The basic model comes with one built-in Sony 3½in disk drive as standard: this is a double-sided unit giving a total formatted capacity of 720k. As the review machine was the expanded model, it had two 3½in drives built-in. In addition to being small these drives also use less power than 5¼in drives, so it's feasible to run a machine with disk drives from batteries.

The manual states that the batteries will last for about eight hours with average disk access, but obviously the

*Verdict: good for tobogganing but, more importantly, two built-in 3½in disk drives*

more you use the disks, the shorter the batteries will last. When the battery level is getting low, a message appears in the bottom left corner of the display to warn you, but the machine doesn't lock up, so you can close down in an orderly manner.

The DG One has an interesting range of optional extras. In order to be hardware as well as software-compatible with the IBM PC, an external 5¼in IBM compatible disk drive can be plugged into the expansion bus. Another external module is available which holds a 5¼in drive and also houses IBM compatible expansion slots, which means that IBM cards can be used with the DG One. A small thermal printer is available too.

The external hardware options were not supplied with the review machine.

The executives at Data General must have been kicking themselves when ACT beat them to launching the world's first micro with a 25-line screen (the ACT Portable) a few weeks ago. The Data General staff can console themselves with the knowledge that they've done a much better job.

The great thing about the DG One's display is that whereas the ACT Portable uses a wide, short screen to display its 80 characters by 25 lines, the screen on the DG One is almost square and is the same size as a 12in monitor screen. This not only means that there's more height to play with, but also has the psychological advantage of looking more like a conventional micro display.

The official specification of the LCD display is: 80 characters by 25 lines in character mode, or 640 by 256 pixels in bit-mapped graphics mode. This can be downgraded to 640×200 pixels in IBM compatibility mode.

Large LCDs take a lot of decoding to work, and the DG One uses two custom-designed CMOS gate array chips to handle the display. In addition to normal display functions, Data General designers have designed comprehensive IBM display emulation into the gate arrays, so that the display on the DG One can emulate both the IBM monochrome and the colour graphics adaptor under software control. If an applications package is designed to display colour graphics, then it will be grey-scaled on the DG One.

In use, the LCD display on the DG One is better than those on most other machines I've seen, but still bad in absolute terms when compared to a CRT. One of the problems is that although the display hinges up, you can only use it at one angle. You can't vary the angle as on machines like the Hewlett Packard HP110. You can, however, adjust the contrast of the display by using the CMD key and the up or down arrow keys. This helps to some extent, but you still need to position the machine carefully to get good results. Not surprisingly, I found that the display was at its best in natural light and at its worst when sitting on my desk at home lit by a single 100 watt lamp.

*Internal modem output, two RS232s, the system expansion bus and two power inputs*

The characters are nicely formed and looked very like the characters found on a VDU, but the 'shadow' characters on the HP110 are superior.

When the unit is closed, the keyboard is hidden underneath the display. As soon as you open the unit to use it, the display hinges up to reveal the keyboard. As on most portable machines, the keyboard on the DG One is cramped. It contains a total of 79 keys, all squeezed together tightly.

*'In use, the display on the DG One is better than those on most other machines I've seen, but still bad in absolute terms when compared to a CRT. One of the problems is that although the display hinges up, you can only use it at one angle.'*

The first thing you notice about the keyboard is that for a machine purporting to be IBM compatible, it's very un-PC like. I suppose this is unavoidable in a portable, but it plays havoc with the pretty keyboard overlays for programs like Framework.

The overall look is very old fashioned, but I'm not sure whether it's because of the cream and brown colour scheme or because the keys look like they're built on two levels. Everyone who saw it commented that it reminded them of old mainframe terminal keyboards.

The layout of the keys is fairly standard. The main qwerty section is set in the middle and coloured a darker brown to distinguish it from the editing keys. The 10 function keys are set out in a row along the top of the keyboard. Above the function keys is a space for a function key strip which can be used with applications custom-designed for the DG One.

The cursor control keys are set out in a line to the right of the space bar. This at least is an improvement over the IBM PC where they're incorporated into the numeric pad. The DG One doesn't have a numeric key pad as such, but the functions are built into the right-hand portion of the typing area. This can be a problem if you don't realise that you have NUM LOCK engaged and get '5's instead of 'l's.

The DG One has more than its fair share of control keys. In addition to the normal CTRL, ALT and ESCAPE keys, it has SPCL and CMD. SPCL doesn't do anything useful. To the right of the RETURN key is a blank key, which doesn't do anything useful either.

In use, this keyboard is an odd mixture. The keys are unusually well pitched for a portable machine and have a good, positive feel. It also has a number of niggling faults which make it less fun to use than it might be.

The first problem is that if you put the machine flat on the table without the back cover opened up, the keyboard is a good inch above the level of the desk and is impossible to use. If you use it with the back flap down it goes to the other extreme and slopes up too much.

Touch typing was a problem because

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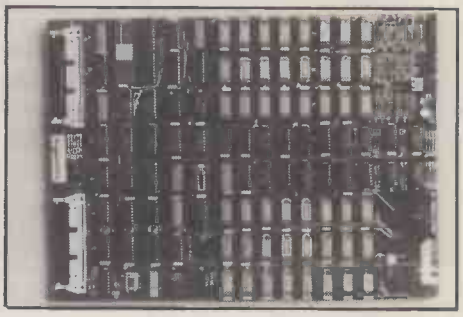

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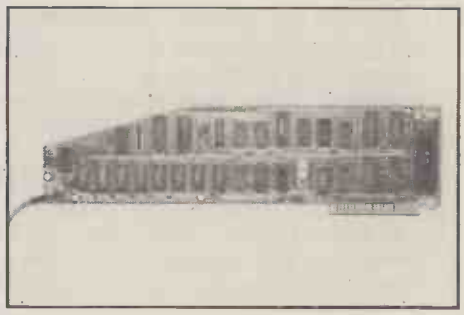

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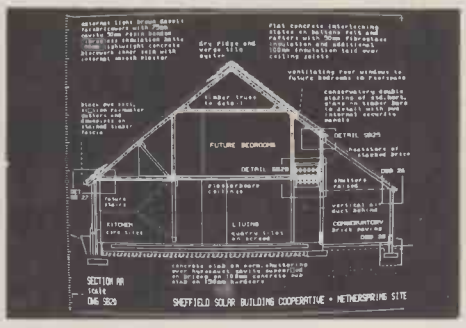


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the right three fingers of my right hand were resting on the cursor and CAPS LOCK keys and accidentally engaging them, which is what happens when you have to fill every available space on the keyboard. Other gripes with the keyboard include a minuscule RETURN key and the fact that there's no indication that CAPS LOCK, NUM LOCK, and so on have been engaged.

Having said all that, the keyboard is still good by portable standards. The only portable with a better one is the HP110.

## System software

The DG One will run both MS-DOS and CP/M-86; the review machine was supplied with MS-DOS version 2.11.

If you reset the machine (CTRL, ALT, DEL as on the IBM PC) without any disks in the drives, the machine will spend a moment searching for a bootable disk, admit defeat and drop into the ROM-based utilities. These can also be reached from DOS with CTRL, ALT and CMD, but the machine is reset so you'll have to reload DOS afterwards.

Four functions are provided from ROM — Notebook, Terminal, Set Up and Diagnostic — and are entered by hitting the appropriate function key (F1 to F4).

Notebook is designed as a basic text entry system for preparing one-off memos, and so on. As such, it's just about (but only just) acceptable. If you're going to do anything more than the most basic test editing, you'd be better off with a proprietary word processing package.

The Notebook screen is divided into two sections: the top 22 lines are set aside as the typing area, and the bottom three lines are used as command/message lines. What is immediately noticeable when typing is that when you get to the end of a line, the machine bleeps and doesn't proceed to the next line. It expects you to insert a carriage return at the end of every line just like a low-tech typewriter! What's the point of a word processor without word-wrap?

Things get worse when you find that although your test is stored in RAM, it's destroyed as soon as you boot DOS and there's no way of saving to disk from Notebook. Even the Tandy 100 can do better than that.

I suppose we should be grateful that editing commands are provided and you're not expected to re-type mistakes. As it is, the editing instructions are strange but effective. Cursor movement is provided by combinations of the CTRL, SHIFT and arrow keys. Notebook can store up to 500 lines of text, so page scrolling is provided in addition to character cursor movements. The command line provides five text editing commands plus commands for Search, Search and Replace, Tabulation, and Printing. The editing commands are Split Line, Join Line, Save Line, and Erase All.

Split Line allows you to move part of the text in the current line to the line below. In most word processors this is done by hitting <CR>, but here it's a separate command. Join Line is the reverse of Split Line.

Using Save Line, you save a copy of the current line of text so that it can be printed out when you hit Insert Line. The same line can be printed out repeatedly until a different line is saved.

*'while the PC uses a parallel printer port, the DG One uses one of the RS232 ports. This might cause problems when IBM applications look for the parallel port and can't find it, but DG has put a patch in the BIOS redirecting all output to COM2 to avoid difficulty.'*

The second ROM-based routine is a dumb terminal emulator. It offers a choice of two emulations: either Lear Seigler ADM 3A or DG's own Dasher D2. Assuming your firm doesn't have a DG kit, the ADM 3 option will get you onto most systems.

The command line allows you to select either the internal modem (which will be an option when BT approves it), or an external modem connected to the RS232 line. XON/XOFF is provided although DG calls it OFC (Output Flow Control). Baud rate, parity, and so on are controlled from the system configuration menu.

As with Notebook, you can't upload or download disk files using the ROM terminal emulator. However, you can run input to Notebook, edit it and send it back down the line.

The third ROM routine allows you to customise the system to your own requirements. You'd probably only use this routine when you first purchased the machine, or when you added to the system.

The Set Up menu has six options: Date/Time, Diskettes, Modem, Printer, Screen and Keyboard.

Date/Time sets the internal real time clock calendar chip, and is only used when the clock batteries are changed. These are separate from the rest of the system and last two-three years.

Using the Diskettes option, you can tell the system how many disk drives you have; the valid range is one to three. There were two on the review machine as three is only used if you're using the optional external IBM compatible drive.

The Modem and Printer options set up the transmission settings for the machine's two RS232 ports. Both ports can work at up to 9600 baud with all the usual choices of data bits, stop bits and parity.

The last two options allow you to set the type of IBM display that the system is emulating and to set up the national keyboard. The system options are saved when the machine is switched off.

The final ROM utility is a set of diagnostics. These allow you to test out the system RAM, both internal disk drives and the external 5¼in drive if fitted, and all are destructive so I didn't run them.

MS-DOS version 2.11 is shipped with all DG One systems. When the system boots up, DOS takes the time and date from the internal clock so you simply accept the defaults when asked for date and time. The implementation of DOS is perfectly standard and is to be expected on a machine which is trying hard to look like an IBM PC.

The only minor addition to DOS on the DG One is an extended version of the MODE command. Using MODE you can change the values of the RS232 lines, change the print mode of the optional DG printer, and change the mode of the IBM display emulator. To change the speed or the protocols of the RS232 lines, you just type something like MODE COM1:1200,N,8,1. This changes the first RS232 port to 1200 baud, no parity, eight data bits, and one stop bit.

One area in which the DG One differs from the IBM PC in terms of hardware is that while the PC uses a parallel printer port, the DG One uses one of the RS232 ports. This might cause problems when IBM applications look for the parallel port and can't find it, but DG has put a patch in the BIOS redirecting all output to COM2 to avoid difficulty.

If you're using the optional thermal printer, you can change its print quality from draft to near-letter quality using the MODE command. For near-letter quality you type 'MODE LTP1:NLQ'. The final use of the MODE command is

### Benchmarks

| | |
|---|---|
| BM1 | 1.6 |
| BM2 | 5.4 |
| BM3 | 12.9 |
| BM4 | 12.3 |
| BM5 | 13.8 |
| BM6 | 25.2 |
| BM7 | 39.5 |
| BM8 | 39.1 |

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

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B. SANYO – MSX WAVY 10
B. SONY – MSX HB – 75
B. TOSHIBA – MSX – 64K
B. SHARP – MZ – 700
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to change the IBM display emulation. Different IBM applications packages are written for different IBM video adaptors, but the DG One can emulate both the IBM monochrome adaptor and the colour graphics adaptor. To change the emulation you type MODE followed by either MONO, 40, 80, BW40, BW80, CO40 or CO80. All the values for mode are reset when you re-boot the system ,so it's best to set the default to the most common screen mode and use a batch file calling the correct mode for non-standard application programs.

The DG One is shipped with two configuration files called VDISK.COM and ANSI.SYS. If the user wishes he can call these as entries in CONFIG.SYS to alter the mode of operation of the DG One. VDISK.COM is becoming more common as MS-DOS machines are shipped with more RAM. It allows users to set aside a portion of RAM as a RamDisk, and on the DG One was accessed as drive C.

ANSI.SYS is a screen device driver which configures the system to respond to ANSI control codes. In this mode, the screen and keyboard respond to the same escape codes as a DEC VT100 terminal.

The final utility allows it to be connected to DG's CEO (Comprehensive Electronic Office) office automation system. As well as allowing access to all the facilities of CEO, it can translate files produced by certain common micro applications such as WordStar and Multiplan and transmit them to and from the CEO system, but as I didn't have access to a CEO system I couldn't try this out.

## Applications software

Because the DG One is software compatible with the IBM PC, there shouldn't be a shortage of applications software to run on it. There will always be one or two packages which don't work, but the majority of popular applications, including Lotus 1-2-3 and Multiplan, are already available.

The major problem is likely to be working out how to get the software onto the 3½in disks. DG has appointed Tamsys to move IBM applications onto these drives.

An alternative is to buy the optional 5¼in IBM compatible external disk drive, which reads IBM disks so that programs can be copied across to the internal disks. The only problem here is going to be copy protected disks, which will have to be done professionally.

The third option, if you already have an IBM PC, is to link the two machines together and download software to the RS232 line. DG's preferred communications system is DGBlast which, in theory, allows you to upload and download program and text tiles. In practice, while my Olivetti M24 would talk to the DG One, the DG One refused to say anything to the Olivetti.

In the old days communications programs were complicated and very unfriendly to use. Recently, however, much more user-friendly programs have been released which make life much easier. My favourite at the moment is Perfect Link for the IBM PC. Unfortunately, DGBlast belongs to the old school and is not to be taken lightly.

## Documentation

Two manuals were supplied with the machine — one was small, the other was very small. The first was the DG One owner's manual, and contained everything you need to know to enable you to set up the machine, use the ROM utilities, and run MS-DOS. Packaged in a spiral-bound typeset form with good use of illustrations, it's relatively low-level and easy to understand.

The second manual was a cut-down pocket quick reference version of the first, which I found quite useful.

## Prices

The basic system with 128k of RAM, one 720k diskette and AC adaptor will cost you £2490. The expanded version with 256k of RAM, two disk drives and rechargeable batteries is £3675. The external 5¼in IBM compatible disk costs an extra £685.

## Conclusion

I always said that I wouldn't buy a lapheld until it had a 25-line screen, disk drives and would work off batteries. I will now add another condition . . .'and I can afford it.'

Low-power technology is still expensive. If it wasn't, the pile-'em-high-and-sell-'em-cheap merchants would be using it.

For an expensive machine the DG One feels cheap. It's certainly nowhere near as well engineered as its major competitor, the HP110.

Apart from the price performance ratio. I have no qualms about the machine. It works well and the package of screen, disks and battery power is just fine. Choosing between the DG One and the HP110 is a difficult decision; if Hewlett Packard built a machine to this specification I'd be ecstatic.

The marketing aim is to poach desktop business. People who use a desktop use the machine for more prolonged periods than people on the go with a lapheld. Given this assumption, I expect a desktop to have a good, easy to read display and a nice keyboard. The display and keyboard on the DG One are fine for occasional use, but I'd hate to spend seven hours a day looking at the LCD screen and using that keyboard.

For anyone who wants a go-anywhere machine that can run IBM PC software, and can afford it, this is a fine machine. I'll wait until CMOS becomes cheaper. END

## Technical specifications

| | |
|---|---|
| Processor: | 80C88 |
| ROM: | 32k |
| RAM: | 128k up to 512k |
| Mass storage: | Up to two 3½in 720k internal disk drives plus one 5¼in IBM compatible external drive |
| Keyboard: | 79-key full travel |
| Size: | 2.8×11.7×13.7ins |
| Weight: | Nine to twelve pounds depending on specification |
| I/O: | Two RS232 ports, system expansion bus |
| DOS: | MS-DOS version 2.11, CP/M-86 |
| Bundled software: | ROM-based terminal emulator plus editor |
| Peripherals: | Optional printer and IBM expansion chassis/5¼in disk drive |
| Modem: | Optional internal modem (not yet BT approved) |
| Power: | 240-volt AC or battery |
| Battery: | Eight to ten hours continuous use |

## In perspective

The marketing people at Data General are trying to be clever with this product. Its obvious market is as a go-anywhere, full-function portable which can be run off batteries and carried in a briefcase.

However, by offering the external IBM compatible disk drive and expansion units, the marketing men are hoping to poach some business from the desktop market. Although great things are forecast for the lapheld market, the real business at the moment is still with desktops. Data General hopes to sell very large numbers of this machine, and to do so so they need to be in as many sectors of the market as possible.

At the portable level, the DG One's main competition is from the Hewlett Packard HP110, which beats the DG One on engineering, user-friendliness and style. The DG One has a bigger screen and built-in disk drives.

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SOFTWARE

# Filevision: data with meaning

*Will Apple's Filevision database, with its unusual terminology and use of graphics, help to dispel fears that the Macintosh is just an 'executive toy'? Peter Bright thinks so.*

The problem with micros in business is that they have a nasty habit of taking once meaningful data and turning it into uninformative figures.

Database programs are often the worst offenders. Take something like stock control: at the start of the chain, the data means something tangible — someone has to go out and count how many widgets you've got. But by the time the computer has had a good munch at the data, you have to think hard about the difference between a widget and a wombat.

Another problem is that building database programs can be a pain. Of all the popular applications, database management is the only one that forces you to dive some way into the works of a micro and get your hands dirty. With a word processor, spreadsheet or graphics program the worst thing you might have to do is think of a new filename. But with a database you have to work out the file structure and field types and, in most cases, field lengths — the list is endless. Even then, you usually have to write an ultra high-level program if you want your database to do anything useful.

Filevision for Apple's Macintosh differs from all the other databases I've seen in that it associates an onscreen picture with each record in the database. You not only get data about your item, you get a picture of it too. It also relieves you of the chore of having to specify the data type for each field or even the field length. The net result, according to the advertising blurb, is that even a computer-naive Macintosh user can create and use a database with a quick flick of the mouse.

Filevision is supplied on a single 3½in disk along with a surprisingly thin manual. When you try to copy the distribution disk, it looks for all the world like you've succeeded. All the files appear to be there and the program gives the impression that it will load, but halfway through loading a copy of Filevision the Mac spits out your disk and asks you to insert the distribution disk. It then reads a few copy-protected routines from the disk and lets you re-insert your copy and carry on.

This is a clever trick and while it does reduce the likelihood of your distribution disk being corrupted, it still means that you're reliant on that one disk.

Before I delve into the workings of Filevision, I'll cover the package's terminology — it isn't the same as is used elsewhere.

The disk file where the data is stored is called the 'drawing file'. The maximum size for a drawing file is 132k, the minimum is 4k, and we'll see later that this needn't be a restriction because you can chain disk files together. You can have as many different drawing files as will fit onto a disk.

At the next level down from the drawing file are 'types'. It's easiest to look on a type as a logical file — think of it in the same way that you would a data file in any other database. When you set up a type, you also define how the data in each record will be structured; each type can have a different data structure. You can have up to 16 types in any one drawing file.

It's worth putting some thought into the way you're going to set up types, because most of the search and printing functions in Filevision will only work on one type at a time. You don't want to end up with important relevant data in two different types.

Below the types are 'objects', which are roughly equivalent to records in any other database; the major difference being that each object has a drawing as well as data associated with it. The maximum number of objects per 'picture file' is 999, which cannot consume more than 2k (2000 characters).

Objects are made up of 'data fields'. Both fields and objects are variable length, so you don't need to worry about making fields long enough. You don't need to declare the field type either (alphabetic, numeric, date, and so on), so setting up the structure is extremely straightforward. The only limitation is that there's a maximum of 30 fields per object.

So to sum up, a Filevision disk file is known as a picture file. This contains up to 16 logical files called types. Each type has a unique data structure made up of objects (records) which, in turn, are made up of data fields.

## *In use*

Filevision can be started in two ways. To open a new file, you select the Filevision ikon from the finder. But if you want to call up a previously saved file, you select the ikon relating to the file and the system automatically loads Filevision and auto-runs your file. You can obviously load and save files from within Filevision too.

Assuming that you're creating a new picture file, the main Filevision screen looks like Fig 1. You'll see that there are nine pull-down menus running along the top of the screen and 10 tools in the toolbox running down the left side. The remaining screen space is taken up by the drawing window, which is blank at the moment.

The first step to creating a new database is to set out a structure for the

data in each type. This is achieved using the 'Types' pull-down menu.

The system always has one default type in place called background. This can be used for anything you like, but its usual role is to make the picture look pretty rather than to hold data.

To create a new type you select 'Add Another' from the Types menu which calls up the data definition screen (Fig 2). The system automatically allocates two default fields — Name and Link. Name is used as a key for searches, so it pays to put some thought into the data you put in that name field; link will be described later.

To add a new field, you select the Add Field button at the bottom of the screen. The system then says 'Where?' and the cursor turns into a picture of a hand. To create the field, position the cursor where you want the field to be displayed and hit the mouse button. You then use the mouse to stretch or contract the field size to your heart's content. It doesn't matter if you find later that you didn't leave enough space: just stretch the field with the mouse. You can add or remove fields at any time, even when you've entered all your data. Ah, the wonders of variable length fields.

Using this combination of mouse and variable length, non-typed fields creating the field structure for the different types are very easy.

After you have created all the types and field structures you need, you can progress to the more interesting job of drawing objects.

The easiest way to describe how objects work onscreen is to give an example. If you look at Fig 3, you'll see a map of Greater London showing the different postal districts. The data hiding behind this map gives information on fictitious London Apple reps. If you want to know who's calling in NW9, just highlight the area and the data screen is displayed.

This picture was created using the 'tools' listed down the left side of the screen; there are eight different drawing tools and two pointing devices. From top to bottom the tools allow you to draw/edit text, symbols, straight lines, rectangles, rounded rectangles, ovals and freehold lines.

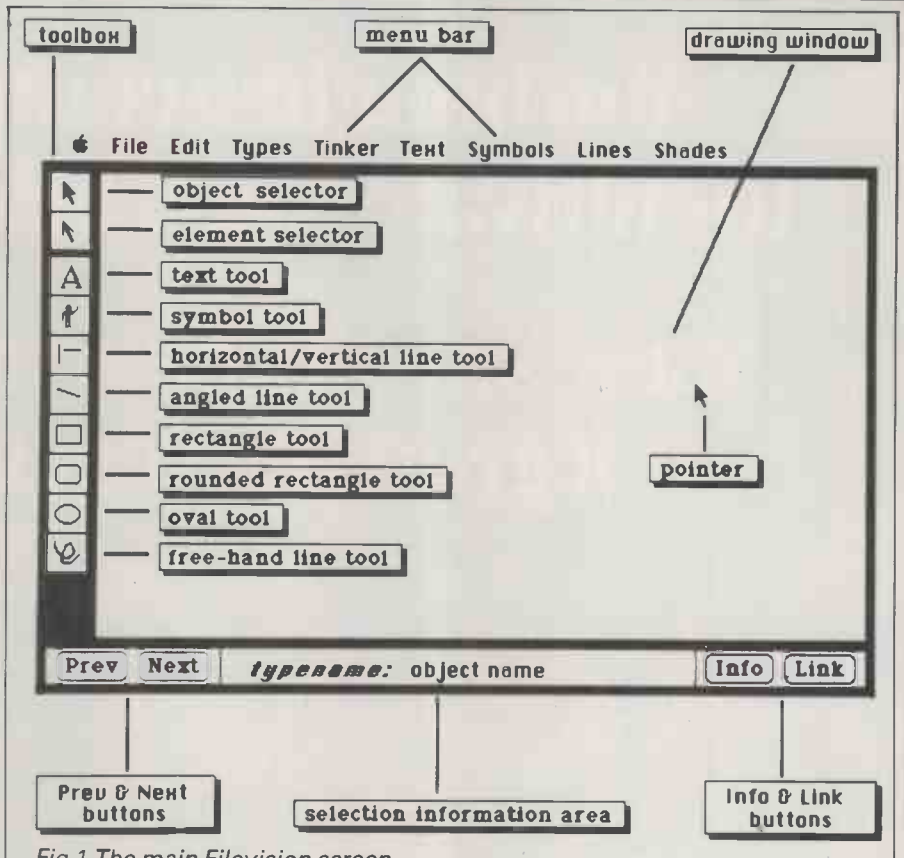


*Fig 1 The main Filevision screen*

Text can be modified in any of the usual Mac ways — different fonts, styles, point sizes, and so on. You can create different symbols using the symbol editor (Fig 4). The system is supplied with 20 pre-drawn symbols, but you can easily create new ones by calling up and modifying the symbol.

Any enclosed spaces such as rectangles or ovals can be filled with any of 20 different shading patterns using the 'Shades' pull-down menu.

The example picture is made up of no less than 172 different objects which on their own are only lines and letters, but which together make up the map of London. Each object can be individually selected and edited — you can move, expand, contract and even reshape objects at any time.

For every object drawn, Filevision creates a related data record. The structure of the record depends on the type under which the object was created. To enter or view data relating to a particular object, you move the pointer to it using the mouse and double click the mouse button; the system then displays the information screen which you designed when you created the type. Within this screen you're free to enter or amend data and play with field lengths, but you can't add or delete fields (this option is available from the 'Tinker' menu).

The only potential problem with the drawing file is that you have to draw a great many objects on the screen just to make the picture look prettier. This is all very well, but you're left with a corresponding number of empty data records which were created for the superfluous objects. An example of this is the map of London where useful data is only associated with the lettering (NW9, SW8, and so on). The lines marking the postal area boundaries make the picture easier to understand and don't have data associated with them.

It's possible to overcome this problem to some extent by using 'Elements'. You can create complex composite objects by holding down the SHIFT key while you draw the object, which combines the shapes you draw into one

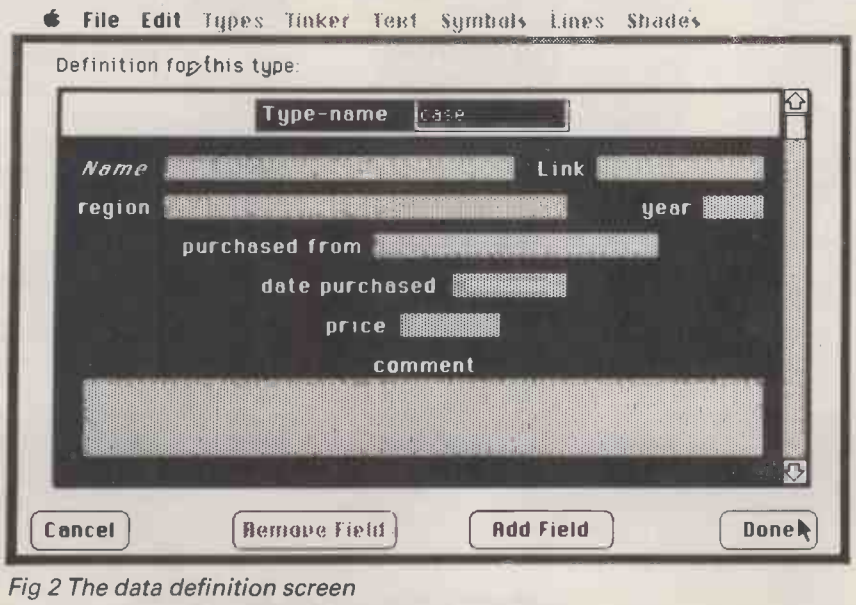
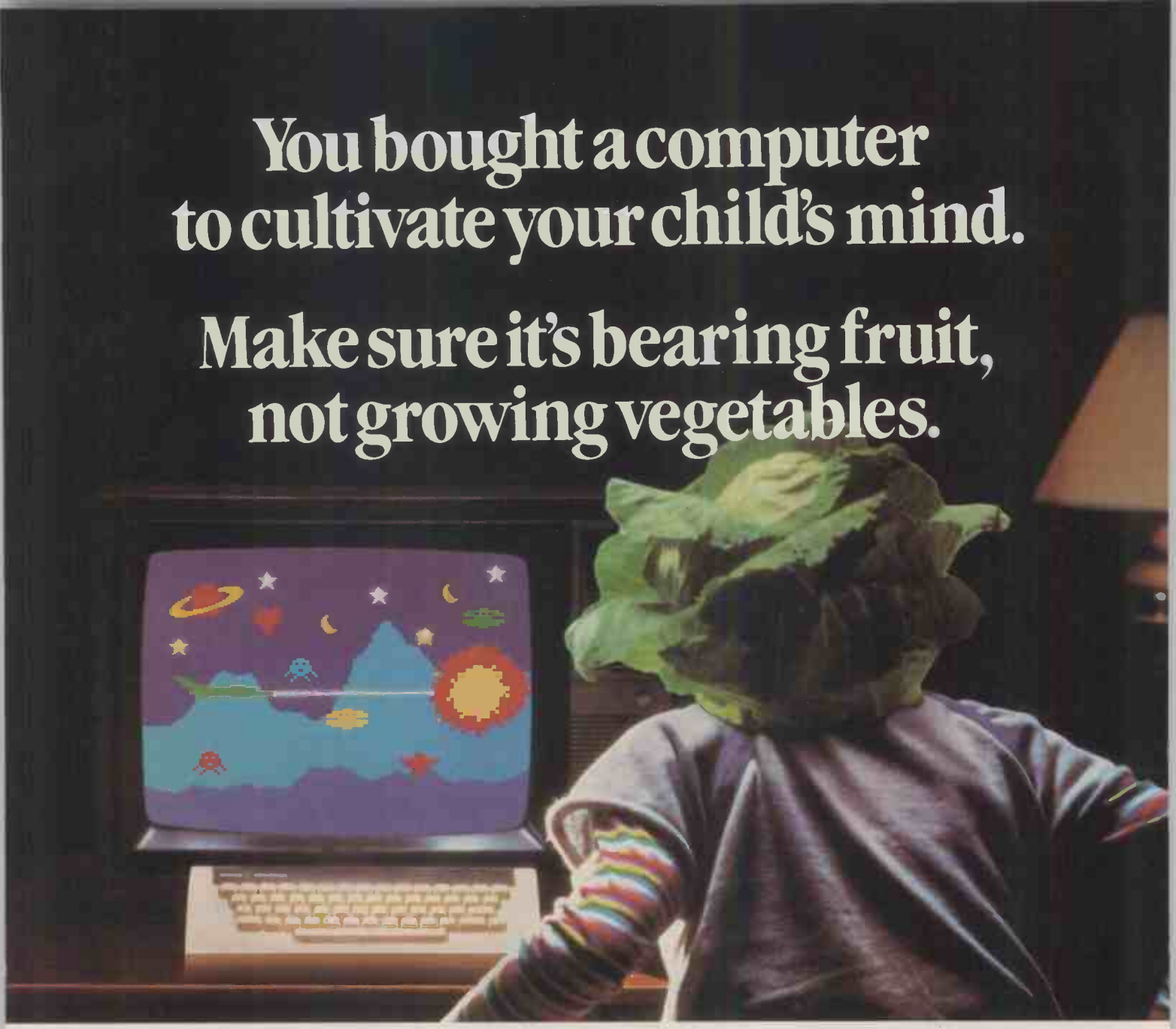


*Fig 2 The data definition screen*

# You bought a computer to cultivate your child's mind.

# Make sure it's bearing fruit, not growing vegetables.



When it comes to developing a child's learning skills the computer's potential is endless. Unfortunately, the search for software that makes the most of that potential has been endless too.

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For further information contact Susan Hough,
W.H.S. Distributors, St. John's House, East Street, Leicester LE1 6NE Telephone: (0533) 551196.

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object. In this way, you can draw a square within a square which Filevision counts as one object instead of two.

## Linking

'Link' is one of the fields automatically created by the system for each object, and is one of the most interesting features of Filevision. If an object has a link entry, the user has the option of calling up a whole new drawing file corresponding to that object from disk. As long as you have enough disk space, you can build up a tree structure of Filevision drawing files.

Let's look at an example. At the top level you have a drawing file showing a map of the world. Each object in the file contains basic details about a country and a link calling a drawing file showing towns in that country. This can go on until you run out of disk space.

The effect of linking is very impressive. To continue the world theme, you could select Great Britain on the map of the world and be presented with a detailed picture. You could then select London and get a map, select Westminster, then a street, and so on down as far as you want to go.

This, of course, is an extreme example. The amount of data and therefore disk space needed to do this is incredible, but it's easy to conceive of projects going one or perhaps two levels down.

## The Tinker menu

The quaintly-named 'Tinker' menu allows you to highlight objects which conform to certain criteria. The main options are: 'Hide These', 'Show Only These', 'Highlight All', 'Highlight Some' and 'Ignore'. The Tinker options only work on one type at a time, so before you use them select the type you wish to work on from the types menu.

Hide These allows you to stop the specified type from being displayed onscreen, which is useful for narrowing down the data you're working on. Show Only These removes everything from the display apart from the selected type.

Highlighting is Filevision's way of selecting data that matches certain criteria. Highlight All displays all the objects in the current type in emphasised print. Types which haven't been selected are displayed in a de-emphasised light grey print.

Highlight Some is the most useful of all Tinker's options. It highlights only those records in the current type which meet criteria you have laid down.

When Highlight Some is selected, Filevision displays the selection screen (Fig 5) which allows you to use the mouse to select objects on up to four different criteria ANDed together. The left side of the screen is used to enter your criteria, and the right side shows what you've entered.

It's possible to use the mouse to enter nearly all the selection criteria; first select the field you wish to work on. The entry box can only display five field names, so if your type contains more than five fields you have to go to a separate screen and decide which ones will be displayed on the selection screen. This works well enough, but it would be easier to scroll through the fields from the selection menu.

Once you have selected the field, you use the mouse to select the criteria. Boxes are provided for the verbs 'is', 'is not', and for the operators 'equal to', 'greater than' or 'equal to', 'less than or equal to', and 'between'.

Finally, you can enter the number or string with which the data is to be compared. If you're doing a string search, Filevision allows you to tune the matching using '^', ',', '..' and '@'.

'^' looks for an exact match at the start of the field. As soon as it has found it, it doesn't bother to look any further in that field. For example, if you specify '^FRED', Filevision matches 'FRED BLOGGS' but not 'RED FRED BLOGGS'. '..' is a wild card match for any character; '@' is a single character wild card; and '@@FRED' will find any occurrences of FRED preceded by any two characters.

The highlighting section's main restriction is that it only allows you to AND a maximum of four criteria. This is fine for most applications, but on one or two occasions I found it a problem.

The only way around it is to apply your four criteria to the current type and then change all the highlighted objects to a new type; this allows you to apply four more selection criteria to the new type. Although this works, it's rather messy and goes against the basic idea of Filevision.

When you choose the Highlight Some option all the objects which meet your criteria are highlighted onscreen, and everything which doesn't is shaded in light grey.

## Printing options

In addition to displaying data onscreen, Filevision also produces various printed reports. There are four printing options, all available from the 'File' pull-down menu. The print options work closely with the screen highlighting options. If you haven't highlighted anything on the screen, the print options will assume that you want all objects in the current type to be printed out. However, if you have highlighted various objects, the print options will only print these.

The first option allows you to dump the screen to the printer. This is available permanently and is useful for getting hard copy of pictures with different highlighting according to different criteria.

The second option is 'Print Info', which prints out all the fields of the selected objects. When it's selected, Filevision allows you to specify headers and footers for the pages along with the field the objects will be sorted on. You can also decide the print quality of the report using the standard Mac printing option box.

The third option is 'Print List', which allows you to create a tailored report based on the selected objects within the current type. In addition to selecting the sort field and the headers and footers, you can also specify how your report

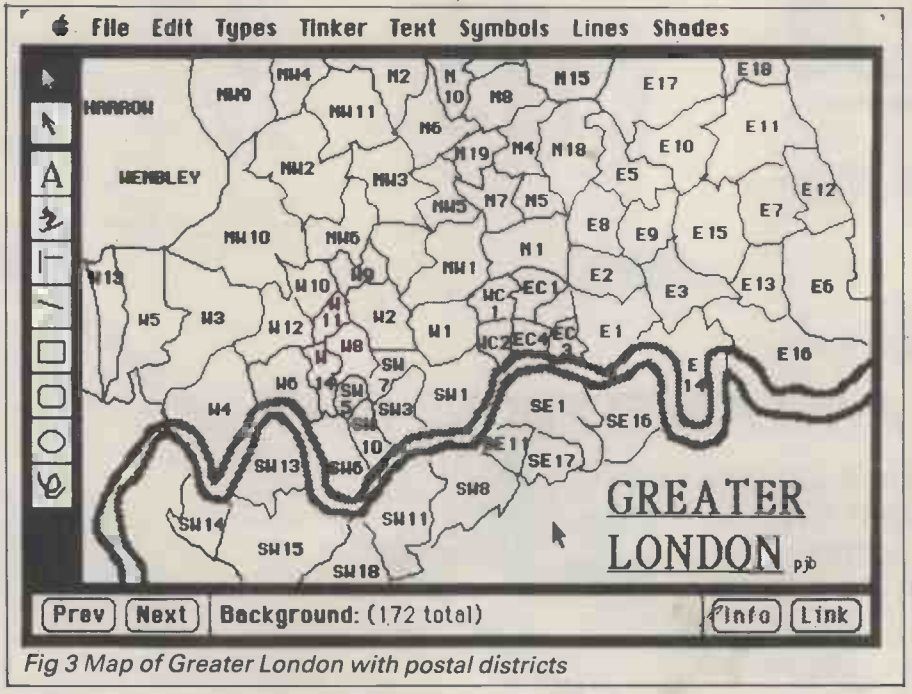


*Fig 3 Map of Greater London with postal districts*

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should look by specifying fields as column headings across the width of the page. Filevision will then print out the selected fields giving each object a new line. You can specify if the data in each field is printed ranged left, centred or ranged right to make your printout visually pleasing.

The final option is a label printer for printing data onto address labels. The screen shows an outline of a label and allows you to specify where selected fields will be printed.

The report generating options were the only area which disappointed me. Although I can see that setting out data pictorially on the screen cuts out some of the demand for printed reports, there will still be times when they're necessary.

The printing facilities aren't comprehensive enough to cope. You can only sort out one field at a time, and the sort can only be in ascending order. There's no provision for totalling of fields or value-based page breaks. You're also limited to printing data in column order; if this doesn't suit, bad luck.

## Documentation

This consists of one 150-page spiral-bound manual. When I first saw it I thought that it was so short it couldn't hope to cover all the aspects of Filevision adequately — database manuals usually make *War and Peace* look short. After using the manual I can say that not only does it cover every area, but that it's the best manual I've ever used of any kind.

Great use is made throughout of illustrations and emphasised printing. Everything is very well broken up and exceptionally easy to follow. The manual is divided into three sections — Learning Filevision, Using Filevision and Filevision Reference. The first section is a tutorial designed to be used in conjunction with a demonstration file provided on the distribution disk. It's only after you've finished the tutorial that you realise that it's taught you everything you need to know about Filevision.

The rest of the manual just provides back-up — it's the tutorial that does the real work.

## Conclusion

I've become bored recently with new business software. While the names may change, the products remain very similar. The last innovative product I saw was Brainstorm, but even this now has a brace of lookalikes professing to do the same thing.

Filevision is the first product for a long time which is truly innovative. In the process, it has brought database technology to the point where it can be used by the proverbial ingenuous MacIntosh user. The use of graphics may at first sight look like a gimmick, but this view couldn't be further from the truth: the graphics allow you to see what the data *means*.

The biggest bore with any database is usually entering the data. Apple is predicting that a whole new market will develop offering ready-made 'data packs' for use with Filevision. Instead of using printed reports, market research companies and the like could just produce a Filevision drawing file with all the data already installed and distribute it on disk.

If this idea caught on, it could have dramatic effects. Instead of ploughing through pages of printed reports, you could call up the required information and analyse it in your own way. Not only that, but the data is represented pictorially. It's a great idea.

Apple says it hopes that Filevision will do for the Mac what VisiCalc did for the Apple II. Obviously some of this is hype but it certainly has the potential, especially if the data pack on disk idea catches on.

This product has not only made me rethink my view of databases, but also my view of the Mac. In the past I didn't want the hassle of setting up a database: now it's positively fun. Where I used to regard the Mac as a glorified executive toy with little practical value, I now see it as a potentially very powerful tool capable of much more than I at first thought.

Although Filevision won't solve all database problems, it's still the best piece of new software I've seen during the last year.

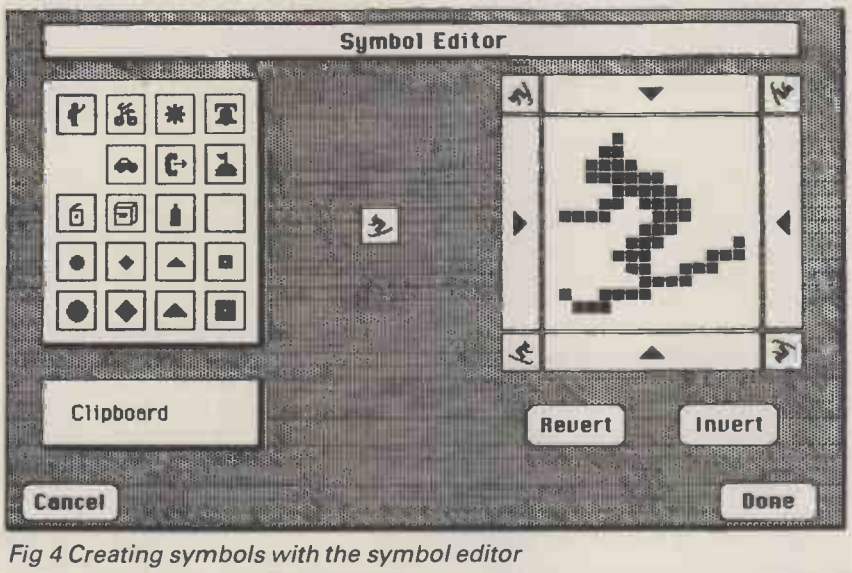



*Fig 4 Creating symbols with the symbol editor*

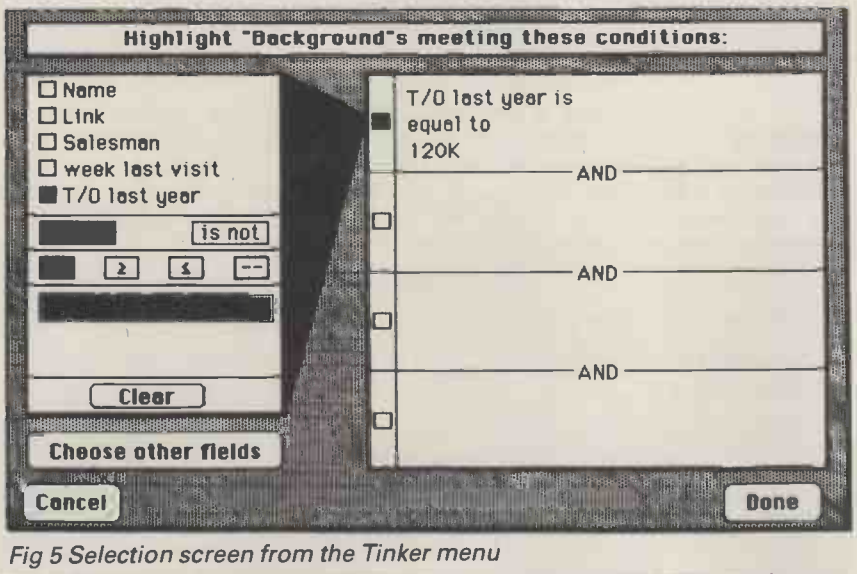



*Fig 5 Selection screen from the Tinker menu*

*Filevision is manufactured by Telos Software and distributed in the UK by Softsel and Pete and Pam. It costs £159 + VAT.* END

# A class for all students

*One of the beauties of Econet is that there are hundreds of ways of configuring software to run on the local area network. But this can create problems — Robert Elliott explains how to avoid them.*

The cost of purchasing an Econet local area network is surprisingly cheap. Assuming all the necessary hardware for the workstations is already available (that is, one BBC Micro with an Econet interface and monitor per station), then the total cost for upgrading to a level II system is £1250. This includes dual 800k, switchable 40/80-track disk drives, a second 6502 processor, level II software, all the cabling and installation.

The commonly held belief that at least 10 stations must be present to make the network viable is misleading. For a start, the teaching advantages of such a configuration are of some worth. Since all students load off the one disk, software is made more easily available; and there's a corresponding saving in disks required to store programs. Network communications allow the teacher complete control over all student activity.

Other resources, such as a printer, can be shared by all users and, contrary to Acorn's own leaflet on Econet, printing takes place in the background, allowing complete use of the printer server as a workstation. Add to this the cheapness of adding further workstations (the price of a BBC with Econet interface and monitor), and I would say that anyone considering a system involving more than six users would be better going for the network approach.

Supplied with the system are three handbooks — *The Econet Manager Guide, The Econet User Guide* and *The Econet Advanced User Guide. The Manager Guide* is excellent with very clear instructions on how to control the network. Learning to use the system is fairly straightforward since most of the commands the manager issues are one-liners. For example; *CDIR BOB' creates a new directory called 'BOB' within the currently selected directory.

Two disks are also supplied: the File Server Master Disk and a Utilities Disk. Together they provide the software necessary to use the system as well as several utility programs to help in its management. There's a utility to convert software in standard DFS format to file server format, another to transfer files from one directory to another, wipe entire directories, add new users, print a disk's structure, and so on.

After the euphoria of successful installation the first decision we had to make was how to organise file server disks.

Econet directories have a similar structure to Unix directories in that entries need not be actual files but may be directories themselves. This hierarchical approach to disk structures means that related files may be grouped in a common 'sub-directory'. For example, a CATalogue of directory MAIN may contain:

```
MAIN (012)              Owner
FSDISC1                 Option 00 (Off)
Dir.MAIN                Lib.LIBRARY
BBEBPLOT      WR/WR
STOCKCTRL     R/
UTILITIES     DL/
```

Users of disk-based BBC systems will be familiar with the concept of a file's *access string*. However, the 'D' attribute will be new to non-Econet users. There are three files in this directory: BEEBPLOT, STOCKCTRL and UTILITIES. In fact the latter is not a file at all. The 'D' attribute denotes that it *is* a directory within the MAIN directory (that's a sub-directory of MAIN). Now a '*CAT' of UTILITIES gives:

```
UTILITIES (005)         Owner
FSDISC1                 Option 00 (Off)
Dir.UTILITIES           Lib.LIBRARY
BEEBMON       R/
EXMON         R/
USRDEFCHR     R/
```

There are *three* files in the UTILITIES directory.

Sub-directories may be created to any depth. One possible disk configuration is shown in Fig 1.

When a user logs on to the network, Econet looks for a directory to match his

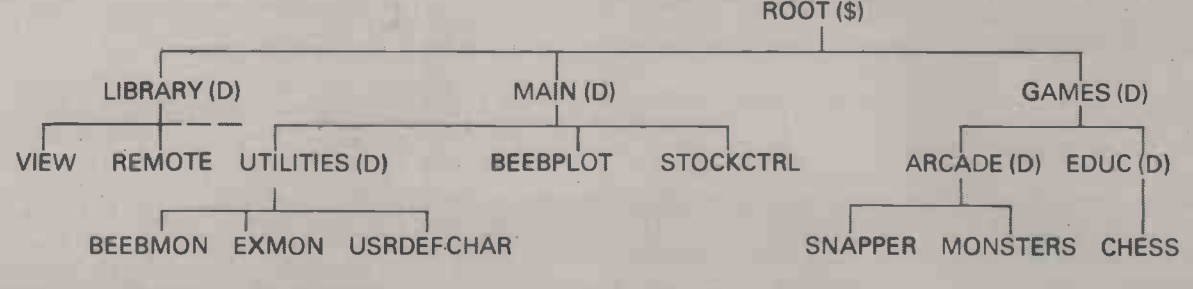



*Fig 1 Disk configuration (sub-directories may be any depth, but the 'Root' directory is always at the top of the tree)*

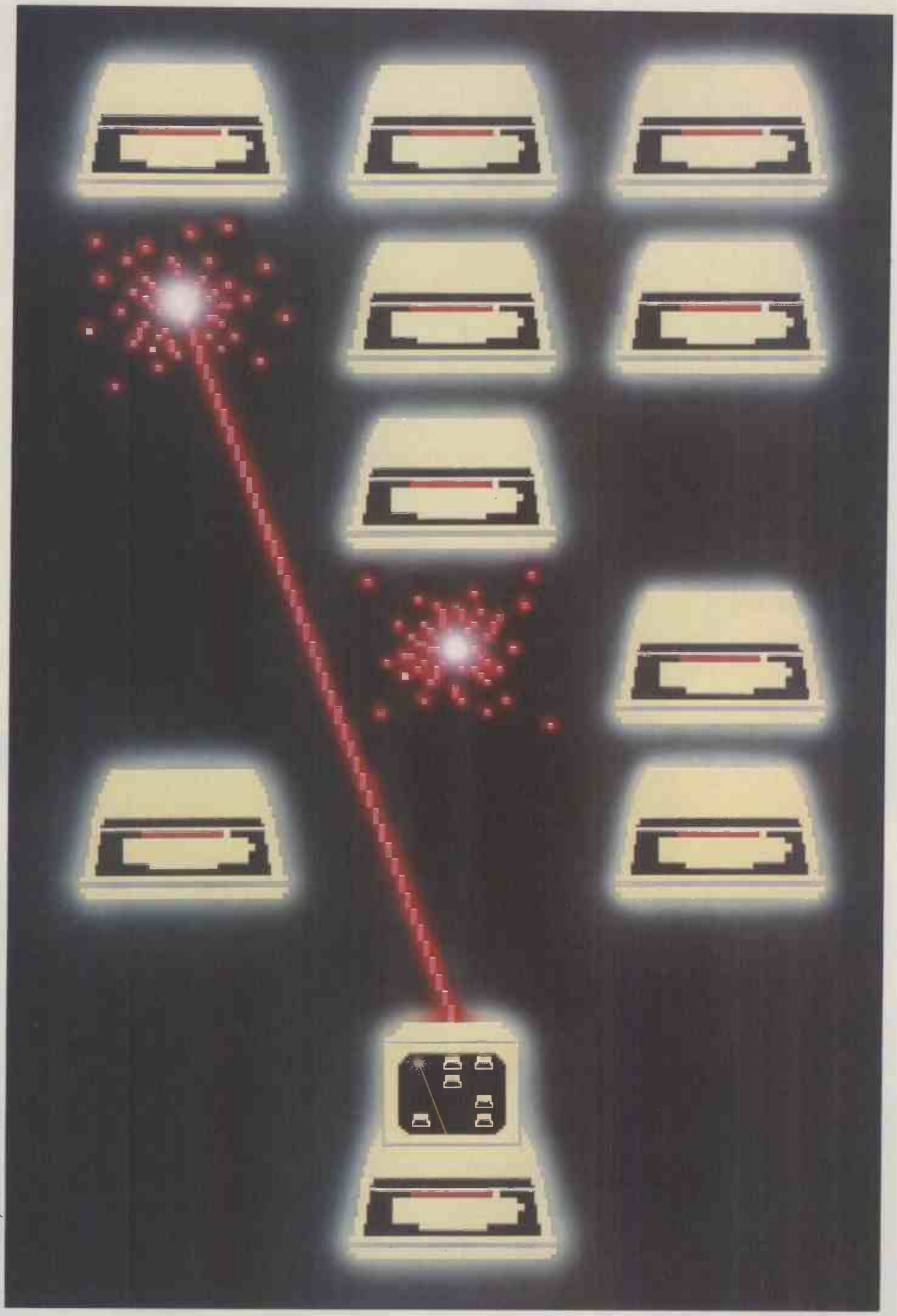
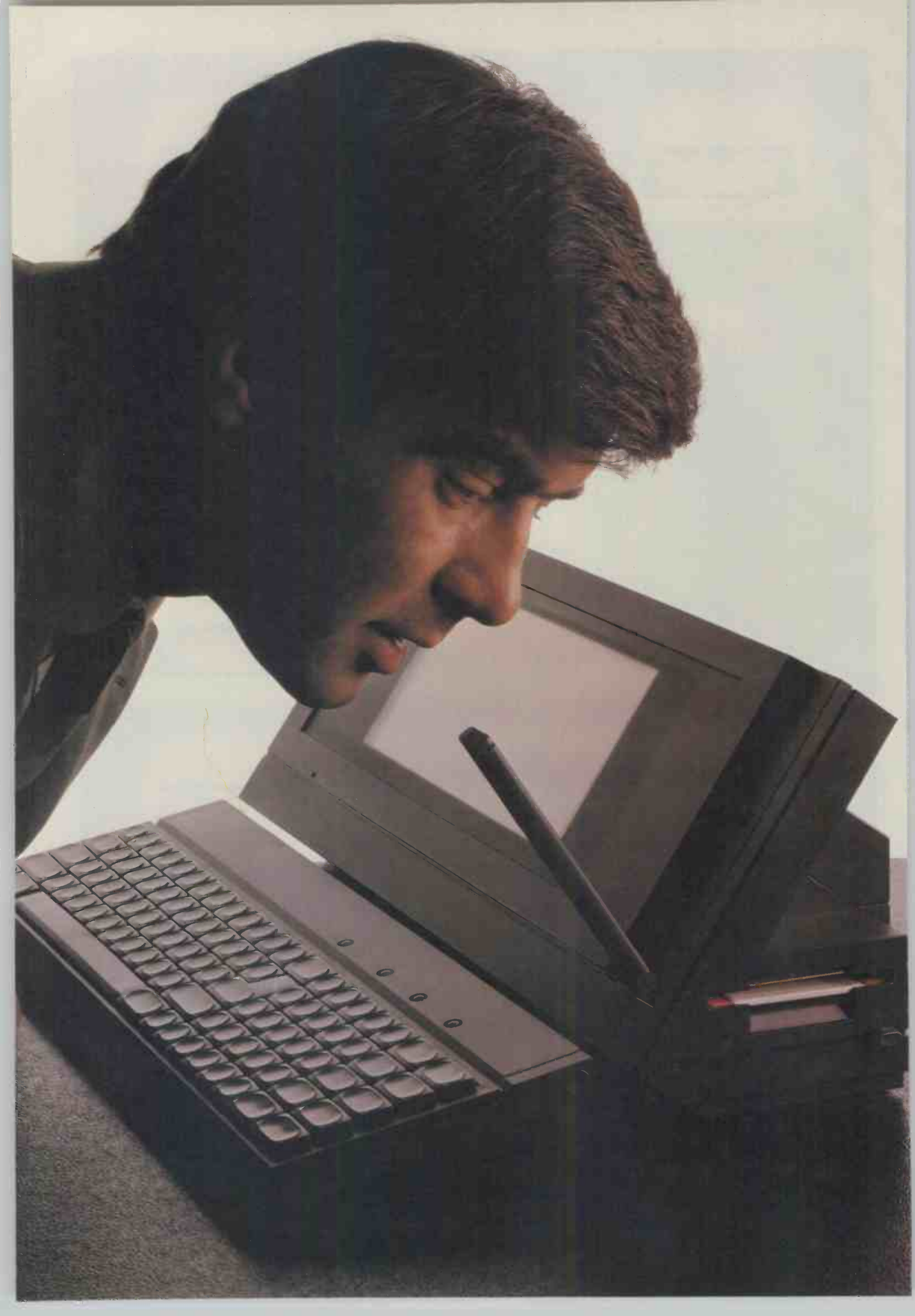


Illustration by Mark Watkinson



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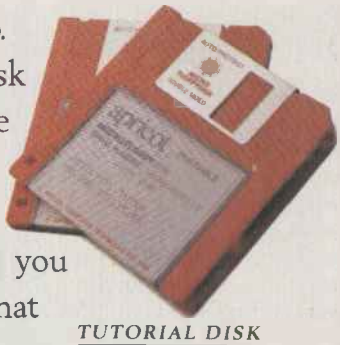

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username and boots him into that part of the hierarchy. If no match is found, he is logged on to the ROOT directory. For example, if you type '*I AM BOB', then Econet attempts to log you on to the directory called 'BOB' (wherever it is in the tree). If no such directory exists (and assuming 'BOB' is a registered user) he will be logged on to the ROOT.

## Disk organisation

The important point to note is that a user who has to move up the tree to access files has only *public* access to those files; if you move down the tree, you have *owner* status. You may have noticed that a files access string is divided (by '/') into two parts: the first half specifies what the owner access to that file is; and the second half, the public access. Therefore, if a file's access string is 'R/', this means that users with owner access have read-only access and users with public access have no access whatsoever. Since the Root directory is at the top of the tree, users who log on to this directory have owner access to all files on the disk.

The problem is, how do you configure the disk so that students have access to all the necessary software while ensuring that they are not allowed to cause any damage (for example, delete important files such as application software) or use facilities that are intended for the teacher (for example, the 'REMOTE' program)?

There are literally hundreds of ways of configuring a file server disk depending on who is ultimately going to use the software on it. If the disk were to be used for learning how to program, then it would be important for each of the disk's registered users to have their own user area (that is, directory), so that when they logged on they would be booted to the directory containing their own personal programs. Conversely, if the group were concentrating on applications software, it would be wasteful to have copies of all the required software in each user's directory.

## Applications

Since we are mostly concentrating on the applications side of things, let's tackle that particular problem.

After much thought the structure in Fig 2 was decided on, where '(D)' denotes directory.

The disk has only two registered users — 'TEACHER' and 'STUDENT'. Since there is no TEACHER directory, when TEACHER logs on, he will go to the ROOT directory by default, giving him owner access to all the files on the disk. However, when the student logs on, he will be booted to the STUDENT directory and will only have public access to directories at a higher level. As all the access strings in directories above STUDENT are 'R/' (that is, read only to owner, no public address), then the user STUDENT has no access to programs such as VIEW, NOTIFY, and so on, which are contained in the LIBRARY which the student has to go up the tree to reach! Notice that the GAMES directory is also inaccessible to user STUDENT! Changing access strings is by the *ACCESS command with a wildcard as a parameter.

```
ROOT(S)

LIBRARY(D)
        NOTIFY
        REMOTE
        VIEW
        PROT
        DISCS
        USERS
        PS
        NETMONITOR
NETMGR
PASSWORDS
GAMES(D)
        ARCADE(D)
                SNOOKER
                etc
        EDUCATION(D)
                WHITE KNIGHT
                ANIMALS
STUDENT
        ACCOUNTING(D)
                STOCKCTRL
                etc
        WORDPROC(D)
                TEXT-EDIT
                WORDCONF
        LIFE SKILLS(D)
                KINGDOM
                etc
        CAL(D)
                HANGMAN
                PEEKO
                DIG-LOGIC
        DATABASE(D)
                DBASE
                VUFILE
        UTILITIES(D)
                BEEBMON
                USERDEFCHR
                etc
        GRAPHICS(D)
                HEADER
                PIE
                etc
        LANGUAGES(D)
                SPASCAL
                etc
        DEMOS(D)
                LED
                BUBBLE-SORT
                AI-OXO
                etc
```

*Fig 2 Structure*

Although there are two physical drives (0 and 1), each with two physical sides (1 and 2), Econet does not distinguish between disk sides. When a user attempts to access a file, Econet searches both sides of the currently selected drive. This means that at any one point in time, 400k of backing storage is online and all 400k can be used since there is no limit on the number of files held on a file server disk. A simple command allows the second disk (assuming dual drives are used) to be selected. Econet is very economical in its use of disk space — I have transferred over thirty cassettes and numerous disks (all the software in the department!) over to the network and it has all been stored on two thirds of *one* file server disk!

*'Econet directories have a similar structure to Unix directories in that entries need not be actual files but may be directories themselves . . . related files may be grouped in a common "sub-directory".'*

## Auto-start facilities

Since individual directories can be configured for auto-start, students can be protected from the rigours of Econet and the operating system. When a user logs on, Econet checks if the auto-start option — in the user's directory — is set; if so, it executes the !BOOT file in accordance with the auto-start option (that is, *LOAD, *RUN or *EXEC). I have used this facility to boot a welcome page when user STUDENT logs on; similarly, when TEACHER logs on, 'KEY-INIT' is chained to set up the user-defined keys with commonly used Econet commands such as *VIEW, *REMOTE and *USERS.

Another auto-start option is achieved by the user pressing <SHIFT><BREAK>. When this happens Econet attempts to log on as user BOOT and, assuming user BOOT and the BOOT directory exist, the auto-start option is set and the file !BOOT is contained within this directory, then the commands contained in !BOOT are executed. In effect, this facility gives the impression of every station having its

own local disk drives.

Any station on the network may have its own local storage facilities. For example, a local tape unit may be used for I/O by selecting the cassette filing system. Consequently, transferring most tape-based software over to Econet is just a matter of selecting the cassette filing system (using *TAPE), loading the desired program, re-selecting the network (using *NET) and saving the file under ECONET. Local disk storage may be used similarly, except the station must have its own disk interface and drive.

## Network communications

The sharing of hardware and software by all users is common to all local area networks. What makes Econet unique is its communications capabilities.

By using the commands supplied, the teacher can supervise the progress of individual students with the minimum of fuss. For example, a student's work may be monitored using the *VIEW command, which transfers the student's screen to the teacher's monitor. If the student is having problems, the teacher may tell him what to do by using the *NOTIFY command. If problems persist, then the teacher may take complete control of the student's station by using the *REMOTE command. This not only copies the student's screen to the teacher's monitor, but disables the student's keyboard, passing control of all further processing to the teacher's station while allowing the student to see exactly what the teacher is doing. Finally, the file server's monitor displays all network activity by echoing every command any user issues with an accompanying station number. All this is possible without the teacher leaving his desk!

One slight omission is the lack of a command to not only view the student's station, but also update the teacher's monitor as the student continues to work (the *VIEW command merely takes a 'photograph' of the student's screen). I have written a small program that adds a new command to Econet (Listing 1). The *STATION command (for example *STATION 12) not only copies the student's screen, but also updates the teacher's monitor as the student's screen changes. The student is unaware of this supervision and the link may be severed by pressing the <ESCAPE> key.

To put the program on the network, log on to the LIBRARY. Type in the program and run it. Now, save the object code by typing '*SAVE "STATION" 199D 1A30'. You may notice that I have saved more memory than appears to be necessary — however, since the new command line is stored immediately after the machine code, room has to be reserved for it. (Remember to give the program an appropriate access string!)

## Conclusion

Econet has not been without its critics. While it's still too early to come to any definite conclusions regarding the robustness and durability of the network, I can say that everything the manager's guide claims to work, does.

*'What makes Econet unique is its communications capabilities. By using the commands supplied, the teacher can supervise the progress of individual students with the minimum of fuss.'*

Transferring software across has been much simpler than expected. Since PAGE is set to &1200, most cassette and all disk-based software has been transferred successfully.

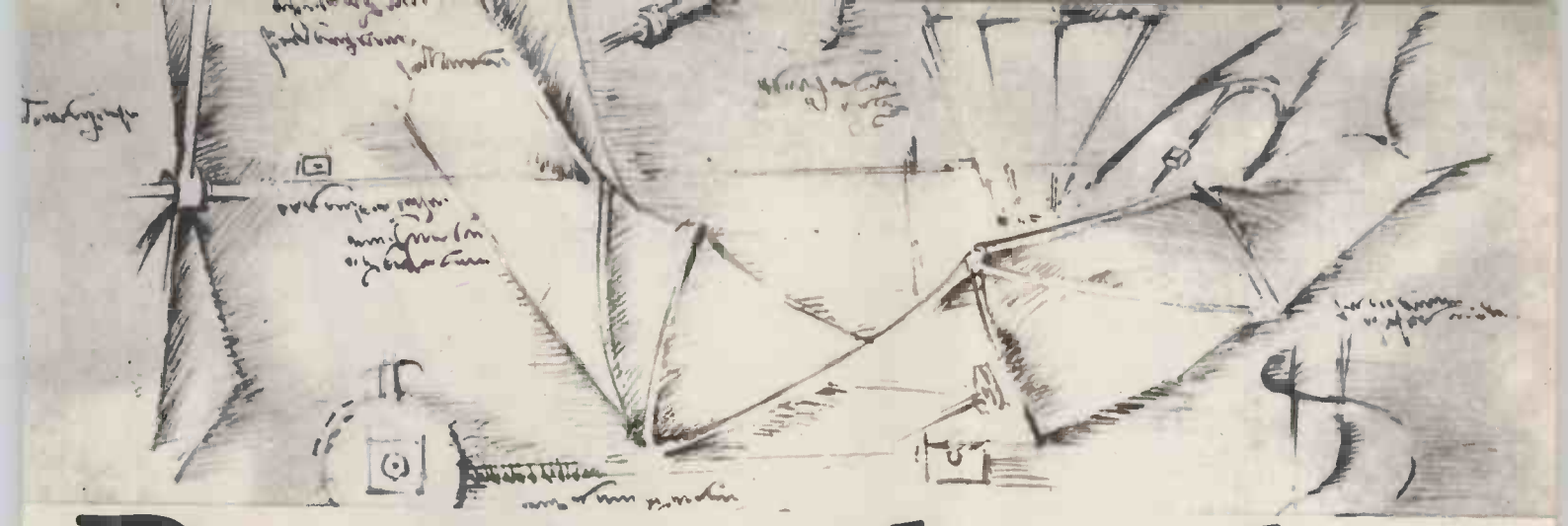
Having said that, I have experienced some difficulty running software which requires data to be saved from within the program. This tends to happen on (some) cassette-based software and has not been a problem with any software transferred from disk. Inevitably, my ROMs don't work! WORDWISE, GRAPHICS and EXMON don't seem to be compatible with the network filing system, although Computer Concept's latest version of WORDWISE is.

One final point in Econet's favour is its cost. Compared with most other local area networks, Econet is remarkably cheap. With twenty user stations on the net, each workstation (including monitor) costs approximately £560 (ex VAT). What other twenty-station local area network can compete with this figure?

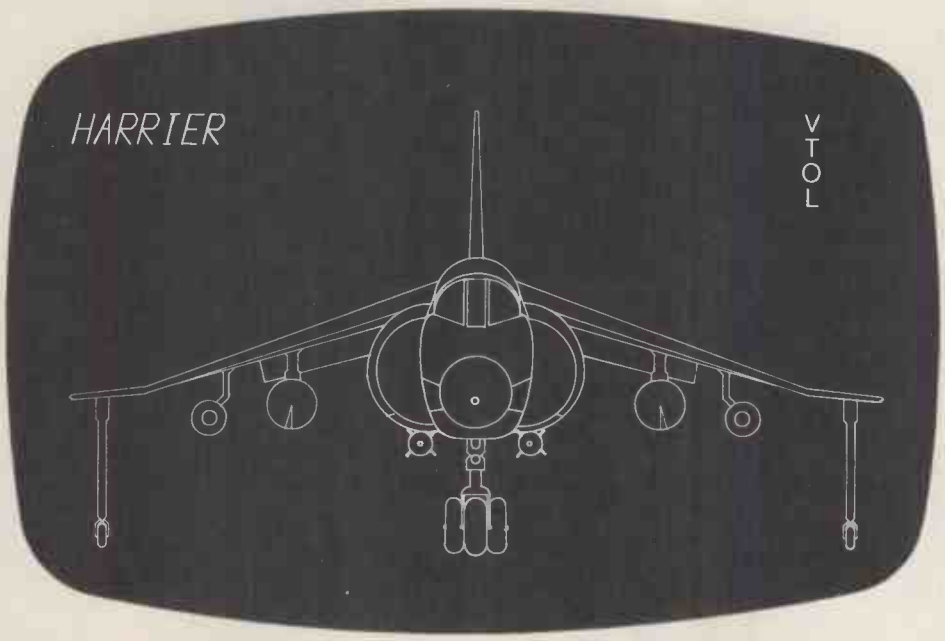
*Robert Elliott is a senior lecturer in Clydebank College's Business Technology Department.* END

```
10  KEYPTR=&02D8:          REM Pointer to next free location in buffer
20  KEYBUF=&0300:          REM Base address for keyboard buffer
30  DOSCLI=&FFF7:          REM Entry point to OSCLI routine
40  DIM MEMORY 100:        REM Reserve 100 bytes for object code
50  FOR PASS%=1
    TO 3 STEP 2
60  P%=MEMORY:             REM Set PC to address MEMORY
70  [ OPT PASS%
80  LDX KEYPTR             / Load X reg with address of next free
                             location in buffer
90  .AGAIN                 / Search buffer (backwards) until a <SPACE>
                             is found
100 DEX                    / Make X point to last character in buffer
                             (&0D)
110 LDA KEYBUF,X           / Transfer this character into accumulator
120 CMP #&20               / Is this a <SPACE>?
130 BNE AGAIN              / If not repeat the search
140 LDY #3                 / Load Y with number of characters in NCL
                             minus 1 ie VIEW
150 .TRANSFER              / This loop transfers characters from OCL to
                             NCL
160 INY                    / Make Y logical index (Y is index for NCL)
170 LDA KEYBUF,X           / Load X with character to transfer
180 INX                    / Make X point to next character in OCL
190 STA TEXTLOC,Y          / Now transfer to NCL
200 CMP #&0D               / Was this character a <CR>?
210 BNE TRANSFER           / If not move onto next character for transfer
220 .VIEW                  / Continually execute NCL
230 LDX #TEXTLOC
    MOD 256                / Load X reg with low byte address of NCL
240 LDY #TEXTLOC
    DIV 256                / Load Y reg with high byte address of NCL
250 JSR DOSCLI             / The OSCLI routine
260 JMP VIEW               / Continue until interrupt
270 RTS
280 .TEXTLOC               / Store NCL here
290 ]:NEXT PASS%
300 $TEXTLOC="VIEW":       REM Store this string from location TEXTLOC
                             on
310 CALL MEMORY
320 END
```

*Listing 1 *STATION command*



# Drawing and words...

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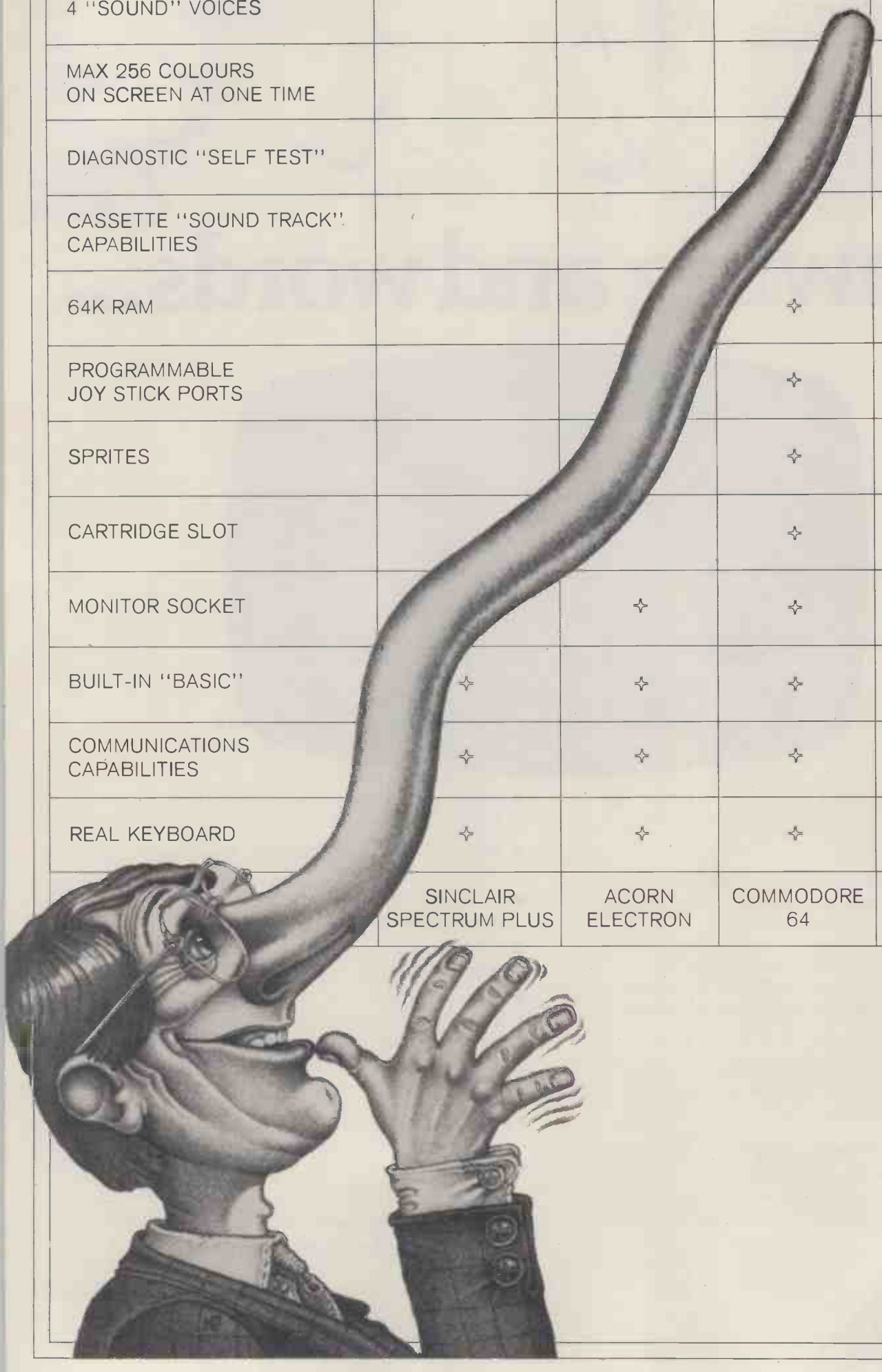

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# IBM PC AT

*The PC AT follows its immensely successful and much-copied little brother into the market, but does it represent good value to the single user or is it designed for bigger things? Peter Bright tests the latest product from the seemingly infallible IBM.*

*The PCAT keyboard is a great improvement on the PC — the typing areas are well spaced and the RETURN and shift keys are larger.*

You're on a 'hiding-to-nothing' reviewing a new IBM micro — the people who don't know any better will buy it anyway, and the people who do, can work out how good it is for themselves.

It was with these thoughts in mind that I set out to review IBM's second offering on the micro scene, the PC AT. 'AT' apparently stands for 'Advanced Technology', and I must admit that on the face of it the AT does boast one or two interesting features: multi-user, the new Intel 80286 processor, optional 1.2Mbyte floppy disk, all for £3000. It looks like IBM might have come up with something new for a change.

## Hardware

IBM won the prize for the lowest specification in the biggest box with the original PC, but I'm glad to say it has managed to do rather better with the AT. The main box is only slightly larger than the PC box, even though it has much more inside it. That said, putting an AT on your desk is as good a way as I have found of hiding yourself from the rest of the office — it's still a big beast.

For this reason, IBM can supply a floor mounting stand which allows you to stand the system unit on its side next to your desk.

The AT is a three-box design in the same mould as the PC and the vast majority of other desktop micros. The monitor is exactly the same as that used on the PC, but the system unit and the keyboard have been completely redesigned.

The system unit is finished in a mixture of grey and cream. Most of the unit is the same grey as the PC, but the front panel is finished in cream to match the monitor and the keyboard.

On the front of the system unit at the far right-hand side is space for two half-height 5¼in floppy disk drives. On the left-hand side are two LEDs, a key and the IBM badge.

The LEDs are used to indicate power on and when the hard disk is reading or writing. The key is used to disable keyboard input from the main unit; it does not disable input from remote terminals. The idea is that the system manager can prevent access to his terminal without throwing off authorised users.

When the machine arrived, I spent a happy 10 minutes trying to bypass the lock. I thought I had found a way by removing the main cover and wedging the micro switch on the lock closed with the aid of a pen top. Then I found that you can't take the cover off if the lock has been activated. Back to the drawing board.

I wouldn't usually class the maker's badge as one of the most innovative features of a micro (I don't know though . . .); however, IBM seems to employ someone to design useless appendages for the AT. On the front panel that person has been hard at work designing a spring-loaded swivelling IBM badge. The idea is that if you have the unit standing on its side on the floor, at least you can make sure that the IBM logo is the right way up. Hey ho.

The rear of the main unit is very unremarkable. From left to right there are sockets for power in and out, the fan, a DIN plug for the keyboard and the exit holes for no less than eight expansion slots. There are also four strips of velcro which look like the work of the useless appendage person.

The velcro is used to hold an optional plastic blanking plate in place. This fits onto the back plate and doesn't seem to serve any useful purpose other than to cover various type approval badges and a few screws. It looks pretty but I'm sure it wouldn't last long before it got lost in an office.

Getting inside is just the same as for the PC: remove five screws and slide the cover off (remembering, of course, to turn the key to the locked position.

The inside is also reminiscent of the PC. The power supply dominates the rear right-hand corner. In front of that are the twin disk drives and the hard disk (which can't be seen from the outside). To their left are the eight full-length expansion slots. The main processor board lies along the bottom of the unit. However, while the layout remains the same, the individual components are very different from the original PC.

The PSU is a multi-voltage unit with external switching for continental use (although you'd have to be Superman to lug this lot over to the continent in your hand luggage). The PSU box also incorporates the system cooling fan. This has a built-in thermistor which regulates the speed of the fan according to how hot the unit is. This apparently helps cut down unnecessary noise. It doesn't work — it's still noisy.

The AT is available with a bewildering range of disk drives. The review machine had one 360k floppy drive, one 1.2Mbyte floppy drive and a 20Mbytes full-height 5¼in hard disk. A 40Mbytes hard disk is also available. The floppy drives aren't marked 'A' or 'B', although the 360k PC-compatible drives are marked with a '*' embossed onto the casing. All the new floppy drives are half-height as opposed to the old full-height units on the PC.

The most interesting aspect of the new drives is the 1.2Mbyte high capacity unit. The only other mass micro I can recall which offers 1.2Mbyte on one 5¼in floppy is the Sirius. This did it by varying the speed of rotation of the disk to allow it to pack in more data.

The AT drive doesn't do this, but it's still non-standard. The drive can actually work in two modes — IBM compatible and high capacity.

If you put a standard 360k PC format disk in the drive, it will happily

read the data. It will also write data back in 360k format, but this is more dodgy. The manual stresses that IBM doesn't guarantee that data written to a 360k disk in a high capacity drive can be read by a standard drive. In practice I didn't have any problems, but don't say you haven't been warned.

The drive will only work in high capacity mode if you use it with special disks supplied by IBM. At first I thought it might just be a marketing ploy, so I shoved one of my 'all-singing-all-dancing' Inmac disks into the drive and tried to format it. The AT would have none of it and spat the disk out with a message to the effect of 'You can't fool me like that, sonny.'

It transpires that the disks have a special surface which can handle the high density needed to achieve 1.2Mbytes. The only doubt I have is about the supply of these new disks. No-one I talked to at IBM was sure whether they were available from anyone other than IBM. If they aren't it means you are dependent on IBM's whim until a third party tools up to produce the things. Not recommended.

The main PCB takes up two thirds of the floor space in the system unit. It is dominated by the processor, memory and the expansion ports.

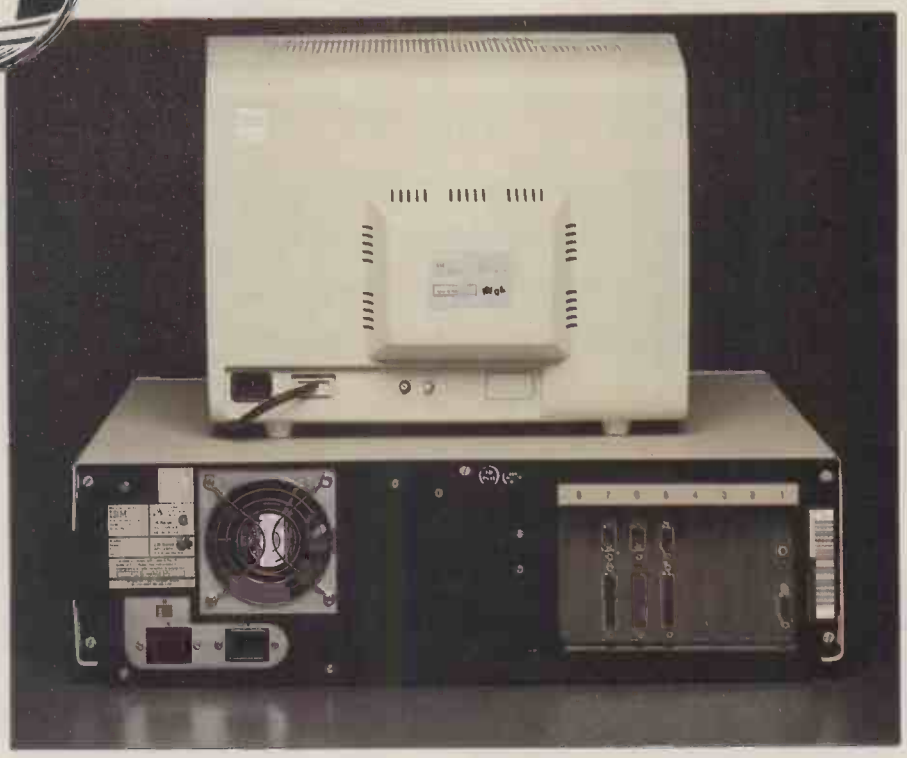
The Intel 80286 main processor is very easy to spot because it's square rather than the conventional oblong DIL package. Many modern VLSI chips are adopting this shape because they can run pins out of each side of the square rather than just two sides on DIL packages.

The 80286 and its smaller brother, the 80186, have been on the stocks for quite a while, but production difficulties and problems with the mask have put the chip in short supply. The mask problem also means that, although the chip has a design clock speed of 8MHz, the production versions can only be safely run at 6MHz.

In hardware terms, the 80286 can be looked on as a CPU and advanced memory management unit combined into one chip. It has a full 16-bit external data bus and a 24-bit address bus which would theoretically give access to a maximum 16Mbytes of RAM. I say theoretical because the amount of RAM that the processor can access is dependent upon the mode in which it's running. In compatibility mode (see below) the maximum is 1Mbyte.

Although it's loosely based on the older 8086/8088, the design of the processor unit is very different resulting in much higher throughput.

The instruction set of the 80286 is also based on the older chips, but in protected mode programmers have access to an extra 28 instructions. Most of these are designed for use with the memory management unit.



*Nothing out of the ordinary here — exit holes for up to eight expansion slots*

*On the right two half height 5¼in floppy disk drives*

The review machine also came with an 80287 maths co-processor fitted. ATs are usually shipped without the chip but with a socket if your software needs it. The 80287 performs the same function for the 80286 processor as the 8087 does for the 8086: that is, it relieves the processor of mathematical calculations and lets it get on with less time-consuming work.

The base model AT is supplied with 256k of RAM. However, the review machine arrived carrying the full 512k, which the main board can take without having to resort to using expansion slots. Maximum RAM using the expansion slots is 3Mbytes. The RAM was provided by 36 of the new(ish) Texas Instruments 128k × 1 giving 512k with parity. The main board also holds 64k of ROM-based operating system routines and diagnostics.

Like the PC before it, the AT makes heavy use of expansion slots to provide basic functions such as video genera-

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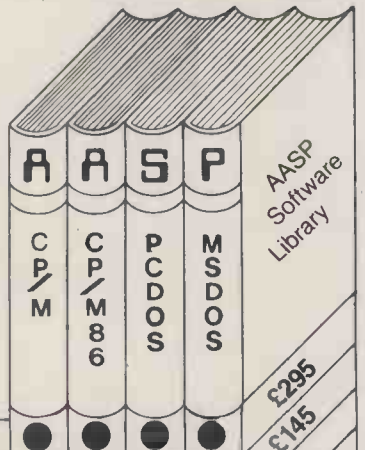


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| **Lattice C** | Well respected version of C Language | | ● | ● | ● | £390 |
| **VAT Analysis** | Calculates VAT for Retailers | ● | | ● | ● | £300 |
| **BSTAM** | Transfers files between micros | ● | ● | ● | ● | £140 |
| **X25 Pad** | Connects IBM PC to world wide packet switched networks | | | ● | | £750 |

tion, disk control and printer connection. The AT does rather better than the PC by having eight full-length slots.

The main difference between the two machines is that where the PC has an 8-bit data bus and limited memory addressing, the AT has a 16-bit data bus and a 24-bit address bus. This means that if you want to take full advantage of the AT's architecture, you need extra lines for the expansion cards.

IBM gets around this problem by giving each slot a PC-compatible socket and a 36-way socket to take the extra data and address lines. This means that the AT will work both with custom-designed cards and most PC cards.

The expansion cage in the review machine was occupied by four cards: a disk controller, two serial/printer cards and a colour graphics card.

The disk controller card is the only one of the three to make use of the extra socket. This is a new custom-designed unit which controls the high capacity floppy, PC-compatible floppy and the hard disk. The card fitted to the review machine was obviously an early version and had a couple of patches fitted.

The two serial/printer cards are used to connect remote terminals to the main unit. Each card houses a standard (for IBM) 25-way D plug for connecting a parallel printer and a 9-way D plug for the RS232 line. The 9-way RS232 line is a bad idea. It seems that whenever IBM comes across something that everyone else uses as a standard, it changes it. It happened on the PC with the parallel printer port and now IBM has done it to the RS232 connection. Everyone else uses a 25-way D plug, so why use a 9-way version?

Interestingly, according to IBM, the maximum number of remote terminals that can be connected is two. At the launch it was said that this was due to a hardware limitation. I have a feeling it has more to do with IBM not wanting to compete with products higher up in its range.

The PC keyboard certainly evoked strong reactions when it was released. You either loved it or you hated it. I rated it as the best keyboard I had ever used until I tried the keyboard on the AT.

The AT keyboard is similar to the PC unit. It's connected to the main unit by an extra long coiled cable, which allows it to be used a fair distance away from the main unit if necessary. Like the PC unit, it has two legs which can be flipped down to alter the typing angle.

A total of 84 keys are divided into three main areas. The main qwerty typing section is in the middle, with 10 function keys set down the left-hand side and numeric pad/editing keys to the right. The feel of the keys is just the same as on the PC — firm, sharp and beautifully positive.

A great deal of criticism was levelled at the layout of the PC keyboard. IBM seems to have taken note of this and rectified it on the AT.

One of the major criticisms was that the RETURN key was too small and difficult to find. The AT has a RETURN key so large that anyone could find it. The shift keys get similar treatment. Another criticism was that there was no gap between the function keys and the typing area, and between the typing area and the numeric keypad. The gaps are there now. Finally, there was no indication on the PC keyboard that CAPS LOCK or NUM LOCK had been selected. Now there is a bank of three LEDs in the keyboard to indicate CAPS LOCK, NUM LOCK and SCROLL LOCK.

It is not all good news though. A major criticism of the PC keyboard was that the cursor control keys doubled up with the numeric keys and invariably the wrong mode was selected. Unfortunately this is still the case with the AT.

Worse than that is what IBM has done with the ESCAPE key, which usually lives somewhere in the top left of the keyboard. IBM has put it in the numeric keypad on the right-hand side of the keyboard. This makes life difficult for anyone used to running Lotus 1-2-3 *et al* which make heavy use of ESCAPE. Having said that, the AT keyboard is still a vast improvement on the PC keyboard and now rates as my favourite keyboard on any micro.

The display on the AT is standard IBM, just the same as the PC. That means that you get an acceptable monochrome display and a downright horrible colour display unless you want to pay for a third party display card that may or may not work in the AT.

The review machine was supplied with the same IBM colour monitor as supplied with the PC. The trouble with this monitor is that it doesn't tilt and only swivels if you pick it up and put it down facing in a different direction.

## System software

With the introduction of the AT, the IBM system software scene is starting to look rather muddled. The AT will be offered with a choice of two operating systems, PC-DOS Version 3 and Xenix.

PC-DOS Version 3 is the latest updated version of the PC-DOS single-user operating system which was originally on the PC. Xenix is Microsoft's adaptation of AT&T's Unix multi-user operating system. In addition, a special single-user version of Xenix called PC/IX will be made available for the PC. However, PC-DOS Version 3 won't run on the PC, so it stays with PC-DOS Version 2.11.

Xenix won't be available for the AT until next year, so the review machine was tested in single-user mode running PC-DOS Version 3.

When you switch on the AT it goes through its self-test routine in much the same way as the PC; the only difference being that it's thankfully much quicker. It then goes on to boot DOS and ask for the date and time in the same way as the PC — only this time you take the defaults because the AT has a battery-backed clock/calendar built-in.

The 80286 processor in the AT is capable of operating in two modes: either compatibility or protected mode. In compatibility mode it emulates an 8088 processor so that programs written for the 8088 will run. In protected mode, the processor offers an extended instruction set along with some very comprehensive memory management features designed for use in multi-user/concurrent processing applications.

DOS 3 works in compatibility mode and limits user memory to 640k. This means that even though you can physically expand your AT to 3Mbytes, your program can only access 640k. The rest will have to be used as RamDisk.

To all intents and purposes DOS 3 is just the same as DOS 2.11 with a few bits rewritten to take advantage of the new architecture on the AT. The user image is exactly the same as DOS 2.11. It looks very much as if IBM and Microsoft have done as little as possible to get PC-DOS up on the AT, which may not have been such a good move. Digital Research is about to release its 80286 version of Concurrent CP/M, and the signs are that it will make full use of the processor as well as offer PC-DOS emulation and a multi-user option. If I were a prospective AT owner I'd give Concurrent CP/M a very close look.

The only interesting features I found with DOS 3 on the AT were a couple of utilities which I've seen elsewhere — but not on IBMs. They are a RamDisk manager and a prompt utility.

The RamDisk utility is called VDISK.SYS and is used to set aside an area of RAM as a virtual disk; the advantage being that you can treat the virtual disk in the same way as you would a normal disk, except that the access time is extremely fast.

To set aside a RamDisk you add an entry calling VDISK.SYS in the CONFIG.SYS configuration file. For example, an

### Benchmarks

| | |
|---|---|
| BM1 | 0.8 |
| BM2 | 2.2 |
| BM3 | 4.9 |
| BM4 | 5.1 |
| BM5 | 5.6 |
| BM6 | 9.4 |
| BM7 | 15.0 |
| BM8 | 13.9 |
| Average | 7.1 |

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

entry in CONFIG.SYS such as 'device = vdisk.sys 256 512 64' would mean that every time the system was booted up, a 256k Ram Disk would be set aside with a phantom 512 sectors and up to 64 directory entries.

The other *new* utility is called 'Prompt'. This is very like a similar utility found in Unix which allows you to alter the system prompt. For example, if you were fed up with the system showing 'A>', you could type 'PROMPT GET LOST' and the system would use 'Get Lost' instead of the default prompt. It's fun for five minutes but wears thin after that. Just out of interest I tried booting my PC system disk with PC-DOS Version 2 on the AT. It booted with no problem and even ran applications, but it couldn't recognise the hard disk.

## Applications software

Applications software — there's the rub. The obvious use for the AT is as a small multi-user machine. In this role IBM's favoured operating system is Xenix. The problem is that there's not yet a great deal of good multi-user applications software on the market but no doubt this will change. Such is the pulling power of IBM that software houses will be falling over themselves backwards to convert their software to multi-user. This will take time, but IBM is giving them some lead time by not releasing Xenix officially until 1985.

There are no such problems with PC-DOS, thousands of programs are available for the PC. The only question is: will they run on the AT? The answer is that you can never be totally sure, but it seems that the majority of popular programs will run out of the box. IBM is giving technical assistance to software houses who have to re-write.

I had a go with Flight Simulator on the AT and it wouldn't run. The reason for this isn't clear as it got very close to running and only failed when it tried to load in the scenery from the disk.

IBM has been very thorough in trying to assist with getting applications software over from the PC. Two of the user manuals supplied with the machine were devoted to giving instructions on how to install specific programs on the AT.

A look at the Benchmark timings shows that the AT is fast, but perhaps not quite as fast as one would have expected. Remember that the AT has the brand new 80286 super processor and that the review machine was also equipped with the 80287 maths co-processor. Even with all this it only came out fractionally faster than the Olivetti M24 with a humble 8086 and no maths chip.

The reasons for this are varied. Firstly, Basica makes no use of the 80287, so it might as well have not been fitted; and secondly, Basica is an 8-bit Basic and is not optimised for this processor. Even so, it's an interesting comparison because the Olivetti's GWBasic is an 8-bit Basic . . .

## In perspective

The AT sits comfortably above IBM's current range of PCs. Although it can be used as a single user machine, its main role will be as a small multi-user unit with a couple of remote terminals added on to the base unit. The only possible conflict would have been the base model AT competing with the PC XT; IBM got over this potential problem by cutting the price of PC XTs.

The base model AT with 256k of RAM and a 1.2Mbyte floppy drive can be had for less than £3000. However, I think it's likely that most AT users will go for the 512k RAM, 20Mbytes disk version for £4300. This is the minimum configuration with which you can do any serious multi-user work.

The fact that the AT was going to be based on the Intel 80286 chip wasn't a particularly well-kept secret. Consequently the flow of AT 'think-alikes' has already started and is likely to continue in much the same way as the PC look-alike market. Most of these products will either give superior performance or be priced lower than the AT.

As with the PC, the people who know what they are doing will probably be able to get better price/performance elsewhere, but other users are likely to buy it regardless.

## Technical specifications

| | |
|---|---|
| Processor: | Intel 80286 running at 6MHz |
| ROM: | 64k |
| RAM: | 256k expandable to 3Mbytes |
| Mass storage: | 20 or 40Mbytes hard disk, 360 or 1.2Mbytes floppy disks |
| Keyboard: | 84 keys |
| Size: | 6.5 × 21.25 × 17ins |
| Weight: | 42lb |
| I/O: | Eight extended PC compatible slots |
| DOS: | PC-DOS Version 3, AT Xenix |

## Documentation

What is the world coming to when IBM documentation sprouts yellow cartoon birds saying how nice DOS.3 is?

Luckily the bird has so far only managed to penetrate the noddy guide to DOS supplied with the machine. Let's hope it gets no further! As a rule IBM manuals are well laid out and easy to understand, and don't need the 'Gee-Whizz' style.

The AT was supplied with three other manuals: the *Set Up Guide*, *Guide to Operations* and the *Applications Installation Guide*. The DOS reference manual wasn't available, so I can't comment on it. However, the others were of standard IBM quality: good use of two-colour printing, plenty of diagrams and easy to follow.

## Prices

The basic AT with 256k of RAM and 1 × 1.2Mbyte floppy disk drive will set you back £2951. I doubt that many people will buy this model. It's more likely that they'll go for the expanded version with 512k of RAM, a 20Mbytes hard disk and a 1.2Mbyte floppy drive. This will set you back £4281.

## Conclusion

I found nothing to dislike about the AT and quite a lot to like. The 1.2Mbyte disk drive is interesting, but I'm not sure how useful it is in a machine which already has a hard disk. It makes backups easier but not *that* much easier — I'd still go for a high capacity tape streamer. It would be of much more use in the PC, but the disk controller card won't work there.

DOS.3 is a disappointment. I was hoping IBM would take the opportunity to improve the operating system, but it hasn't made full use of the main processor's facilities.

As far as Xenix goes, it will be a while before it's launched and even longer before decent software is available. I think a long look should be given to the 286 version of Concurrent CP/M. Assuming Digital Research doesn't make any major *faux pas*, it could have a great deal to commend it to the AT user.

The AT doesn't look like good value as a general purpose single user machine, nor was it so designed. But as a small multi-user system or as part of IBM's new micro LAN it begins to look much better. Perhaps even good value.

The IBM PC AT is a good solid product, just as you would expect from IBM. It nods towards innovation by using a new chip and a high capacity disk drive, but on the whole sticks with what IBM stands for — good solid conservative technology that sells by the bucket-full.

*Thanks to IBM dealer Silicon Valley for supplying the review machine.* END

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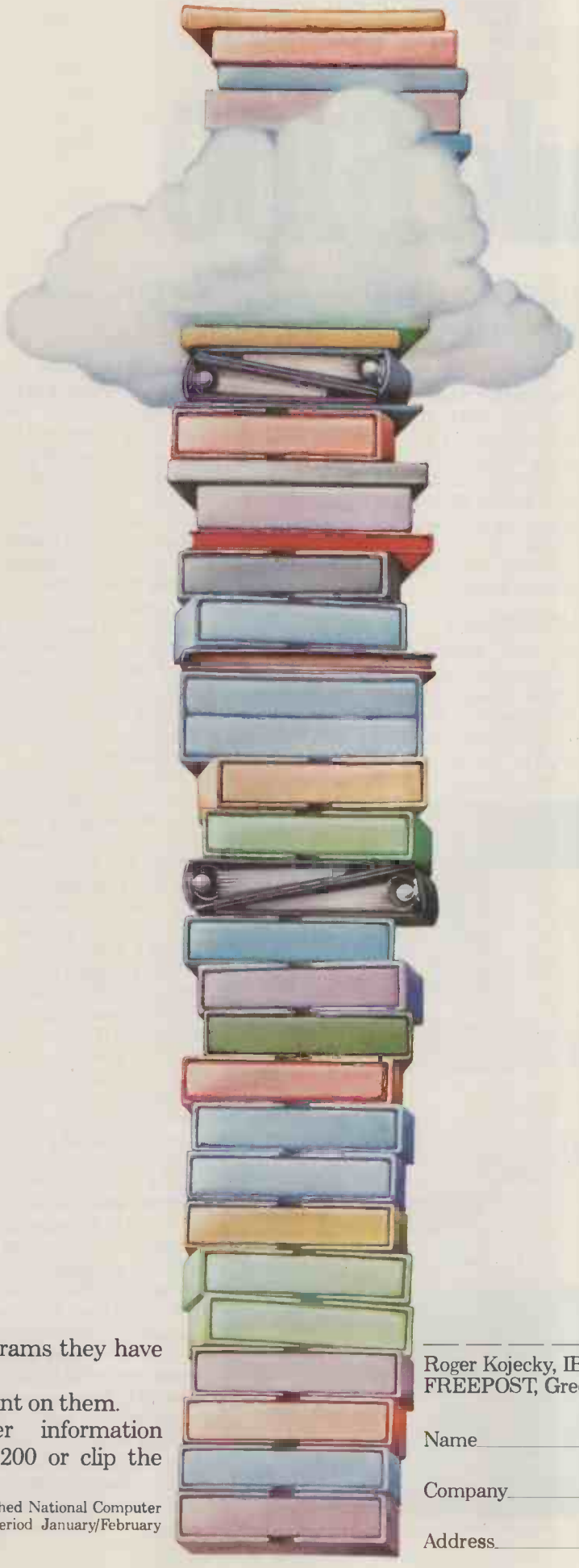

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# Juki 6100

*Simon Craven looks at the Juki 6100, an inexpensive, letter-quality daisywheel printer, and is suitably impressed.*

There's never been a better time to buy a computer printer but, paradoxically, choosing which one to go for has never been more difficult. The latest round of price reductions has brought daisywheel printers down to a level previously occupied by draft-quality, dot matrix types, so the main criterion for selecting something suitable for your particular application is the kind of compromise you are prepared to strike between speed and print quality.

The Juki 6100 certainly offers excellent print quality for a £370 unit, but the *other* price you pay is a speed of only 18 characters per second. A £370 dot-matrix printer can be expected to zip along at up to 100cps, dropping to about half that figure in a double-strike 'correspondence quality' mode.

Whether this is important to you depends mainly on the length of your printing tasks. The Juki comes into its own for letters, when the delay is never long enough to be irritating. However, with an article of 2000 words or more, the speed differential is more noticeable: the Juki takes about 12 minutes to stutter it out, against two and a half minutes for a typical mid-range dot-matrix printer.

## Hardware

If your desire to see fully-formed characters marching crisply across the page overrides your impatience, then the Juki 6100 has much to recommend it. Daisywheel printers are traditionally bulky, heavy pieces of equipment which threaten to shake the house down when they burst into *staccato* action; the Juki breaks with that line of development. Its overall dimensions are 20.5 × 5.9 × 14.2ins, making it a sensible choice if you want your computer system to leave a couple of square inches free on your desk top. This is about six inches wider and two inches deeper than an Epson FX80 dot matrix printer, but a couple of inches smaller in those same dimensions than the main daisywheel rivals.

Nor will you need to weld bracing struts to the furniture before putting your new 'toy' online. It weighs in at 27lb — about 10lb less than much of the competition — and the low weight of the moving parts keeps vibration at acceptable levels.

Noise is frequently the Achilles' heel of a daisywheel printer, but I found the Juki subjectively less irritating than an Epson FX80. Although the noise continues for a longer period than a dot matrix type, being much lower pitched the irregular beat of the daisywheel is less annoying than the predictable scream of the Epson.

The physical design of the printer is very thoughtful. An injection-moulded plastic case keeps the internals free of dust, and the dust cover-*cum*-acoustic muffler is engraved with typescales for the three type pitches (10, 12 and 15) which the Juki can produce. All the controls are easy to reach, and include two platen knobs instead of the one that many printer manufacturers provide.

The front-mounted control panel is slightly unusual. A small slider control is an immediate attention-grabber: it allows you to change the pitch setting without sending special codes through software or fiddling about with internal DIP switches. But you can't change horses in mid-stream: once it has been moved to a new position, the printer must be turned off and then on again to reset it to the new parameters.

WordStar users, indeed, anyone whose word processor allows the use of an alternative character set, can still use software control to alternate between, say, 10-pitch and 12-pitch.

There are three ZX81-style touch-sensitive keys to the right of the slider, but instead of the normal Line Feed, Form Feed and On Line/Off Line toggle, you get separate keys for Off Line (here marked Pause) and On Line (marked Reset). The Form Feed function remains, but Line Feed is not present.

One of the most inconvenient aspects of many printers is gaining access to the DIP switches, but the Juki is definitely superior in this respect. All you have to do is pull off the top part of the case and a single bank of switches is revealed — no screws to undo, no need to remove the ribbon nor the paper. It is, however, a good idea to switch off the power before you get stuck in!

The functions of the switches themselves are straightforward enough. Switch 1 determines whether or not a carriage return should automatically imply a line feed, and switches 4 to 6 are used in various combinations to select one of the eight international character sets available. Switch 7 distinguishes between continuous stationery and single sheets, 8 gives two choices of form length, and 9 provides two options for the spacing between lines.

So far, so conventional, but switches 2 and 3 offer a little more of interest. Switch 2 selects one of two levels of daisywheel impact. In my case, the lower intensity setting proved more than adequate for normal use, and probably reduced wear and tear on the plastic daisywheel supplied, but if you want to produce a clear impression through weighty wads of carbon paper then you can turn the power up.

Switch 3 is aimed at users of the IBM PC. The PC has a couple of idiosyncratic tricks up its sleeve, including a habit of cutting off diplomatic relations with any peripheral it hasn't heard from for a while. If a signal is not received from the peripheral, be it a modem, printer or plotter, then the communications channel is closed after a certain period of time. This can cause problems with parallel printers, as the PC gets impatient when it fills the Juki's 2k buffer and can't send any more data.

A couple of software patches are recommended in the manual. Setting switch 3 to ON sets the scene by selecting the appropriate mode for the buffer's data processing.

## Setting up

Hooking up your computer to a Juki 6100 is unlikely to cause too many problems. The standard parallel interface, using an ordinary Amphenol connecter, can be supplemented by an RS232 serial interface at extra cost. The codes which turn on and off various features such as underlining, shadow, bold and double printing, as well as superscripts and subscripts, have been made identical to those used by the Diablo 630. Any piece of software which includes a printer installation menu is likely to include a driver suitable for the Juki.

This compatibility with convenient standards also extends to the ribbon, which is like that of an IBM Selectric typewriter. Supply of single-pass carbon ribbons and the more durable multi-strike cloth ribbons is unlikely to cause any headaches. Using single-pass carbon ribbons makes the print quality especially crisp and clear, but the traditional drawback is the need to buy a replacement ribbon at short intervals. The 6100 does a very good job at squeezing the most out of its ribbons, striking each bit of the ribbon in three vertically arranged tracks. The ribbon life is 160,000 characters, or about 27,000 words, although the multi-strike cloth alternatives should be good for at least 100,000 words before the print becomes faint.

The advantage of a cloth ribbon is not the decrease in running costs, of course — it's the progressive way the ribbon wears out. If you stick to carbon ribbons the time will come when, say, it's eleven o'clock on Sunday evening and your last ribbon runs out in the middle of printing a 12-page report which has to be on somebody else's desk by nine o'clock the next morning. If you have a cloth ribbon, you can always squeeze a few more pages of print out of it, even if the quality isn't everything you might have hoped for.

*'Hooking up your computer to a Juki 6100 is unlikely to cause too many problems. The standard parallel interface, using an ordinary Amphenol connecter, can be supplemented by an RS232 serial interface at extra cost.'*

The other major consumable with a daisywheel printer is the daisywheel itself. Plastic wheels like the one supplied with the printer have a low initial cost, but in the long-run their higher rate of wear makes them less economical than metal wheels. The daisywheels used are compatible with those used on Triumph-Adler machines, so there should be no difficulty in getting hold of your required typeface.

## Documentation

The unusually high quality of the documentation which accompanies the Juki 6100 is a powerful incentive for selecting this product over some of the alternatives. In an ideal world, all computers, software and peripherals would come with a manual this good.

All the usual information is supplied in a clear and concise format, and the well-designed contents pages make it easy to get straight to whatever snippet you are looking for. There's also a decent index — a feature noticeable by its absence on too many computer products. It's all beautifully written, with a noticeable American idiom which manages not to get in the way of the information, and never skimps on the well-presented technical information. The design is clear and entertaining, with numerous cartoons injecting a little levity into what could too easily become a dull subject.

What makes the documentation stand out in terms of content as well as presentation is a series of chapters devoted to interfacing the Juki to the most popular personal computers, and the most likely choices of word processing software for those systems.

The computers covered are the IBM PC, Apple II family, Kaypro II, Osborne 1 and TRS-80 Model III. The software featured is mainly the relevant versions of WordStar, although Perfect Writer also puts in an appearance and the Tandy chapter goes into Superscript. The explanations of how to get the most from your system even suggest using DEBUG.COM to patch your WordStar program files.

## Optional extras

Optional extras for the 6100 include a continuous stationery tractor-feed device with an accompanying end-of-paper detector. Another possible enhancement is the expansion of the 2k static RAM print buffer to 8k, just by plugging in 2k RAM chips until the desired capacity is reached. A list of compatible memory chips is given in the manual, along with full fitting instructions.

The latest offering from Juki is the larger 6300. This is a rather more conventional device than the 6100, and provides a much wider carriage and significantly higher speed. Unfortunately the example borrowed was not complete with documentation so a full evaluation was impossible, but initial impressions were of a solid, well-engineered machine which nevertheless lacks some of the 6100's thoughtful touches. For example, the external control for pitch setting has been replaced by a combination of internal DIP switches, and the typescales on the platen cover have been omitted. The print quality was very good, though, and I was impressed by the low noise of the printer.

## Conclusion

Overall I was very pleased with the Juki 6100. With the prices of this class of product falling steadily it's difficult to make specific recommendations about the value for money offered by various competitors, but operationally the Juki is extremely competent with no noticeable weak spots.

If you are in the market for a low-cost letter-quality printer, I can foresee few grounds for dissatisfaction with the 6100. END

# Play it again, Beeb

*Good quality, multi-channel sound is one of the many advantages of the BBC Micro, but playing Bach on a qwerty keyboard is a pianist's nightmare. Richard Tomlinson tells you how to build your own electronic keyboard from easily obtainable parts.*

The four sound channels on the BBC Micro produce an imaginative range of effects over five octaves. Sounds from buzzes and beeps to multi-voice melodies can be coaxed from the sound generator, but most games on the market settle for zaps and pings which don't do justice to the micro's full potential.

Our keyboard uses the BBC's 12-bit analogue to digital converter (ADC). The keyboard's internal resistor chain is simply a potential divider arranged so that when a key on the keyboard is pressed the resistance chain is electrically divided and the computer calculates which key is being pressed by the amount of current being fed into the ADC. (This contrasts with the operation of a qwerty keyboard, where each keypress generates an ASCII code corresponding to a character in the ROM or user-defined character set).

## Naming of parts

All the parts needed for the project, with the exception of the wood glue and double-sided tape, are available from Maplin. The keyboard used on the prototype is the XB15RM a 49 note C to C keyboard, although a cheaper version (ref XB17T), which is not as deep front to back, can be used just as well. Keyboards with fewer or more keys can also be used and will require modifications to the test program (see below).

Forty-nine GJ keyboard contact blocks are needed to go with the keyboard. Each of these is a single pole changeover switch which is activated by depression of the lever arm. When the keyboard has been constructed these lever arms are depressed by the key plungers. The keyboard contact blocks are stuck onto four SRBP mounting strips.

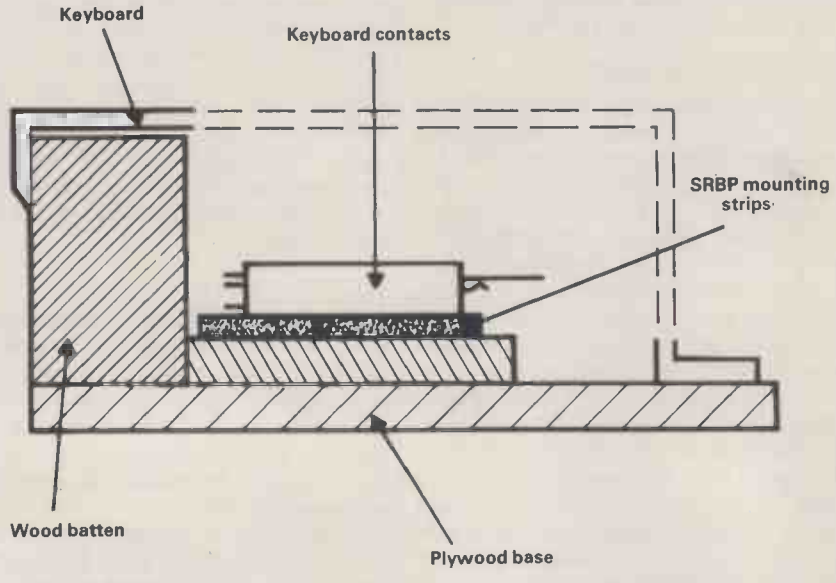


*Fig 1 Assembly*

The potential divider chain is constructed out of one 100k Ohm, one 220 Ohm and 50×100 Ohm resistors. Having designed the keyboard and built the prototype, I discovered that the first and last keys did not produce a steady output, but oscillated in an alarming way. Although the explanation *wasn't* obvious, the solution *was*: a 220 Ohm and a 100 Ohm resistor were added to the beginning and end of the resistor chain respectively. A load had to be put onto the ADC when no keys were being pressed, so a 100k Ohm resistor was added between the VREF and CHANNEL 0 lines in order to keep the ADC at a steady preset value.

Connection between the keyboard and the computer is achieved with three one metre lengths of flexible cable connected to a 15-way D-type plug. About 1.5 metres of light duty connecting wire will be required to join one pin of every contact block together. For the termination of wires a terminal block (HF01B) is used.

The base of the unit is formed from a sheet of ¼" (minimum) plywood 2'2" by the depth of the keyboard (in the case of the XB15R). To raise the contact blocks a piece of ¼"×2"×2'4" is also needed. A wooden batten about 2'4" long supports the keyboard (see Fig 1). Wood glue, a strong adhesive such as Araldite and double-sided tape (carpet tape) are the other essential ingredients.

## Assembly

Glue and screw the smallest side of the wooden batten onto the edge of the plywood base. Screw the keyboard hinge onto the batten as in Fig 1, and glue down the thin strip of plywood on the base next to the batten.

Stick the mounting strips temporarily to the small strip of plywood with a modest amount of double-sided tape, so that the mounting strips can be

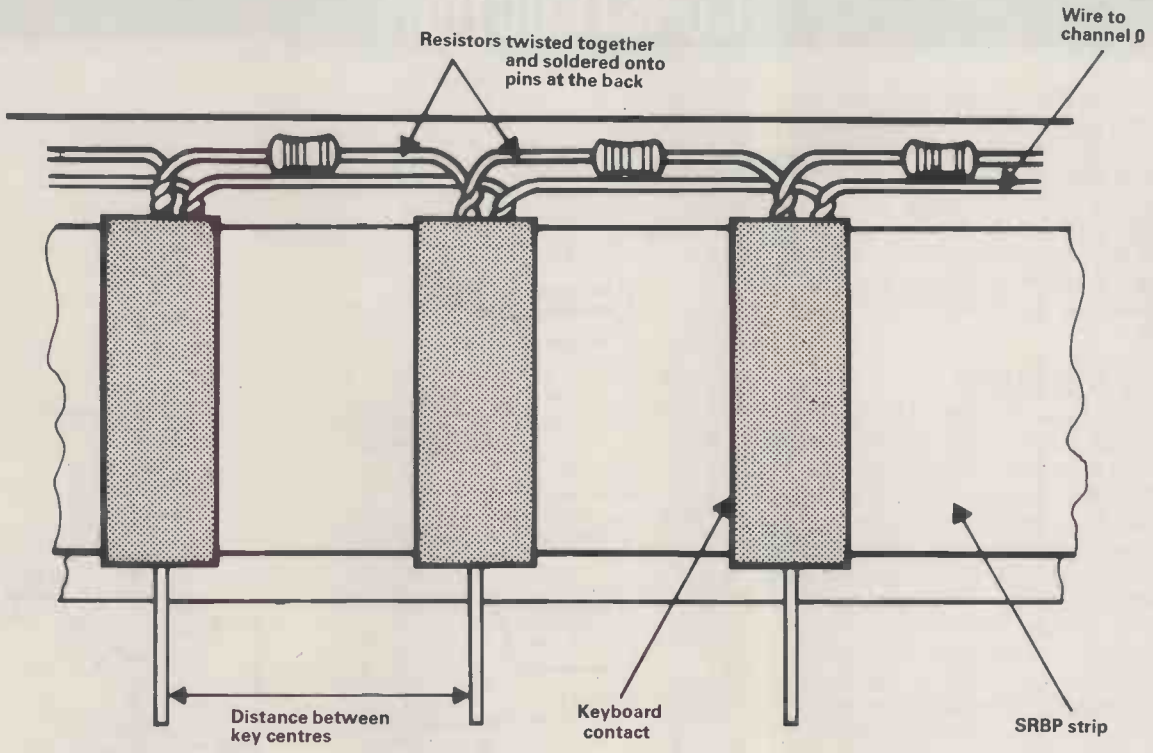


*Fig 2 Positioning of resistors*

removed after alignment of the contact blocks. Place each keyboard contact on the mounting strips, taking care to centre the contact arm under the keyboard plunger (Figs 1 & 2) and mark off the position. After all the positions have been marked, remove the mounting strips and glue the keyboard contacts to the mounting strip using a strong adhesive.

Join the 100 Ohm resistor legs by twisting and soldering them together. The spacing of the resistors *must* be as shown in Fig 2. The resistor legs can then be cut back to the length shown in Fig 2 and the chain soldered into place. (Other methods were tried but this proved to be the most convenient!). All the keyboard contacts must then be connected to channel 0 (Fig 3). This is achieved by soldering a long connecting wire to one of the pins on each contact block (Fig 2). Only two of the three pins on each block are used, making them function as on/off switches (Fig 4). The three flexible wires are terminated at the keyboard end by the use of the terminal block.

Once the wires, resistors and resistor chain have been connected to the

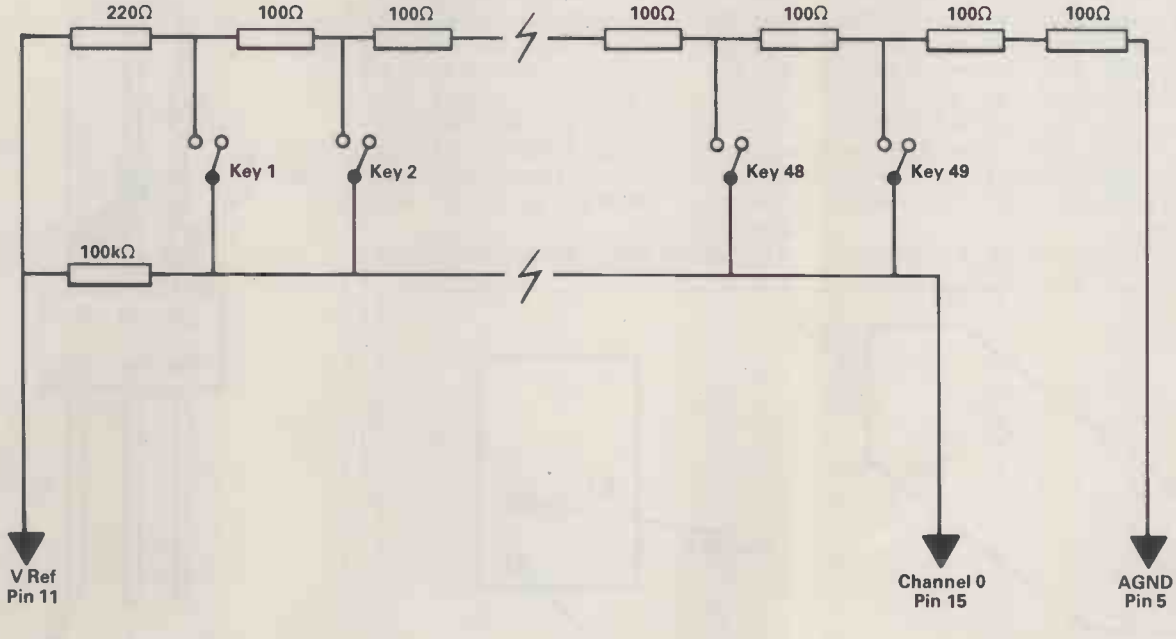


*Fig 3 Connecting keyboard contacts to channel 0*

terminal block, the block is screwed to the wooden base, inside the keyboard. Make sure that no bare wires or resistor legs touch the metal surface of the keyboard. The 15-way plug is now connected to the three flexible wires which run from the keyboard to the ADC as follows: channel 0 wire to pin 15, AGND wire to pin 5 and VREF wire to pin 11 (Fig 5).

## *Testing the board*

The test program (Listing 1 & Fig 7) allows you to solve any problems that might have occurred during construction of the board. If an alternative board (see below) has been used, only minor changes will be necessary. Once the board is fully operational it can be used as a keyboard instrument capable of generating a wide variety of sounds from an organ to bagpipes, from one channel sound to simple additive (Fourier) synthesis. The board can also be used (with minor modifications to the test program) as a device for writing music into other programs. Most schools nowadays have at least one BBC B, so by expanding the program the board can take its place in the school orchestra as an organ/synthesiser or in the music department as a teaching aid.

To make the board compete with other keyboards, accompaniment must be incorporated into the program (Fig 6). There are two types of accompaniment, real time and step time. Real time is where the accompaniment is played back exactly as it was played in (mistakes and all!). Step time is where all the notes have the same duration, which is changed by the speed of the tempo.

To keep the key response quick, the program must regularly call a procedure to keep updating the accompaniment. The test program can be used with the addition of a few procedure calls. Where there is a loop, which could last for a long time, (line 190 for example) a procedure call should be placed between the REPEAT and UNTIL commands.

When the sound buffer is full and a sound command is executed, the program will pause until there is space in the buffer for the command. If this happens when the keyboard is being used, then the board will go 'dead' for a short period of time. Therefore, when a procedure is called to update the accompaniment, the sound buffer must be checked for space. If there is no space the computer must return from the procedure without updating the accompaniment.

Pitch and duration are needed for real

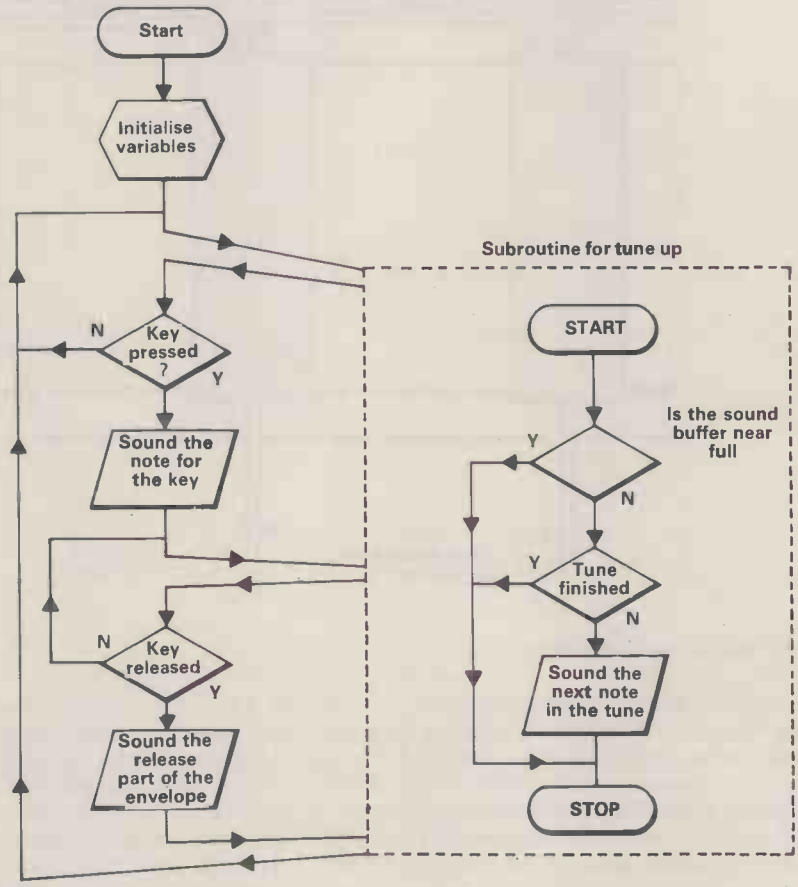


*Fig 6 Modifying the test program to enable accompaniment*

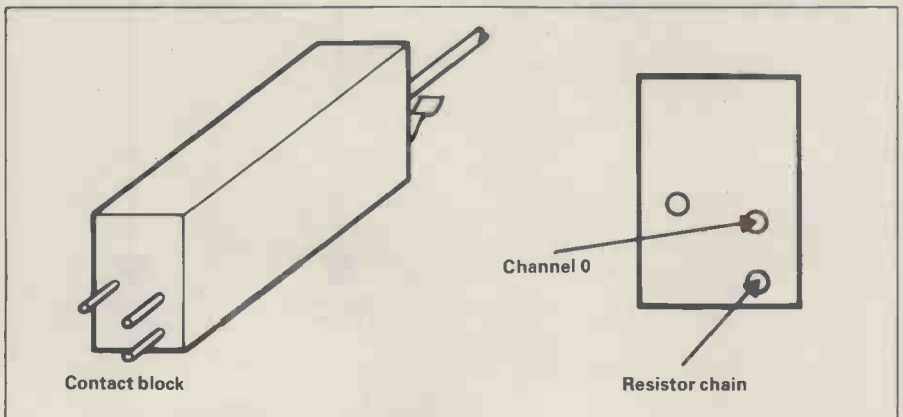


*Fig 4 Two pins function as on/off switches*

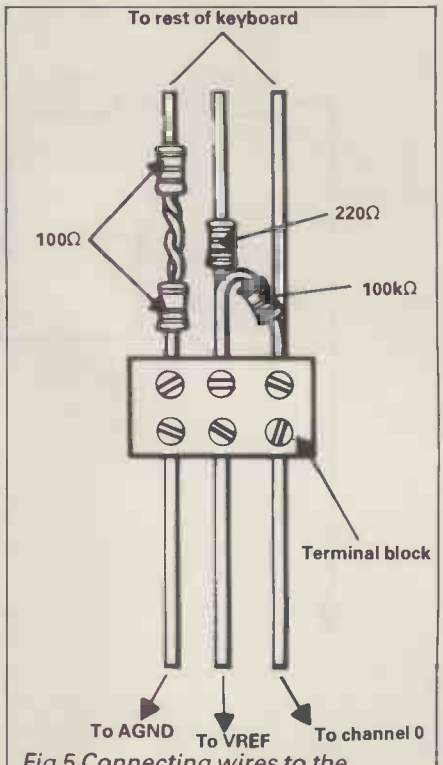


*Fig 5 Connecting wires to the 15-way plug*

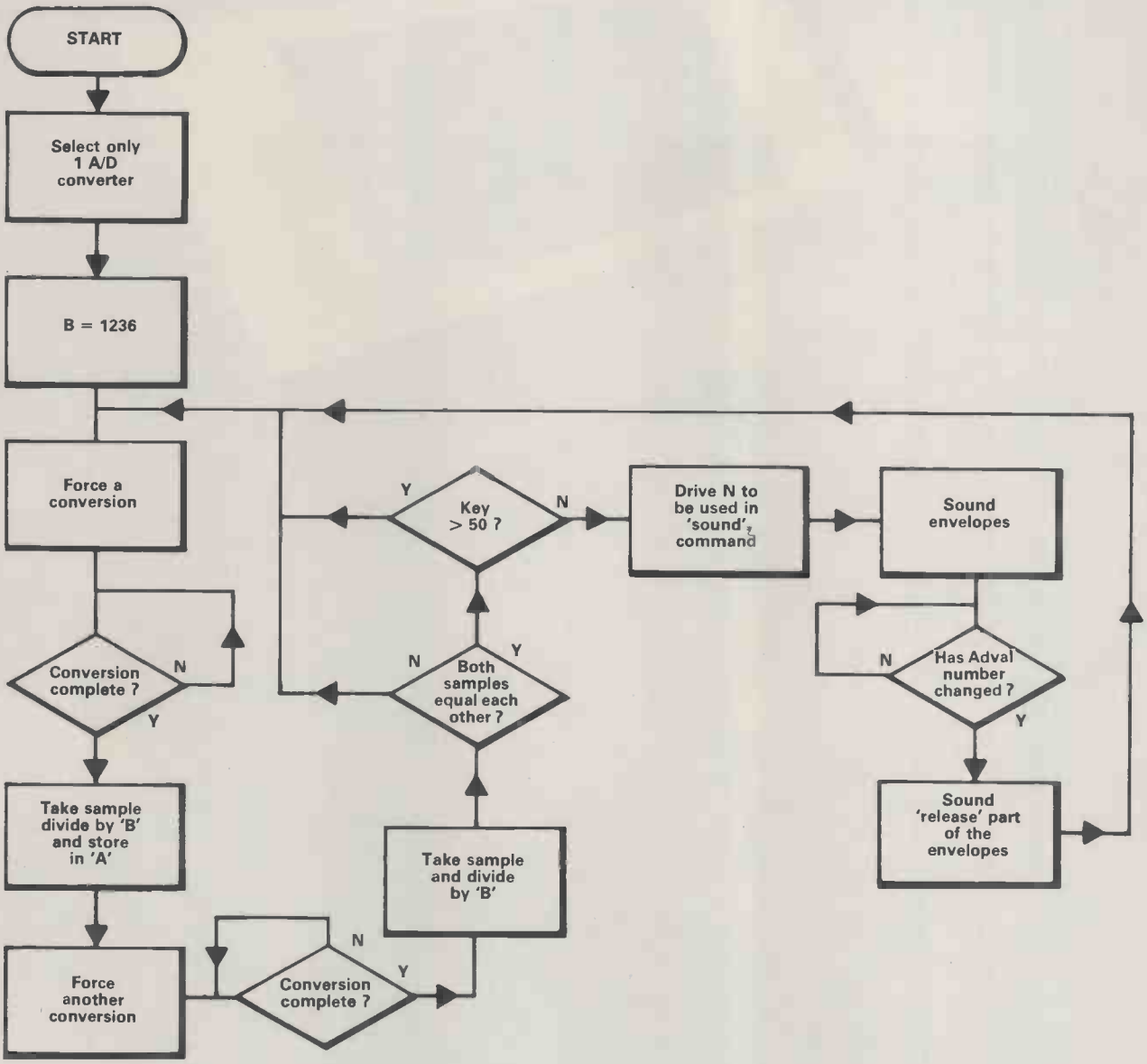


*Fig 7 Test Program*

time accompaniments; when recording the TIME command is used to time the length of the notes and through a small equation the value for the sound command may be found. A value of zero for the pitch could be used to indicate a pause. The computer could then SOUND & 100 channel, envelope, 0,duration. This would sound the release part of the envelope and a pause for the duration indicated. To indicate the end of the accompaniment a value of 255 can be used. Two bytes per note are needed for real time and only one byte (pitch) for step time. The values can either be stored in a DIM array or be directly poked into memory.

*Keyboard adaptation notes:* you can use keyboards other than the Maplin versions mentioned here but you'll need to make a few modifications to the test program. Lines 70 and 150 will need to be changed. The value for B in line 70 will have to be found by a little experimentation. The value 48 in line 150 will also need to be modified. If your keyboard isn't a C to C one — that is, if the first note isn't a C, then the +5 will need to be changed to a number corresponding with the musical value of the first key (see the SOUND command in the *BBC User Guide*). END

```
 10 REM *** *** *** *** *** *** *** ***
 20 REM
 30 REM       (C) R.TOMLINSON 1984
 40 REM
 50 REM *** *** *** *** *** *** *** ***
 60 *FX 16,1
 70 B=1236
 80 ENVELOPE 1,1,0,0,0,0,0,0,63,43,0,-63,63,126
 90 REPEAT
100 *FX 17,1
110 REPEAT UNTIL ADVAL(0) DIV 256=1:A=ADVAL(1) DIV B
120 *FX 17,1
130 REPEAT UNTIL ADVAL(0) DIV 256=1:IF ADVAL(1) DIV B<>A THEN 110
140 IF A>50 THEN 110
150 SO=(4*(48-(A-2)))+5
160 SOUND&1,1,SO,-1
170 SOUND&2,1,SO,-1
180 SOUND&3,1,SO,-1
190 REPEAT UNTIL ADVAL(1) DIV B<>A
200 SOUND&1001,1,0,-1
210 SOUND&1002,1,0,-1
220 SOUND&1003,1,0,-1
230 UNTIL FALSE
240 REM
250 REM
260 REM *** *** *** PIANO *** *** ***
270 ENVELOPE 1,1,0,0,0,1,1,1,127,-1,-1,-1,126,1
280 REM
290 REM
300 REM *** *** *** VIBRA *** *** ***
310 ENVELOPE 1,3,1,-1,1,1,2,1,75,0,0,-75,126,126
320 REM
330 REM
```

*Listing 1 Keyboard test program*

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# Caught in a trap

*The 'cascading IF syndrome' can plague Microsoft Basic programmers struggling with the problems of data validation. Ron Yuen has the cure.*

Many programmers never use the error trapping features available in Microsoft Basic. Others may not even realise why they exist, and what can and cannot be done with them. So for all you that haven't used them or don't, here are some useful ideas.

The standard reason as to why the command
ON ERROR GOTO <line number>
exists is usually *to enable errors to be dealt with by the program* — as opposed to letting it crash as would otherwise happen. This is very true but not very informative. What sort of errors? Logic, data, input, disk and catastrophic errors are all common.

In my view, it's better to look on the command as a powerful aid to *verification* and *validation* techniques.

Microsoft Basic, in the Extended and Disk versions (as used under CP/M, for instance), can recognise 47 different error conditions. When a program is running and an error condition is detected by the interpreter (or compiler run-time module), an appropriate code number is allocated to the reserved function ERR, the line number generating the error is stored in another reserved function ERL, and program execution is terminated with the error messages displayed.

If the error happens to be in the program logic, then a crash is what you deserve. On the other hand, many error conditions are generated because information typed in at the keyboard is incorrect or not what the program expects. A good applications program will be able to handle these kind of errors in a controlled way *in-house*, and it's because of this feature that I consider error trapping to be a validation tool.

If an error is detected (some errors can't be trapped) once error trapping has been enabled by the ON ERROR command, control will pass to the specified line number. To get back into the main program a RESUME, RESUME NEXT, or RESUME <line number> command must be issued.

## Error codes

The Microsoft Basic manual describes all 47 error messages in some detail.

Numbers 1 to 30 are mainly errors arising from faulty syntax or bad program logic. However, one or two of them might conceivably arise *on purpose*, and program flow can be redirected if they are detected.

Error codes 50 to 67 inclusive are concerned with various Disk Errors and it is here that error trapping is at its most useful.

To see how things work let's write a rough program outline for a practical problem. In order to keep things simple the program (Listing 1) is written in 'pseudo-MBasic' using occasionally *crude* methods.

The program fragment (Listing 1) deals with a typical situation in business programming, or indeed any file-handling job. Data is read from one file as a result of which (and depending on the data) a second file needs to be accessed to get yet more data. Finally, selected data items from both files are written to a third file.

Ignore the fact that the subroutine at 1500 is inefficient: it illustrates the point very well. Looking at what could (very easily) go wrong with the program, not

```
100  REM ****** Main program ******
120  PRINT "Input name of Data File" ; : INPUT FILENAME. TWO$
140  PRINT "Input name of Report File" ; : INPUT FILENAME. THREE$
160  PRINT "Input name of Code File" ; : INPUT FILENAME. FOUR$
180  GOSUB 1000 ' search the data files
190  STOP ' **********************
1000 REM first subroutine
1010 OPEN "1", 2, FILENAME. TWO$
1020 OPEN "0", 3, FILENAME. THREE$
1030     FOR X = 1 TO 100
1040       INPUT £2, CODE%, INFORMATION$, AMOUNT
1050       GOSUB 1500 ' search for matching name
1070     NEXT X
1080 CLOSE 2
1090 KILL "OLDDATA.BAK"
1100 NAME FILENAME. TWO$ AS "OLDDATA.BAK"
1110 RETURN ' **********************
1500 REM search code/name subroutine
1510 OPEN "I", 4, FILENAME. FOUR$
1520     FOR Y = 1 TO CODE%
1530       INPUT £4, NAME$
1540   NEXT Y
1550 RETURN ' **********************
```

*Listing 1 Main program*

| Line | ERR | Probable reason |
|---|---|---|
| 1010 ) | 53 | Wrong filename typed |
| 1510 ) | | |
| 1020 ) | 61 | Disk is full |
| 1040 ) | | |
| 1530 ) | 67 | Directory is full |
| 1040 ) | 13 | Wrong filename but it exists and records are in a different format<br>Possibly filename is OK but data is corrupted |
| 1100 | 58 | "OLDDATA.BAK" already exists |
| 1010 ) | 62 | Endof file reached and |
| 1510 ) | | data not found |
| 1010 ) | | |
| 1020 ) | 64 | Incorrect filename format |
| 1510 ) | | |

*Fig 1 Potential program problems*

through faulty logic but just from having *bad* data *forced in*, possible sources of problems are shown in Fig 1. Any of these errors will lead to a program crash but they are all easy to trap. ERR 62 is best trapped using the EOF function, and not by the ON ERROR techniques. For example use a line like:
IF EOF(file number) THEN <action>

For the rest the first thing to do is initialise the error trapping routine. The best place to do this is right at the start of the program. In our example simply insert the line:
110 ON ERROR GOTO 2000

Immediately an error is detected the program will jump to line 2000 with the variables ERR and ERL set.

At line 2000 we must insert a routine to correct or ignore the error, as appropriate, and take any necessary action to correct consequential errors.

```
130  WRONG.FILE$ = FILENAME.TWO$      :
     NAME FILENAME.TWO$ AS FILENAME.TWO$
150  WRONG.FILE$ = FILENAME.THREE$    :
     NAME FILENAME.THREE$ AS FILENAME.THREE$
170  WRONG.FILE$ = FILENAME.FOUR$     :
     NAME FILENAME.FOUR$ AS FILENAME.FOUR$
```

*Fig 2*

```
2010  IF  ERR=64
          THEN PRINT WRONG.FILE$;" is in the wrong format ! "; :
               RESUME <ERL-10>
```

*Fig 3*

```
2010  IF  ERR=64
          THEN PRINT WRONG.FILE$;" is in the wrong format ! "; :
               RESUME 2020
2020 ' a re-routing routine for ERR=64
2030   IF  ERL=130 THEN RESUME 120 :
       IF  ERL=150 THEN RESUME 140 :
       IF  ERL=170 THEN RESUME 160 :
```

*Fig 4*

For example, we could start with Listing 2. But this already makes things look very cumbersome. While it's OK as far as it goes—which isn't very far—it's time to rethink.

Firstly, lines 2030 and 2050 are going to have to make fairly complex decisions as to what to do with data already processed and written into FILENAME.THREE$.

Secondly, there is a lot of almost duplicated code in lines 2060 to 2080. Can this be reduced?

Thirdly, we have run smack into a major problem. We are in the middle of an error trapping routine. *We can not trap any errors generated in this section* as all errors detected in an error trapping routine are terminal.

Since we are inputting data in our error trapping routine, we are asking for trouble. As trouble is what we are trying to avoid, different methods must be adopted.

The solution, in principle, is easy. *Trap your errors at source, that is at the moment of first entry into the computer.* This is the first, and most important, law of data processing. Garbage, once admitted, wreaks havoc out of all proportion to the effort required to filter it out in the first place. So, what can be caught at source? The obvious thing to check is if the file name format is correct—and also check to see if the file already exists, otherwise something important might be overwritten.

*Illustration by Chris Winn*

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Let's start again with a clean slate and delete the whole error trapping attempt.

The NAME <old filename> AS <new filename> command can be used to check the file name format. The NAME command demands that <old.filename> exists and that <new.filename> doesn't. If this is not so, then useful ERR messages are generated. Using our example, insert the lines shown in Fig 2.

By introducing a new variable — WRONG.FILE$ — at this stage we can cut down the code needed in our error trapping routine.

Logically we ought to check first for correct file name format (Fig 3).

We are getting tidier, but unfortunately since ERL is a reserved variable we cannot use the syntax RESUME ERL-10 so we have to cheat (Fig 4).

Looks OK? Well, it's not! This is a classic trap for the unwary, perhaps it should be called the 'cascading IF syndrome'.

```
2010  IF  ERR=64
          THEN PRINT WRONG.FILE$;" is in the wrong format ! " :
                IF ERL=130
                  THEN RESUME 120
                  ELSE IF ERL=150
                          THEN RESUME 140
                          ELSE IF ERL=170
                                  THEN RESUME 160
```

*Fig 5*

```
2000  REM ****** Error Trapping ******
2010  IF  (ERR=53) AND (ERL=1010)
          THEN PRINT "Can't find "+FILENAME.TWO$;
                     "Please re-enter "; :
               INPUT ; FILENAME.TWO$ : RESUME
2020  IF  (ERR=53) AND (ERL=1530)
          THEN PRINT "Can't find "+FILENAME.FOUR$;
                     "Please re-enter "; :
               INPUT ; FILENAME.FOUR$ : RESUME
2030  IF  (ERR=61) OR (ERR=67)
          THEN PRINT "No room on the disk ! " :
               PRINT "Insert name of file to delete "; :
               INPUT ; FILE.TO.DELETE$ :
               KILL FILE.TO.DELETE$ : RESUME
2040  IF  (ERR=13) AND (ERL=1040)
          THEN PRINT "Can't recognise this data ! " :
               PRINT "Is ";FILENAME.TWO$;" the right file? ";:
               INPUT(1) ; ANSWER$ :
               IF ANSWER$ = "Y"
                 THEN PRINT "Data is corrupt" : END
               ELSE<get the right filename,
                     correct mistakes so far &
                     resume>
2050  IF  (ERR=13) AND (ERL=1530)
          THEN PRINT "Can't recognise this data ! " :
               PRINT "Is ";FILENAME.FOUR$;" the right file ? ";:
               INPUT (1); ANSWER$:
               IF ANSWER$= "Y"
                 THEN PRINT "Data is corrupt" : END
                 ELSE <get the right filename,
                       correct mistakes so far &
                       resume>
2060  IF  ERR=58 THEN KILL "OLDDATA.BAK"
2070  IF  (ERR=64) AND (ERL=1010)
          THEN PRINT FILENAME.TWO$;" is the wrong format " :
               PRINT "Please re-enter "; :
          INPUT FILENAME.TWO$ : RESUME
2080  IF  (ERR=64) AND (ERL=1020)
          THEN PRINT FILENAME.THREE$;" is the wrong format "
               PRINT "Please re-enter "; :
               INPUT FILENAME.THREE$ : RESUME
2090  IF  (ERR=64) AND (ERL=1510)
          THEN PRINT FILENAME.FOUR$;" is the wrong format " :
               PRINT "Please re-enter "; :
               INPUT FILENAME.FOUR$ : RESUME
```

*Listing 2*

It's not the logic that's at fault but the syntax. What happens is that if the test for the first part of line 2030 fails, then *the rest of the line is ignored.*

The answer is to write each 'IF' test as a separate line, or include the 'ELSE' test and make sure that all the tests are nested correctly. This is the method I prefer, so what we should have written is shown in Fig 5.

If we then get a bad file format typed in we are forced straight back into the input routine, until we have input an acceptable format.

Two of our files are input files and as such it is necessary that they exist. The third file is an output file and if it doesn't exist, then the interpreter will create it for us as line 1020 is executed. This could also lead to a problem as it may result in a file being overwritten accidentally. Fortunately, we already have enough ERR information to avoid this and to check for file existence/duplication.

Note that because of the complexity a GOSUB has been introduced into the error-trap to get a yes/no answer. It will often be necessary to use subroutines in error trapping. Fig 7 shows how to write the program.

Here is an example of the use of the RESUME NEXT syntax. In this case, if we'd answered 'Y' to the overwrite question, then RESUME would have left the program in an infinite loop on the error line, but we have chosen to disregard the error and continue with the next statement.

There is an important point here regarding the use of the GOSUB. Routines that require additional keyboard input should be used sparingly in error trapping. The reason is that once in an ON ERROR routine all subsequent error trapping is disabled, until a RESUME command has been issued. In this case we are only looking for a one character input and so can use INKEY$ with safety. If more complex data needs to be input, then beware! The picture is looking clearer now but we still have to rewrite the sections checking for Disk/Directory full errors and look at the problem of Type Mismatch errors.

To solve the Disk/Directory full problem, it is necessary to give the error routine the capability to delete a disk file to make room. This can be a dangerous thing to do in its own right, so we need to be able to 'protect' important files against erasure.

A simple way to do this is to draw up a list of files that you are *not allowed* to erase, and to compare the erasure request with this list using the INSTR command to search the list (Fig 8) where 2200 is the deletion routine.

We are still not home and dry as END could leave us with files of indeterminate content. In other words the disk

might fill half way through writing the file and we might choose not to delete. If this happens we will have a file — FILENAME.THREE$ but no means of telling how many records have been written. Whether or not this is critical will depend on your application. I would DELETE the partially written file, take a new disk and re-run the whole program.

Why, you may ask, can't you GOSUB 2200? You could, but remember that in an error trapping subroutine, error trapping is disabled . . . we must issue a resume first to re-enable (Listing 3).

```
2020  IF  ERR=53
          THEN IF ERL=150
                  THEN RESUME NEXT
                  ELSE PRINT WRONG.FILE$;
                            " doesn't exist, try again " :
                       IF ERL=130
                         THEN RESUME 120
                         ELSE IF ERL=170
                                 THEN RESUME 160
2030  IF  ERR=58
          THEN IF ERL=150
                  THEN PRINT WRONG.FILE$;
                         "already exists, Overwrite ? "; :
                         GOSUB <get yes/no> :
                         IF <yes>
                           THEN RESUME NEXT
                           ELSE RESUME 140
                  ELSE RESUME NEXT
```

*Fig 6*

```
2100  REM ****** GET YES/NO ******
2110  ANSWER$ = INKEY$ : IF ANSWER$ = "" THEN 2110
2120  ANSWER$ = CHR$(ASC(ANSWER$) AND &H5F) ' upper-case
2130  RETURN
line 2030 then becomes
2030  IF ERR=58
          THEN IF ERL=150
                  THEN PRINT WRONG.FILE$;
                            "already exists, Overwrite ? "; :
                       GOSUB 2100 : IF ANSWER$ = "Y"
                                      THEN RESUME NEXT
                                      ELSE RESUME 140
                  ELSE RESUME NEXT
```

*Fig 7*

```
2040  IF  (ERR=61) OR (ERR=67)
          THEN PRINT "Disk is full. Delete a file ? "; :
               GOSUB 2100 : IF ANSWER$ = "Y"
                               THEN RESUME 2200
                               ELSE END
```

*Fig 8*

## Conclusion

These examples of the right — and wrong — approaches to validation should ease a few programming problems, although the routines obviously still need some work. More importantly, some general points can now be made about error trapping.

Firstly, *always* use a RESUME to get back into the main program or any of its other subroutines. If you are in a subroutine and an error is detected which requires you to RETURN to the main program, then *don't just issue a <return> command*. The command will be obeyed but the whole error trapping system will be disabled, and the subroutine Stack may behave in an unexpected manner. The correct answer is to RESUME at the line number at the end of the subroutine you are in.

Secondly, it's good practice to end all the error trapping tests with the command.

ON ERROR GOTO 0

which will terminate and print any error not allowed for. This then becomes a 'safety-net' to catch errors for which recovery is not possible or practical.

Thirdly, error trapping can quickly degenerate into a spaghetti-like shambles of GOTOs. Since proper structuring is almost impossible to achieve, it pays to keep the traps modular, small and close to the source of trouble, if possible. It may mean duplicating code but it's usually worth it. END

```
2200  REM ****** Delete a file routine ******
2210  OLD.ERL=ERL ' remember original ERL to enable correct return to main program
2220  ON ERROR GOTO 2300
2230  PROTECTED.FILE.LIST$ = "<file1file2 . . . file99>"
2240  PRINT "Input name of file to delete";
2250  INPUT FILE.TO.DELETE$
2260  IF  INSTR(PROTECTED.FILE.LIST$,FILE.TO.DELETE$) > 1
          THEN PRINT "Protected file — try again "; :
               GOTO 2240
2270  KILL FILE.TO.DELETE$
2280  ' now we have to get back to the main program we can't use ERL because we may have generated a new one
       since entering this routine
2290  IF  OLD.ERL=1020
          THEN GOTO 1020
          ELSE IF OLD.ERL=1060
                  THEN GOTO 1060
2300  REM delete a file error trapping
2310  IF  (ERR=53) OR (ERR=64)
          THEN PRINT "No such file — try again "; :
               RESUME 2240.
2320  IF  (ERR=55)
          THEN PRINT "Can't delete that one, try again "; :
```

*Listing 3*

# A SELECTION FROM OUR PRODUCT RANGE

## High Level Languages

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| ADA | Supersoft | ● | | | |
| BASIC INTERPRETER | Microsoft | ● | | ● | ● |
| BASIC COMPILER | Supersoft | | ● | ● | ● |
| BASIC COMPILER V5.3 | Microsoft | ● | | ● | ● |
| BUSINESS BASIC COMPILER | Microsoft | | | ● | ● |
| C COMPILER | Microsoft | | | ● | ● |
| C COMPILER | Supersoft | ● | ● | ● | ● |
| CBASIC | Digital Research | ● | ● | | |
| CBASIC COMPILER | Digital Research | ● | ● | | |
| CIS COBOL | Micro Focus | ● | ● | | |
| COBOL COMPILER | Microsoft | ● | | ● | ● |
| FORTH | Supersoft | ● | | | |
| FORTRAN | Supersoft | ● | | ● | ● |
| FORTRAN COMPILER | Microsoft | ● | | ● | ● |
| LEVEL-2 COBOL | Micro Focus | ● | ● | ● | ● |
| LISP | Supersoft | ● | | | |
| muLISP | Microsoft | ● | | | ● |
| muMATH/muSIMP | Microsoft | ● | | | ● |
| PASCAL COMPILER | Microsoft | | | ● | ● |
| PASCAL MT+ | Digital Research | ● | ● | ● | ● |
| PL/I | Digital Research | ● | ● | ● | ● |

## Low Level Languages

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| MACRO-80 | Microsoft | ● | | | |
| DR ASM + TOOLS | Digital Research | ● | ● | ● | |

## Program Development Tools

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| ANIMATOR | Micro Focus | ● | ● | | |
| BUG | Phoenix Software | ● | | | |
| DISPLAY MANAGER | Digital Research | ● | ● | | |
| FTNUMB | Micrology | ● | | | |
| LEVEL II ANIMATOR | Micro Focus | ● | ● | ● | ● |
| PDEVELOP | Phoenix | ● | | | |
| PLINK | Phoenix | ● | | | |
| PLINK II | Phoenix | ● | | | |
| PLINK-86 | Phoenix | | ● | ● | ● |
| SID | Digital Research | ● | | | |
| SPEED PROGRAMMING PACKAGE | Digital Research | ● | ● | | |
| XLT-86 | Digital Research | ● | | | |
| ZSID | Digital Research | ● | | | |

## Utilities/System Tools

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| CLIP | Keele Codes | ● | ● | ● | ● |
| DESPOOL | Digital Research | ● | | | |
| DIAGNOSTICS II | Supersoft | ● | ● | | |
| DISK DOCTOR | Supersoft | ● | ● | | |
| DISKED-2 | Slogger Software | ● | | | |
| DISK-EDIT | Supersoft | ● | ● | ● | ● |
| DISKMAN | Slogger Software | ● | | | |
| DISKORG | Slogger Software | ● | | | |
| DISKTOOLS-1 (DISKMAN & DISKORG) | Slogger Software | ● | | | |
| DISKTOOLS-2 (DISKTOOLS-1 & DISKED-2) | Slogger Software | ● | | | |
| dUTIL (FOR DBASE-II) | Fox & Geller | | | | |
| FILESHARE | Micro Focus | | ● | | |
| DEC RAINBOW SERVICE S/W: | Silicon Valley Corp. | | | | |
| (1) Format/Verify Service | | | ● | | |
| (2) Autorun Service | | | ● | | |
| (3) Function Key Service | | | ● | | |
| SERVICE S/W VOL. I (1, 2 & 3) | | | ● | | |
| SYSTEM CHECKER | Supersoft | ● | | | |
| THE OPERATING GUIDE | Decision Systems | ● | | | |
| UTILITIES I | Supersoft | ● | | | |
| UTILITIES II | Supersoft | ● | | | |

## Sorting

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| MSORT | Microsoft | ● | | ● | ● |
| SUPERSORT | Micropro | ● | ● | ● | ● |

## Code Generators

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| AUTOCODE | Stemmos | ● | | ● | ● |
| FORMS-2 | Micro Focus | ● | ● | ● | ● |
| QUICKCODE | Fox & Geller | ● | | | ● |
| SOURCEWRITER | Softwright | ● | ● | ● | ● |
| THE LAST ONE | D.J. 'A1' Systems | ● | ● | ● | ● |
| THE LAST ONE—COMPACT | D.J. 'A1' Systems | ● | ● | ● | ● |

## Telecommunications/Conversions

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| BACDEBIT | Comley | ● | | | |
| BACSCOPY | Comley | ● | | | |
| BSTAM | Byrom Software | ● | ● | | ● |
| BSTMS | Byrom Software | ● | | | |

## Telecommunications Cont.

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| ICL CO3 EMULATION (Bulk) | Synchro Systems | ● | | | |
| ICL CO3 EMULATION (Interactive) | Synchro Systems | ● | | | |
| ICL CO3 EMULATION (Interactive & Bulk) | Synchro Systems | ● | | | |
| REFORMATTER CP/M ↔ DEC | Microtech Exports | ● | | | |
| REFORMATTER CP/M ↔ IBM | Microtech Exports | ● | ● | | |

## Word Processing/Text Editing/Editors

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| CORRECTOR | Supersoft | ● | | | |
| EDIT-80 V2.02 | Microsoft | ● | | | |
| FRIDAY | Ashton Tate | ● | ● | ● | ● |
| MAILMERGE | Micropro | ● | ● | ● | ● |
| MEMOPLAN | Chang Labs | ● | ● | | ● |
| WORD | Microsoft | | | | ● |
| WORD WITH MOUSE | Microsoft | | | | ● |
| PARAGRAB | Focus | ● | | | ● |
| PEDIT | Phoenix | ● | | | |
| PMATE | Phoenix | ● | | | |
| SPELLSTAR | Micropro | | ● | ● | ● |
| STARBURST | Micropro | | | | ● |
| STARINDEX | Micropro | ● | ● | ● | ● |
| WORDMASTER | Micropro | | ● | | |
| WORDSTAR | Micropro | ● | ● | ● | ● |
| WORDSTAR PROFESSIONAL (WS+MM+SS+STAR INDEX) | Micropro | ● | ● | ● | ● |

## Databases/Data Management Systems

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| DATASTAR | Micropro | ● | ● | ● | ● |
| dBASE-II | Ashton Tate | ● | ● | ● | ● |
| INFOSTAR | Micropro | ● | ● | ● | ● |
| REPORTSTAR | Micropro | ● | ● | ● | ● |

## Financial Accounting

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| INCOMPLETE RECORDS SYSTEM | MPI | ● | ● | ● | ● |
| NOMINAL LEDGER | Padmede | ● | | ● | ● |
| OPEN ITEM PURCHASE LEDGER | Padmede | ● | | ● | ● |
| OPEN ITEM SALES LEDGER | Padmede | ● | | ● | ● |
| PADMEDE BUSINESS CONTROL SYSTEM | Padmede | ● | | ● | ● |
| PAYROLL | MPI | ● | | ● | ● |
| PURCHASE LEDGER | Padmede | ● | | ● | ● |
| SALES INVOICING | Padmede | ● | | ● | ● |
| SALES LEDGER | Padmede | ● | | ● | ● |
| TIME & COST RECORDING | Padmede | ● | | ● | ● |

## Financial Modelling/Problem Solving

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| CALCSTAR | Micropro | ● | ● | ● | ● |
| DECISION ANALYST | Executive Software | ● | ● | ● | ● |
| LINEAR & GOAL PROGRAMMING | EAS | ● | | | |
| MATHSPACK | MPI | ● | | ● | ● |
| MICROPLAN | Chang Labs | ● | | ● | ● |
| MULTIPLAN | Microsoft | ● | | ● | ● |
| PLANTRAC I | Computerline | ● | | ● | ● |
| PLANTRAC I | Computerline | ● | | ● | ● |
| PROFIT PLAN | Chang Labs | ● | ● | | ● |
| QSTAT | Pivotal Software | ● | | | |
| STATSPACK | MPI | ● | | ● | ● |
| TK! SOLVER | Software Arts | | | | ● |
| TK! SOLVER PACKS | | | | | |
| FINANCIAL MANAGEMENT | | | | | ● |
| MECH ENGINEERING | | | | | ● |

## Business Applications

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| JOB COSTING | Heseltine | ● | ● | ● | ● |
| POLICY MASTER | CSA Micro Systems | ● | ● | ● | ● |
| PRINT ESTIMATION | Software Mgmt Systems | ● | | ● | ● |
| STOCK CONTROL | Padmede | ● | | ● | ● |

## Training Aids

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| CP/M TUTOR | Syntax Software | ● | | | |
| KEYBOARD MASTER | Anthony Ashpitel | ● | ● | | ● |
| TYPING MASTER | Anthony Ashpitel | ● | | | ● |

## Graphics

| | | CP/M | CP/M-86 | MS-DOS | PCDOS |
|---|---|---|---|---|---|
| dGRAPH | Fox & Geller | ● | | | ● |
| STATSGRAPH | Supersoft | ● | | | |

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# SCREENPLAY

*Tony Hetherington fights his way to the top and joins the Elite, takes a dive in search of an undersea monster and joins the wacky races in this month's selection of games for the BBC B, Commodore 64, Atari and Spectrum.*

## The bounty hunters

**Title: Elite**
**Computer: BBC B**
**Supplier: Acornsoft**
**Format: Cassette/disk**
**Price: £14.95/£17.95**

You start your Elite career as a space trader officially described in police records as clean and harmless, with only 100 credits and your trusty Cobra trading ship to your name. Your initial course of action should be to buy fuel and cargo and head for another planet, where hopefully you'll make a profit selling your goodies.

But it's a large, unfriendly universe and there are pirates about, as well as other traders who won't lose any sleep over killing you for your cargo. Your next priority is to arm your ship with more weapons which leads to another profession — bounty hunting.

As you trade and fight your way through the galaxy, your status will progress from harmless to dangerous until eventually you become one of the Elite.

It will take you months of practice to reach this goal and you'll attain the 'dead' status many times along the way.

You're free to trade in anything, but don't carry slaves or narcotics until you're suitably skilled and armed to tackle the police and every bounty hunter in the area. Profits are high and there's lots of combat.

The hardest task facing a new trader is docking with the space stations that orbit every planet — a necessity since this is where you buy and sell your cargo, and where you equip your ship.

It's also where you'll meet other ships, so check the planet's political leanings before you travel: an anarchist planet is the end of the line for a novice pilot.

The graphics are constructed from line drawings, but what isn't clear is the way they're animated to produce smooth movement across the screen.

Below your view out into space is the control panel incorporating a 3D radar which indicates other ships' relative positions. It doesn't indicate these ships' intentions towards you, but don't worry — you'll soon find out.

I played the tape version which was accompanied by a 60-page instruction book, a function key overlay, a 'know your enemy' chart, a command summary card and a 50-page novel 'inspired by the game.'

My attempts were disappointing, but I am convinced that Elite will soon be the number one game for the BBC.

## Wacky races

**Title: Pitstop**
**Computer: Commodore 64, Atari**
**Supplier: Epyx**
**Format: Cartridge**
**Price: £34.25**

Pitstop challenges you to master six of the toughest race tracks in the world as you cut corners and burn up tyres in a bid to save those vital seconds.

It's a game for up to four people but unfortunately only one can race at a time, therefore each sets a time for the others to beat. The races are average, you weave your way inbetween the other cars, but the fun starts when you're in the pits.

On the track you have to keep an eye on your fuel and tyres; fuel is represented by a gauge, and tyre wear by a

change in the tyres' colour. They start a comforting dark blue and gradually wear through green to red, then briefly turn yellow before bursting. They become damaged through collisions with other cars and reckless cornering, but if you slow down to save them you'll lose valuable time. The harder you drive the more fuel you use, but the less fuel you have the lighter and faster your car.

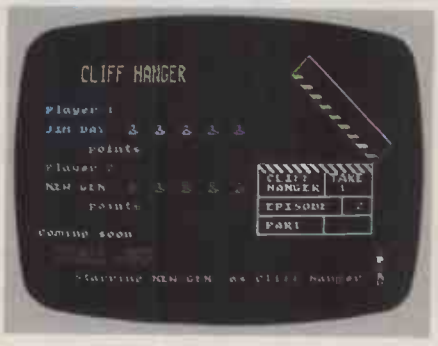
Such are the choices facing the driver in a race that can be won or lost by a fraction of a second.

Races are won and lost in the pits — if your team can put you back on the road ahead of the opposition, you'll have a winning advantage.

To be successful you must be fast in the pits. The screen display shows your team around the car, and you use your joystick to move the men who refuel your car and replace worn tyres.

You may decide to change one or two tyres, or perhaps only half-fill the fuel tank. Either way will save you seconds, but if the gamble fails you'll get nothing from the winning purse. After each race the purse is divided, and at the end of the three- or six-race series the player with the most money is the winner. Individual races can be either three, six or nine laps long, but six is best for gamblers.

Pitstop is produced by the American company Epyx and is available here through Softsel.



# 'Beep-beep!'

**Title: Cliff Hanger**
**Computer: Commodore 64**
**Supplier: New Generation Software**
**Format: Cassette**
**Price: £7.95**

Cliff Hanger is obviously inspired by those infamous *Roadrunner* cartoons and as such uses cartoon logic, so be prepared for the unexpected.

You are Cliff, the hero of the piece who must prevent a bandit from shooting up the canyon. This you attempt to do in a variety of comical ways ranging from shooting cannons to dropping boulders.

These methods increase in complexity as the game progresses through its levels. You start at level one which consists of 10 screens, each with a different method of stopping the bandit. Once you've killed him in all 10 ways, you progress to level two and 20 screens; each screen is preceded by a clapperboard which gives you a clue to what should happen.

You then see a classic cartoon impression of the canyon with a variety of boulders, bombs, see-saws and ton weights at your disposal. You have to work out from the clue and equipment how to stop the bandit before he passes you, otherwise you'll have to start again.

In certain circumstances the computer will take control of the action, usually when you step off a cliff; the situation is then resolved in true cartoon fashion. You walk off the cliff, realise that you're walking on air and look down. You're naturally amazed that you're standing in mid-air, so you jump up and down until finally you plummet to the canyon floor. You then lose one of your five lives, which are displayed on the clapperboard as coat hangers.

There are 50 screens in this comical game which is accompanied by the musical strains of Brian Doe (he used to belong to Dave Dee, Dozy, Beaky, Mick and Titch), and may become a game that's fun to watch as well as play.

# Adventures in history

**Title: Eureka**
**Computer: Commodore 64, 48k Spectrum**
**Supplier: Domark**
**Format: Cassette**
**Price: £14.95**

There's a £25,000 prize awaiting the first person to solve Eureka and they'll have earned it: the winner has to complete five difficult adventures. You try to foil the evil Von Kemp's attempts to control or destroy the world. During your travels you'll meet dinosaurs in pre-history, soldiers of the Roman Empire, knights of King Arthur's round table, prisoners in Colditz castle and finally, Von Berg in a James Bond-style Caribbean mystery.

The adventures use a mixture of text and graphics, some of which are animated, but a particularly nice feature is the combat system. When you're fit and healthy you have a vigour of 50, visually represented by a standing figure, which gradually stoops, crawls and collapses into a heap as you suffer injuries.

I played a limited pre-release version of two of the modules, Celtic Britain and Roman Times, and enjoyed them, although it was a shock to the system to discover that the Romans speak Latin. People with a classical education may have an advantage here, but the Romans certainly understand the language of the sword.

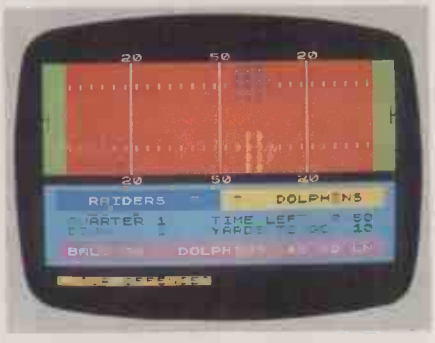
£14.95 for five adventures representing 250k of code is good value, even without the chance of winning the £25,000 prize.

Who'll be the first to offer the first computer game million? Answers, please, to Robert Maxwell.

# SCREENPLAY

## Football focus

**Title: American Football**
**Computer: 48k Spectrum, Commodore 64**
**Supplier: Argus Press**
**Format: Cassette**
**Price: £9.99**




It's the third down with four yards to go on your own 23rd line. Will you run the ball or pass it? The choice is yours in this American football game that treats the sport as a tactical battle rather than an excuse for a punch-up.

You're head coach and call your team's plays against either a human or digital opponent.

As in the real game, the plays are divided up into offence or defence; there are 11 offensive and four defensive plays which make for some interesting combinations and results.

Once the players have entered their choice of plays, the result is graphically displayed onscreen by Football Manager-style players who line up before the game. It's quite an achievement to have all 22 players moving realistically around a Spectrum screen and Argus has done well here.

My only complaint is that the scale of the pitch is rather odd — distance onscreen can be anything between four and 14 yards.

Below the pitch display is all the information you'll need during the game including which down you're on, and the yards and time to go. The stats freaks are well catered for — every conceivable game statistic you'll ever need is displayed at the end.

American Football plays well and includes all the game's major aspects including penalties, time and a good choice of plays.

## The art of self-defence

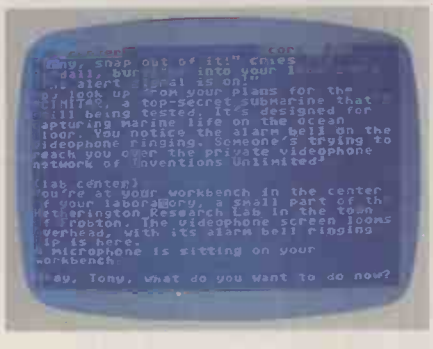
**Title: Kung-Fu**
**Computer: 48k Spectrum**
**Supplier: Bug-Byte**
**Format: Cassette**
**Price: £6.95**

There's an old adage that simple games are often the best which is ably supported by this Kung-Fu game from Bug-Byte. It's a fight between two superbly animated characters — you and a friend (or the Spectrum). The game can be played with joysticks, or a sensible keyboard arrangement.

It's an easy game to learn as there are only six keys to master, two to move you backwards and forwards, two kicks, and two punch movements. However, getting the punches and kicks in the right order is a skill which takes some time to acquire.

At the bottom of the screen there are indicators showing the physical state of you and your opponent. Your state is depicted by a clenched fist which changes colour as you weaken; and your opponent's by a series of disappearing all symbols — but this is academic when you're flattened by the first blow.

If you beat the computer you face two, then three opponents, which are definitely anti-social odds. When you've fought three times, your ability is judged and you're awarded a suitably-coloured belt.



## Stranger things are happening

**Title: Seastalker**
**Computer: Commodore 64 and Atari**
**Supplier: Infocom**
**Format: Disk**
**Price: £34.15**

Infocom's latest release, Seastalker, is described as a 'junior level introduction to interactive prose'. In other words, it's easier than its predecessors and designed as an introduction to the company's particular style of adventures.

All Infocom's adventures are supplied on disk, which is ideal and might account for its success in this medium. Disks make it quick and easy to load and save game positions and, more importantly, the game isn't restricted by memory size as the rest of the game is just a disk-read away. Even so, Infocom has resisted the urge to litter its games with graphics and concentrated instead on producing locations to rival the works of Tolkien and Asimov. Seastalker has the depth of the Zork trilogy and is superbly packaged.

You're head of a marine institute and are completing your latest invention, a new submarine. Suddenly, a message comes through — the undersea Aquadome is being attacked by a monster! Your adventure begins. There's more than a hint of sabotage in the air, and you'll have to prove yourself as a detective before the game is out.

Enclosed with the disk is a folder containing a navigational chart, a log-book containing rules and instructions, charts and diagrams of the laboratory and submarine, and a set of information and hint cards.

If you get completely baffled you can send for a hint book supplied, via Infocom, by Bilk and Wheedle, the infamous upper Mongolian company which also covers life, health, auto, blizzard, mongul horde invasion and yak stampedes.

Finally, good news for Commodore 64 owners — Commodore has just announced three more Infocom adventures at a bargain price of £11.99. The new titles are Deadline, Starcross and Suspended. END

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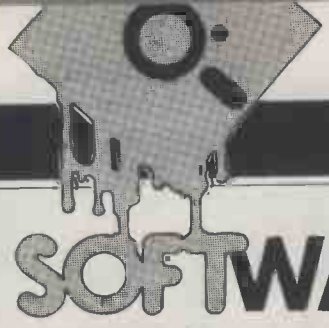

SOFTWARE

# Language of the MicroCat

*Linguist Paul Holland appreciates the intricacies of accurate foreign language translation, so it was with some scepticism that he agreed to look at a machine-aided translation package called MicroCat.*

MicroCat is the small brother of a more powerful system called MacroCat. They are the brainchildren of the Weidner Communications Corporation of Utah, one of the main contenders in the field of machine-aided translation. MacroCat has been on the market for around five years, and uses a large mainframe computer such as the DEC PDP-11 or Vax series CPU, so the launching of a similar system on a personal computer is a natural development. In this case, the machine chosen was the IBM PC XT. At present there are no plans to adapt it for other micros on the market but, as I was told, 'if the customer is willing to pay . . .'

The difference between the two machines is perhaps best illustrated in the claimed translation rate of the two systems — 8000 words per hour for MacroCat versus 3000 for MicroCat. Broadly speaking, big brother is intended for the large institutional user and junior is aimed at smaller companies, translation bureaux or even cooperatives of freelance translators. The system was launched at this year's IBM Users' Show and is distributed by the Software Connection Ltd, Fareham.

It must be pointed out that the machine does not do away with the linguist, rather it demands new skills and disciplines of him.

## The translator's task

Before going on to find out what the machine can do, it's necessary to understand the work of the translator. The foreign language text, of course, always has to be in a legible form — printed, typed or, at worst, handwritten. With this in front of him the translator sets out to produce a translation in his own language.

In a large organisation, such as the EEC, the draft is dictated onto a dictaphone, typed up by a professional typist then passed on to the revisor (a senior or more experienced translator), who checks it for: faithfulness to the original; style; consistency of vocabulary, and so on. The revised version goes back to the translator for information and from there is passed back to the typist for production of the fair copy and final distribution to the customer.

Until the advent of word processors, this was the method of producing high-quality output. Now, the translation need never come out of soft copy until it reaches its final destination. The use of word processors increases output by about 100 per cent. The usual features of any good word processor, such as programmable PF keys (used for much-repeated words), block and copy (for repeated sections of text), and the retrievability of electronically-stored data on disk (for repeat translation of similar texts) all contribute to raising the well-equipped translator to a high degree of efficiency.

Once on MicroCat, the foreign language text undergoes a 'vocabulary search' where the text is compared against the words available in the machine's dictionaries. Words not found are automatically written to a special vocabulary file. The linguist must now do a dictionary update, taking the words one by one and entering them into one of the machine's dictionaries.

## Dictionaries

Dictionaries fall into three categories — the core, the main and the specialised. The number of specialised dictionaries is not fixed. Once the software has been loaded, there are seven megabytes left for files and dictionaries. The core of around 10,000 words is supplied by Weidner and cannot be altered by the user; it contains the foreign language's basic vocabulary compiled from a word frequency count. The user can add words to the other two dictionaries.

One of the system's features is the option to alter the sequence in which dictionaries are consulted. If a text deals with telecommunications, you instruct the machine to consult the telecommunications dictionary first, then the general, then the core. If, however, the text covers the application of plastics to telecommunications with the emphasis mainly on plastics, it is advisable to instruct it to consult the specialised plastics dictionary first, followed by telecommunications, general and core. A sequence of up to nine dictionaries can be specified.

This feature might be considered a double-edged sword. On the one hand you're free to create user-specific dictionaries with obligatory translations for certain terms; on the other, the very creation of dictionaries is tedious and time-consuming in the extreme.

It's during dictionary update that any errors in the foreign language text will come to light. Words which have been misspelt will be presented to the translator as words not found in the dictionary. Although this acts as an error correction device, further human intervention to correct the source text is required if the word is to be correctly translated. In 'steam' translation, the human brain merely takes the error in its stride and produces the correct translation nonetheless.

Before translation proper can begin, the machine carries out 'preprocessing' of the vocabulary search. Once completed, machine translation can start — translation at the press of a button. When the process is completed, a raw translation is available for what's known as 'post-editing'. This involves taking the raw translation provided by the computer and turning it into an understandable version of — in this particular case, English. This is normally done on the machine using split-screen mode, with the original foreign

language text in the top split and the raw translation in the bottom split. The user alters the raw translation using the machine's word processor facility, scrolling both texts as required. The finished product is the polished translation ready for its final customer.

## Testing the system

The language pair chosen was from French into English. The system can only work in one direction at a time, so to change from French into English to English into French, the software for one language must be unloaded before the other pair can be used.

A variety of texts both long and short were selected; with one exception they were technical in content, chosen at random from various issues of a highly respected French electronics magazine. I must stress the point of the sample being genuine French from France and not just any old rubbish. This allows me to highlight the fact that even in texts such as these, taken from a magazine, there can be faults, and faults there were in plenty. Such occurrences are hardly surprising: you need only think of some of our revered 'quality' dailies to see just how inaccurate some publications can be. However, whereas the average reader takes errors in his stride (in the same way that the translator does when reading his text), MicroCat cannot. It demands that mistakes be corrected. The opportunities for error were further compounded: since the texts were extracted from magazines, they had to be typed in by hand, and the length of each text varied — the longest being just under a thousand words and the shortest 59.

I decided to see how the machine would cope with an 'unseen text'. What better, I thought, than the old chestnut of 'La plume de ma tante . . .'? Therefore, with one slight modification, I entered 'La plume de ma tante est dans le jardin de mon oncle Pierre.' I gave the machine no help, and added no words to its dictionary: I just let it get on with it. To my surprise it produced 'The feather of my aunt is in the garden of my Rock uncle.'

All very well for a laugh, but it does reveal a few of the strengths and weaknesses of the system. Even though all the words are in the dictionary, the machine will reproduce whatever version of a word it finds irrespective of context. It can recognise verbs without prompting; it will take French word order and reverse it to give English word order: for example, noun adjective in French becomes adjective noun in English. It was just unfortunate in this case that it thought uncle Peter was a rock.

It's possible to isolate words the machine is *not* to translate. With the alteration of 'feather' to 'pen', the deletion of 'rock', and the insertion of 'Peter' at the end of the sentence, you have a piece of intelligible English. In many cases such a translation might be sufficient for a customer's needs, but it falls far short of being a masterpiece of English prose. The system does not produce the English possessive apostrophe — for example, aunt's.

All the texts were entered by hand which gave me a good opportunity to test the machine's word processing capabilities. The word processing element was Weidner's own and not IBM's. Since I was entering text in a foreign language, I had to use unusual characters such as ç, ö, é, ô, à, and so on. These characters were achieved by using a minimum of two key depressions and in one case three.

The default setting of the word processing option puts the user in insert mode. Modify mode also exists, and I would have preferred this as my default setting rather than insert for ease of working. Insert mode makes error correction very slow: if more than one character needs to be inserted, letters have to be deleted before they can be replaced.

To build up experience I started with a short text, a paragraph of 119 words. Unfortunately, MicroCat took a dislike to my example. On two occasions I tried to get it to do a vocabulary search. All went well until it reached 81 words and on both occasions, for no obvious reason, it baulked and went to sleep.

My next attempt was on a paragraph of similar length, 103 words, covering the same technical subject matter. The vocabulary search took only 60 seconds and produced two unknown words. These were entered into the dictionary and the translation began — and was completed in five minutes. The result was the best of all those produced, with few alterations needed to turn it into an acceptable piece of English. This paragraph did, however, reveal a major drawback of the system. Although the dictionary contained all the words bar two, it was unable to pick out multi-word technical terms. The term in question was 'tête de lecture écriture', which means 'read-write head' rather than 'reading head ----- writing' with which I was presented.

It's possible to enter such terms into the machine's specialised dictionaries. The only problem is that since the machine will not automatically identify them as terms (because the individual words are already in the machine's dictionary), the translator is given additional work. He must either go through the text beforehand to look for such terms and then add them to the dictionary (thereby nullifying the automatic nature of the vocabulary search), or he must spend a great deal of time correcting each occurrence of the term at the post-editing stage.

The main test was a long passage of 959 words; the vocabulary search took 8.5 minutes and the translation proper took 52 minutes. The final raw translation was poor and required a good deal of work to produce an intelligible end product. The result achieved did not support the claim that 'MicroCat can translate at speeds of up to 3000 or more words per hour.'

In describing the process of translation on MicroCat, a false impression may be created: the work done in entering new vocabulary appears excessive in view of the results obtained. However, it must not be forgotten that the technical vocabulary entered for one translation on a given subject could eventually pay dividends if large amounts of translation on the same subject were required.

As a rough guide, a competent translator using a word processor could produce a polished translation of the same text in a couple of hours. I have deliberately made no mention of the time taken to enter the text by hand, enter the vocabulary in the dictionary and do the post-editing, since the system and machine were new to me and familiarity with the package would improve speed of operation. Nonetheless, all these procedures must be added to the time taken by the machine for the press-button translation.

## Justification

Weidner makes no claims that this machine produces automatic translation — it is Computer-Aided Translation (the CAT of MicroCat). The translator remains an essential part of the whole operation. How do the claims put forward for the machine stand up?

**Deferred translation**: up to 14 jobs can be stacked up to run at will — this feature is absolutely essential. In the test case, 1000 words took just under an hour to be processed and obviously during that time the machine was unavailable for any other work.

But in an office situation with only one machine dedicated to translation, if a text were presented at 9am, then unless the machine were devoted entirely to that job, the most efficient use of manpower and machine would be achieved by doing the vocabulary search and dictionary update in one working day, stacking up the translation to be processed overnight and post-editing the following day. In other words, the finished translation would not be available until more than 24 hours later. In business, translations are normally wanted *yesterday* at the very latest, so a minimum of two machines would appear essential.

**Lexical (or terminological) consistency**: a word of explanation is required here. To get a long piece of text translated in a reasonable period of time, it's common practice to split it up among several translators. Such a procedure could well give rise to different people translating the same word or expression in different ways, and the result would be a sloppy finished product. In large organisations the problem is resolved, or at least minimised, by the intervention of the

revisor. With MicroCat, you can translate 'une pelle' as 'a spade' throughout and it won't appear as 'spade', 'shovel', or 'agricultural manual hole-digging system', according to the whim of the individual translator.

Weidner's system is not unique in being able to provide such consistency. The same can be achieved through adequate customer-translator liaison, by the sharp-eyed revisor, or even by the search and replace facility of a word processor. Nonetheless, Weidner's invariable substitution of one word for another could well prove attractive to many potential customers.

## Dictionary building

Dictionary building is the stage I found the most mind-numbingly boring and also the hardest to grasp. The fact that all the necessary documentation was not provided didn't help matters, although I subsequently received later versions of the manuals.

The presentation of the process on screen was acceptable: and the words not found by the machine in the dictionaries were clearly displayed, well-presented, highlighted in capitals within the line of text in which they appeared, and again, on their own, on the line below. Such a presentation allows the linguist to react to the word immediately since it's placed in context — there's no need to search the original text to find out what the word meant in that instance. To add the word to the machine's dictionary you need a detailed knowledge of basic grammar both in English and in the foreign language, but that's not an unreasonable requirement to ask of a professional linguist.

The machine provides prompts at the bottom of the screen for the coding of entries which cover most eventualities. In other, more complicated, cases, the linguist has to refer to the user's manual. Providing you do what it expects, all goes well; however, if you get it wrong it punishes you by removing the prompts, leaving you at a loss as to how to proceed.

The greater part of a trainee's time will no doubt be split between mastering dictionary update and coming to terms with the word processor. As an example, there are 48 noun inflection rules, 82 verb inflection rules, and a dictionary update manual running to 29 pages. Where a word can only be one part of speech, things are fairly simple. For words that can be more than one part of speech (homonyms) — for example, 'est', which can be both noun and verb — the task of entry is much more involved. All the same, the fact that the machine can cope with homonyms at all is quite an achievement, but the brochure's claim of adding words 'in seconds' would only apply to the most straightforward entry being processed by a very experienced operator. Apprenticeship appeared long and arduous to me.

Niggles were many, but the only serious one was the word processor. Having gone to the trouble of producing your own word processor element, I would have expected it to be quick and easy to use. Sadly this was not the case. The manual is not a model of clarity when explaining how to achieve the various functions, and a bewildering combination of key depressions was usually required to achieve the desired end. Since word processing is the key to the post-editing phase, greater thought should have gone into this function. The word processor does have automatic word-wrap and reformatting, but too many functions required more then one keystroke. Such basic functions as 'scroll text up' (ALT + KP5), 'next screen' (F5 + KP9) and 'previous screen' (F5 + KP7) were all double keystrokes. It would have been much more satisfactory to use just one.

The keyboard on the review machine used the standard IBM PC XT layout, but I was told that MicroCat customers could use overlay stickers. However, I do foresee difficulties for customers using the same machine for other purposes with IBM software.

Another of the system's foibles was its disconcerting habit of unaccountably freezing the keyboard so that the operator is left with no option but to reload the terminal. This happened more than once: on one occasion I asked it to list the dictionary I had just created, and at the thirteenth entry it went to sleep leaving the keyboard disabled.

The major niggle was vertical movement of the cursor. If the cursor encounters a blank line it will shoot over to the margin and continue its journey along the margin rather than its original axis. For the linguist this is hard work.

## Conclusion

Does it work? The short answer is yes, it does, but with qualifications. The distributor's literature does not compare like with like — 'The whole process is cleaner, faster, less wearisome and altogether more satisfying than the time-honoured method of pencil, rubber and typewriter'; and 'A translator using traditional methods and working a normal eight-hour day would be pleased to produce an average of 1200 words of finished text per day.' Under certain circumstances, the above might be true when compared with what can only be described as amateur 'stone age' methods. When compared with a professional using a good, efficient word processor, the claims don't stand up at all.

The transition from mainframe to PC-based system is not as advisable as it might first have appeared. A mainframe-based system scores where the PC falls down: that is, on speed, multi-user capability, the ability to process one translation while the linguist prepares or post-edits another. But, in fairness, there's a considerable difference in price!

The foibles of the word processor I could probably learn to live with but prefer not to; the same can't be said about living with the raw translations produced by the machine. In its present form I predict a fair amount of translator resistance to working with such a product day after day — but perhaps that's just the Luddite coming out in me. MicroCat could never be competitive for doing one-off translations: it scores where there is repeated demand for translation of texts on the same subject. I advise potential customers to think long and hard before embarking along this path. END

## Summary

| | |
|---|---|
| Package type: | Partial Machine Translation using an IBM XT personal computer |
| Facilities: | Word processor, user-definable dictionaries, vocabulary search, onscreen post-editing |
| Drawbacks: | Two machines required for most applications |
| Ease of use: | Five days' training required |
| Documentation: | Latest version much improved |
| Price (ex VAT): | PC — £5244<br>Software: 1 language direction — £8000, including five days' training and manual<br>2 language directions — £15,000, including 10 days' training and manual<br>Additional language direction — £7000 each, including five days' training and manual<br>Note: five days' training supplied with package |
| Supplier: | The Software Connection Ltd, The Old Manor House, Wickham Road, Fareham, Hampshire PO16 7AR. Tel: (0329) 230870/239025, John Newton |

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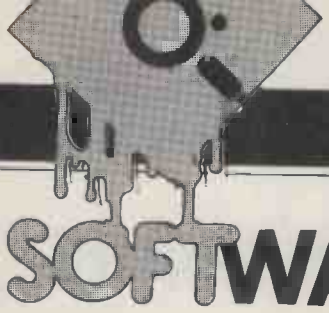


SOFTWARE

# ISO-Pascal: perfect timing

*Cornelia Boldyreff conducts a lesson in the virtues of Acornsoft's ISO-Pascal for program development on the BBC Micro and Acorn Electron.*

There are two reasons why Acornsoft should be applauded for its ISO-Pascal system: it supports the ISO-Pascal standard; and it truly is a system which supports Pascal program development.

The ISO-Pascal system is available for both the BBC Micro, on which this review was carried out, and the Acorn Electron. The Electron version comes on cartridge, while the one for the BBC consists of two plug-in ROMs and a disk with extensions. The system manual incorporates a comprehensive user guide covering usage on both Acorn micros. An excellent tutorial book by Professor Peter Brown of Kent University entitled *Pascal from Basic* is also supplied. No price was available for the Electron at the time of writing, but the BBC version costs £69.

One aspect of the implementation which initially strikes the user is the simple and wonderfully consistent interface which the Pascal has with the BBC's operating system; few things make a new system easier to use than building on already familiar ground. Both systems, for example, treat unrecognised commands uniformly. Integration of the new ISO-Pascal system with existing systems is bound to make the Pascal more attractive to existing users of those systems who are potential customers of this product.

The Pascal is strongly reminiscent of the UCSD-Pascal system in many respects. It has retained many of the latter's better ideas without perpetuating any of its annoying features. Its strongest point is that it supports the ISO-Pascal standard, and the British Standards Institute has validated the Acornsoft Pascal compiler's adaptation to the standard.

The Pascal system has four major components: a command interpreter, a powerful screen editor, a compiler and an interpreter. The compiler produces an intermediate code, BL-code, which is executed by the BL-code interpreter. The authors of the preliminary user guide describe Acornsoft Pascal as 'semi-compiled'. They relate several of the Acornsoft language products on a scale ranging from purely interpreted to purely compiled; this is reproduced in Fig 1. Unfortunately this section has been edited out of the final edition of the user guide.

On small micros such as the BBC and the Electron, the trade-off of compact intermediate code requiring less storage than purely compiled code against slightly slower execution speed through interpretation rather than direct execution of machine code is a reasonable one.

| Purely interpreted ——> | Semi-compiled ——> | | Purely compiled |
|---|---|---|---|
| Atom Basic<br>BBC Basic<br>Lisp | Acornsoft BCPL<br>Acornsoft Pascal | Forth | 16032 BCPL |

*Fig 1 Acornsoft language products*

Of the system components, the command interpreter is the one the user sees first and is probably the least obtrusive.

It announces its presence by a simple prompt and allows the user to access the other system components. By default, the Pascal commands are interpreted as operations on current memory files, thus the EDIT command, unless the user specifies otherwise, operates on the current text file.

Similarly, the COMPILE command uses the current memory text file as its source and produces a current memory code file. The command GO executes the current memory code file, and the SAVE command is used to save it onto the filing system in a named file (Fig 2).

Once a code file has been saved to a named file, the Pascal command interpreter will interpret its name when typed as a command — it will load the named code file and execute it. In this fashion, users of the Pascal system can extend its functionality by introducing new commands of their own invention.

There are a few more Pascal system commands: LOAD, which enables a named code file to be loaded into memory as the current memory code file and then subsequently executed by GO; RUN, which accomplishes a LOAD and GO together, that is, it's equivalent to LOAD followed by GO; CLOSE, to close all open files; TRACE, to enable or disable tracing of programs; and MODE, which is used to select various modes on the BBC Micro. All the commands operating on memory files may also, where appropriate, operate on named files.

In addition to the eight commands described above, all the usual operating system commands are also available.

## Screen editor

In order to assist users with the task of preparing the text of their programs, a powerful screen editor is distributed with the Pascal system. This can be used initially by those already familiar with text editing on the Acorn Atom as a function key-driven editor. For the more experienced, the editor has comprehensive pattern matching facilities. As these are very similar to those found in the standard Unix system editor, Ed, little effort is required to use them for anyone already familiar with Ed or one of its variants.

This combination of powerful pattern matching and replacement facilities with a simple cursor and function key-driven editor makes for a very attractive programmer's editor. The editor tutorial section in the user guide has many illustrative examples, and includes a short 10-character line to reverse the order of alternative characters in a file.

When the user is entering Pascal program text, the editor 'remembers' indentation but only if requested. This is a welcome change from the auto-indent mode featured in many other editors for programmers.

There is one serious drawback to the editor — it has no UNDO command. This is especially serious when one realises that there's a one-character difference between a global deletion of a string and a global count of the number of times that string occurs. The manual alerts users to the danger, but this will be little consolation to anyone caught out. Reversibility in an editor is always a welcome facility: it's a pity that such a fine editor in other respects does not allow for users changing their minds or recovering from mistakes.

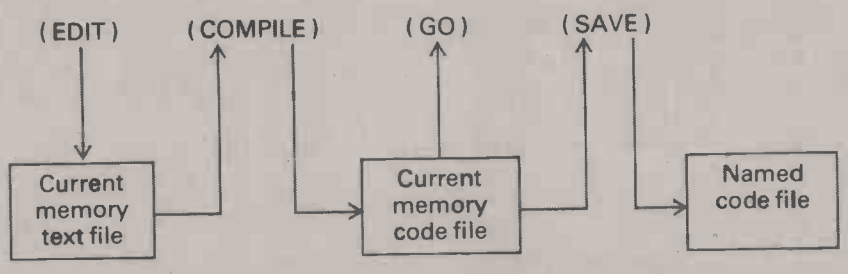



*Fig 2 Pascal system overview showing operations on memory files*

## Compiler

The compiler supplied with the system has itself been written in Pascal and is supplied in BL-code form; therefore, it runs interpretatively like any user-developed Pascal program. For the sake of simplicity, I have been referring to *the* compiler. In fact, two are supplied: one which supports ISO-standard level zero Pascal with minor restrictions; and one which supports ISO-standard level one.

(A BSI official divulged at a recent UCSD-Pascal System Users' Society meeting that the Acornsoft Pascal compiler was the first commercially available micro Pascal compiler to pass the newly developed Version 4 of the Pascal Compiler Validation Suite. Full details for those who are interested are included in the Pascal user guide, as is a reprint of the ISO-standard for Pascal.)

The level one compiler is only available for use on BBC Micros fitted with a second 6502 processor. It is supplied, with its own interpreter, on the disk which comes with the BBC version.

Both compilers support a range of Acorn extensions. The extensions provided by Acornsoft are primarily concerned with allowing access to the more exotic input and output facilities offered on the Acorn machines — for example, graphics and sound. The user guide helpfully relates these to their Basic equivalents.

One useful extension to Pascal on small micros is support for separate compilation, which enables part of a large program to be compiled. There's individually no provision for this in the language standard and Acornsoft has not provided it.

The ISO-Pascal was put through the *PCW* suite of Benchmarks devised by Chris Sadler (Fig 3). The results are shown in Fig 4 with the results for two other 6502-based systems, Apple UCSD and Acorn Atom, being used for comparison (reprinted from May 1982, *PCW*).

| | Apple UCSD | Atom Acorn | BBC ISO-Pascal |
|---|---|---|---|
| Magnifier | 6·4 | 1·8 | 2·4 |
| Forloop | 74·3 | 25·0 | 29·6 |
| Whileloop | 70·9 | 59·7 | 120·0 |
| Repeatloop | 63·3 | 52·8 | 119·7 |
| Literalassign | 88·5 | 36·7 | 52·3 |
| Memoryaccess | 91·0 | 36·5 | 53·1 |
| Realarithmetic | 93·0 | 121·0 | 61·2 |
| Realalgebra | 83·4 | 133·0 | 58·3 |
| Vector | 203·3 | 102·0 | 202·1 |
| Equalif | 116·7 | 65·5 | 105·6 |
| Unequalif | 115·3 | 68·0 | 105·2 |
| Noparameters | 50·2 | 10·3 | 30·7 |
| Value | 54·4 | 18·0 | 37·9 |
| Reference | 55·3 | 22·2 | 34·8 |
| Maths | 66·0 | 115·0 | 346·1 |

*Fig 4 ISO-Pascal Benchmark results and comparisons*

## Conclusion

Many universities already use Pascal as their main teaching language and have bought several BBC Micros — this Pascal should be very attractive to them. Small engineering firms using Pascal will find that it provides them with an inexpensive development system. They can also use the system to design in Pascal, replacing time-critical routines by machine code — something for which Acornsoft has made provision.

Will self-taught Basic programmers be tempted to sample the possibilities offered by a high-level programming language such as Pascal on the Acorn micros?

Guided by Professor Brown's excellent book, *Pascal from Basic*, which Acornsoft has included, they could take this transition in their stride and reap the benefits of a host of software published in Pascal. As Donald Knuth recently noted in an article on literate programming defending his choice of Pascal for an illustration, Pascal has become something of a *lingua franca* among programmers who know more than one language.

The low price of this product should lead to its widespread use in schools already using the Acorn micros. It could form the basis of improvements to the level of computing already taught — there are numerous textbooks which support the teaching of programming in Pascal.

An efficient Pascal compiler should also enable software developers and system engineers to more fully exploit their micros in a host of applications, with the added advantage of software portability achieved through ISO-Pascal. END

```
program value(input,output);
var j,k:integer;
procedure value5(i:integer);
begin
  j:=1
end;
procedure value4(i:integer);
begin
  value5(i)
end;
procedure value3(i:integer);
begin
  value4(i)
end;
procedure value2(i:integer);
begin
  value3(i)
end;
procedure value1(i:integer);
begin
  value2(i)
end;
begin
  writeln('s');
  j:=0;
  for k:=1 to 10000 do
  value1(j);
  writeln('e')
end.
```

```
program noparameters(input,
 output);
var j,k:integer;
procedure none5;
begin
  j:=1
end;
procedure none4;
begin
  none5
end;
procedure none3;
begin
  none4
end;
procedure none2;
begin
  none3
end;
procedure none1;
begin
 none2
end;
begin
  writeln('s');
  j:=0;
  for k:=1 to 10000 do
    none1;
  writeln('e')
end.
```

```
program maths(input,output);
var k:integer;
  x,y:real;
begin
  writeln('s');
  for k:=1 to 10000 do
  begin
    x:=sin(k);
    y:=exp(x)
  end;
writeln('e')
end.
```

*Fig 3 ISO-Pascal Benchmarks (devised by Chris Sadler)*

```
program vector(input,output);
var j,k:integer;
  matrix:array[0..10] of
 integer;
begin
  writeln('s');
  matrix[0]:=0;
  for k:=1 to 10000 do
    for j:=1 to 10 do
      matrix[j]:=matrix[j-1];
  writeln('e')
end.
```

```
program realalgebra(input,
 output);
var k:integer;
  x:real;
begin
  writeln('s');
  for k:=1 to 10000 do
      x:=k/k*k+k-k;
  writeln('e')
end.
```

```
program memory access(input,
 output);
var j,k,l:integer;
begin
  writeln('s');
  for k:=1 to 10000 do
    for j:=1 to 10 do l:=j;
  writeln('e')
end.
```

```
program repeatloop(input,
 output);
var j,k:integer;
begin
  writeln('s');
  for k:=1 to 10000 do
  begin
    j:=1;
    repeat
      j:=j+1
    until j>10;
  end;
  writeln('e')
end.
```

```
program forloop(input,
  output);
varj,k:integer;
begin
  writeln('s');
  for k:=1 to 10000 do
    for j:=1 to 10 do;
  writeln('e')
end.
```

```
program literalassign(input,
  output);
var j,k,l:integer;
begin
  writeln('s');
  for k:=1 to 10000 do
    for j:=1 to 10 do l:=0;
  writeln('e')
end.
```

```
program equalif(input,
 output);
var j,k,l:integer;
begin
  writeln('s');
  for k:=1 to 10000 do
    for j:=1 to 10 do
      if j<6 then l:=1
           else l:=0;
    writeln('e')
end.
```

```
program unequalif(input,
  output);
var j,k,l:integer;
begin
  writeln('s');
  for k:=1 to 10000 do
    for j:=1 to 10 do
      ifj<2 then l:=1
         else l:=0;
  writeln('e')
end.
```

```
program whileloop(input,
   output);
var j,k:integer;
begin
  writeln('s');
  for k:=1 to 10000 do
  begin
    j:=1;
    while j<=10 do j:=j+1
  end;
  writeln('e')
end.
```

```
program realarithmetic(input
 ,output);
var k:integer;
  x:real;
begin
  writeln('s');
  for k:=1 to 10000 do
    x:=k/2*3+4-5;
  writeln('e')
end.
```

```
program magnifier(input,
  output);
var k:integer;
begin
    writeln('s');
    for k := 1 to 10000 do;
    writeln('e')
end.
```

```
program reference(input,
  output);
var j,k:integer;
procedure refer5(var i:
  integer);
begin
  j:=1
end;
procedure refer4(var i:
  integer);
begin
  refer5(i)
end;
procedure refer3(var i:
  integer);
begin
  refer4(i)
end;
procedure refer2(var i:
 integer);
begin
  refer3(i)
end;
procedure refer1(var i:
 integer);
begin
  refer2(i)
end;
begin
  writeln('s');
  j:=0;
  for k:=1 to 10000 do
    refer1(j);
  writeln('e')
end.
```

# BIBLIOFILE

*David Taylor raids the* PCW *bookshelf and finds a stablemate for Dallas and Dynasty, plus — what's this — the QL's in business?*

## Silicon soap opera

**Title: Hypergrowth: The Rise and Fall of Osborne Computer Corp**
**Authors: Adam Osborne and John Dvorak**
**Publisher: Idthekkethan of California**
**Price: £14.25**

Better than an episode of *Dynasty* is this: the horse's-mouth account of how, in the space of just a couple of years, one of the computer industry's most flamboyant pioneers built up from nothing a huge, multi-million dollar business and then watched it crash into equally spectacular bankruptcy.

It's a numbing indictment of the commercially cut-throat and personally back-stabbing nastiness which did, and presumably still does, infect the atmosphere of California's Silicon Valley; the hotbed of microcomputer development where (way back in 1981) the Osborne Computer Corporation was the fastet-growing outfit in the West.

Doing his damndest to maintain an objective, level-headed tone, Adam Osborne begins by describing how he got out of small-time publishing and into big-time micro-making in the first place. He then vividly recalls the heady days when high-tech start-up companies could click with a startling innovation (in Osborne's case the portable business micro) and practically overnight see sales and profits go through the roof. He details the pressures of putting such upstart companies on a more secure (as he imagined) footing.

Then really biting his lip, Osborne tells how Bob Jaunich (at the time an executive of Consolidated Foods) was appointed Chief Executive Officer of Osborne.

From here on, the book splits its personality. Part of it continues the documentary analysis, weaving through the highly-complex way the company was structured and funded, and part of it makes no bones of the fact that Osborne came to regard Jaunich as one son-of-a-bitch.

Osborne is saying here's the extraordinary rags-to-riches, riches-to-rags history of my company. He's saying here's my view, from hindsight, of where many of us made mistakes. He's saying this is my overall analysis of the way the industry in general was, is, and will develop. But most of all he's saying this is how Jaunich stitched me up.

No doubt the writs will fly. Osborne's book cheekily prefaces its text by reproducing a You-Have-Been-Warned letter from Jaunich's lawyers, but Adam bashes on regardless. The result is a fascinating, cautionary, and grippingly bitchy read.

## QL in business ...at last

**Title: Desk-top computing with the Sinclair QL for professions and businesses**
**Author: Barry Miles**
**Publisher: Hutchinson**
**Price: £6.95**

Now that the living, breathing, all-

singing, all-dancing QL has, not before time, supplanted the cardboard cut-outs in the shops, you can hardly stir for manual addenda. The shelves are groaning with *Introducing the QL, Getting Started with the QL, Making The Most of the QL, Making Tea with the QL*, and no doubt the spring tide will be full.

Barry Miles's approach raises the vexed question of whether Sinclair's *wunderkind* is, or is not, to be considered a proper business machine. His view is that if it isn't quite yet, it jolly well soon will be, so why muck about? There's huge interest in a desk top micro that comes in at about a fifth of the price of many rivals. Never mind the present lack of disk drives, says he. The 500k RAM pack *will* come soon, he's sure of that, if not from Sinclair then from somewhere else. It's a damn nuisance, he admits, that no centronics port means a round-the-houses arrangement to put most dot matrix printers online. Software? Dammit, says Barry, you do get four cracking packages thrown in and, well, the Spectrum didn't have to wait long for universal support now, did it? A separate numeric keypad for quick sums? Listen, it *is* only £400.

My own view is that most businesses or professionals who depend heavily on a fully-developed micro will wait a while yet for the QL to mature. But for many at the toe-in-the-water stage, or for home-users on a limited budget who aspire towards serious stuff, the promise of what the QL seems certain to become (and its not-to-be-sniffed-at present merits) are already fierce competition for the likes of the BBC. This book is a chatty manual re-write, nicely presented, and honestly listing the cons as well as the pros of the package as it goes along.

Don't expect professional-standard miracles of the QL just yet. But if you're itching for an aperitif of its business potential as you get to grips with working it, then this book is a good example of its ever-increasing kind.

# Much ado about nothing

**Title: Disk-Drive Projects For Micros**
**Author: Michael Milan**
**Publisher: NCC**
**Price: £5.95**

This rather pedestrian paperback assumes that you have a BBC and are fed up to the back teeth with loading and saving programs via cassette. It therefore sets out in laborious detail what a disk drive is and what it's for.

Teacher then devises projects for us to try. The first is formatting: 'A new disk, when it's first taken out of the packet, is completely blank. It's like a car park with no spaces marked.' Having mastered marking out the car park, we then learn to save, load and back-up programs with diskettes and are instructed in file handling.

I'd hesitate to call such manoeuvres *projects*, myself. As a painstakingly thorough book of disk operating instructions, this passes muster. As an amazing insight to new computer horizons, it's the let-down you might expect. Many people regard disk drives merely as a fast method of saving and loading programs, the author says, as if to imply that he's about to put them straight. I'd have thought many people were right all along.

# A kick up the sober approach

**Title: The Micro Manual**
**Author: Stewart Hasted**
**Publisher: SHA Publications**
**Price: £9.95**

Millions of otherwise highly intelligent, generally well-informed people are still computer dimwits. Embarrassed as hell about it, and aware at least that tackling a micro is the way to learn, they all want a definitive crammer.

What they don't want is to be patronised, foxed with jargon, or bored stiff.

Week in, week out, dozens of computer-smart authors take a crack at the First Principles market. Most adopt an industry overview approach, soberly describing the breadth of micro applications from zap to DOS, and stressing the old chestnut that you must decide first what you want your computer to do, then decide which system you'll buy to do it. Such guides are often helpful but almost invariably dull.

Stewart Hasted isn't dull. Stewart's a lot of fun. In fact, fun-loving Stewart is so much fun, so flip, so hip, that you want to throw a bucket of water over him. He describes himself as a nautical astronomer by profession, a writer by trade and a downhill skier by inclination. He has a high-tech consultancy which published this book.

It reads like an introduction to microcomputing as told to Kermit the Frog. There's scarcely a page that isn't packed with snappy one-liners — 'There are three types of RAM chip: static, dynamic and deep-fried' — or smothered by wacky illustrations of the fresh-out-of-art-school kind — Mona Lisa with an apple on her head and a rubber-suckered arrow on her brow. It's slick, cheeky, dizzily fast-moving and occasionally incomprehensible to anyone but an all-American yuppie — 'We just can't wait to get on top of Mount Bisset, score for the Rampling Cleavers or strike gold at the confluence of the Streep.'

Kids who sit glued to *A Kick Up The Eighties* might relate to the style and, if you can handle it, the information content of *The Micro Manual* is a rich concentrate. It hurtles across historical snippets (meet Leibniz and Stibitz, Boole and Babbage, Byron's 'naughty daughter' Ada and Grace Hopper of the US Navy), crashes through basic Basic, teases up thickets of CP/M and MS-DOS, and juggles with concepts, programs, procedures and files. From Stewart Hasted's helter-skelter of a manual, you do learn quite a lot.

A case of nutty but nice.

# Computing is a feminist issue

**Title: Women and Computing: The Golden Opportunity**
**Author: Rose Deakin**
**Publisher: Papermac**
**Price: £5.95**

Lord Byron's number-crunching daughter Ada, Countess of Lovelace, turns up again in this book, although there aren't many laughs from Rose Deakin, a former social worker. Ada, we're told, was one of the first to grasp the concepts of computing, or, Charles Babbage's 19th century Analytical Engine. Thus Ada demonstrates Ms Deakin's central thesis: that women are not half as daffy-headed about matters mathematical as male chauvinist pig-headed men like to make out.

Women do, nevertheless, shamefully neglect the opportunities provided by today's micro revolution, Ms Deakin laments. Male-dominated culture is at fault, conditioning attitudes against female high-tech achievers right from schooldays. And since 1984 is apparently The Year of WISE (Women Into Science and Engineering), it's high time something was done about it.

Ms Deakin proposes a radical shake-up of the school curriculum, wants to see far more software for girls, and wants grown-up girls to try computing as a home-based career — word processing, book indexing, setting up training schemes or specialist databases are among her suggestions. We're then given detailed case histories of a handful of ladies who've crashed their way into successful computing from home or, as in Ms Deakin's own case, turned full-time professional. And finally we get an over-abbreviated guide to choosing kit.

There could have been more of the practical advice and less of the unavoidably provocative feminist beef. I'm all for computer-smart women doing high-tech jobs, but it does get dreary reading drum-beating demands for equal opportunities. No-one in their right mind any longer challenges the justice of such claims. Better to concentrate on *how* to stake them, rather than to hammer *why* it's only fair. No doubt Ms Deakin would counter that attitudes aren't changed overnight and that you can't over-stress the need for more women to wake up to the chip.

Fine, just so long as the chip isn't on their shoulder.

# TEACH YOURSELF LISP

*Dick Pountain concludes his 'Teach Yourself' series with a look at the important fringe features of the language.*

This month I'll examine several important but unrelated features of Lisp that haven't yet been covered.

First let's find out how to split the atom. Although Lisp is excellent for list processing, on the evidence so far presented it isn't much use with strings. Names have been treated as if they are atomic; they either exist or they don't but you can't get inside them.

Sometimes we *need* to break down a name into its individual letters; a good example is the extension of the MATCH function defined last month. I suggested that it would be interesting to use variables instead of * and ?, so that the matched values could be returned to us. In order to do this we need a scheme of variable naming so that the match variables can be distinguished from ordinary list elements. Using a $ as the first letter will suffice, as in:

(MATCH '($name likes $animal) '(fred likes tree-frogs))

which leaves 'name' equal to 'fred', and so on.

To recognise variables in such a scheme, we need a way to inspect the first letter of an atom. Most Lisp dialects have the dramatic-sounding functions EXPLODE and IMPLODE to accomplish this (sometimes they're called UNPACK and PACK, or IMPLODE may be called COMPRESS). EXPLODE applied to an atom returns a list of the letters in the atom:

(EXPLODE 'frog)
(f r o g)

Now we can use all the list processing we've learnt to manipulate the individual letters and stick them back together with IMPLODE, which takes a list of letters and returns an atom. Don't forget that neither function alters the orginal atom: a new atom is formed, and it's up to you whether to substitute it for the old one. The function we need can now be defined as shown in Fig 1, and we test the result to see if it's a $ to recognise variables in the match list.

Lisp is an excellent language for handling databases, and one of the chief reasons lies in a facility that we haven't used called the 'property list'. Without getting too far into the internal workings of Lisp, let's just say that every name which you define has associated with it a list called its property list. When a name is created, this list is empty. You can use the list to give named properties to an atom, just like the fields in a database record.

If we create a name FRED, it could have properties called, say, GENDER and HEIGHT which are quite independent of any value that FRED might have. In fact the value of a variable which we've been using so far is merely one of its properties, called the 'value property'. The value property is special because it has no name of its own: it's what is returned by Lisp when the name is evaluated, and it's altered by SETQ. Other user-defined properties are manipulated by the fuctions PUTPROP, GET and REMPROP.

PUTPROP puts a value onto the property list of a name under a property name which is one of its arguments. (PUTPROP 'FRED 'MALE 'GENDER) sets a property called GENDER to the value MALE. Some dialects might take the arguments to PUTPROP in a different order, so check your manual before experimenting.

We can read back such property values with GET:

(GET 'FRED 'GENDER)
MALE

REMPROP (from REMove PROPerty) removes a property from the list (not just its value but the whole thing), so (REMPROP 'FRED 'GENDER) leaves FRED in the fashionable state of being genderless.

```
(DEFINE FIRST-LETTER (NAME)
     (CAR (EXPLODE NAME))  )
```

*Fig 1 Function to inspect an atom's first letter*

```
(DEFINE KEEP-OBJECT (CHARACTER OBJECT)
     (PUTPROP CHARACTER
              (CONS OBJECT (GET CHARACTER 'POSSESSIONS))
             'POSSESSIONS ) )
```

*Fig 2 List of POSSESSIONS property*

```
(DEFINE REST-NAME (NAME)
     (IMPLODE (CDR (EXPLODE NAME))) )
```

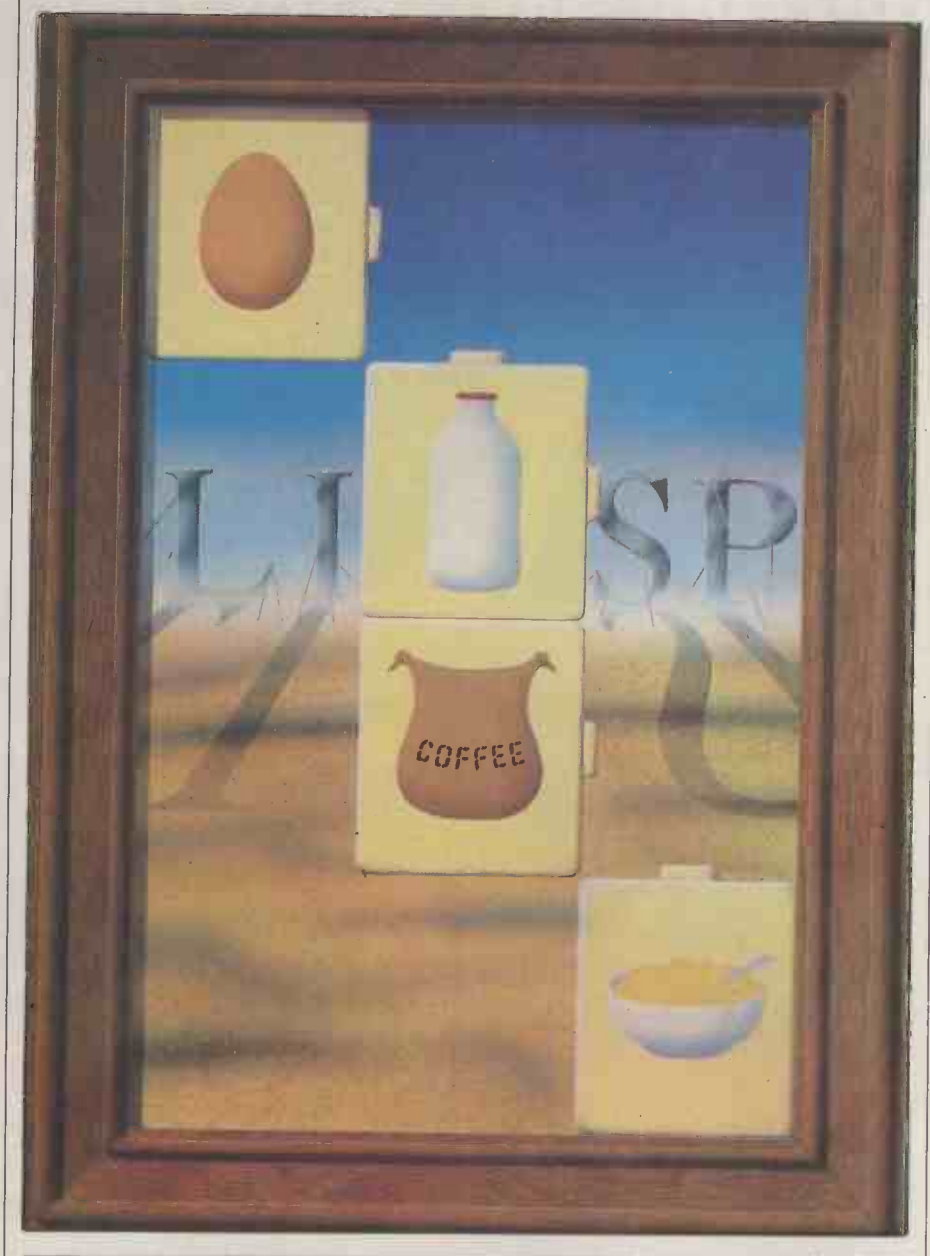
*Fig 3 Defining REST-NAME to FIRST-LETTER*

```
(DEFINE MATCH (PATT LIST)
     (COND
          ((AND (NULL PATT)(NULL LIST)) T)
          ((OR  (NULL PATT)(NULL LIST)) NIL)
          ((OR  (EQUAL (CAR PATT) '?)
                (EQUAL (CAR PATT)(CAR LIST)) )
           (MATCH (CDR PATT)(CDR LIST)) ) ) )
```

*Fig 4 First version of MATCH*

```
((AND (EQUAL (FIRST-LET (CAR PATT)) '$)
      (MATCH (CDR PATT)(CDR LIST)) )
 (SETQ (REST-NAME (CAR PATT)) (CAR LIST) )  T)
```

*Fig 5 Clause which checks for words beginning with $*




```
(SETQ NAME NIL)
(SETQ EPITHET NIL)
(MATCH '($NAME IS A ? $EPITHET) '(RUDOLPH ,IS A BIG WALLY))
NAME
 RUDOLPH
EPITHET
 WALLY
```

*Fig 6 Testing the new MATCH*

```
(DEFINE SQUARE-ALL (LIST)
     (COND
          ((NULL LIST) NIL)
          (T (CONS (SQUARE (CAR LIST)) (SQ-ALL (CDR LIST))) ) ) )
```

*Fig 7 Function to return a list of results*

```
(DEFINE DO-TO-ALL (LIST FUN)
     (COND
          ((NULL LIST) NIL)
          (T (CONS (FUN (CAR LIST)) (DO-TO-ALL (CDR LIST))) ) ) )
```

*Fig 8 Passing the function to be applied as a second argument*

```
(DEFINE ATOMCOUNT (LIST)
     (COND ((NULL LIST) 0)
          ((ATOM LIST) 1)
           ( T (APPLY 'PLUS (MAPCAR LIST 'ATOMCOUNT))) ) )
```

*Fig 9 Function using APPLY and MAPCAR to count all list atoms*

I'm sure your imagination will tell you just how powerful this facility is. It provides a way of creating fully dynamic databases whose record structure can be changed, pruned or expanded at anytime during a program run. There's no limit on the number of properties an atom can have, save that of memory space.

Let's suppose we're writing an adventure game in which characters pick up and drop possessions. Each character's name has a property called POSSESSIONS, which is a list of what they've picked up so far (Fig 2).

The character and object can be obtained from pattern-match variables. We'll start by defining a complementary function to FIRST-LETTER called REST-NAME (Fig. 3), which returns a name with the first letter stripped off. Our MATCH function can now test the first letter to see if it's a $ (indicating we've found a match variable), then put values in the variables names (without the $) and these can be used by KEEP-OBJECT. Then perhaps we could do:

MATCH '($CHARACTER picks-up ? $OBJECT) (READ))

to analyse user input expressions such as 'Frodo picks up the Orc-Repellent', and have the Orc-Repellent added to Frodo's list of possessions.

For simplicity's sake, let's use the first version of MATCH which only used ? to match any single atom (Fig 4).

We need to add a new clause to the COND which checks for words beginning with $. If it finds one and if the rest of the lists match then we have a variable match, and we want to set the value of the variable to the matched word. A suitable clause appears in Fig 5.

But, unfortunately, this won't work. The SETQ expression will bomb out because its first argument isn't an atom. Remember that SETQ *doesn't evaluate* its first argument, so (REST-NAME . . . . is just so much garbage to it. What we need instead is the related function SET, which we haven't used before, that evaluates both its arguments. (SETQ is just a SET which quotes its first argument for you, which is usually what you want.) SET will evaluate the (REST-NAME . . . . expression and all is well. Test the new MATCH with Fig 6.

Try to extend this variable matching scheme to accept *variables which match any number of atoms (assigned as a list). You could also try using a PROG to read input lists, match things, and add the things to a property list like KEEP-OBJECT does.

The last major Lisp constructs I should mention are the mapping functions. A very common need in Lisp programming is to apply a function to each member of a list in turn and return a list of the results. It's perfectly possible to do this by writing a function as in Fig 7 to apply SQUARE to each element of a list of numbers. The disadvantage is that you'll have to write a new definition for each different

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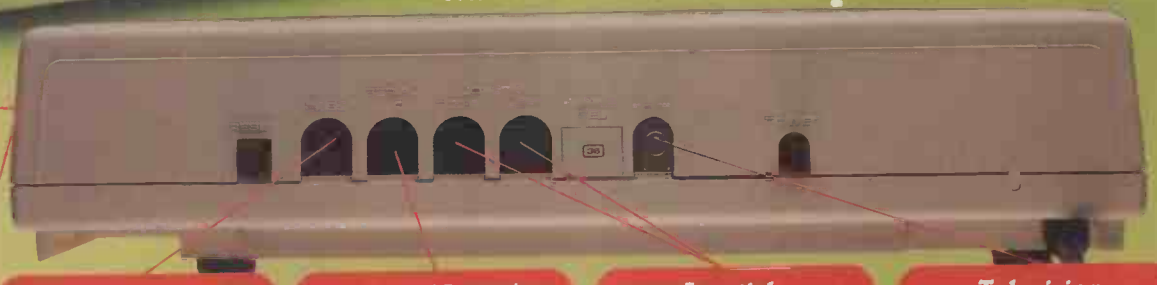

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function you want to apply in this way. We can make the definition general by passing the function to be applied as a second argument (Fig 8).

Used as in (DO-TO-ALL '(1 2 3) 'SQUARE), this will return the same answer, (1 4 9 ), as (SQUARE-ALL '(1 2 3)) does.

You may be worried by this cavalier passing of a function as an argument to another function, but Lisp is happy with it. In general, you may pass functions as arguments just as you pass numbers or lists. Complications can arise if the function passed uses variables which it doesn't bind itself, but some dialects provide a function FUNCTION which should be used instead of QUOTE when passing a functional argument, and this solves any problems.

Most Lisps provide the function MAPCAR (sometimes called MAPC) which does exactly the same thing as our DO-TO-ALL (warning: some dialects have the arguments to MAPCAR in reverse order — that is, function, list). The 'MAP' part refers to the mathematical notion of a 'mapping' rather than the everyday idea of a chart, although the two are connected.

Closely related to MAPCAR is the important function APPLY. APPLY also takes a function and a list as its arguments but instead of applying the function to each member of the list, it passes the list as multiple numeric arguments, rather than a single list argument, to the function. Take the example of PLUS which can (usually) accept any number of arguments, so (PLUS 1 2 3) is 6. If we tried to give PLUS a list of arguments, (PLUS '(1 2 3)), it wouldn't like it one bit. By using APPLY we can make it accept:

(APPLY 'PLUS '(1 2 3))

Think of it this way; APPLY takes the function and places it inside the brackets at the front of the list. APPLY is used in the inner workings of the Lisp interpreter, where multiple arguments are always represented by a list.

Don't worry if the difference between these functions doesn't sink in at once. You'll find that you only understand them properly when you use them to solve a programming problem.

As an example of their use, Fig 9 is a function which uses both APPLY and MAPCAR (a very common construction) to count all the atoms in a list.

This will only work if your PLUS can take more than two arguments, and will give an error with a single atom list. Do you know why?

Very often it would be handy to use APPLY or MAPCAR to apply a function that we're only going to use once. It isn't worth defining such a function with DEFINE and wasting valuable memory by giving it a name and permanent storage. Instead we can define an 'anonymous' function which is created only where it's needed, using that cryptic word LAMBDA. It's used so:

```
(MAPCAR LIST '(LAMBDA (NUM)
  (TIMES NUM NUM)) )
```

The LAMBDA expression defines a function identical to SQUARE (try reading DEFINE SQUARE instead of LAMBDA), but which has no name and only exists during the evaluation of the MAPCAR.

Some readers may be using versions of Lisp (muLisp, for example) which require the function LAMBDA to be used in ordinary definitions. To them I apologise. What's more, *all* versions of Lisp insert LAMBDA into the internal stored form of definitions (just as they expand into (QUOTE editor). I deliberately postponed examination of LAMBDA until this late stage because it's too confusing and alarming to introduce it at the same time as DEFINE. LAMBDA is the function which defines functions and controls the way arguments are passed, but most modern dialects disguise its presence from the user as it means a whole extra level of brackets and makes definitions much less readable.

You should now be convinced of the importance of list processing as a technique. It can model anything from human languages to the construction of DNA (ribosomes as biological Lisp machines?) Lisp is an elegant, at times beautiful, but sometimes exasperating implementation of list processing for computers. Languages like Logo and POP-11 provide a more conventional (and friendly) syntax, Prolog adds the power of automatic pattern matching, and in the future we might even see Basic with list processing extensions. But in learning Lisp you've started at the right place — the beginning. **END**

*This is the final part of our six-part Teach Yourself Lisp series. Back issues can be obtained from our office at 53 Frith St, London W1A 2HG, tel: (01) 439 4242.*

## Lisp discount offer

To help you get the best from the Teach Yourself Lisp series, *PCW* has arranged special discounts on several Lisp packages. Identify your machine from the list below and send the offer tab at the corner of this page with a cheque for the full amount to the appropriate address, stating clearly which machine it is for.

| Machine | Address | Cheque (includes VAT and p&p) |
|---|---|---|
| Spectrum<br>NewBrain | Serious Software<br>5 Wimbourne Avenue<br>Chislehurst<br>Kent BR7 6RQ | £10.50<br>(Normal price £15.50) |
| CP/M-80:<br>QX-10<br>Televideo<br>Kaypro<br>Sirius<br>SuperBrain<br>Apple II<br>Lynx Laureate<br>Transtec<br>Tatung PC2000<br>NEC 8000<br>Pied Piper<br>DRS-20<br>TAP3 & PC<br>BBC B<br>IBM PC | Software Ltd, for...<br>2 Alice Owen Centre<br>251 Goswell Rd<br>London EC1<br><br>OR<br><br>Text 100, for...<br>South Black Lion Lane<br>Hammersmith<br>London W6 | Supersoft Lisp: £75<br>(Normal price £115)<br><br>Microsoft MuLisp: £112<br>(Normal price £170) |
| | Text 100<br>Address as above | MuLisp (MicroSoft): £112<br>(Normal price £170) |

LISP DISCOUNT VOUCHER

# Look back in dismay

*The World Microcomputer Chess Championship held recently in Glasgow was full of surprises, as Tony Harrington found out.*

Looking back with hindsight at the predictions I made about the likely outcome of the 4th World Microcomputer Chess Championship (WMCC), I find many reasons for dropping the prediction-making habit as quickly as possible (see October *PCW*). This World Championship was full of surprises.

The first of these concerned those who weren't there at the off. The Novag Super Constellation was many people's idea of a hot favourite prior to the event. It had beaten all kinds of international masters at blitz chess and had acquired a great reputation in the process. Surely Novag would want to cash in on its potential and claim a WMCC title. But no, instead of an entry form, Novag sent round a circular to everyone except the organisers a week or two before the tournament, stating why these kinds of events are not worth entering.

In golf that would be called playing the percentage shot: if you have a good reputation already, why risk blowing it? However, that wasn't one of Novag's reasons for not entering. It was worried about the absence of any reliable test to differentiate between a genuine 'commercial entry' and something running on equipment way out of reach of most people's pockets. That sounds a reasonable grumble, but it has more to do with marketing nerves than reality. I still think the Super Constellation might have won if it had been allowed a chance (another prediction, but habits are hard to break).

SciSys was a less surprising absence. Nothing had been said before the tournament about a real improvement in the SciSys Superstar program. The word from SciSys was that it was working on one but that it would not be ready in time for the event.

Even with these two manufacturers out of the running, the field was one of the largest ever with nineteen entries beginning and — even more remarkably — finishing the tournament (despite the occasional threat of a walk out, a normal occurrence at these events).

Far and away the most astonishing thing about the tournament, from my point of view, was the reappearance of Conchess, which had three entries. Ulf Rathsman, the programmer, had been quietly beavering away since Conchess's rather undistinguished initial public performance at the 1982 *PCW* tournament, and had come up with a program capable of testing the best.

Then there was the Mephisto team, also with three entries. Mephisto had drawn some flak over the last year for releasing a Mephisto III which had the unfortunate habit of losing to the earlier Mephisto II. (New releases are supposed to be better than the old, rather than just different.) So it was nice to see that Hegener and Glazer, the supplier, appeared to have some improvements to offer.

Fidelity, as usual, had a strong array of entries, supplemented by a number of Spracklen programs running on business computers like the Compaq, the Macintosh and the Apple. Intelligent Software entered an experimental program and — good news for home computer owners — Richard Lang and Martin Bryant, two regular participants in what used to be the annual *PCW* European Tournaments, also had entries.

Lang's Cyrus program, available in one form or another on both the Spectrum and the Dragon, was replaced for this event by a new generation program designed for the Sinclair QL. Sponsored by Psion, which will be marketing it in the UK, Lang's program (called Psion after the sponsor, undoubtedly a wise decision) ran, for the purposes of the tournament, on an 8MHz Sage computer. It will, he reckons, be slower by a factor of three on the QL, but even so, it looks like being one of the strongest home computer programs around. Lang won joint first prize in a four-way tie for first place. This earned him a large bottle of Lang's Whisky (though he assures us he is not related).

Bryant's home computer program for the BBC Model B, White Knight Mk 10, won the 'Best home computer chess program' section at the 1983 *PCW* tournament. Bryant improved on White Knight with a program called Colossus, which has done very well as a commercial program for the Commodore 64 (see November *PCW*). For this event, he entered a souped-up version of Colossus, running on an Apple II.

Last but not least, there was the solitary amateur entry, Geoff Bulmer's 'Chessnut', a plucky little program running on a Commodore 64 and guaranteed of the best amateur trophy even if it didn't win a game (it didn't).

The seven-round Swiss tournament was held in Glasgow at the Stakis Ingrim Hotel (9 to 15 September) as part of the centenary celebrations of the Scottish Chess Association. Sponsored by CGL Ltd and Langs Supreme Whisky, in association with Stakis Hotels PLC, my main concern is that unless the Scots feel like an early celebration, we might have to wait another hundred years for a micro tournament to be as well organised and presented.

From the opening ceremony to the grand buffet close, it was a splendidly organised and run event.

Rounds began at 2pm each day and went through to a *theoretical* 10pm close. I say theoretical because the tournament director, Mike Valvo, a US International Master, made a practice of allowing play to go on where necessary until the computers either bored their programmers to death or reached a result. If there was the smallest sign of theoretical interest left in the game, he was willing to pace the floor and let the machines fight it out. Even when the programmers themselves wanted to

**Game No 1 Sargon Compaq versus Mephisto B**

| | | | |
|---|---|---|---|
| 1 | Nf3 | d5 | |
| 2 | g3 | Nc6 | |
| 3 | Bg2 | e5 | |
| 4 | d3 | Nf6 | |
| 5 | 0-0 | Bf5 | |
| 6 | Bd2 | Bc5 | |
| 7 | b4 | Nxb4 | |
| 8 | Nxe5 | Qd6 | |
| 9 | Bc3 | 0-0 | |
| 10 | Nd2 | Rf-e8 | |
| 11 | e4 | dxe4 | |
| 12 | Nec4 | Qa6 | |
| 13 | Bxf6 | Qxf6 | |
| 14 | dxe4 | Bg6 | |
| 15 | Rb1 | Qa6 | |
| 16 | a3 | Nc6 | |
| 17 | a4 | Bb4 | |
| 18 | Ra1 | Rad8 | |
| 19 | Qc1 | Bxd2 | |
| 20 | Nxd2 | Qe2 | |
| 21 | Rfd1 | Bh5 | |
| 22 | f3 | Ne5 | |
| 23 | g4 | Nxg4 | |
| 24 | fxg4 | Bxg4 | |
| 25 | Qa3 | Rxd2 | |
| 26 | Rxd2 | Qxd2 | |
| 27 | h3 | Qd4+ | |
| 28 | Kh1 | Bd7 | |
| 29 | a5 | Bc6 | |
| 30 | a6 | b5 | |
| 31 | Rb1 | Bxe4 | |
| 32 | Qb3 | Bxg2+ | |
| 33 | Kh2 | Bc6 | |
| 34 | Kg3 | Re2 | |
| 35 | Qf3 | Bxf3 | |
| 36 | Rf1 | Qe5+ | |
| 37 | Kxf3 | Qe4+ | |
| 38 | Kg3 | Rg2 mate | 0-1 |

This was one of the better games from the tournament. The manner in which Mephisto forces the win is particularly impressive.

**Game No 2 Intelligent Chess Software (ICS) versus Chessnut**

| | | | | | |
|---|---|---|---|---|---|
| 1 | d4 | d5 | 9 | f3 | Bh5 |
| 2 | c4 | Nc6 | 10 | Qb3 | b6 |
| 3 | Nc3 | dxc4 | 11 | Qa4+ | Qd7 |
| 4 | d5 | Ne5 | 12 | Bb5 | 0-0-0 |
| 5 | Nf3 | f6 | 13 | Qxa7 | Qxb5 |
| 6 | Nxe 5 | fxe5 | 14 | Nxb5 | Nxd5 |
| 7 | e4 | Nf6 | 15 | Qa8+ | Kd7 |
| 8 | Bxc4 | Bg4 | 16 | Qxd5+ | Kc8 |
| 17 | Qc6 | Rd1+ | | | |
| 18 | Kxd1 | Kd8 | | | |
| 19 | Nxc7 | Bf7 | | | |
| 20 | Kc2 | Kc8 | | | |
| 21 | Na6+ | Kd8 | | | |
| 22 | Rd1+ | Bd5 | | | |
| 23 | Rxd5 | mate | | | |
| 24 | 0-1 | | | | |

Although ICS didn't do well overall, it was quite up to exploiting a poor opening by Chessnut.

call things a draw Valvo was heard to say: 'Let's give it 10 more moves and see what happens . . .'

The chess played was definitely of a higher standard this year than ever before, but you would have been hard pressed to spot that from most of the games scores.

Computers, even good ones, play boring chess against each other; they look much more impressive against chess players, when the game takes on more shape and sharpness.

But although it didn't lead to much in the way of spectacular middle game fireworks or witty sacrificial attacks, the increased strength of many of the participants showed up in the large number of end games that were reached (see Games section).

Another indication of the strength of the event is that Martin Bryant's Colossus — which I have always thought of as a rather good program — could only scrape up one and a half points against the dedicated machines.

And L'Empereur, an old Intelligent Software program which tied for first commercial place in the 1982 *PCW* Tournament, entered here by its French manufacturer, could do no better.

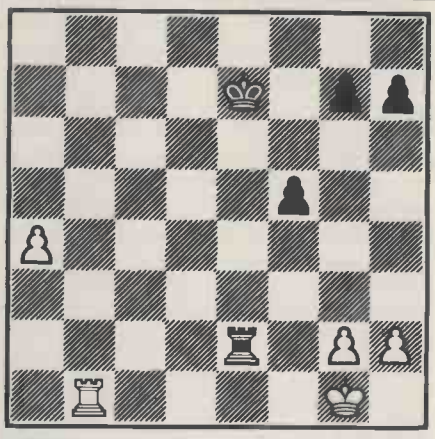
Caithness Glass bowls were presented to the four winners by Professor Monroe Newbarn, president of the ICCA. The actual title of commercial world champion, though, went to the Mephisto A, since it was the only machine among the winners which fulfilled the condition of being currently available in the shops.

The Fidelity Elegance ran at 6.1MHz on a 6502 processor, the Mephisto programs at 12MHz on a 68000 and Princhess (or Conchess) at 6.1MHz on a 6502 chip. Full tournament bulletins are available from Chess Suppliers (Scotland) Ltd, 15 Hope St, Glasgow G2.

## *Games section*

**White: Fidelity Elite X. Black: Mephisto B. Notes by Grandmaster Dr John Nunn**

(The 4th World Microcomputer Chess Championship was notable for the close finish and for the surprising number of interesting end games arising. The reason for this is probably that the struggle between the stronger programs created today is likely to remain finely balanced for a long time. The following fascinating ending was of some sporting interest since the Fidelity Elite X needed to win against Mephisto B to tie for first. We take up the story with the Elite, as White, about to make its 43rd move.)



43 Rb1-a1!

(Although material is level, White has all the chances because the passed a-pawn can be used to deflect Black's pieces from the defence of his kingside pawns. White correctly places his rook behind the pawn to support its advance.)

43 . . . Ke7-d6

(Black later decides to blockade the pawn with his rook in any case, so it would have been better to do this immediately by 43 . . . Re2-e6 44 a4-a5 Re6-a6.)

44 a4-a5 Kd6-c7
45 a5-a6 Re2-e8

(Black would have preferred to use his king to obstruct the pawn's advance by 45 . . . Kc7-b8 46 a6-a7+ Kb8-a8, so as to leave the rook actively placed, but White can play 45 . . . Kc7-b8 46 Ra1-b1+! followed by RB1-b7 attacking the kingside pawns.)

46 Ra1-b1?

(Giving Black unnecessary chances. 46 a6-a7 Re8-a8 47 Kg1-f2 Kc7-b7 48 Kf2-f3 Ra8xa7 49 Ra1xa7+ Kb7xa7 50 Kf3-f4 Ka7-b6 51 Kf4xf5 Kb6-c7 52 Kf5-e6 followed by Ke6-f7 wins the kingside pawns. We shall meet several lines in which the rooks are exchanged, when the result depends on whether White's king can penetrate to attack the g7 and h7 pawns before Black's king comes to the rescue. Here the result is as close as it could be, depending on a single move.)

46 . . . Re8-b8

(46 . . .g7-g6 47 Rb1-b7+ Kc7-c6 48 Rb7xh7 Re8-e1+ 49 Kg1-f2 Re1-a1 was no better because of the strong reply 50 Rh7-h6!.)

47 Rb1-e1?

(Missing 47 Rb1xb8 Kc7xb8 48 Kg1-f2 winning as before.)

47 . . . Kc7-d6
48 a6-a7 Rb8-a8

(White reverts to the correct plan. Black's rook is completely immobilised, so White has time to bring up his king.)

49 . . . g7-g6
50 h2-h3 Kd6-c7
51 g2-g4?

(This should have thrown away the win, which could have been forced by the familiar plan of 51 Kg1-f2 followed by a king advance.)

52 . . . f5xg4
52 h3xg4 Kc7-b7

(Now we can see the difference. Thanks to the pawn exchange Black can meet 53 Kg1-f2 by 53 . . . Ra8xa7 54 Ra1xa7+ Kb7xa7 55 Kf2-f3 h7-h5 exchanging White's last pawn and drawing.)

53 Ra1-b1+ Kb7-c6

(Black could also have taken the pawn, but he has not spoilt anything yet.)

54 Rb1-a1 Kc6-b6
55 Ra1-b1+ Kb7xa7
56 Kg1-f2

(White is in no danger of losing despite his minus pawn, since Black's king is too far away, but equally he should not win.)

56 . . . Ra8-f8+
57 Kf2-g3 Rf8-f7

(57 . . . h7-h5 was the simplest draw.)

58 g4-g5 Rf7-f5
59 Kg3-g4 Ka7-a6
60 Rb1-d1 Rf5-f7
61 Rd1-b1 Rf7-b7??

(Mephisto's blunder allows the Elite X to take joint first place. Black only needed to mark time by 61 . . . Ka6-a7 to draw, since White cannot undertake anything positive.)

62 Rb1xb7! Ka6xb7

(White's king is able to win both Black pawns and reach a won position with king and pawn vs king.)

63 Kg4-f4 Kb7-c6
64 Kf4-e5 Kc6-c5
65 Ke5-f6 Kc5-d4

(Or 65 . . . Kc5-d6 66 Kf6-g7 Kd6-e7 67 Kg7xh7 Ke7-f7 68 Kh7-h6 Kf7-f8 69 Kh6xg6 Kf8-g8 70 Kg6-f6 Kg8-f8 71 g5-g6 Kf8-g8 72 g6-g7 Kg8-h7 73 Kf6-f7 and the pawn promotes to a queen.)

66 Kf6-g7 Kd4-e4
67 Kg7xh7 Ke4-f5
68 Kh7-h6 Kf5-e5

(Black has no choice but to abandon his last pawn to its fate.)

69 Kh6xg6 Ke5-e6
70 Kg6-h7 Ke6-d5
71 g5-g6 Kd5-e6
72 g6-g7

(and Black resigned.) END

SOFTWARE

# Files & Folders

*Does ACT Pulsar's Files and Folders, a straightforward data management system similar to dBase II, provide every useful facility for the user? Kathy Lang finds out.*

Files & Folders is a file management package intended to allow people new to computers to set up their own filing systems on micros running MS-DOS or PC-DOS. The package stores information in records of fixed length and a fixed format, with the option of using one or more items in a record as keys with which to quickly access the records. You can keep several sets of records in separate files and relate them together, perhaps by having a customer file, stock file and order file in an order processing system.

Files & Folders is completely menu-driven; I reviewed it on an Apricot, and the microscreen has been used to effectively provide the menu options. Setting up a folder is a simple job and exploits the facilities of keyboard and screen well. There are, however, no batch processing options at the moment. You can't, for example, ask the package to automatically update the prices of a range of products by 10%, nor can you put together sequences of operations for subsequent execution with a single key — there's no programming capability at all.

In some respects the package's facilities are rather limited, but on the other hand, as you can see from Fig 1, it's rare to find the file linkage capability in packages in this price bracket.

## Constraints

The major constraints of Files & Folders are shown in Fig 2, together with its main features. The limitation on the number of files open at a time and on total number of related files is reasonably generous, since it doesn't include indexes or report files. The overall limit on key length may be a restriction; according to Pulsar the limit is a total of 29 characters, but I successfully used a key of 46 characters long, so the actual limit remains unknown. You can't use several fields in conjunction as indexes, which will be a disadvantage in some applications. A large number of date formats is provided, plus three time formats — an unusual feature. Field names may not be longer than the field length they identify, although you can have separate captions which may be longer. As field names are used for identification in several places, this could be a nuisance if you have many short items to store.

## File creation and indexing

The first step in setting up a file is to design a screen format. This process allows the user plenty of flexibility, but is also well guided by the package. For each field (called a box in Files & Folders) you type any labelling information you need, then press a microscreen key to 'start a box'. Cursor movement is used to indicate the desired length: when a box is the right length, you press RETURN or a microscreen key. If you've placed boxes or captions incorrectly, you can use a cut and paste technique very similar to that used by word processors to move the row, column or block of information to

| Package | Cost (£) | Summary |
|---|---|---|
| Condor | 295 | Fixed record structure, two data files available at once. Good post feature for updating related files. Only one index per data file. Very like dBaseII, although some people find it easier to use. |
| DMS+ | 195 | Stripped-down version of Delta from same (British) supplier — one file open at a time, no tailoring. Indexes must be reformed when data is altered. Good reporting features including letter writer. |
| Friday! | 195 | Simple, single-file, fixed format record handler. Drawbacks are clumsy approach in letter writer and when designing screen formats. Excellents tutorial manual and menu charts, but not easy to find items in reference manual. |
| Files and Folders | 295 | Easy-to-use package: allows up to three data files open at once, up to eight linked together. Good use of screen when setting up files. Good list and sort features, but no letter writer. Menu-driven, with no tailoring or automatic command execution. |
| Pearl | 190 | Economical storage of varying length records, indexes kept up-to-date, paint-a-screen formatting for screens and reports, entry screens can read from several files at once. |
| Rescue | 295 | British-supplied package with good data validation features. Menu-driven with few short-cuts. Single file, fixed record structure stored, but good facilities for displaying and entering records with irregular structure. |
| dBASEII | 438 | Popular fixed-format package allowing two data files at once. Any field may be a key, so retrieval is fast. Flexible key construction. Commands used to give instructions. Can operate on whole file in 'batch', and stores sets of commands to tailor system. |

*Fig 1 Comparison of similar data management packages*

the required place. And it's very clear — you actually see the whole block moved one line or column at a time as you move the cursor.

So far, so good. Some of the process details are rather tedious, though; for example, when you start to enter information into the records, the system assumes that you want to enter the data in fields in the order they were set up. You can change the order later but that's another stage, so it helps to set them up in the right order to begin with. When you finish setting up a box, pressing RETURN moves you to the next line but beneath the caption of the box you have just defined.

The only other way to move the cursor is with the arrow keys, which is tedious for a whole line.

The process is easy and quick if you only have one field per line, or if your data entry treats the screen as, say, two columns, going down the first and then the second. But if you want to put several fields on each line, and have them entered row by row across one complete line before going to the next, the set-up process is much less helpful.

Once you have designed the screen format, you must set up the attributes required by each field. Once again, the process is a mixture of quick and easy, and slow and difficult. Files & Folders assumes that all fields will be text fields unless informed otherwise, so if most of your data is text then type definition is very quick. On the other hand, it assumes no correspondence between captions and field names: if you've used as captions the names you want to use for identification, you still have to respecify them each time. (Some of you would *want* to respecify because of the limitation on field name length, but it would be useful to have to respecify only those.)

Any field may contain only unique values, may be cleared each time the entry form is displayed, or have its value carried over from the previous record, and be saved or stored temporarily. Using these last two attributes simultaneously, it's possible to create the effect of cumulative memory variables so that, for instance, as you enter a set of orders you can see a display of their cumulative total value. The default attributes for each field are non-unique, cleared and saved, and are the most sensible ways to set those switches for minimum change by the user.

Sort keys, on the contrary, are treated in the reverse of what's needed. You must have at least one sort key: these are used for retrieving individual records for screen display and amendment. The manual warns against having long sort keys and too many of them — and then proceeds to set up the first five characters of each field as a sort key unless told otherwise! It's more sensible to make it easy for people to do sensible things, and difficult for them to take undesirable courses of action.

In addition to these compulsory elements, Files & Folders also has several optional elements in file specification. You can provide for links with one or two other files which may in turn be linked to other files, with a maximum of eight being connected together in a single group. Numeric fields may be calculated from the results of other fields, either within the record or by being accumulated across records. You may also specify an Edit Mask for the field, which gives a limited data validation capability. (The facilities for checking use the same rules as when testing to see if a record should be selected for listing or reporting.)

Once a file has been created, its structure can be changed by asking Files & Folders to revise the folder, then opting to copy the data from the old folder to the new one. (The same process can be used to create a file with a structure similar to an existing file, only in that case the data won't be copied.) Both files must be in the same 'filing cabinet': that is, on the same floppy disk or in the same hard disk directory.

| | |
|---|---|
| Systems supported | MS-DOS, PC-DOS |
| Maximum file size | OSL |
| Max record size | Approx 1600 chars |
| Max no fields | Limit of screen |
| Max field size | 78 |
| Max digits | NS |
| Max prime key length | NS |
| Special disk format? | No |
| File size fixed? | No |
| Link to ASCII files? | Yes |
| Data types | C, N, D, L, T, Seq# |
| Fixed rec structure? | Yes |
| Fixed record length stored? | Yes |
| Amend rec structure? | By copying |
| Link data files? | Yes |
| No data files open | Three (eight total) |
| No sort fields | Five |
| No keys | Varies with length |
| Max key length (chars, fields) | Not stated |
| Subsidiary indexes kept up-to-date? | UTD |
| Data validation | Adequate |
| Screen formatting | Paint-a-screen |
| Unique keys | Optional |
| Report formatting | Paint-a-screen |
| Store calculated data | On data entry |
| Totals & statistics | Yes |
| Store selecn criteria | Permitted |
| Combine criteria | And, Or |
| >1 criterion /field? | Yes |
| Wild code selection? | String within |
| Browsing methods | Any Key |
| Interaction methods | Menus |
| Reference Manual (max 5*) | ** |
| Tutorial Guide (max 5*) | *** |
| Reference Card (max 5*) | N |
| Online Help (max 5*) | *** |
| Hot-line? | Dealer support |

*Fig 2 Features and constraints*

## Data input and updating

When adding or amending records, Files & Folders displays the format you defined for the record when the file was created. You can work through a file in record order, or you can select a particular record by entering a value into any field which is a sort key, and the record most closely matching it will be displayed. Once you have retrieved a record using a particular field as a key, you can browse through the file in the order of that field. You can also retrieve records from related files so that you can, for example, display the record for the associated stock item when entering an order. (You cannot, though, display the two records side by side.)

Amendment and replacement of records is reached through the menu for adding records — one of the options on that menu is to search for a record to amend. Once into that function you can continue amending, browsing or directly selecting new records until you've completed the changes. You are then returned to the menu which allows you to add records.

Records are directly edited on the screen under full cursor control. There are, however, no editing commands within a field except Backspace (used to delete the preceding character). To amend a field, the only option is to completely retype it.

## Screen display

For record addition and amendment, only one format is provided using one screen per record. You can, however, also list records onscreen, one per line.

In this mode you can display any or all fields, and any or all records using selection criteria which can apply to any field, not just indexed fields. Records can be listed in any order, not only by key field. There is, however, no way to display onscreen, before printing, a report which has been set up using the full report formatting facilities.

## Printed reports

There's a standard format for printing automatic reports which uses the information about field lengths in the record definition. Files & Folders will send a listing of records to the printer,

but to print a full formatted report you have to set up a report format.

Report formats are attached to particular folders, although they can access information from other linked folders. The report definition allows you to specify both detail information to be taken from each record, and summary information. You can have the records sorted on up to five fields, and these may be used to give page breaks and to trigger the printing of sub-totals. You can specify which fields are to be used as the sort items when the report is printed, so you could use the same report format to produce several reports on the same file using different sort and sub-totalling sequences. I couldn't, however, find a way to use the same report format with two different folders of similar layout.

No special features are provided for printing personalised letters, so if you need anything more than the crudest facilities in this area you have to send the required information to a file, and then process this with a 'mailmerge' program such as that associated with WordStar. This can be done using the report formatter, by setting up a format which produces the detail records in the appropriate form and then sending the report output to a text file for later use by the mailmerge program.

## Selection & sorting

When selecting records for amendment, or in order to view complete records one on each screen, you can use only key fields to extract particular records and only one key can be used at a time (that is, you can't use the direct retrieval features to ensure a record passes two or more tests). To be more selective, you can either set conditions on the listing of records on screen, or set similar tests which must be passed by records which are to be the subject of a printed report.

Three types of test are allowed: against a constant value; against the value of a field in the same record; and against a field in a linked file record. The usual comparison operators (equal, not equal, less than, greater than) are allowed, but no special text comparison operators such as the wild codes common in many packages. If you need to apply several tests, the results may be ANDed or ORed or a combination of the two, so that you can arrange for all tests to be passed, or any subset that you require. The method of specifying how tests are to be combined is, however, rather verbose. To specify that one field may take only one value, and another may take one of two, you must respecify the essential condition once for each alternative value of the second test field. The user is helped by the way Files & Folders allows you to press one key or microscreen position for each field name or condition, but the process is still tedious. People quickly become used to the idea of constructing conditions using brackets if the system is reasonably helpful; once this skill has been learned it saves a lot of time!

These selection features apply to listing onscreen with the one-record-per-line automatic report feature, and with the formatted report writer. In each case you specify the selection in full when you want the report — there's no way of storing a sequence of selections for future use.

When retrieving complete records for amendment or display, one record per screen, you can see the records in order by any one of the key fields specified when the file was set up. When listing records — one on each line of the screen using the automatic report feature — you can see the display sorted on any one field (not just a key field), and it's this feature which was used in Benchmark seven. When using the full report format, you can sort on up to five fields at a time.

As with selection criteria, there's no way to store sort field specifications. It's good to be able to specify the sort field afresh when printing the report if you need to, but equally it's helpful to be able to specify with the stored format the order in which you'll most often want to see the report.

## Calculation

The record definition can include the specification of calculations on numeric fields so that you can construct a numeric field from constants, the values of other fields in the same record, and from the values of fields in other related files. You can also concatenate text strings or characters from text fields, but you can't carry out calculations using dates or times. Similar calculations can be carried out in reports to produce averages and simple statistics such as standard deviations. In records and reports, you can create temporary fields for accumulating values or calculating information which you want to display but don't need to store. But you can't, as in some packages, use Files & Folders as a desk calculator.

## Multiple files

Files & Folders allows you to have three files open at once, and up to eight linked together; the linkage allows indexed retrieval of records in related files. You can write to other files as well as retrieve information from them, making it possible to use the system in quite sophisticated applications provided the limits on file numbers don't worry you. Indeed, these limits are more flexible than those on some more expensive packages. The fields by which files will be linked are specified when the files are set up, as are the rules for linkage. This means that the relationships between files are an explicit part of their structure, rather than being specified by processing statements when files are being updated or read. The Files & Folders method is easier to use and involves much less work for the user, but is less flexible than the alternative approach.

## Tailoring

There are no facilities for tailoring Files & Folders to specific needs (for example, by storing sets of commonly used actions in a command file). This can make the system tedious to use if you repeat tasks regularly.

## Security & housekeeping

Files & Folders uses a simple password system to protect files against unauthorised access. Every user may have a password, and to each password is attached an access number; the password owner may use only those files which have the same number. Files

## Benchmarks

| | |
|---|---|
| BM1 | Time to add one new record (Inst) |
| BM2 | Time to select record by primary key (Inst) |
| BM3 | Time to select record by secondary key (Inst) |
| BM4 | Time to access 20 records from 1000 sequentially on three-character field (1m 40secs) |
| BM5 | Time to access record using wild code (Inst) |
| BM6 | Time to index 1000 records on three-character field (14m 5secs) |
| BM7 | Time to sort 1000 records on five-character field (14m 20secs) |
| BM8 | Time to calculate on one-field per record and store result in record (NA) |
| BM9 | Time to total three fields over 1000 records (3m 31secs) |
| BM10 | Time to add one new field to each of 1000 records (22m 4secs) |

Time to import file of 1000 records: 16m 10secs

Notes: NA = Not Applicable — no batch updating available
Benchmarks done on Apricot with hard disk

with access number zero may be used by anyone, while the password with access number 255 allows the user to carry out any tasks on any file, including changing, listing and adding passwords.

The ability to have several files with the same access number allows several users to have access to a group of files, but the restriction to one access number per password will often mean that some users will need several passwords.

For example, if I have some files which I wish to share with a colleague, but others which are personal to me, I'll need two passwords — one with the access number of the shared files, and another with the access number of my personal files. This simple system should nevertheless be adequate for applications where the basic data management functions provided by Files & Folders are sufficient.

Each password may also have an access flag, which means that the user may be restricted to reading files and adding records to them, or to adding, amending and deleting, but not creating new files or modifying file structures. The feature is rendered less useful than it might be by the necessity for users to have the full capability of adding and altering files if they are to create new formats for reports, since this involves creating a file (albeit a layout file rather than a potentially large data file). There's also no read only flag: surely a user must at least be allowed to create new records.

Files & Folders keeps all the files on one disk or in one hard disk directory in a single 'filing cabinet'; all files which interact with one another must be within the same filing cabinet. Within the package, you can delete files and copy files between filing cabinets. The maximum number of files in one cabinet is 30, but this is not likely to be a problem for most people, given the limited capacity of floppy disks and the ability to create new cabinets in other directories on hard disks.

## Links with outside

You can write a text file from within the system by setting up an appropriate report format to create the required output format (for example, to write a file of names and addresses which can be read by a word processor with mailmerge capabilities). It also provides a facility for writing a DIF™ format file, which allows you to pass information from the package to most spreadsheets. In the full version of Files & Folders, which needs at least 320k memory, you can import text records provided they are of fixed format. This allows you to import files from another data management package such as dBasell.

## User image

Files & Folders is entirely menu-driven, with function keys used to involve options. This applies even to options such as the number of decimal places a numeric field should have. Such an approach should make the system very easy to use when first starting and for those who use the system only occasionally, but may become tedious for experienced users. This applies particularly to such aspects as setting up selection rules; users soon learn how to write a conditional expression using brackets, which saves a geat deal of time.

The other area where no concession has been made to more experienced users is in the paths through the menu structure. You can't jump to a particular part of the system once you know your way around, but must go down through the menu tree in the defined order. Nor can you exit quickly from the lowest levels of menus, but must press the EXIT option key several times — sometimes as many as six or seven times — to get out cleanly. This is a shame — it's not difficult to provide short cuts for experienced users.

By and large the system is consistent in its use of options and keys. For example, in all but the main menu, function key 1 is used to exit to the level above, and on the Apricot function key 1 always has this meaning. The functions available at any time are shown at the bottom of the screen, with pictograms of the (numbered) function keys; up to eight are used at once.

On the Apricot, on which Files & Folders was tested, the function keys are implemented partly on the microscreen's six keys, with the other two being FINISH and HELP from the Apricot's fixed bank of function keys. This means that the purpose of each function key is shown on or above it. The numbering scheme used by Files & Folders does, however, make matching keys to function rather awkward. Exit is usually function 1, with the main options on the menu numbered two to seven. On the Apricot, this means that in general microscreen key one matches menu option two, key two matches option three, and so on. But on the main menu, things are worse: the keys are labelled and used in the same way as on all subsequent levels, but this is not the same convention as the manual uses — here it's the last key which gives Exit. As a result, all the manual references to the main menu are, for the Apricot, one number out. The section of the reference manual referring to setting page formats in reports suggests that the appropriate menu path is 1-4-3-3-5, whereas on the Apricot it's 2-4-3-3-5.

## Documentation

Files & Folders comes with a single manual in two sections, tutorial and reference. The tutorial section I found quite helpful, although some sample files (rather than just instructions on how to set them up) would have made them even better.

The reference section is less good, not so much in what it includes as in what it leaves out. It consists entirely of an explanation of what each menu option does, ordered by option numbers. You get the whole of the submenus for main menu option one, then those for main menu option two, and so on though with no clear indication of where a new major option begins. But it's supplemented by an effective index, making it an improvement on most reference manuals.

On the bad side, there's no reference summary to give a brief overview of the package features, and no explicit information about constraints (I still don't know the maximum total size of key fields for a file). Worse still, in many ways, is the absence of a menu tree diagram. This makes it hard to tell where a particular feature is, either in the software or in the manual, and is not helped by some rather infelicitous naming. For example, 'revise a folder' means 'change the structure of a file', not 'change entries in an existing file'.

Files & Folders provides a reasonable level of online help which briefly explains each option currently available. There isn't any way of getting a more detailed level of help than this one line per option, although the help screens do, I'm glad to say, refer to the appropriate page number in the manual.

## Conclusion

Files & Folders is a simple, straightforward data management system. In its price bracket it provides better-than-average facilities for retrieving and listing records onscreen, and reasonable reporting features including five levels of sub-totals. The facilities for file linking should meet most users' needs.

The absence of any batch processing features will, however, be a major disadvantage in many applications, and the lack of tailoring facilities will restrict its use to those whose needs are met by the package as it stands.

END

## Summary

| | |
|---|---|
| Package Type | Data management system with basic features plus relationships between several files. |
| Ease of Use | Good for novices, rather tedious for experienced users. |
| Error Messages | Adequate. |
| Documentation | Tutorial manual quite good, reference adequate. |
| Costs (ex VAT) | £295 |
| Supplier | UK distributor: ACT Pulsar, (021) 455 7000. Freepost, Birmingham B16 1BR. |

# T.J.'s Workshop

*Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to TJ's Workshop, PCW, 62 Oxford Street, London W1.*

*Please keep your contributions concise. We will pay £5-£30 for any tips we publish. PCW can accept no responsibility for damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.*

## VIC-20 CONTROLLER

This VIC controller program may be the answer to many problems, as well as an innovative way of achieving new screen displays.

It effectively gives you two VIC chips: one operating on top of the screen, the other on the bottom. The changeover point can be altered, as shown in the first demo program. This sets up the system, and sets two different screen and border colours, but because of the routine they both appear onscreen at the same time, one in the bottom half, the other in the top.

The program then alters the changeover point. The second demo program turns on just one sprite, but shows that it's displayed twice by the swapping of the registers.

To use the routine, issue the SYS command as in the demo files, then treat the two areas of memory (defined as VIC1 & VIC2) as the normal VIC chip. VIC + 32 is the usual address of the border colour. To set the border colour of the top of the screen, just use VIC1 + 32 in place of VIC + 32. For the bottom of the screen, use VIC + 32.

The changeover point can be changed: for example, allowing a small text screen at the bottom and a large hi-res screen at the top. It's best to play about with the demo programs to get the feel of the system, then to write your own program. Don't forget to run the loader program first to load in the control code.

*Steve Mehew*

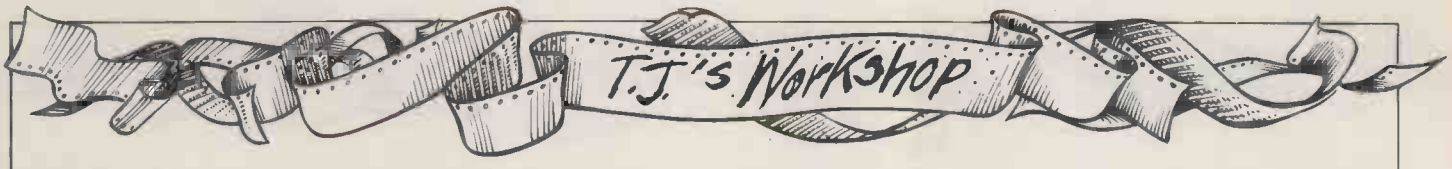
```
10 REM VIC CONTROLLER BASIC LOADER.
20 REM (C) STEVE MEHEW 1984.
30 :
40 S=49152:E=49332
50 FOR R=S TO E:READ A:POKE R,A:NEXT
60 PRINT"DATA COMPLETE.":END
70 :
400 DATA 32,45,192,120,169,60,141,20
405 DATA 3,169,192,141,21,3,169,200
410 DATA 141,18,208,173,17,208,41,127
415 DATA 141,17,208,169,127,141,13,220
420 DATA 173,13,220,173,26,208,9,1
425 DATA 141,26,208,88,96,162,46,189
430 DATA 0,208,157,0,206,157,0,205
435 DATA 202,16,244,96,162,17,189,0
440 DATA 206,157,0,208,202,16,247,162
445 DATA 21,189,0,206,157,0,208,232
450 DATA 224,25,208,245,162,27,189,0
455 DATA 206,157,0,208,232,224,47,208
460 DATA 245,169,120,141,20
465 DATA 3,169,192,141,21,3,169,251
470 DATA 141,18,208,169,1,141,25,208
475 DATA 76,188,254,162,17,189,0,205
480 DATA 157,0,208,202,16,247,162,21
485 DATA 189,0,205,157,0,208,232,224
490 DATA 25,208,245,162,27,189,0,205
495 DATA 157,0,208,232,224,47,208,245
500 DATA 169,60,141,20,3,169,192,141
505 DATA 21,3,169,200,141,18,208,169
510 DATA 1,141,25,208,76,49,234,202

READY.

100 REM TEST PROGRAM FOR CONTROLER 1
110 :
120 REM WRITTEN BY STEVE MEHEW -- 1984
130 :
140 V1=52736:REM PSEUDO VIC #1
150 V2=52480:REM PSEUDO VIC #2
155 VA=49320
160 :
170 SYS 49152:REM START ROUTINE
180 POKE V2+32,0
190 POKE V1+33,0
195 GOSUB 400
200 :
210 FOR LINE=70 TO 230
220 POKE VA,LINE
240 NEXT
250 :
260 FOR LINE=230 TO 70 STEP-1
270 POKE VA,LINE
290 NEXT
300 :
310 GOTO 210
320 :
400 PRINTCHR$(147):PRINT
410 PRINT"WATCH THE SPLIT LINE MOVE..."
430 RETURN

READY.

100 REM TEST PROGRAM FOR CONTROLER 2.
110 :
120 REM WRITTEN BY STEVE MEHEW -- 1984
130 :
140 V1 = 52736
150 V2 = 52480
155 VA = 49320
160 :
170 SYS 49152:REM START ROUTINE
180 :
190 REM SET UP SPRITE (ONLY ONE !!!)
200 POKE V1,100:REM X COORD
210 POKE V1+1,200:REM Y COORD
220 REM POSITION ONE SPRITE AT 100,200
230 POKE V1+39,1:REM COLOUR=WHITE
240 REM
250 POKE V2,100
260 POKE V2+1,100
270 POKE V2+39,1
280 REM
290 POKE V1+21,1:POKE V2+21,1
```




```
291 REM ABOVE SHOWS ONLY ONE SPRITE
292 REM IS ACTUALLY TURNED ON.
300 REM
310 POKE VA,150:REM SWITCH AT LINE 150
320 REM
330 POKE 2040,13
340 FORR=0TO62:POKE 832+R,192:NEXT
350 REM
360 POKE V1+16,0:POKE V2+16,0
370 END

READY.
```

# ATARI OUTPUT DEVICE

This subroutine allows you to change the Atari's standard output device (the standard output is where all system messages, PRINT statements, and so on appear, and normally this is the screen). With this subroutine, you can specify another device (usually a printer) and save yourself the bother of writing everything twice using PRINT &LPRINT. The routine will work regardless of operating system, or even if you have superseded the normal device driver by adding a new device handler.

Simply type STDOUT$ = "P:" or STDOUT$ = "E:" (depending on whether you want printer or screen output), then GOSUB 10000. Everything will be then sent to the chosen device.

```
10 DIM STDOUT$(2):
   REM DECLARE THE
   STRING FOR USE
   THROUGHOUT THE
   MAIN PROGRAM
   AND IN THE
   SUBROUTINE ITSELF
   .
   .
   .
   .
   MAIN PROGRAM
   .
   .
10000 FOR DEVICE = 830
   TO 794 STEP -3: IF
   PEEK (DEVICE) = ASC
   (STDOUT$) THEN
   HANDLER = PEEK
   (DEVICE + 1) +256 *
   (PEEK (DEVICE + 2)):
   POP: GOTO 10020
10010 NEXT DEVICE: PRINT
   "NO SUCH DEVICE":
   RETURN
10020 POKE 838, PEEK
   (HANDLER + 6):
   POKE 839, PEEK
   (HANDLER + 7):
   RETURN
```

*F M O'Dwyer*

# COMMODORE 64 PRINT AT

The use of cursor controls within a print statement on the Commodore 64 allows flexible use of printing, but inevitably results in statements containing large numbers of cursor control characters which are almost impossible to read on a printer. What is needed is a PRINT AT command, which is provided on some machines such as the ZX Spectrum.

Here is a short machine code routine (only 29 bytes long) which is accessed by a SYS call, followed by the x coordinate (0-39) and the y coordinate (0-24). 0,0 is the top left-hand corner.

The routine is fully relocatable, and by letting the variable AT be the address of the routine in memory, the call is easy to read and understand. For example:
SYS AT,x,y: PRINT B$

The program is split into two parts: the first loads the routine at address ADDR; and the second is a very short demonstration showing the command's ease of use.

This routine does not affect the print routine at all.

*The routine*

```
10 REM M/C PRINT AT
   ROUTINE
20 ADDR = 10000
30 COUNTER = 0
40 FOR T = ADDR TO
   ADDR + 28
50 :READ D: POKE T,D:
   COUNTER =
   COUNTER + D
60 NEXT T
70 IF COUNTER < > 3857
   THEN STOP
80 DATA 32, 253, 174, 32,
   138, 173, 32, 247, 183,
   152, 72, 32, 253, 174, 32,
   138, 173
90 DATA 32, 247, 183, 166,
   20, 104, 168, 24, 32, 240,
   255, 96
100 REM DEMO
110 AT = ADDR
120 PRINT "(CLR/HOME)"
130 SYS AT, 16, 12: PRINT
   "SCROFF"
```

*David Gristwood*

# SPECTRUM DRAW TO

One problem with producing graphs on the Spectrum is its lack of a DRAW TO command. Calculating and plotting each point is unnecessary and time-consuming, so I've written a simple routine to make it easier.

After the code has been typed in using the short program in Listing 1 RANDOMIZE USR 32000 will create a line from the last point plotted to the new point specified by the following POKEs:
POKE 32007 — x coordinate
POKE 32027 — y coordinate

You can initialise the graphics cursor by POKEing the system variable COORDS:
POKE 23677,x
POKE 23678,y

Listing 2 is an example program of the routine in use, showing the amount of time it saves.

*Listing 1*

```
10 FOR n=32000 TO 32049
20 READ po
30 POKE n,po
40 NEXT n
50 DATA 217,229,217,33,125,92,
62,250,150,79,30,1,210,23,125,30
,255,126,33,7,125,150,79,33,126,
92,62,69,150,71,22,1,210,43,125,
22,255,126,33,27,125,150,71,205,
186,36,217,225,217,201
```

*Listing 2*

```
1 REM Demonstration
2 REM
3 LOAD ""CODE
4 REM
5 LET step=1
6 LET graph=1000
7 LET a$="Using PLOT"
8 REM
10 FOR f=1 TO 2
15 PAUSE 30: CLS
20 POKE 23677,0
30 POKE 23678,80
40 PRINT a$
50 FOR x=0 TO 255 STEP step
60 LET y=80+75*SIN (x/128*PI)
70 GO SUB graph
80 NEXT x
85 REM
90 LET step=10
```

```
 95 LET graph=500
 96 LET a$="Using DRAW TO"
 97 REM
 98 NEXT f
101 STOP
102 REM
500 POKE 32007,x
510 POKE 32027,y
520 RANDOMIZE USR 32000
530 RETURN
600 REM
1000 PLOT x,y
1001 RETURN
```

# BBC SECOND PROCESSOR

I have spent a few weeks getting to grips with the Acorn Z80 second processor attached to my BBC Micro, and have uncovered a few interesting points.

1) Although some reviews have mentioned compatibility problems when using non-Acorn ROMs, I didn't realise that Disk Doctor would completely stop the Z80 from functioning. I've overcome this by the drastic but simple means of bending up DD's pin 28 (that is the positive p/supp rail) and including a switch in the supply to the chip.

Operation is simple — switch off before attempting to use the second processor, and to use DD again, switch off the Z80, switch on DD and press break. Most DD routines seem to work while the Z80 is on, but Disk operations return Load Error' while no other ROM in my expansion board gives any trouble.

2) The mass of software accompanying the Z80 needs some studying (a useful index would make an ideal example for Fileplan), and includes buried files of which we are told nothing. Two useful programs (both in Z80 Basic) are READDFS and 6502-Z80. The first transfers an Acorn (or, presumably, other Acorn-compatible) Disk file onto a CP/M disk while the second re-formats the file into CP/M format. This latter operation is necessary as CP/M doesn't 'type' variables but stores them in, generally, the reverse order from that used by Acorn. For example, strings are the right way round!

As part of its function, 6502-Z80 re-formats Basic program files, the new format being of the type in Fig 1.

After BREAK, the content of the first location is set to zero which Basic interprets as no program. The effect of OLD is simply to count up to the next RETURN and insert the appropriate calculated line length.

The end of the program is marked by the sequence &FFFF after the last RETURN. Note that TOP points to the next location after these.

3) Some not-so-good news. The elegant facility of specifying load destinations for disk files as being in either the I/O or language processor by inclusion of all four bytes of the address isn't supported by CP/M on the BBC. I found this a problem when trying to adapt some of my old Basic programs, which typically read a file into the function key definition area rather than explicitly set up the keys.

The desired result can be achieved by calling upon the semi-retired DFS. To do this, it's necessary to precede the OSCLI call by an asterisk, producing:

**L.:1.$.KEYS FFFFOBOO

But the catch is still there: invoking DFS requires a DFS format disk, holding the required file, to be present. The added scope for confusion when operating with two filing systems/disk formats should be enough to deter most people!

*Dave Johnson*

| Field | Description | No of bytes |
|---|---|---|
| Line length | Inclusive * | 1 |
| Line number | 16-bit binary | 2 |
| Basic text | As for 6502 | n |
| Line terminator | &OD | 1s |

*Length = n + 4

*Fig 1*

# DRAGON 32 ARRAY PASSING

In many high-level programming languages, it's possible to pass variables from the main program to a subroutine. In Dragon Basic, an example of this is the function (DEF FNA (X)) which allows one simple variable to be passed to a one-line function.

I've written a simple method to enable one or more arrays to be passed to a subroutine. The program works by finding the position of the array name in the variable storage space (using VARPTR). This is changed to a local variable name, 'W', by which it is known throughout the subroutine.

At the end of the subroutine, the array name is converted back to its original name with some error trapping for incorrect names (recorded in I$).

The method is useful for performing the same operations on various arrays of the same number of dimensions but different numbers of elements: for example, summing the elements of two arrays.

If there's any reference to the passed array in the subroutine, an error will occur.

*P G Woodcock*

```
10   ' MAIN PROGRAM
20   DIM A(6,6,6),B(3,3,3)
30   J=3                                  'number dimensions A&B
40   'CALL SUBROUTINE
50   'I$ IS NAME OF ARRAY BEING CALLED
60   I$="A":I=VARPTR(A(0,0,0)):GOSUB2000
70   PRINT A(1,1,1)          'SHOWS EFFECT OF SUBROUTINE
80   I$="B":I=VARPTR(B(0,0,0)):GOSUB2000
90   PRINT B(1,1,1)
100  END

2000 'SUBROUTINE
2010 POKE I-J*2-5,ASC("W")   'CHANGE ARRAY NAME TO W
2020 POKE I-J*2-4,0
2030 W(1,1,1)=6
.
.
3000 'CHANGE ARRAY NAME BACK TO I$
3010 IF LEN(I$) < 1 THEN STOP ELSE I$=I$+CHR$(0)
3020 I$=LEFT(I$,2)
3030 I=VARPTR(W(0,0,0))
3040 POKE I-J*2-5,ASC(LEFT$(I$,1))
3050 POKE I-J*2-4,ASC(RIGHT$(I$,1))
3060 RETURN
```

# NUMBERS

## *Mathematical mind-benders from Mike Mudge*

This month sees a dramatic change in the area of research covered in Numbers, a move from integer arithmetic to floating point arithmetic.

Consider the decimal expansion of a fraction (which for convenience will be supposed to lie between 0 and 1). This either terminates, for example, 73/200 = .365 or yields a repeating pattern called a recurring decimal, say, 7/13 = .538461 538461 538461 . . . written .538461. There is little of interest for us in such cases.

However, suppose that we start with an irrational number, which by definition cannot be exactly represented as a fraction. What happens in its decimal expansion?

A number is said to be *simply normal* if each of the digits 0, 1, . . .9 occur equally often in the non-terminating expansion as a decimal; furthermore, it is said to be *normal* if every combination of these digits occurs with the proper frequency — by which we mean the frequency calculated on the assumption of randomness . . . the absence of any pattern.

A number which preserves the property of normality in every possible number system, including of course binary, is said to be *absolutely normal.*

Now we shall restrict our discussion to two famous irrational numbers:

(1) 'Pi', $\pi$, the ratio of the circumference of a circle to its diameter.

Readers may wish to use the series:
$\pi = 1/1\ (16/5 - 4/239) - 1/3(16/5^3 - 4/239^3) + 1/5(16/5^5 - 4/239^5) \ldots$
approximately 3.1415926536.

(2) 'e', the base of natural logarithms, defined by the series:
e = 1 + 1/1 + 1/(1.2) + 1/(1.2.3) + 1/(1.2.3.4) + 1/(1.2.3.4.5) . . . approximately 2.7182818285.

Readers are encouraged to examine and improve upon the very crude ZX81 Basic program given here.

```
 1 DIM X(100)
 2 DIM Y (10)
 3 DIM Z (175)
 4 DIM W (60)
 5 FAST
10 LET N = 40
15 PRINT "THE CALCULATION OF E
   TO ";N," DECIMAL PLACES
   YIELDS . . ."
20 LET M = 4
22 FOR D = 1 TO 10
23 LET Y (D) = 0
24 NEXT D
30 LET TE = (N + 1)* 2.30258509
33 LET M = M + 1
34 LET DI = M* (LN (M) - 1) + 0.5 *
   LN(6.2831852* M)
35 IF DI <= TE THEN GOTO 33
36 PRINT " AN M REQUEST OF ";M
38 FOR J = 2 TO M
40 LET X (J) = 1
42 NEXT J
44 LET FI = 2
45 LET Y(2) = 1
48 FOR I = 1 TO N
50 LET CA = 0
52 LET J = H
54 LET TE = X(J)* 10 + CA
56 LET CA = INT (TE/J)
58 LET X(J) = TE - CA* J
60 LET J = J - 1
62 IF J >= 2 THEN GOTO 54
64 IF CA = 0 THEN GOTO 68
66 GOTO 70
68 LET Y(10) = Y(10) + 1
69 GOTO 72
70 LET Y(CA) = Y(CA) + 1
72 LET Z(I) = CA
74 NEXT I
76 PRINT FI; ".";
78 FOR Q = 1 TO 60
80 PRINT Z(Q);
81 NEXT Q
82 LET J = 61
84 IF J >= N THEN GOTO 97
86 LET M=J-1
88 FOR D = 1 TO 60
89 LET M = M + 1
90 LET W(D) = Z(M)
91 NEXT D
92 FOR E = 1TO 60
93 PRINT W(E);
94 NEXT E
95 LET J = J + 60
96 GOTO 84
97 PRINT
98 PRINT "END"
```

With each of the numbers $\pi$ and e (and if a further challenge is needed the square root and cube root of 2), readers are invited to submit programs to calculate any required number of decimal places and to test at least for simple normality by counting the numbers of each digit present in the resulting decimal expansion.

*Test Data:* computed on ENIAC around 1950 took approximately 11 hours for e with a further 17 hours for card-handling and checking, and a total of around 70 hours machine running time for $\pi$. Readers will appreciate how computing has changed over the past quarter of a century (see Fig 1).

Submissions should include program listings, hardware description, run times and output; these will be judged for accuracy, originality and efficiency (not necessarily in that order) and a prize of not less than £10 will be awarded to the 'best' entry received by 1 March 1985.

Please address entries to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffs. WV4 5NF. Tel: (0902) 891141.

*Please note that submissions can only be returned if a suitable stamped addressed envelope is provided. Expanded reviews of previous 'Numbers' problems together with, subject to the approval of the contributor, copies of detailed programs from the prize-winning submission may also be requested.* END

| Digit | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2,035 decimals of $\pi$ | 184 | 213 | 210 | 190 | 198 | 211 | 204 | 200 | 207 | 218 |
| 2,000 decimals of e | 196 | 190 | 208 | 202 | 201 | 197 | 204 | 198 | 202 | 202 |

*Fig 1*

# LEISURE LINES

## *Brain-teasers courtesy of J J Clessa*

### *Quickie*

Their are three mistakes in this sentense — can you find them?

### *Prize Puzzle*

This one should keep the micros humming over the Christmas period. I believe the puzzle was originated by Ernest Dudeney but it's certainly been around a while.

Can you find an integer which — divided by 5 and multiplied by 4 — gives the same result if you move the first digit of the number to the end.

For example, suppose the number is 2615. If you divide it by 5 and multiply it by 4 you get 2092. But if it were the number we were seeking, we would get 6152.

Answers please, on postcards only, to: *PCW* Prize Puzzle, December 1984, Leisure Lines, 62 Oxford Street, London W1. Entries to arrive not later than 31 December 1984.

### *August Prize Puzzle*

The answers are as follows:

(a) The largest perfect square with digits in ascending order is 134 689.

(b) The largest perfect square with digits in descending order is 961.

Winner: D Haworth, Bolton, Lancs. Congratulations! END

# 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, 62 Oxford Street, London W1A 2HG.*

## 32-BIT RANDOM

RNDL (Datasheet 1) from Matthew Rhodes of Bradford implements SubSet's favourite 32-bit pseudo-randomnumber algorithm on the 68000 series computers. His routine to generate a 16-bit random number, RNDW, was given last month. Both RNDW and RNDL are untested as yet.

RNDL is written to use the short addressing mode, which covers memory in the range $FF8000 to $007FFF. Only 'a1a0' is required in this mode, the high order bit being sign extended.

For a 'SEED' outside the short address range, change the coding of the first instruction to $2039 a3a2 a1a0, and of the instruction before RTS to $23C0 a3a2 a1a0. This makes the routine four bytes longer with an increase in operating time (clock cycles) to: 212 (68000), 308 (68008) i 178 (68010).

Descriptive reference to any combination of the four bytes in a 68000 register is by a binary coding of their position expressed as a hexadecimal digit. Thus D1\C refers to the two highest bytes, and D1\3 the lowest two bytes, in data register 1.

## DATASHEET 1

```
;=================================================================
:= RNDL      32-bit pseudo-random number generator.
;=================================================================
:JOB         To generate a 32-bit random number from the
:            series: Ri+1 = (Ri * 69069 + 41) mod 2**32.
:ACTION      Read previous random number from store.
:            Acting separately on HI-word and LO-word and
:            using the identity, 69069 = 65536 + 3533,
:            new number =
:              ((3533 * HI + LO) mod 2**16) * 65536
:              + 41 + LO * 3533.
:            Write new random number to number store.
:-----------------------------------------------------------------
:CPU         MC68000 series.
:HARDWARE    Four bytes of RAM for random variable, must be
:            located between $FF8000 to $007FFF inclusive.
:SOFTWARE    None.
:-----------------------------------------------------------------
:INPUT       32-bit seed or previous random number must be in
:            RAM variable SEED.
:OUTPUT      New random number in SEED.
:            D0 = new random number. D1 is changed.
:            Negative (N) and Zero (Z) flags show the status.
:            Overflow (V) and Carry (C) flags are cleared.
:ERRORS      Re-entrancy could cause numbers in the sequence
:            to be missed, affecting the randomness.
:REG USE     D0 D1 CCR
:STACK USE   None.
:RAM USE     None.
:LENGTH      32
:CYCLES      68000: 204.  68008: 292.  68010: Max. 170.
:-----------------------------------------------------------------
:CLASS 2     -discreet  *interruptable  *promable
:-**-*-      -reentrant  *relocatable  -robust
;=================================================================
;
SEED    EQU     $a1a0     :Address of 4-byte random number.
;
RNDWAS MOVE.L  SEED,D0   :Get old number or seed into     2038
                         :Data register 0 and             a1a0
       MOVE.L  D0,D1     :copy into D1.                   2200
       SWAP    D1        :Move HI-word to D1\3 and        4841
       MULS    #3533,D1  :multiply by 3533; D1\F =        C3FC
                         :D1\3 * $DCD, then add in        0DCD
       ADD.W   D0,D1     :LO-word and multiply by 65536;  D240
       SWAP    D1        :D1\C = (D1\3 + LO) * $10000.    4841
       MOVE.W  #41,D1    :Put constant in D1\3 for        323C
                         :adding in to D0.                0029
       MULS    #3533,D0  :Multiply LO-word by 3533;       C1FC
                         :D0\F = D0\3 * $DCD.             0DCD
       ADD.L   D1,D0     :Combine parts then store        D081
       MOVE.L  D0,SEED   :new number (mod 2**32 since     21C0
                         :D0 is 32 bits) back to          a1a0
       RTS               :variable and exit.              4E75
:=================================================================
```

## REPETITIVE SPEED

Frank Golding of Newcastle upon Tyne has taken me to task for comparing the fill times of the Z80 instruction LDR with those of Roy Easto's routine QUKFLL (August 1984, *PCW*).

He writes:

'. . . although QUKFLL is an absolutely brilliant idea it is only capable of filling a block of RAM with the fixed contents of HL. In this respect it is not a block transfer operation like LDIR or LDDR, both of which update the source and destination pointers on each operation! The comparison of 21 T states (clock cycles) for LDIR against about 6.3 T states for QUKFLL is pretty meaningless except in the quoted example, where presumably LDIR is used to transfer a "blank" screen onto a real screen, looping through several thousand blank bytes of separate memory in the process.'

QUKFLL doesn't set out to be a block transfer — only to fill a RAM area with one character more quickly than by using LDIR. For all of you who have not come across it, the block transfer method of screen clearing is shown in Fig 1. Only screen memory, in this case that of the Exidy Sorcerer, is accessed by the method.

The same method is used to clear individual screen lines on the ZX Spectrum (see page 47 of *The Complete Spectrum ROM Disassembly* by Dr Ian Logan and Dr Frank O'Hara, published by Melbourne House).

```
START  EQU  0F080H     :Start address of screen memory.
BYTES  EQU  780H       :No. of screen memory bytes.
;
CLEAR  LD   HL,START   :Point HL to 1st byte,        21 80 F0
       LD   DE,START+1 :DE to 2nd byte and give BC   11 81 F0
       LD   BC,BYTES-1 :no. of bytes to copy to.     01 7F 07
       LD   (HL),32    :Clear 1st byte and copy it  36 20
       LDIR            :to all other screen bytes.  ED B0
```

*Fig 1*

## BBC ASSEMBLER FORMATTING

Sverrir Karlsson of Kopavogi, Iceland, who sent LSTFMT, the marvellous listing formatter for BBC assembly language programs (September 1984, *PCW*), has written to correct the mistake I made about locations &D00 and &D01 being set to &FF on machine reset. Only &D00 is affected this way.

There are, in fact, several pages below the Basic program area available for storing machine code routines — provided Basic isn't using them. The assignments for these pages are shown in Fig 2. A fuller description of the BBC memory usage can be found in the *Advanced User Guide for the BBC Micro* by Bray, Dickens and Holmes,

published by Cambridge Microcomputer Centre.

Probably the safest way to store a program like LSTFMT is to set the PAGE variable to &F00 (&1A00 for a disk machine) and change LSTFMT lines 50 and 180 to write the machine code to address &E00 (&1900). PAGE will need to be reset after every BREAK.

```
&800 - &8FF:   Sound.
&900 - &9FF:   Cassette and RS-423 output.
&A00 - &AFF:   Cassette and RS-423 input.
&B00 - &BFF:   Soft key expansion.
&C00 - &CFF:   Redefined characters.
&D00 - &DFF:   NMI routine and ROM expansion vectors.
```

*Fig 2*

# 6809 ERROR DETECTION

ECAL9 (Datasheet 2) and EFIX9 (Datasheet 3) from Martin Chadwick of Oxford are conversions to 6809 code from the original Z80 versions (December 1982, *PCW*). 6502 versions were published in January 1983.

ECAL9 forms an error correction byte (ecb) by parity coding the position of every bit on a 31-byte data block. The ecb can be appended for transmission or storage of the data.

On receipt or recovery of the data, EFIX9 tests the appended ECB against that recalculated for the received data. Any set bits in the resultant error correction code are used to index and re-invert any single bit error that may have occurred.

# DATASHEET 2

```
;=================================================================
;= ECAL9     Calculate error correction byte.
;=================================================================
;JOB         To calculate a single byte parity code, capable
;            of being used to detect and correct a single bit
;            error in a 1 to 31 byte data block.
;ACTION      IF block byte length > 0 AND < 32 THEN:
;            [ Parity mask bit count = bytes * 8 + 7.
;              Clear error correction byte (ecb).
;              WHILE bit count > 7:
;              [ IF current bit = 1 THEN:
;                [ ecb = ecb EOR bit count. ]
;                Bit count = bit count - 1. ] ]
;-----------------------------------------------------------------
;CPU         6809
;HARDWARE    Memory containing data block.
;SOFTWARE    None.
;-----------------------------------------------------------------
;INPUT       Y addresses first byte of the data block.
;            B = no. of bytes in data block (max. 31).
;OUTPUT      Cy = 0: aborted. B = 0 or B > 31. A,Y unchanged.
;            Cy = 1: A = ecb. Y = block + 1. B = 7.
;ERRORS      None.
;REG USE     CC A B Y
;STACK USE   1
;RAM USE     None.
;LENGTH      34
;CYCLES      40 + average 145 per byte.
;-----------------------------------------------------------------
;CLASS 2     -discreet  *interruptable  *promable
;-*****      *reentrant  *relocatable  *robust
;=================================================================
;
ECAL9  PSHS B       ;Save block length and test          34 04
       DECB         ;for valid length 1 to 31,           5A
       CMPB #30     ;exiting immediately if 0 or         C1 1E
       BHI  ECOUT   ;greater than 31 with C = 0.         22 19
;
       LDA  #8      ;Multiply length - 1 by bits per     86 08
       MUL          ;byte, then add by subtraction so    3D
       SUBB #-15    ;B = no. of bits + 7 & C = 1.        C0 F1
       STB  ,S      ;Save parity mask bit count.         E7 E4
;
BYTELP LDB  ,Y+     ;Get indexed byte, index next.       E6 A0
       ROLB         ;Move 1st bit out to C. Move 1 in.   59
;
BITLP  BCC  NXTMSK  ;"ecb EOR 0" if bit reset, else      24 02
       EORA ,S      ;"ecb EOR bit count".                A8 E4
NXTMSK DEC  ,S      ;Count off bit processed, move next  6A E4
       LSLB         ;data bit out, and repeat until      58
       BNE  BITLP   ;Carry = initial Carry = 1.          26 F7
;
       LDB  #$F8    ;Test if parity mask bit count is    C6 F8
       BITB ,S      ;less than 8, repeating until it     E5 E4
       BNE  BYTELP  ;is, when all bits done. C = 1.      26 EE
;
ECOUT  PULS B,PC    ;Exit, C = 0 = invalid, else C = 1.  35 84
;=================================================================
```

# DATASHEET 3

```
;=================================================================
;= EFIX9     Validate data with error correction byte.
;=================================================================
;JOB         To examine a 1 to 31 byte data block with
;            appended error correction byte, correcting any
;            single bit inversion indicated.
;ACTION      IF block byte length > 0 AND < 32 THEN:
;            [ Calculate new error correction byte (ecb).
;              Correction code = new ecb EOR appended ecb.
;              IF set bit(s) in correction code THEN:
;              [ IF correction code addresses data bit THEN:
;                [ Correct bit error by re-inversion. ] ] ]
;-----------------------------------------------------------------
;CPU         6809
;HARDWARE    Memory containing data block.
;SOFTWARE    "ECAL9" - routine to calculate ecb, located
;            within single byte signed offset range.
;-----------------------------------------------------------------
;INPUT       Y addresses first byte of the data block.
;            B = no. of data bytes in block (max. 31).
;OUTPUT      Cy = 0: aborted. B = 0 or B > 31. A,Y unchanged.
;            Cy = 1: Y = block + 1. B is unchanged.
;               Z = 0: Data assumed valid.
;               Z = 1: A single bit has been corrected.
;ERRORS      More than one real bit-error, or a bit error in
;            the error correction byte can result in an
;            uncorrupted bit being inverted.
;REG USE     CC B Y
;STACK USE   7 (including BSR ECAL9)
;RAM USE     None.
;LENGTH      36
;CYCLES      Average 123 + 145 per data byte.
;-----------------------------------------------------------------
;CLASS 2     -discreet  *interruptable  *promable
;-****-      *reentrant  *relocatable  -robust
;=================================================================
;
EFIX9  PSHS A,B,X  ;Save regs. with length on top + 1. 34 16
       BSR  ECAL9  ;Get new ecb in A, Y addressing      8D nn
       BCC  EFOUT2 ;appended ecb, or skip if invalid.  24 1C
;
       EORA ,Y     ;Correction code = new ecb EOR       A8 A4
       TFR  A,B    ;appended ecb. Copy it to B          1F 89
       ANDB #$07   ;and get error bit number in B.      C4 07
       LSRA        ;Divide correction code              44
       LSRA        ;by 8 to give position of corrupt    44
       LSRA        ;byte from end of block in A.        44
       BEQ  EFOUT1 ;Exit if no error indicated.         27 10
       CMPA 1,S    ;Compare with block length and       A1 61
       BHI  EFOUT1 ;exit if indicated error outside.    22 0C
       NEGA        ;A = -A (set Cy), add to end         40
       LEAX A,Y    ;pointer, X addresses corrupt byte.  30 A6
       SEX         ;Clear A, (Cy unaffected).           1D
;
EBIT   ROLA        ;Rotate set bit from Carry into      49
       DECB        ;corrupt bit position, using bit     5A
       BPL  EBIT   ;number from correction code.        2A FC
;
       EORA ,X     ;Re-invert corrupt bit and           A8 84
       STA  ,X     ;restore correct data to byte.       A7 84
;
EFOUT1 COMB        ;C = 1 always, Z = 1 only if error.  53
EFOUT2 PULS D,X,PC ;Restore and exit with flag info.    35 96
;=================================================================
```

# 68000 MULTIPLICATION

The 68000 performs both signed and unsigned 16-bit multiplication. The first argument must be in the low word of a data register (Dn/3) and the second in any of 11 other source operands — the 'Effective Address', or 'ea'. The 32-bit result overwrites the first argument and also the high word in that register.

According to the *M68000 16/32-Bit Microprocessor Programmer's Reference Manual*, fourth edition, published by Prentice-Hall, the execution time of MULU and MULS is defined as a constant plus 2n where:

n=the number of set bits (1s) in the 'ea', (MULU).

n=the number of 10 or 01 patterns in the 'ea' extended to 17 bits by attaching a '0', (MULS).

For the 68008, the manual tags the 17th bit for the MULS algorithm as the most significant bit. It is tagged as the least significant bit for the 68000, probably in error.

Matthew Rhodes makes the point that, where speed is paramount, a few cycles can sometimes be gained by carefully selecting between MULU or MULS to match the bit pattern of the multiplier. This only applies when the most significant bit of the multiplier is zero, as it's in the value $0DCD in RANDL. Matthew reckons that using MULS instead of MULU saves two clock cycles. END

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**Line length:** 150 characters with 10 pitch. 180 characters with 12 pitch. 225 characters with 15 pitch.
**Method of printing:** Automatic bi-directional printing with shortest path seeking logic. Automatically skips over blank fields.
**Paper feed:** Variable, 96 positions/inch, bi-directional.
**Buffer:** 4 K Buffer. Keyboard option. Qume/Diablo. Code option.
**Function control led:** ON/OFF-Line. Paper out. Ribbon out. Cover open. Error.
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**Interface:** RS232 IEEE, Centronics.

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**Width of printline:** 14.2" (360.6mm)
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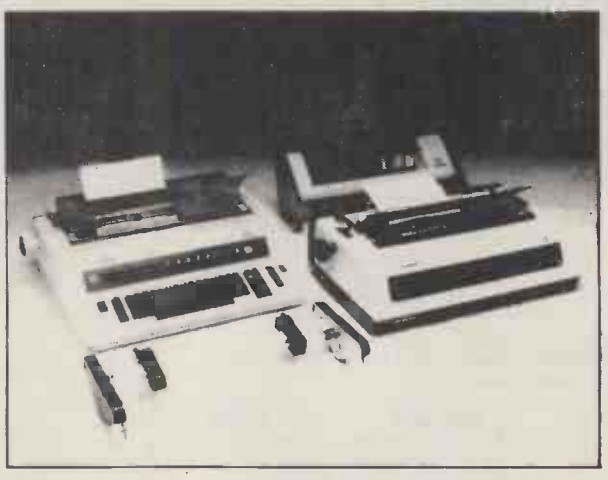
**Pitch:** 10, 12, 15 characters/inch proportional spacing
**Line length:**
141 characters with 10 pitch
169 characters with 12 pitch
212 characters with 15 pitch
**Paper feed:** Variable, 96 positions/inch, Bidirectional, indexing one half space up/down.

**Printing:** Automatic bold, (1/120"), expand and double print. Automatic bidirectional printing with shortest path seeking. Automatically skips over blank fields.
**Buffer:** 4 k byte. Keyboard option. Qume control code. Option for Wordstar.
**Function controls led:**
102 ON/OFF-Line. Error.
103 ON/OFF-Line. Error.
Bold print.
Expand print. Double print.
**Interfaces:** RS232, Centronics IEEE.



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# COMPUTER ANSWERS

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

## Loss of memory

**Although my IBM PC has 256k RAM, only 60684 bytes are available when using Basic. Why is this? Will buying extra memory help? And is the Apple Macintosh any better than the PC in terms of memory organisation?**
***Anne Stokes, Newcastle***

The 8088 in the IBM PC can address 1024k (or one megabyte). However, the PC organises its memory into blocks of 64k (which IBM calls 'segments'). IBM Basic is an old version which was originally designed to work on 8-bit micros, so it only runs within one segment. This is why only 60k is available for programs after the computer has taken what it needs for its own operation.

Unfortunately, buying extra RAM won't help as the Basic will still only work within one segment. There are three courses of action open to you:
(1) write a machine routine to switch in another segment;
(2) look for a third party version of Basic that will address all 256k; and
(3) write your program in a programming language such as 'C'.

Although the PC is actually called a 16-bit computer, the CPU can only transfer eight bits at a time. The CPU in the Apple Macintosh can directly access 16 megabytes (16384k) and can transfer 16 bits to and from memory at a time.

## Do-it-yourself

**I have a Sharp MZ80A and would like to add a printer and perhaps a disk drive.**

**Have you any information on the necessary interface boards and outlet ports which I can self-assemble and fit? Details of suppliers would be a great help.**
***Paul Thompson, Hoddesdon, Herts***

Can't bring you much good news on this one as I haven't been able to track down any self-assembly kits for MZ80A boards.

However, Peterson Electronics in Scotland manufactures an £80 interface board which will let you run a centronics printer. It comes in two versions: one fits directly and the other plugs into the Sharp expansion box. Peterson makes various other Sharp accessories and you can contact the company on (0307) 62591.

The expansion box costs about £80 from Sharp itself. It will let you run a Sharp printer (the cheapest is £350) and a Sharp dual disk drive system (which will cost you another £700) but I'm afraid you'll have to add VAT to all those prices.

## Looking for adventure

**I own a Colour Genie computer, which I have been programming in Basic for some time. I now feel that I need to learn machine code/assembly language in order to speed up my programs. Could you recommend some books on the subject and tell me where I can get hold of them?**

**I am also interested in writing adventure programs (I have written two to date), but I would like to learn more about the subject, so I'd appreciate a further list of books on adventure writing techniques.**
***Richard Goldring, Ilfracombe, North Devon***

The best book on Z80 machine code programming is Rodney Zak's *Programming the Z80* published by Sybex. Your local bookshop should be able to get hold of it for you. The problem is that it's a bit impenetrable, so I wouldn't recommend it to any but the most determined beginner.

As ever, few good books are available devoted specifically to micros which haven't sold in vast quantities. The problem is, unfortunately, similar for Colour Genie adventure programming books.

One of your best bets is Keith Campbell's *Computer and Video Games Book of Adventure*. This is a good, general purpose introduction to writing adventures — but the sample listings are all predictably devoted to the BBC, Spectrum and Commodore 64. It's published by Melbourne House and costs £5.95.

## Baffled and bewildered

**I am a complete novice in the world of personal computers. Have you any literature — a *Which?*-type survey, perhaps — which might be of assistance?**
***Peter Buswell, St Leonards on Sea, Sussex***

We used to run a section in the magazine called 'Newcomers Start Here' — the problem was that it just kept on growing. You'd be better off looking at books such as Dennis Jarrett's *The Good Computing Book for Beginners* (published by Hutchinson) or the more expensive *Choosing and using your home computer* from Orbis.

The consumer choice magazine *Which?* has done some microcomputer surveys but they're a bit suspect. Another magazine, *What Micro?*, publishes a table in each issue comparing various micros.

Clubs and Computer Towns can help answer some of your questions (see our Club News section in Direct Access). Better still, beg or borrow a cheap machine plus manual and start playing around.

## Fly-by-night owl?

**The copyright banner on the Acornsoft Lisp package includes a reference to Owl Computers. Could you tell me:**
**(a) if this company is still in business and, if so, where to contact it?**
**(b) if not, whether its Lisp interpreter for the Apple is still available? and**
**(ç) is there a UK Lisp user group?**

**Acornsoft has been unable to help me on this matter.**
***A Jappy, Perpignan University, Perpignan, France***

Owl Computers is now called Owl Micro-Communications. Its address is The Maltings, Station Road, Sawbridgeworth, Hertfordshire, tel: (0279) 723848.

Owl has originated various Lisp packages, including Acornsoft's, but the only one it sells itself is the Apple interpreter which costs £58 (plus VAT for anybody living inside the UK).

I don't know of a UK Lisp user group but as you're writing from a university you may be interested in the AISB, which actually stands for the Society for the Study of Artificial Intelligence and Simulation Behaviour. The society, which consists of European academics and representatives from industry, has about 600 members. There's a quarterly newsletter and annual meetings (a conference one year, a summer school the next). The secretary is Dr R Young at the MRC Applied Psychology Unit, Cambridge.

Still on the subject of Lisp, Grant McFarlane of Clydebank has written to ask if I know of a VIC implementation (or one for Logo). Given the VIC's memory capacity it seems unlikely, and I don't know of any. But if anybody else can help, write and let us know.

## Don't judge a book . . .

**I would be very interested to know if you propose to review the Sanyo MBC 555 in *PCW* in the near future. I am looking for a reasonably-priced micro for my business, primarily word processing, and the Sanyo seems to have a lot to offer in this respect.**

**I've also got a more specific question: why do you need twin disk drives? I understand two to be necessary for serious computing yet the Apricot F1 is, according to your review, aimed at the business market, and it only has one disk drive. It was a pity your reviewer of the F1 did not list the areas, other than greater disk capacity, where it scores over the Sanyo.**
***Terence Lawton, Norwich, Norfolk***

The Sanyo is certainly a machine worth considering,

Really inexpensive way of writing down whatever comes up on your computer screen.

Lightweight and totally portable — independent power source!

Normal, EMPHASIZED, CONDENSED and ENLARGED print.

Works perfectly in the dark even during a power cut!

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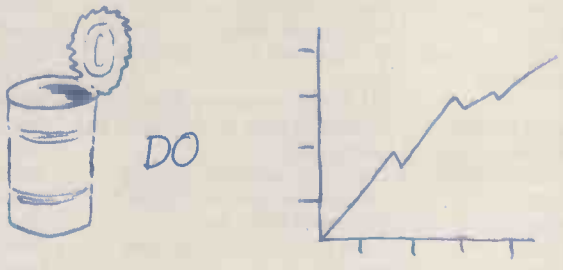


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and we may be reviewing the upgraded models.

Twin disk drives usually make it easier to do back-up and provide more memory space. However, the Sanyo machine has twin 160k drives while the Apricot F1 has 720k, all on one drive.

The F1 also has a more advanced CPU than the Sanyo and offers facilities such as ikons — but the Sanyo is cheaper.

## Wired for sound

**I am planning to build the sound sampling system for my BBC described in the December (1983), January and February (1984) issues of *PCW* for which a BBC Micro with the OS 1.2 is needed. My one has an OS 1.20. Will this do or will the program need adjusting? If it needs changing, could you tell me what the changes would be? Also, is there a PCB available?**
***Robert Pritchard, Warrington, Cheshire***

OS 1.2 is the same as the 1.20, so you can rest easy on that one. But I'm afraid you'll have to build the sound sampling system yourself as a PCB isn't available.

## Novelist seeks advice

**I am an unpublished novelist looking at a computer to assist me with my next book. I have settled on the software (WordStar); now I am looking at hardware.**

**Among members of the Society of Authors there is no consensus. Judging from some members' experience and from reading the columns in computer journals, one factor stands out . . . teething troubles — unreliability. Some may be due to inexperience of new owners anxious to get things working, striking the wrong keys. But to talk of reliability in the computer world is like talking about chastity in a brothel.**

**The view from the outside (my view) is that the industry is feverishly bent on producing faster-working machines, novelty and innovation generally; and at a speed which takes one's breath away. It looks like the Gold Rush all over again and, from what you say about Sinclair, even the manufacturers cannot keep up.**

**So what happened to that old-fashioned virtue, reliability?**

**I realise you are in a difficult position, for you serve two masters: your advertisers and the public. But you are in a position to know the wheat from the chaff. What about identifying the best hardware, as of here and now? I believe you would be doing a service to all, and, I suspect, to the industry itself.**

**Who on earth would buy a motor car with vouchers to exchange later, for what? The seats? The exhaust? The windows!**
***Peter Pompa, Portsmouth, Hants***

To answer one particular point: we have only one master — and that's our readers.

But independence doesn't make it any easier to identify the best hardware — there are just too many different factors and subjective elements to take into account. Even if we were to agree on a fixed set of criteria in the office, I doubt whether we'd be able to agree on a best buy.

The usual advice is to select your software first and then look at the machines that will run it. As you've chosen WordStar already, there's a lot of machines to consider.

The conservative advice, which is usually the best to follow if you want to keep life simple, would be to look at established business machines with a wide user base. In the UK that means ACT's Apricot and IBM's PC. The fact that the machines are established means that any teething troubles will have been ironed out — and that answers can be found to most of the questions you're bound to need answers to.

You're right that it does sometimes look like the Gold Rush out there — I'm not sure how successful we are as the sheriff.

## Portable chip talk

**I came across a reference to a chip called the 80C86 in a review of a portable machine. Can you tell me some more about it?**
***Steve James, London SW18***

The 80C86 (and the 80C88) is a Harris-made CMOS version of the Intel 8086 (and the 8088).

The advantage of CMOS chips is that they don't use much power and don't generate much heat, making them ideal for battery-powered portable machines such as the HP110 and the Data General One (see Benchtest on page 136).

However, CMOS derivatives of well-known chips are not always that straightforward. For example, the 65CO2 is not only a CMOS version of the 6502, but it's also enhanced with a faster clock speeds and more instructions.

## Commodore — game for a laugh?

**Earlier this year I was on the verge of buying a Commodore 64 when an announcement was made concerning the new family of micros under development.**

**After deciding to wait I have read several glowing reports of the new Plus /4, including the Benchtest in *PCW*.**

**The Plus/4 seems suitable for the applications I would need; however, I am disturbed that it lacks the sprites and sound capabilities of the 64, therefore making it less suitable for games.**

**I wonder if the popular games for the 64 will be made available for the Plus/4. Do you think that the 64 will die out as a result of the release of the Plus/4?**

**Although the ultimate choice remains mine I would like your advice as to whether the Plus/4 is worth waiting for or should I stick with the already established 64?**
***Vincent Tuckwood, Watford, Herts***

It is the Commodore 64's sprites and sound capabilities which have made it into such a good games playing machine. These same facilities are missing from the Plus/4 as Commodore has tried to distance the two machines and is aiming them at different markets. The Commodore 64 is aimed at the home games player whereas the Plus/4 is for more serious professional users, hence the built-in software packages.

This will have two effects: the Commodore 64 will continue to be Commodore's leading seller and the Plus/4's games library will be limited. I say *limited* because even pure business micros such as the IBM PC support some games.

As I said in the review most of the Plus/4's games software will drift up from titles prepared for its smaller brother, the C16. However, since this has limited memory the games will hardly be to the same standard as the leading 64 titles. Therefore, I would suggest that you consider buying a Commodore 64 for its games playing abilities as well as a word processor and database program from the many that are available.

Incidentally, Commodore raised the price of the Plus/4 between the writing of the review and the launch of the machine. The Plus/4 will now sell at £299.

## Time to speak your mind

**The Speech Therapy District for which I work (Maidstone) has recently acquired a BBC Micro Model B. So far it has only been used for statistics, and so on, but we would like to extend its use to therapy programs for the benefit of patients.**

**We are, therefore, planning to replace our black-and-white TV monitor with a good-quality colour one. Can you recommend any make?**

**And what about a colour television/monitor *in case* the NHS grants us money for a video recorder later on? I would be grateful for your comments.**
***Dr Gerda Frank-Gemmill, Sevenoaks, Kent***

Microvitec monitors can be safely recommended but make sure you visit a dealer first to compare them with others.

A colour television/monitor will cost a bit more. Laskys expects to be selling Hitachi's CPT 1444 now — this has a 14in screen and costs about £210. Also on its way is a Philips model with the same size screen.

For a bigger screen, try Sony's Profeel (which we reviewed in the May issue), but again you'll have to pay more — from £500 to £700 according to the model. END

# NETWORKS

*Peter Tootill looks at the differences between dumb and smart terminals, and gives guidelines on buying terminal software.*

One of the prerequisites for using your micro for telephone networking is the software that will turn it into a terminal (a terminal is basically an input and output device connected to a computer). In our case the terminal (the micro) will be connected via a telephone line, but the principle is the same as for the terminals directly connected to a mainframe computer. There are two types of terminal, 'dumb' and 'smart', and two types of micro terminal software.

## Dumb terminal programs

A dumb terminal sends and receives characters; it has no ability to store or edit messages. Dumb terminal programs are simple and easy to write. All that's needed is a routine to convey what's typed on the keyboard through the RS232 port, and another to take what comes in through the RS232 port and display it on the micro screen (this can be done in Basic on most micros). Some micros permit you to use the RS232 port as if it were a file so that you can open it, print to it and read from it as you would a data file on cassette, for example.

## Smart terminal programs

The main difference between a smart terminal and a dumb terminal is the former's ability to implement data to be transmitted. The terminal usually stores a certain amount for offline editing; some smart terminals are really dedicated micros with disk storage and comprehensive text editing facilities. Smart terminal software is the more complex, and is normally written in machine code or a suitably compiled high-level language such as 'C'. A Basic program is unlikely to be able to provide all the usual facilities.

What mainly turns dumb software into smart terminal software is the ability to store incoming data and transmit prepared files. It's preferable that the files be stored in such a way that the computer can load them later for use as programs. Smart terminal software is of limited use if it's the only program that can read and write the files it uses.

Many micros can load and save Basic programs in ASCII format, which means that they can easily be used as data files by other programs such as word processors and terminal software. Saving and loading data for offline use is just one feature of a good smart terminal program; others are as follows:

**Up-and downloading of files and programs**: it's necessary to make the distinction between files and programs, because not all smart terminal software can save a downloaded program in a format that can be used by the computer afterwards. Under the heading of 'Upload'is the transmission of prepared messages to a BBS, as the methods and principles are much the same. Good software should support several methods of up-and download including the popular Xmodem protocols.

**X-on/X-off flow control**: most online systems support this very useful method of stopping and starting the flow of data they are transmitting — it can be essential at fast data rates. Other methods of flow control do exist, but X-on/X-off is the most common.

**Echo incoming data to printer**: it's handy to be able to keep online a printed copy of what happens during a session.

**Software control of RS232 settings**: the ability to alter RS232 interface parameters from the terminal program can be important. Some systems use seven bits, even parity; others use eight bits and no parity, and so on. There are also systems using different baud rates, but some RS232 interfaces can't be controlled by software, so this feature isn't always possible.

**Half-full-duplex and host echo**: it's rare to find a modem with a half-duplex switch, so the software will have to stand-in if necessary. 'Half-duplex' is a method whereby onscreen characters are placed there locally rather than being echoed back from the computer at the other end of the phone line, which is the normal way of working. You may need this if you're communicating with other micros that are not running BBSs — if you're online to a friend exchanging programs, for example. 'Host echo' is what the BBS does when it sends back what you type, and is also useful for micro-micro communication.

**Auto-log on and macro keys**: many systems such as Prestel and bulletin boards support an auto-log on feature. If your terminal software responds to this, it will save you having to type your name or account number each time you use the system.

Macro keys, or programmable function keys, can also come in handy. The programmable key can be set to a particular set of characters: for example, a mailbox number you call frequently. Press the function key and the number will be sent automatically.

**Auto-dial**: to use a modem with an auto-dial facility, you'll need the software to support it. The main problem is that auto-dial modems are rare as yet, and methods of operation vary. If you're buying, make sure that the modem and the software are compatible.

**Translation tables**: these are filters in which data is continuously monitored for certain characters which are then translated, or changed, into different characters. For example, if you're using a system that sends you ASCII code 08 for backspace and your computer uses ASCII code 127, you can set the translation table to change every 08 code it receives to 127, enabling a proper backspace on your screen and *vice versa*. Your printer may go haywire if certain codes appear in the data, so you can set up a table to filter out these codes and keep a listing of incoming data.

Another situation in which translation tables are essential is when using a micro (using ASCII codes) as a terminal to a system with EBCDIC codes, which most mainframes use. You can build ASCII to EBCDIC translation tables and convert the incoming and outgoing data to suit. In general use with BBSs translation tables are not essential, as the BBS software will be configurable to suit your computer system.

**Prestel graphics**: these use special code combinations to display coloured graphics on the user's terminal with only the normal seven-bit ASCII alphabet. If you use viewdata systems and don't want to buy a separate software package, it's useful if your terminal software

supports these codes. It's unusual to find terminal software that does both, although hopefully it will become more common.

**Direct cursor addressing:** you'll only need this feature in specialised applications. If you're using your micro as a terminal to a mainframe or database system, check that the machine supports this feature. If so, then you'll need to choose a terminal program that supports the relevant mode (for example, VT52).

## Conclusion

The number of terminal packages available is growing rapidly, and you're likely to find a confusing variety and price range for some micros. However, the price doesn't always reflect the quality or versatility of the software: some public domain programs are far better than many pricey commercial packages.

The best approach is to find a cheap, or preferably free, public domain program that you can use temporarily (users' groups are a good starting place). As you gain experience, you'll discover which features are essential and which are desirable. You can then look at the more expensive commercial packages and see which is the best value for money.

If you have a computer that's available in the US then that's the most likely source, or at least origin, of good terminal software.

# BULLETIN BOARDS

## UK free networks

(0626) 890014. Hours: 24 hours daily.

**Mailbox-80, W Midlands** Tel: (0384) 635336*. Hours: 6pm-8am daily (ring-back system).

**Forum-80 Hull** . . . (Forum-80 HQ) Tel: (0482) 859169. International electronic mail, library for up/down loading. Hours: 5-11.30pm, Mon-Fri; noon-11.30pm, Sat & Sun (CCITT); midnight-8am, daily (Bell 103).

**Hamnet** . . . Tel: (0482) 497150. Hours: 6pm-8am, daily.

**Forum-80 Users Group,** PET Users section shopping list system. Hours: Tues/Thurs 7-10pm; Sat/Sun 1-10pm; nights, midnight-8am, US (Bell 103) standards.

**Forum-80 London** . . . Tel: (01) 902 2546. Electronic mail, library for down-loading. Hours: 7-10pm weekdays; midday-10pm weekends. Ring and ask for Forum-80.

**MG-Net CBBS London** . . . Tel: (01) 399 2136. Facilities: electronic mail, program downloading. Hours: Sun 5-10pm.

**Liverpool Mailbox** . . . Tel: (051) 428 8924. Electronic mail, down-loading, TRS-80 information. Hours: 24 hours daily.

**TBBS, London** . . . Tel: (01) 348 9400. Hours: daily 9am-7am.

**BASUG** . . . Tel: (0742) 667983. Hours: 24 hours daily.

**Computer Answers** . . . Tel: (01) 631 3076. Hours: 24 hours daily.

**CBBS Surrey** . . . Tel: (04862) 25174. Hours: 24 hours daily.

**Blandford Board** . . . Tel: (0258) 54494. Hours: 24 hours daily.

**Southern BBS.** Tel: (0243) 511077. Messages, down-loading. Hours: 8pm-2am daily (ring-back system).

**NBBBS-North Birmingham** . . . Tel: (0827) 288810

**TBBS Southampton** . . . Tel: (0703) 437 200 (ring-back)

**Stokel TeC (Information Technology Centre)** (Remote CP/M) . . . Tel: (0782) 265 078. Hours: 24 hours daily.

**TBBS Nottingham** . . . Tel: (0602) 289783. Hours: 24 hours daily.

**Clinical Notes Online** . . . Tel: (0254) 60339. Hours: 24 hours daily.

## UK commercial systems which are free in part

**DISTEL.** Tel: (01) 679 1888. Run by Display Electronics (new and surplus electronic and computer equipment, components, etc). The system provides information about stock lines, credit card sales, and some message facilities. 300 baud only at present. Cost: free. 24 hours.

**MAPTEL.** Tel: (0702) 552941. Run by Maplin (electronic components and micro-computers). Provides information on stock levels, credit card sales to existing customers only. 300 baud only. Cost: free. 24 hours.

**ESTELLE.** Tel: (0279) 443511 V21 (Datel 200); (0279) 441188 (Datel 600); (0279) 441222 (Datel 1200). For customers of STC Electronic Services. Office hours only.

## Subscriber commercial systems in the UK

**PRESTEL.** Subscribers only: Prestel consists of a database made up of individual pages provided by many different organisations (not by Prestel itself). 1200/75 baud service at local call rates for a large percentage of potential users. 300 baud service on London telephone number only, at present. Cost: domestic subscribers £5 per quarter and no time charges outside peak periods, 80 per cent of pages are free. 6pm and Saturday mornings, no time charges outside these hours (time charges also apply to domestic users). Information: Dial 100 and ask for Freefone Prestel sales.

**MICRONET 800.** An organisation providing information within the Prestel database specifically aimed at microcomputer users. Service details as Prestel. Cost: £50-£75 joining fee (covers acoustic coupler and software — for a limited range of machines at present) and £8 per quarter on top of normal Prestel charges. Information: Micronet 800, 8 Herbal Hill, London EC1R 5JB. Tel: (01) 837 3699.

## Subscriber business systems in the UK

**TELECOM GOLD.** Info from: sales admin, 60-68 St Thomas Street, London SE1 3QU. Tel: (01) 403 6777

**COMET.** Message handling system giving user facilities for leaving and retrieving messages: costs £30 per month. Info from: John Douglas, BL Systems Limited, Grosvenor House, Prospect Hill, Redditch, Worcs. Tel: (0527) 28515.

*RING-BACK SYSTEM — dial the number, let phone ring once and then ring back.

END

## Modem Operating Frequencies

| Modem Type | Speed (Bit/s) | Duplex | Transmit Frequency 0 Hz | Transmit Frequency 1 Hz | Receive Frequency 0 Hz | Receive Frequency 1 Hz | Answer Tone Freq Hz |
|---|---|---|---|---|---|---|---|
| CCITT V.21 Orig | ≤300 | Full | 1180 | 980 | 1850 | 1650 | — |
| CCITT V.21 Ans | ≤300 | Full | 1850 | 1650 | 1180 | 980 | 2100 |
| CCITT V.23 Mode 1 | 600 | Half | 1700 | 1300 | 1700 | 1300 | 2100 |
| CCITT V.23 Mode 2 | 1200 | Half | 2100 | 1300 | 2100 | 1300 | 2100 |
| CCITT V.23 Back | 75 | — | 450 | 390 | 450 | 390 | — |
| Bell 103 Orig | ≤300 | Full | 1070 | 1270 | 2025 | 2225 | — |
| Bell 103 Ans | ≤300 | Full | 2025 | 2225 | 1070 | 1270 | 2225 |
| Bell 202* | 1200 | Half | 2200 | 1200 | 2200 | 1200 | 2025 |

***Bell 202 has no back channel as such, only a 5 bit/sec on/off signal (387Hz = on, no signal = off) used for handshaking. (CCITT V22 & Bell 212A do not use single frequencies like these and cannot be simply included in such a table.)***

# TRANSACTION FILE

● FREE JOYSTICK + software (£30-worth) for Sharp MZ700 when you buy printer/plotter for MZ700. Printer + joystick are still under guarantee, £100 ono. Will also sell separately. Tel: Dumbarton 31969.

● SUPERBRAINS (two). Quad density with newly fitted drives, £700 each, or nearest offer. Tel: (0922) 418670, Highfield Insurance, 478-480 Walsall Road, Great Wyrley, Walsall, Staffs.

● VIEWDATA printer. Radofin VDXZ100P. Offers? Tel: Wisborough Green 700678 (Sussex). Ask for Brett.

● COMMODORE 4032. With graphics keyboard, printer 4022, dual disk drive 8050, with instruction manuals and demonstration disk, £600 delivered. Will sell items separately. Tel: Hastings 423780.

● MZ-80K, 48k. Very good condition. Basic, Invaders, Frogger, Star Trek, etc, and manuals included. Also reset switch (not attached). £200. Tel: Southend (0702) 618661.

● NEWBRAIN Model AD 32k. Hardly used, £100 ono. Tel: 021-354 2201.

● NEC PC-8000 users! Have much American public domain software in N-Basic and CP/M. Would like to meet other PC-8000 users. Box 4072, RAF Bentwaters, Suffolk IP12 2RQ. Tel: Columbia (039443) 342.

● MICROLINE 82A dot-matrix printer. Centronics and RS232. Lightly used over period of 14 months, £190 ono. R.F. Swallow, Bridge House, Culmstock, Devon EX15 3JJ. Tel: (0884) 40513.

● TRS 80. 48k, high res graphics, printer interface, single disk drive, word processor and other software, £420 ono. Aculab super fast tape drive, tapes, software for Tandy Level I, £100. Tel: 01-368 3460.

● APPLE II EUROPLUS, 80 column card, Hitachi 9in monitor, Apple disk drive, full 64k RAM, lots of disks and software. £500. Tel: Epsom 26854.

● VIDEO GENIE EG3003 with Aculab floppy disk drive, dual cassette, monitor, sound, desk and software games, APL, Assembler, File handling, Renum, Word processor, £185 ono. Tel: Chris on Oxford 245842 (eve).

● COMMODORE PET 32k. Cassette deck, centronics interface, some software, games and utilities, £225 ono. Tel: David Edmunds on 01-904 1845.

● ICL PC1. VDU Microline 82A: 500k storage on two 5¼in FD, 64k RAM, CPM2.2, Wordstar, Datastar, MBasic included. Home use only. Delivery by Securicor to any UK address. £1,400 ono. Tel: Addingham (0943) 830798.

● SHARP MZ-80B. Wish to correspond and exchange tips with users anywhere. Send 2 internat reply coupons (Post office), to Joseph Arens, 5 Heidepark, NL-6705 AB, Wageningen, Holland. Reply guaranteed.

● VIDEO GENIE with 40 track disk drives, hi-res, Eprom board, software, £295 ono. Epson RX-80, six months old. Tel: Tony on 021-329 2305 after 6pm.

● SEIKOSHA GP700A colour printer. New with guarantee, £340 including postage. Also Sanyo SCM14M 14in high resolution colour monitor, £320 including postage. Tel: (0267) 231246 (Carmarthen).

● TANDY LP VII (DMP 100) dot matrix printer. 5 or 10 cpi graphics, 50 cps underline, parallel and serial interfaces, adjustable tractor feed, dust cover, manual. Very good condition, £110 inc post. Tel: Bristol (0272) 510969.

● DISK DRIVES. New unused dual Shugart 801 8in cased unit with power supplies. 400k on BBC 800k dual density. Superb quality, an absolute bargain at £350 ono. Tel: Cwmbran 73049.

● GEMINI G811, 80 BUS/Nasbus compatible Z80A, based CPU card. For sale £90 ono. Tel: Potters Bar (0707) 42065 after 7pm.

● PRINTER SEIKOSHA GP100A. For BBC micro or other with parallel interface. Variable width pin feed. Graphics dumps from any mode. Excellent condition. £125. Tel: Chorley (02572) 78286 (Lancs).

● NASCOM 2. Cased, 48k RAM, Nas sys, Nas sys 3, Zeap ROM, Naspen ROM, ext Basic, various games etc, EG100 12in monitor. Complete £220. Tel: (0604) 67851.

● OSBORNE 1, single density, Wordstar, Supercalc, CBasic, MBasic, CP/M, separate monitor, VGC, £550. Tel: Camberley (0276) 21874 (eve or weekends).

● HEWLETT PACKARD, HP41CV Alphanumeric programmable calculator. With Math Pac. Excellent condition, £190 or nearest offer. Tel: Holywood (02317) 3212.

● SALE, SHARP disk Basic, floppy interface, plotter cable, printer cable, printer I/O card, £60 ono. Tel: Cosham (Wilts) 714589 (24hr). All items for Sharp MZ80A.

● APPLE SILENTYPE printer with interface and word processing software. No 80 column card required. Will demo and deliver. Tel: Hackwood 8717 (eve).

● VIDEO GENIE, 48k. Expansion box with RS232, twin 40 track disk drives, Lcase mod, Ldos 5.13, Edas and many games, £475. Will split. Tel: Hatfield (07072) 61397.

● MZ-80A. Home or business computer, original packing, hardly used. Cassette, monitor, tapes, all one unit. Not one scratch, perfect condition. Quick sale, £250. Tel: 051-546 5037 (after 6pm).

● COMMODORE 8032. Commando, Arrow, Netkit, cassette recorders, light pen, much software, £500 ono. Tel: 01-405 2933. Leave message for Dr. Schooneveldt.

● TRS-80 32k, Level two, screen, expansion interface, over thirty games, books, etc, £250 ono. Write with offers to M. Hurer, Brenthurst, Barnet Road, Arkley, Herts EN5 3LW.

● EPSON HX20 Micro cassette drive, tapes, games software, carrying case, manuals and mains charger, £310. Tel: Chobham (09905) 7225.

● APPLE III. Complete 256k system, disk drive, Apple monitor, Apple printer, communications interface, Apple II emulation, Applewriter, etc. Mint condition. Offers over £1,000. Tel: 01-836 5317 (Shirley, daytime) or 01-444 0611 (eve).

● FOR SALE: Tandy line printer V11. Works with BBC, Dragon, or any computer with parallel or serial interface. 80 columns, 50 cps, £150. Tel: St. Helens (0744) 25030 (ask for Carl).

● SERIAL INTERFACE for Epson MX80, £60 ono. Shugart SA460 drive, £160 ono. Both unused. Tel: 01-603 2312 (work, days), 01-940 9174 (eve) (Phil B.).

● SHARP MZ80A. With Sharp software. Also Epson MX80F/T3 printer with interface and ROMs for full Sharp character set, (plus normal Epson ROMs). Excellent condition. £475 ono. Tel: Abingdon (0235) 27042.

● A QL complete as new. Immediate availability. Best offer. Tel: 01-989 8742 (eve and weekends). QL QL QL.

● SHARP MZ-700, 64k, built-in data recorder, games and other software. Original packing etc. 3 months guarantee. Hardly used, £170 ono. Tel: Mark on (0865) 58513 (Oxford).

● OSBORNE 1. Double density, CP/M, Wordstar, Mailmerge, Supercalc, MBasic, CBasic, Ashton Tate DB II manual plus blank diskettes. As new in original box, £600. Tel: (0792) 390365.

● SHARP MZ-80K, 48k. With built-in monitor, tape cassette player, manuals, Basic tapes, also ASR33 teletype not interfaced. £200 the lot. Tel: (0276) 28291 (eve). Reid, Camberley, Surrey.

● EXCHANGE ZORK I and Zork II, in mint condition, for flight simulator or what games can you offer for use on IBM-PC. Cash adjustment if needed. Tel: Rust on (0438) 736030 (daytime).

TRS-80 Mod 1 L11. Expansion interface (48k), green screw monitor, perfect. Lots of software (assembler, Forth, Pascal, word processor, adventures, etc). Books and 80-micro mags, £220. Peckett, Tel: Farnborough (Hants) 517498.

● Olivetti ET225, word processor/electronic typewriter. 32KB non-volatile text storage. Can be used as quality daisywheel printer with optional interface. Includes spare consumables, all documentation, £1,000. Tel: 01-542 2916 after 6pm.

● Word processor Supertyper FD85. Efficient professional system, Qume Sprint 345CPS, daisywheel printer, tractor feed, cut sheet feeder, dual disks, 520k, manuals, leads. Delivery, good condition, urgent, £950 ono. Tel: 01-626 1515 ext 2214. Robert.

● SHARP MZ80K, (48k), built-in monitor, cassette player, £80 worth of software, with operating manual, perfect working order, £200 ono. Purchasing business system. Tel: (Birmingham) 021-353 1809.

● SORCERER 55k CP/M system, twin 315k disks, MBasic, word processor pac, all manuals etc, also IBM Golfball printer, plus Aculab 735 interface, £600. Tel: 0642 243370 office hours, 0642 315123 eve.

● TRS80 Model 1, Level 2, 16k, monitor, interface, Lcase modif, leads, manuals, software (games and utilities), £225 ono, may split, offers. Tel: 0633 892570 (eves).

● MASTERPLANNER CP/M business spreadsheet program, liquidator's sale, unregistered, with full documentation, £100. Tel: 02814 4563 (Farnham Common).

● SANYO DM2112 green video monitor, £60, includes carriage to any UK address. Tel: 0389 63198 after 6pm or Prestel Mailbox 038963198, Robert Henry.

● SHARP MZ80A Computer, includes Expanded Basic, Forth, Pascal, Database, many games, utilities and books, as new condition, must sell (upgrading), so all for £275. Tel: Wilmslow 532864 anytime.

● NORTHSTAR Advantage with Quad disks, usual software, CP/M etc, very little used, with Spellbinder, as new, £1,350. Tel: 01-459 5056 eve.

● DIABLO 630 daisywheel printer, little used, good working order, with tractor feed and sheet feeder, cost new £2,200+, wanted £1,550. Tel: 01-499 1670 eve.

● DIABLO 620, ace condition, £500. Tel: 01-499 1670 eve only.

● NASCOM 2, 52k, cased, running Nas-Sys 3 at 4MHZ, Zeap, Nas-Dis, Nas-Debug, Nas-Pen, Nas-Gro, and MBasic in ROM, full documentation with user group magazines etc, £215. Tel: 0632 810338 eve.

● MICROFOCUS Cis Cobol +Forms-2 (new £479), reasonable offers considered. Tel: 0202 486344 ext 2724 (Bernard Moss) between 9am-5pm.

● 48k LYNX, unwanted gift, boxed, as new, sell for £225, accept £175. A. Thomson, 170 Gilmartin Road, Linwood, Strathclyde PA3 3SL.

● WANTED: Atom disk pack or Dos ROM, controller card, data etc; also Wordpack ROM and manual. Tel: John on (0734) 882354 after 6.30pm.

● TRS-80 Model 4, 64k, includes monitor, 2 disk drives, TRSDOS 6.00, boxed with manuals and Mod.4 Planner-Calc plus misc software, £775. Tel: Hatfield 68419 eve or weekends for demo.

● VIDEO graphic printer, Sony UP101UB or similar for Prestel terminal wanted, would consider purchasing one or more complete systems. Tel: 0703 767903.

● MEMOTECH MTX512, 80k RAM computer, fitted with "NewWord" word processor ROM, with Memotech DMX80 printer, six months old, boxed, complete, manuals, £500 or exchange cheaper computer plus cash. Tel: Southend 529169.

● SHARP MZ80K, (48k), excellent condition, Basic, Basmod, Pascal Assembler, manuals, books, £250 ono. Tel: (0422) 201543 after 6pm. C. Ward, 1 Anderton Fold, Northowram, Halifax, Yorks.

● MICROTAN 6502 computer system, Basic, Forth, Assembler, Toolkit, 80k RAM, Tanram, RS232, Centronics, 32-bit PIO, keyboards, full mother board, manuals, plus extras, any reasonable offer, might split. Tel: 0604 46765.

● WANTED: Apple II software, Real Estate Property, Capital Investment, Structural Analysis, CAD, Architecture, Nutrition, Diet, Languages, Statistics, Database, Word proc, Accounting, also d/drives, co-processors, accelerator cards, absolutely anything considered. Tel: 01-736 7809 (daytime answerphone).

● WANTED: Cromenco computers and Persci 299B drives for breakdown, best price paid, please ring during office hours. Tel: (0234) 213645, ask for Mr Massey.

● COLECO Adam owners, join The Independent Coleco Adam Users Club. Write to: PO Box 9, Towcester, Northants NN12 7QG.

● VIDEO Genie EG3003, with 12inch green monitor, software and manuals, £150. Contact: N. Clemons, 34 Montalt Road, Coventry CV3 5LU. Tel: 504254.

● APPLE II + 64k twin drives and monitor, £375. Microline 83 wide carriage printer, £200. VisiCalc, Applewriter, stock control software (new), £60 each. Copy II+, £15. Tel: Preston 58044 (day), 713941 (night).

● SHARP PC1500, colour printer, expanded memory, consumables, programs, hardly used and as new. Offers to: N. Harris on Bicester 252322 (day) or 242089 (eve).

● BRITISH Micro Mimi 802G, updated to 803 plus graphics, Philips monitor, yellow running Xtal Basic 3.1C, all manuals, disks, quick sale, £750 ono. Tel: 01-994 2995.

● WORDWISE, tape, manual, £25. Beebug Exmon, ROM, manual,

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● IBM-PC, 10 meg Winchester 1×360k, 1×810k floppy disk, 640k, 2 serial, 2 parallel ports, amber screen. Microsoft, C Turbo, Pascal, Lotus 1-2-3, Wordstar, Spelstar, Mailmerge, Epson FX80, box of 200 floppy disks, all original menu, 6 months old, boxed, £3,800. Tel: 01-809 3854.

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● TIPC100C print cradle for TI58/C and 59 models, very good condition, hardly used, £80 ono. Tel: JC on 01-249 8209.

● EX BBC 5.25 SS disk unit (Alpha) by Canon of Japan, complete with PU + leads, genuine unwanted gift, bargain at £70. Tel: 061-865 5809 anytime (Manchester).

● EXCHANGE: Zorc 1 and Zorc 2 programs, in mint cond, for Flight Simulator, or what have you? For use on IBM PC. Cash adjustment if necessary. Tel: 0438 736030.

● CASIO PB700 handheld computer, 4k RAM, expandable to 16k, 32 Basic ROM, LCD screen (20×4 lines dot addressable), mint condition, complete with box, manuals etc, £100. Tel: Sedeley 2275 after 6pm.

● APPLE II+, 64k, 2 drives, accelerator card, Digitek 80 col card keyboard enhancer, Digitek colour card, cooling fan, lots of software available, £950 ono. Tel: Guildford (0483) 69975 evenings.

● HEWLETT PACKARD HP15C calculator, mint condition, manual, £58, no offers. Trutwein. Tel: Bracknell 483244 ext 120 10am to 2.30pm, Monday to Friday.

● TANDY Model Three computer, as new, 48k, two drives, RS232, communications software and much more, £850. Also digital printer/terminal Decwriter IV, RS232, £325. Tel: Robert, Winkfield Row 884879 anytime.

● NASCOM 2, 64k RAM. NAS-SYS 3 Basic, NAS graphics, VDU/keyboard, boxed, Nascom PSU boards in 19in rack, software, cassette player, £220 ono. Tel: Crawley (0293) 29183.

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● COMMODORE 64, disk drive, printer, word processing program, several disks, file, games, huge box paper, under one year old, hardly used, £650 ono. NB: still under guarantee. Tel: 01-794 1204.

● SHARP MZ80K, 48k, excellent condition, Basic, Pascal compiler, Forth Cecil, plenty of games, adventure, utility software, all manuals included and original box, also includes cover, only £210 ono. Tel: High Wycombe 28992.

● CORONA portable, IBM compatible, 256k, 9in green screen, twin 320k DSDD disk drives, software includes GW Basic and Multimate word processor, £1,500 ono. Tel: 0482 212761 after 6pm.

● WANTED: Apple II, Sharp MZ80B, or BBC B micro computer. Also wanted: Atari 400/800, must be cheap. Robert, 27 Keresforth Hall Rd, Barnsley, S Yorks S70 6NF, or tel: Barnsley (0226) 299715 after 6.30pm.

● ITT 20/20 (Apple II), 48k disk drive, parallel interface, lowercase card, paddles, assembler and editor program, software, golfball/printer/typewriter, circuit diagrams, comprehensive manuals, as new, £540. Tel: Jan Hall, Farnborough (0252) 548236.

● TRS-80, Level II 16k, excellent condition, APL-80, Forth, Tiny Pascal, assemblers, disassembler, games, Scott Adams' adventures, all with manuals or instructions, five books and tape recorder, bargain £135. Tel: (0274) 637377 evenings.

● COMMODORE 64 system includes cassette, 1526 printer, monitor and disk drive, with Easyscript, File program, Synthesound, several games, all vgc, bargain at £850. Tel: Staines 52777 after 6pm.

● HP75C, complete, purchased Nov '83, with Easymemo program and PPC User Club journals for 1983/4, which include many programs, etc, £375 ono. Ray Wearn, tel: 01-943 4628 eves, 01-839 7000 days.

● NEWBRAIN AD, with handbook, tapes etc, Sanyo DM8112CX hi-res monitor, NewBrain technical manual, Zen assembler, books: NewBrain dissected, c/w tape, Getting More From NewBrain, Z80 assembly programming, £270. Tel: Lincoln 31861.

● WANTED: Apple III disk drive, paddles, plotter, clock, business and games software, utilities. Call Richard Sheridan, 01-221 3378 home, or 01-491 7545 office.

● BURROUGHS B80 business computer with two floppy disk drives and one 18 megabyte hard disk drive, very little used, originally £25,000, but asking £5,000 for quick sale. Tel: 01-609 0061.

● NEWBRAIN Model AD with remote stop cassette, Sharp monitor and OKI Microline 82A printer, little used, £650 the lot or offers. To sell separately: manuals and leads available. Tel: Kettering 84175 eve.

● NEWBRAIN AD, beginners guide, technical manual, pristine, £99. Apple bits: 8 port RS232 interface, £45. Normal RS232 interface, £20. U-Talk speech synthesiser, £20. ITT2020 64k, disk, printer, £399. Tel: 0270 780608.

● CBM 8032 + 8050 double disk drive + 4023 printer + Superscript, Petchess, adventure games, good condition, £1,500, buyer collects. Tel: 04203 4261 (Hampshire).

● CBM 4032 computer with tool kit + 4040 disk drive + 3022 printer, not used much, £815 ono. Tel: 0705 373666 (Hants).

● CASIO PB-100 pocket computer, qwerty keys and Basic, ideal for learning programming, plus FA-3 cassette interface, manuals and book of programs, as new, £55. Tel: Otford (09592) 3256 eve.

● SHARP MZ700 with printer plotter and data corder; software includes two Basics, many games, and tutorial, £300 ono. Offers to: Ralph Brook-Fox, Old House, Blundells, Tiverton, Devon.

● NEWBRAIN AD plus manuals and software, good condition, £175 ono, low price for quick sale. Tel: Fishcer 0905 620098 evenings. The Chestons Cottage, Uphampton, Ombersley, nr Droitwich, Worcs.

● SHARP MZ-711 computer, new, in original packing with manual, leads and Sharp Basic on cassette, tried in the shop before purchase, otherwise unused, £160 total. Tel: 0580 712019 day or evening.

● 64 CBM + cass deck + Simons Basic + joystick + books + cass games and cartridge games, unwanted gift, any offer around £300 considered. Correspondence only to: 28 Sainfoin Road, London 8EP SW17, Mr G Roberts.

● TUSCAN S100, 2×5¼in disks, 64k RAM, CP/M 2.2, Pascal, Micro Prolog, Pilot, £350 ono. Tel: John on 01-736 4524 eves.

● SHARP MZ80K (48k), manuals, games, Basic, toolkit included, £200. MZ80 I/O, £30. MZ80 P3 printer, £190. All in superb condition, boxed. Tel: South Benfleet (Essex) (03745) 56940 after 6pm.

● COMMODORE 1525 printer, 1541 disk drive, business software worth over £200, the lot for £350. Contact: Chris Norris on Winchester 60725.

● OSBORNE I S/D disks, complete with bundled software, Wordstar, Mailmerge, Supercalc, CP/M etc; also printer lead, blank diskettes, vgc, recently serviced, £520 ono. Tel: 0274 872350.

● VIC-20, cassette deck, all manuals and programmers reference guide, Gridrunner and Abductor originals included, all boxed and as new, joystick included, £100. Tel: Sedgeley 3468 after six, ask for Mr Spencer.

● SHARP MZ80k, (48k), includes monitor, cassette, excellent condition, 4MHz upgrade, lots of software including several Basics + toolkit, Pascal, adventure, arcade games, also books, manuals, £250 ono. Tel: (0472) 696393 after 6pm.

● SEIKOSHA GP100A printer and BBC cable, very good condition, in original box, £135 ono. Tel: Manchester 061-740 3477 after 6pm.

● VIC-20 add-ons, switchable memory board 8k on, expandable to 27k, plus Vick it II, £35 ono. 40×80 column card, £40 ono. Write to: S Stonehouse, 22 Hylton Road, Sunderland SR4 7AA.

● IBM PC, compatible Corona PC, 256k RAM, twin 360k disk drives, RGB card, RS232, b/w monitor, full software support, £1,300 ono. Tel: Coventry 419769 after 6pm.

● NASCOM 2, 36k, Hobbit microcassette drive, (worth £120 alone!), toolkit, compression assembler, user defined graphics board, user group magazines, full documentation, level 9 software and more, only £200. Tel: (0372) 53464.

● TRS-80 Model III, 48k, twin disk drives, LDOS5.1, VisiCalc, all manuals, as new, £850. Tel: David Lines on 01-942 2266 evenings, 01-643 8020 daytime.

● PHILIPS P2012C portable computer, 640k disk drives, bundled software includes CP/M, Wordstar, Supercalc, £1,450. Tel: Bedford (0234) 741626 after 6pm.

● TRS-80 Mk 1, Level 2, 32k expansion interface, twin disks, VDU, tape recorder, line printer 7, RS232 board, hi-res graphics, XYprint Eprom, sound box, 100+ games, ED/Ass Series 1, lots of books and software, £780 ono. Tel: 051-486 7030.

● PET Fat-Forty, 32k, 4040 twin disk drive, interface and Epson MX80FT printer, cassette, Doctor Watson cassette assembler and manual, Pet Revealed, etc, £850 + P&P. Tel: (0772) 729803.

● WANTED: Apple disk drive without controller and VDU, no leads necessary, postage will be repaid on serious offers. Will pay up to £200. Write to: T Stevens, 21 Coldstream Gardens, London SW18 1LJ.

● SINCLAIR QL, full production model and software, hardly used, first offer over £350 secures. Tel: Sevenoaks (0732) 458989.

● TANDY Model 100, 24k, including cables and some software, £450. Epson HX-20 with cassette drive, £325. Both little used, manuals and charger included. Tel: Tonbridge (0732) 356 036 after 7pm.

● SHARP MZ80-k, 48k, 200+ programs, Basic/Zen word processing, assembler/editor, reset switch, Xtal Basic, dust cover, manuals, very good condition, realistically priced, £250 ono. Tel: Cardiff (0222) 842521.

● S100 system, partially assembled, Integrand case/PSU, Jade CPU, 64k RAM, disk controller and I/O board, CP/M, software and documentation, £500 or offers. Tel: 04895 82186 eve.

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● DAI 48k personal computer, hi-res, 16-colour graphics, RS232 and PIO ports, stereo sound, cassette recorder, leads and manuals, demo and games tapes, £179 ono. Mr Lee, tel: 0392 216570 eve.

● £650 Video Genie, expanded 48k, 2×100k, 1×400k disks, Centronics 737 printer, business software, manuals etc. Hartley, 35 Dacres Road, London SE23 2NS. Tel: 01-699 5662.

● VIDEO GENIE 16k computer with leads, software and integral backing storage, £95 ono. Tel: Hamilton 088 32-4115.

● TANDY TRS-80 Model 1, Level II, + 32k S100 Genie interface, monitor, cassette recorder, software, magazines, (PCW/Micro-80) for last two years, books etc, bargain at £100. Tel: John on 01-947 8442 after 6pm.

● MOTO-GUZZI V50 MkII, 500cc, 7,400 miles, excellent condition. Will exchange for printer and disk drives or equivalent system compatible with BBC, or sell for £650 ono, real bargain. Contact: Frank on 01-693 4736.

● APPLE II+, 64k, twin drives, monitor II, joystick, manuals, books, software (assembler, Debugger, Locksmiths, Copy II+, Zaxxon, Lode Runner), purchased 1984, excellent condition, £900. Tel: 051-722 8411, Michael Humphreys.

● TRS80, Model 1, Level II, 48k, hi-res monitor, interface LPV11, two tapes, all connectors, lots of progs including Scripsit, Edtasm, Debug, £550 ono. Tel: Houston (STD 0249) 890624 for full details.

● WANTED: IEEE to RS232 Bidirectional interface, any condition. Contact: Chris on Wolverhampton (0902) 761888.

● EASY SCRIPT WP package for CBM64, disk unopened, offers. Tel: Forest Row 3200 eve.

● SPECTRUM 48k system, including interface I, microdrive, ZX printer, cartridges, software: Assembler, monitor, Forth, Pascal, Tasword, VU-series, Hobbit, Advent X3, Flight, many arcade games, books, including ROM, Debug, £255 ono. Tel: Hitchin 812521.

● RML 380S 56k, 2 5¼in SSSD driver, HRG extra serial port, text editor and formatter, Forth assembler, etc, £1,000. Corby, tel: Littlewick Green 3158 (Berkshire).

● VIDEO GENIE, 16k, with inbuilt cassette, manuals etc, games programs included, £90 ono, or £130 with VDU monitor (b/w), buyer collects. Tel: Dave on Preston (0772) 321419 eve.

● SEIKOSHA GP80A, plain paper, dot matrix printer, hi-res graphics, 80 columns text, full ASCII upper/lower cases, serial RS232 and parallel interfaces, £140. Tel: Alistair on Norwich (0603) 486296.

● ADVANCE 86B, 128k, with Zenith green screen monitor, £1,150 ono. NewBrain AD, £80. HP75C, £350 ono. HP printer, (Epsom), £250 ono. Tel: 01-868 9517 after 8.30pm.

● SHARP dual disks for MZ80K computer, together with expansion box, utilities and valuable Wdpro software, all as new condition, for quick sale, alll for £499. Tel: Wilmslow 532864 anytime.

● APPLE IIc, 128k RAM, 80 col, built-in disk, portable, latest model, matching hi-res monitor, new price £1,185, bargain £1,050 ono. Tel: Leamington Spa (0926) 27201 pm or weekend.

● SECONDHAND ACT Sirius computer, lots of software, very keen price. Tel: 0624 5998.

● SECONDHAND Wang PCS II, 8-bit micro, twin disk printer, offers? Tel: 0624 5998.

● TANDY TRS-80, Model III, 48k, integral dual Teac disk drives, Basic and TRS-DOS disk user manuals, enhanced VisiCalc and other programs, various books and magazines, £875. Tel: Eastbourne (0323) 33088.

● COMMODORE, upgraded to 8032 with 3022 printer and tape deck, odd bits of software, £650. Ray Bateman, 9 Grampian Way, Luton, Beds. Tel: Luton (0582) 504308.

● BUG-FREE QL, £380 ono, including all leads, packages, manuals. Ben Last, 5 Haymeads, Welwyn Garden City, Herts, or tel: Welwyn Garden 21901 after 6.

● SHARP MZ80k, I/O box, P3 printer, as new, extras, £495 ono. Mr. Williams, 11 Priory Oak, Bridgend, Mid-Glamorgan. Tel: 0656 60369.

● EPSON HX-20 portable, complete with manuals, charger expansion unit. No cassette drive, must sell, offers over £200. Tel: Leon 01-881 3435 day or night.

● KAYPRO II 64k. Twin drive portable, lots of software, tabs, ledgers, stock and payroll, Wordstar, spreadsheet, games etc etc. Little used, £850. Tel: 061 477 7628 (Stockport).

● ACORN Z80 SP. Plus DNFS ROM, bundled software and literature, good condition, £300 plus carriage. Write to D. Gay, 13 Bank End Road, Worsbrough Dale, Barnsley S70 4AF.

● MZ80B. Disks, 2× graphics, RS232, 2× parallel I/F, CP/M, Wordstar, MBasic, + compiler, Macro 80, ZS1D, ProPascal, (+ other Pascals), lots of programs, + 50 top quality disks (mostly Mascell). All hardly used, £850. Tel: Brighton (0273) 420918.

APPLE II + 64k. Monitor, twin disk drives, silent type printer, ROM plus board, language board, parallel interface, Visicalc, database packages, plus many extras, £800. Tel: Ponteland 25564.

● APPLE II+48k. Disk drives (2), language card, UCSD Pascal, printer card, Videx 80 column, NEC monitor, Merlin assembler, £800 ovno. Tel: 0494 716830.

● APPLE IIe 64k. Disk drive, Kaga 12 in monitor, joystick (IIE), software (price less £50 if not required). All less than one year old, mint, boxed, £800. Tel: Southampton 584487 evenings except Thursdays.

● INTERPOD. Free standing IEEE + full RS-232-C interface for Commodore VIC or 64. Enables use of 2mB disks + printer of your choice. Excellent condition, hardly used, £80 ono. Tel: 0742 551656 after 6pm.

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● SHARP MZ80B 64k. Integral monitor and cassette drive, high res card, assembler, disassembler + lots of software, £500 ono. Tel: 01-647 4993 office hours.

● SHARP MZ80B. Computer, excellent condition, as new. Basic tape, manuals included, a bargain at £550 ono. buyer collects. Write: C8, Aldis House, 55 Osborne Road, Newcastle-on-Tyne, Tyne & Wear. Tel: 0632 2725201 after 6pm.

● BBC MICRO B. Cumana 40/80 track dual disk drive, monitor, Z80 second processor + CP/M software (worth £3,000) + View word processor. All VGC, asking £950. Tel: 01-959 0394 after 6pm.

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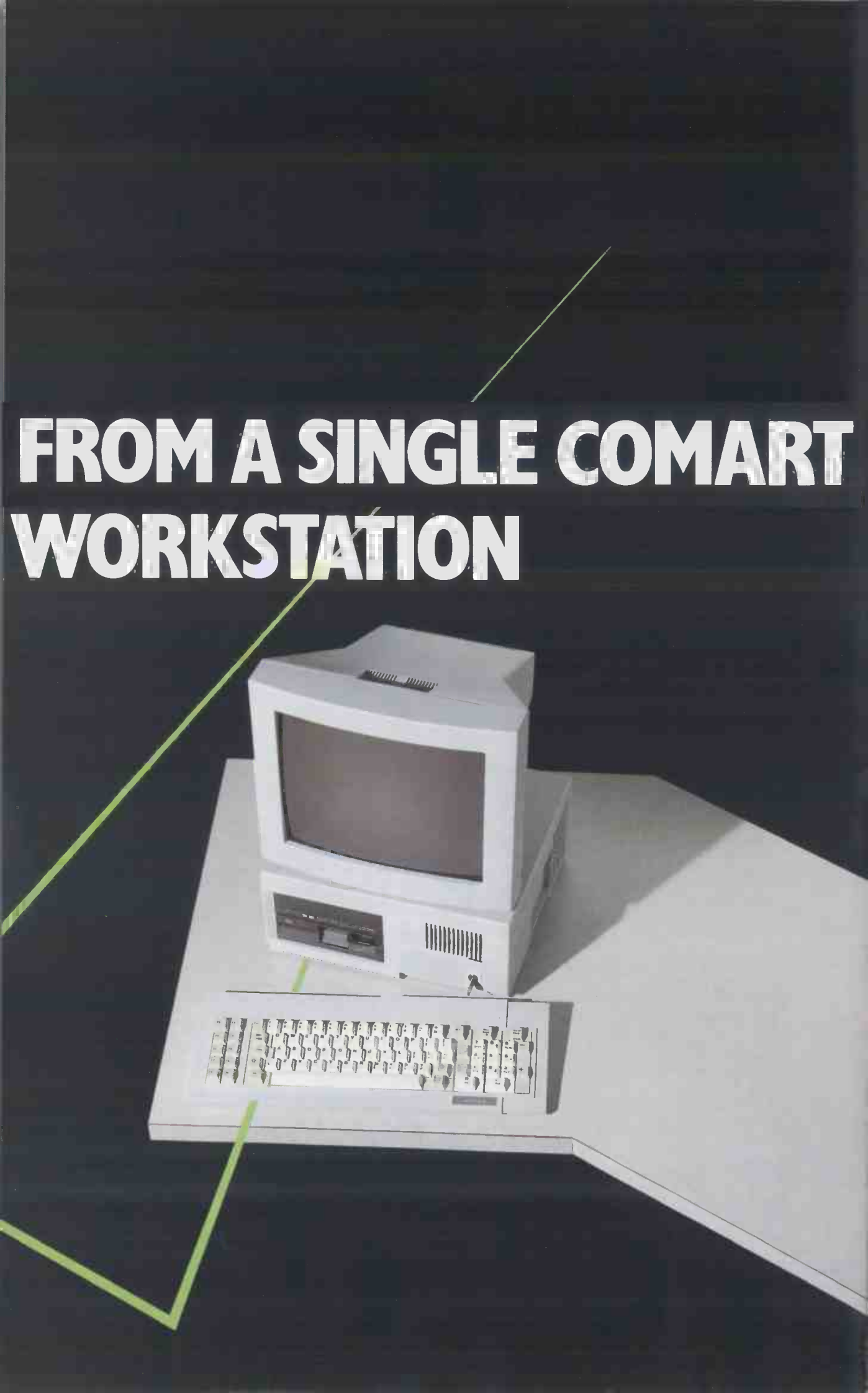

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**You will have achieved total integration . . . compatibility with the IBM software library . . . and, in addition, compatibility with past, present and future Comart Systems.**

**Comart modularity means you can continue to build-on power and facilities without fear of the future (Comart machines may grow old, but never obsolescent).**

**With so much power to go round, Comart puts an end to frustrating waiting.**

**And with such an extraordinary degree of flexibility – enabling you to give each individual precisely what is needed – Comart systems are, without doubt, uniquely cost effective.**

*The Comart WY50 smart editing terminal achieves excellent performance at a very competitive price. Utilising a large 14" screen, 80/132 column display and soft key set up, the terminal has a small footprint and an attractive ergonomic design.*

## THE SYSTEM

A microcomputer system can solve many business problems by more efficient organisation and more effective use of management resources – but only if you get the combination right.

Unfortunately, most micros offer precious little flexibility and (worse) a limited future because you can't upgrade them. This, however, will never be the case with Comart.

The modular design of our systems ensures that you get the performance you need – both today and tomorrow.

With conventional desk top micros, once outgrown, you simply have to ditch them.

With Comart systems, expansion could just mean changing a circuit board or two . . . extra capacity, a simple matter of additional disk storage and extra memory cards. In this way, you can easily keep abreast of developing technology and expand your computer capability in step with the growth of your business. You just add further users, computers and workstations using the Comart Local Area Network and Comart's built-in modularity. Further, you will also have the benefit of a special Comart software endorsement scheme which works continually to 'field test' the best multi-access software – guaranteeing that it will fully meet your requirements.

## COMART COMPUTERS

At the heart of a Comart system you have the choice of two elegantly styled series of Comart computers which provide a variety of storage, memory and user options:

The well-established, excellent value CP1000 series comfortably supports from one to eight users and, in common with all Comart computers, runs the very latest industry standard operating system, Concurrent CP/M. It accords well with the Comart principle of only paying for the specification you require.

The new CP2000 series of Supermicros belongs to a new generation of very fast, powerful computers.

Because the CP2000 Series uses the super Intel 80286 processor it runs at speeds not yet associated with microcomputers at all: up to 8 times faster than ordinary 16 bit machines and 14 times faster than 8 bit computers!

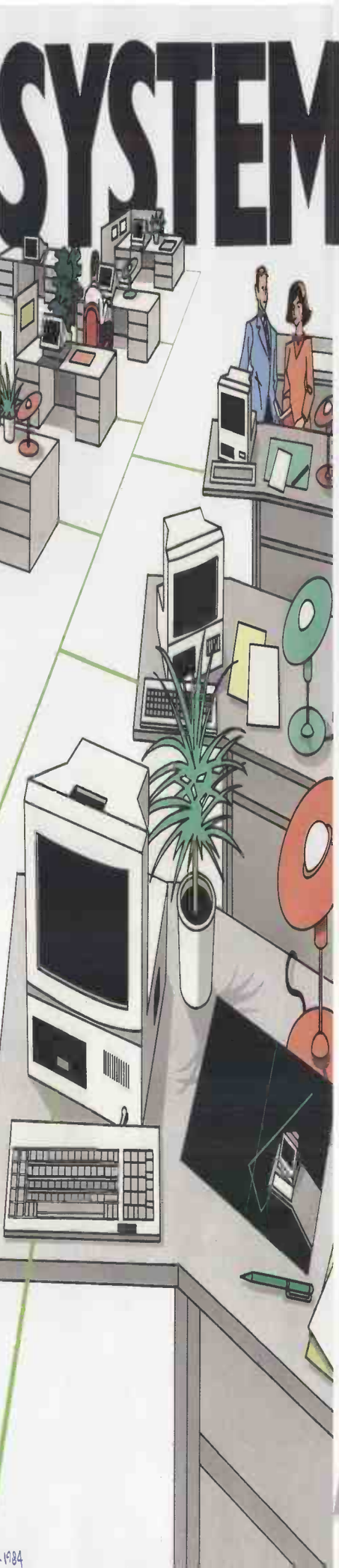
This speed really becomes useful when running the new generation of operating systems like Concurrent CP/M from Digital Research. Whenever up to four programmes and up to 12 users are running simultaneously, the processor's time is shared between them, visibly slowing down the response of ordinary micros. But with the new Comart Supermicro the processor is moving so fast that it copes with plenty to spare.

This same speed/power capability makes the CP2000 series ideal for integrated business and commercial software plus all the popular applications such as word-processing, database management and spreadsheets, within a multi-user environment

Each of the Comart 1000 series and 2000 series computers can be readily added to, expanded or updated by slotting in new or extra cards.

Add on sub-systems include 8" floppy disks, cartridge tape

# SYSTEM GROWS



back-up and hard disk storage of up to 40 Mb. All sub-systems are styled in half height compatible cabinets. For users requiring extra large databases, the CP 2000 series can accommodate up to 200 Mb of on-line data storage!

Security back-up from hard disks can be a long and tedious business. The Comart CB 240 cartridge tape unit will copy 40 Mb of data in just 10 minutes.

## THE COMART WORKSTATION

The new Comart workstation is like a well adjusted personality—happy and able to work on its own, and yet prepared to work with others, sharing and contributing as a member of the team!

It is a high performance, high specification microcomputer designed to fulfil the needs of the individual user—within an overall Comart system capable of sharing data and resources. Much more than a personal computer the Comart workstation has full graphics and communications facilities with a choice of sophisticated management tools and built-in networking.

The sleek new design has a space-saving footprint of less than one square foot, and a low profile multi-language IBM compatible keyboard.

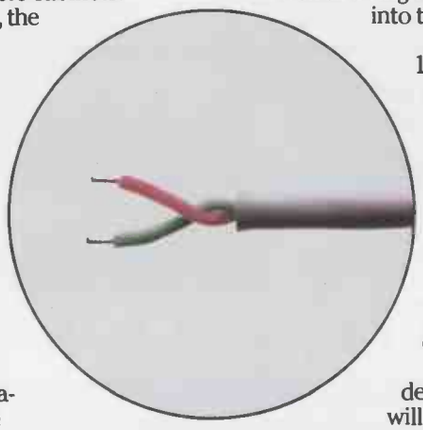
There are three models. A single high capacity floppy diskette system, and the choice of dual diskette or 10 Mb hard disk systems. With each workstation, a 256 kbyte memory (expandable to 512 kb) is standard; so too is the large, easy to read 14" swivel and tilt monochrome display.

At no additional costs, all models will fully support an IBM compatible colour or high resolution display, printers (either serial or parallel) and support mouse data entry—as well as being able to connect both to a modem and into the Comart Local Area Network.

The use of an Intel 80186 advanced 16-bit processor ensures ample power to perform multi-tasking (essential for successful network use and window display software). Extra data storage and processing capacity can be obtained by using the Comart CP series as file servers on the network.

Concurrent DOS also provides GSX graphics display facilities, DR-NET and PC-MODE. MICROSOFT MS-DOS is an optional operating environment.

Under MS-DOS and PC-MODE, well designed software written for the IBM-PC will operate on the workstation including full colour graphics.



*Using a low-cost twisted pair network cable (easily installed with junction boxes and interface cables) Comart Workstations can be joined together to communicate and share information without further modification or addition. All told, the Comart network can accommodate up to 255 computers or workstations!*

## COMART—THE COMPANY

Since 1977, Comart has been a major force in microcomputer development in the U.K., earning a reputation for the kind of innovation which meets genuine customer needs.

Now part of the Kode International PLC microcomputer group our record of quality, reliability and service has few equals (as the owners of thousands of Comart systems installed not only in the U.K., but worldwide, will testify). Our growth rate and success ensures that our company will remain a vital market leader long into the future—in other words, you can have complete confidence in the fact that Comart will always be there to support your current installation and provide after-sales service and training.

Another important reason for Comart's world-wide success is our superb network of dealers and specialist suppliers available to give full advice and after-sales support. And you can never be far from Microserve, Comart's own customer-service division offering maintenance and field-service for Comart systems nationwide.

## WHAT NEXT?

For more information or for an opportunity to see the Comart System for yourself, please complete and return the coupon overleaf.

## THE COMART SYSTEM.

All working together.

1984

# COMART SYSTEM SPECIFICATIONS

| MODEL | PROCESSOR | CARD EXPANSION | RAM | DISKETTE STORAGE 5¼" | HARD DISK STORAGE 5¼" | STANDARD INTERFACES |
|---|---|---|---|---|---|---|
| **CP 1000 SERIES** | | | | | | |
| CP 1202 | 8086 6MHz | 7 | 256kb –IMb | 2x790kb | – | 2 serial asyn/syn 1 parallel |
| CP1502 | 8086 6MHz | 6 | 256kb –1Mb | 1x790kb | 1x5Mb | 2 serial asyn/syn 1 parallel |
| CP1522 | 8086 6MHz | 6 | 256kb –1Mb | 1x790kb | 1x20Mb | 2 serial asyn/syn 1 parallel |
| CP1542 | 8086 6MHz | 6 | 256kb –1Mb | 1x790kb | 1x40Mb | 2 serial asyn/syn 1 parallel |
| CP1525M | 8086 6MHz | 4 | 512kb –1Mb | 1x790kb | 1x20Mb | 10 serial asyn/syn 1 parallel |
| Options: additional memory, processors, storage, communications, interfaces. | | | | | | |
| **CP2000 SERIES** | | | | | | |
| CP2202 | 80286 6MHz | 7 | 256kb –1.5Mb | 2x790kb | – | 4 serial asyn/syn 1 parallel |
| CP2522 | 80286 6MHz | 6 | 256kb –1.5Mb | 1x790kb | 1x20Mb | 4 serial asyn/syn 1 parallel |
| CP2542 | 80286 6MHz | 6 | 256kb –1.5Mb | 1x790kb | 1x40Mb | 4 serial asyn/syn 1 parallel |
| Calendar clock as standard. | | | | | | |
| Options: additional memory, processors (including 80287 numeric co-processor), storage, communications and interfaces. | | | | | | |

**FEATURES COMMON TO CP1000 SERIES AND CP2000 SERIES SYSTEMS:**

- Operating system software: Concurrent CP/M 86 single or multi-user, MPSL BOS/5 and M-BOS/5 optional.
- Keyboard/Display: 80/132 columns, 101 key detached with typewriter, numeric and function key sections, 14" green screen swivel/tilt.
- Printers: choice of daisy wheel, dot matrix and dual function printers with single sheet feeders – speeds up to 300 CPS.
- Expansion – internal: S100 cards, IBM and ICL main frame communications and protocols.
- Expansion – external: stackable modules including high speed tape drive, 8" floppy disks and 5" hard disks providing up to 200Mb of on-line data storage.

## Sub–systems

| MODEL | STORAGE CAPACITY | STORAGE TYPE | AVERAGE ACCESS TIME | ROTATIONAL LATENCY | RECORDING DENSITY | TRANSFER RATE |
|---|---|---|---|---|---|---|
| FD800 | 256kb | 1x8" diskette SS/SD | 130ms | 83ms | ★ | ★ |
| HD520 | 1x22Mb | 5¼" Hard/8 surface | 85ms | 8.3ms | ★ | ★ |
| HD540 | 1x40Mb | 1x5¼" Hard/8 surface | 85ms | 8.3ms | ★ | ★ |
| CB200 | 13.4Mb | Cartridge DC300XL | ★ | ★ | 6400bpi | 30kb/sec |
| CB240 | 40 MB | Cartridge DC300XL | ★ | ★ | 8000bpi | 90kb/sec |
| System dimensions: 197x370x525 (HxDxW) | | | | | | |
| Sub-system dimensions: 143x370x525 (HxDxW) | | | | | | |
| System power requirements 110, 220, 240v ± 10% 50/60 Hz | | | | | | |

# COMART WORKSTATION

| MODEL | PROCESSOR | RAM | DISKETTE STORAGE 5¼" | HARD DISK STORAGE 5¼" |
|---|---|---|---|---|
| WS20 | 80186 | 256k-512kb | 1x720kb | – |
| WS30 | 80186 | 256k-512kb | 2x720kb | – |
| WS40 | 80186 | 256k-512kb | 1x720kb | 1x10Mb |

## FEATURES COMMON TO ALL COMART WORKSTATIONS:

**Memory:** 256kbyte (optional expansion to 512 kbyte)
32kbyte display screen memory

**Diskette capacity:** 5¼" 720kbyte capacity, soft sectored, double sided, 80 track, 9 sector/track, 512byte/sector

**Disk capacity:** 5¼" 10Mbyte formatted (WS 40)

**Display:** 14" monochrome (green P39 phosphor) swivel & tilt, 25 line x 80 character (7x9 matrix in 9x12 cell), blinking, underline, dual intensity, normal and reverse video.
Character sets may be downloaded into RAM

**Graphics:** Low, medium and high resolution.
Modes include: 640x200 2 colour (IBM compatible)
640x400 2 colour
320x200 4 colour (IBM compatible)
320x200 16 colour

**Keyboard:** Detached keyboard
83 keys, including 10 function keys, numeric pad and cursor controls
4 multi language options

**Serial ports:** Mouse – asynchronous
Printer – asynchronous
Modem – sync/asynchronous

**Parallel port:** Printer – Centronics compatible

**Network port:** 1Mbit/second, token passing LAN controller

**Calendar/clock:** Time of day with battery backup

**Dimensions:** Enclosure and screen 343x318x432mm (WxDxH)
Keyboard 457x178mm (WxD)
Keyboard angle 7 degrees or 15 degrees

**Power:** 230V ± 15% or
115V ± 15% (link)

**Approvals:** UL, VDE, FCC and BT (pending)

**Operating System:**

**Software:** Digital Research
Concurrent DOS with windows
GSX86 graphics support
DR-NET network support
PC-MODE, IBM Personal computer PC-DOS emulatio
MS-DOS (optional)

I would like to know more about the Comart System, specifically .....(state which product). Please send me details of my nearest Comart dealer.

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Daytime tel. no. _____

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# ACC NEWS

*Rupert Steele gives a round-up of new computer clubs.*

Two towns and one credit were missed out of last month's round-up. Computer Town Croydon has two branches, one in central London and one in Norbury. The Norbury branch is run by Vernon Quaintance and meets every Saturday from 9.30am to 12.30pm at Norbury Junior Library, Beatrice Avenue, Norbury. Admission is free and there's a regular attendance of about 25 children whose ages vary from 8 to 18. Typical machines include the BBC, Apple, Commodore 64, Tandy TRS 80 and Spectrum.

Computer Town Eastwood continues to meet once a month under the care of organiser Ted Ryan. Ted's address is 15 Queen's Square, Eastwood, Nottingham.

And Paul Gray should have been credited as running Computer Town South Shields which meets every Wednesday night from 7pm to 9pm at the local branch of the YMCA. Paul's address is 1 Morton Walk, South Shields, Tyne and Wear.

And now on to this month's club news.

Firstly, there's news from an old friend, the Thames Valley Computer Club (TVCC). Founded in 1978, the club is centred on Reading and meets in the Church House, Church Street, Caversham. It has a strong membership ranging from beginners to professionals, who between them have experience of most micros and many aspects of hardware and software. Its main club meeting is on the first Tuesday of each month, and there's usually a guest speaker or demonstration followed by a general discussion. New members are always welcome, and if you're interested you should contact the secretary, Joe Edwards, 32 Redlands Road, Reading RG1 5HD or call (0734) 867855.

Staying south, but straying westwards there's the Cheltenham Amateur Computer Club which is based at the YMCA in Vittoria Walk, off Oriel Road, Cheltenham. It meets at 7.30pm on the third Tuesday of each month. The December meeting (on the 18th) is intriguingly titled: 'Q. What is an elephant?' A. 'A mouse with an operating system.' For further information contact Steve Smith on Cheltenham (0242) 576043 whose address is 5 Westal Park, Cheltenham, Gloucs GL51 5BL.

Not far away is the Midweekly Spectrum User Group, Gloucester, run by Barry Ledbury on Gloucester (0452) 23186. Meetings occur at Barry's home on Thursday if Wednesday's date is odd, otherwise on Wednesday from 7pm; the address is 8 Linnett Close, Gloucester. The club is an informal workshop-type affair, rather than formal group meeting. TVs and a light pen are available, so bring your Spectrums!

Mrs C Sargent writes about the club she's running at Broomhill Youth Club, 208 Allison Road, Bristol BS4 4NZ. Tel: Bristol (0272) 779574. The club is aimed mainly at the 10-21 age group, whether or not they're members of the youth centre. Mrs Sargent is also anxious to hear from older computer users who can assist in the running of the club. The main interest is in the Dragon and Spectrum machines, but other micros are very welcome.

To the south we find Mr Leo Hughes, the secretary of the Bognor Computer club. His address is 20 Pinehurst Park, Aldwick, Bognor Regis, West Sussex PO21 3DL. The club meets on the last Thursday of each month at 7.30pm at the RAFA Club, Waterloo Square, Bognor Regis and there's a BBC sub-group which meets every second Thursday. Leo describes it as a 'social computer club' and says that visitors are always welcome, as are all types of computer.

Also on the South Coast is the Lordshill Computer Club run by Mr N W Whitlock of 9 Matheson Road, Southampton SO1 8GR. The club is still at a preliminary stage of formation, so write for details first.

Moving towards the teeming metropolis, my eye is caught by a veritable dinosaur of a computer club. Mr K M Shaw of the Biometrics and Computing Section, British Museum (Natural History), Cromwell Road, London SW7 5BD writes to tell me of the British Museum (Natural History) Computer Club. Contact Mr Shaw on (01) 589 6323 extn 636 for membership details.

In Middlesex there's the Hayes Computer Club. This has been running for about nine months and the person to contact is Mr G E Clow of 9 Hurstfield Crescent, Hayes, Middx UB4 8DN. And there's the new Lynx User Group which has been formed in the wake of Rob Poate's *Nilug* magazine. The new man is Mr Robert Jones of 209 Kenton Lane, Kenton, Harrow, Middx HA3 8TL. LUG's main activity will be the production of a magazine, but Mr Jones is anxious that any prospective members in the West London area will consider active involvement.

Remember that the ACC has a database enquiry service which advises people, either by post or telephone, of a nearby computer club. Please supply an SAE and/or a telephone number for a reply.

If you want more information about the ACC, or would like a Club Information Kit, contact me: Rupert Steele, ACC chairman, 17 Lawrie Park Crescent, London SE26 6HH, or tel: (01) 370 0601.

*'It's a new cereal. When you add milk, it goes snap, crackle, pop, syntax error.'*

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| | |
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| Appleworks Software | **£175** + VAT |

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# BENCHMARKS

*Test your micro's speed of execution by running our Benchmarks.*

A listing of the Benchmarks used when evaluating micros is given below. An explanation can be found in the December '83 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 220
170 FOR L=1 TO 5
180 NEXT L
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXT L
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

# DIARY DATA

*Readers are strongly advised to check details with exhibition organisers before making arrangements, in order to avoid wasted journeys due to cancellations, printer's errors, etc.*

| | | |
|---|---|---|
| London | (Barbican), International Exbn on Computers & Communications in Investment Banking & Insurance. Contact: Online Conferences Ltd, (01) 868 4466 | 20-22 Nov |
| London | (Barbican), Computers in The City. Contact: Online, (01) 868 4466 | 20-22 Nov |
| London | (Heathrow Penta Hotel), COMCON 84. Contact: M Dodds, (01) 686 2599 | 20 Nov |
| Glasgow | (Kelvin Hall), Business & Data Processing Exbn. Contact: Scottish Industrial & Trade Exbns Ltd, (031) 225 5486 | 20-24 Nov |
| Nottingham | (East Midlands Conf Centre), East Midlands Computer Show. Contact: Central Exbns, (0827) 896474 | 27 Nov-2 Dec |
| London | (Olympia), Your Computer Christmas Fair. Contact: Reed Exbns, (01) 643 8040 | 30 Nov-2 Dec |
| London | (Novotel), International Online Information Meeting. Contact: J Mulligan, (0865) 730275 | 4-6 Dec |
| London | (New Horticultural Hall), Electron & BBC Micro User Show. Contact: Database Publications, (061) 456 8383 | 6-9 Dec |

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# PROGRAM FILE

*PCW is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation, and a listing on plain white paper — typed if you have no printer.*

*Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.*

*All programs should be fully debugged and your own original, unpublished work.*

*We prefer to receive programs which adhere to the following criteria:*

*1 Maximum 80-column width; and*
*2 Emphasised typeface.*

*Please keep a copy of everything.*

*Programs are paid for at the rate of £50 per page of published listing, plus a £50 bonus for the Program of the Month. Send your contributions to Nick Walker, PCW Programs, 62 Oxford St, London W1A 2HG.*

There's a *pot-pourri* of utilities, games and serious programs this month covering a wide range of micros. Program of the Month is chosen for partly personal reasons — I've spent hours designing teletext screens on the BBC Micro and know how tedious it can be. 'Teletext Graphics Editor' greatly eases this process, and will be a boon to programmers designing teletext screens.

Dragon owners who have created an adventure party with 'Brimstone Part One' published last month can now explore their first dungeon with 'Brimstone Part Two'. This advanced Dungeons and Dragons-type program, although lacking the polished finish of commercial programs, has great puzzle quality and game depth. Next month there'll be another scenario — 'The Tavern' — and details on how to create your own dungeons.

There's a comprehensive financial program for the Sirius which calculates every possible banking facility you could want. 'Defkeys' for the Commodore 64 allows the function keys to be defined to any string, and there's 'Golf' for the Spectrum, 'Trader' for the BBC, 'Program Editor' for the NewBrain, and a useful 'sort at' input for the TRS-80 which is general enough to be easily converted for other machines.

*Games*

*Scientific/mathematic*

*Business*

*Toolkit/utilities*

*Educational/Computer Aided Learning*

## Program of the Month

## Teletext Graphics Editor

### by Shane Murphy

As every BBC owner knows, it's difficult creating a teletext screen. This is a shame, as teletext screens are the most economical graphics screens in terms of memory, and teletext is a standard in computer graphics. This program allows the easy creation of teletext screens via a graphic screen editor, thus eliminating the calculations and tedious PRINT statements which are normally needed.

The program contains all the necessary instructions in the form of two 'help' pages which are called from the main menu, although a basic understanding of mode seven teletext graphics will help. Inexperienced users will have to experiment with the various options before tackling anything serious. Screens can be saved to disk or tape for future editing or incorporation in other programs. The following notes

# PROGRAM FILE

may help if you find yourself in trouble:
1) In text mode, the cursor may sometimes become obscured by control codes: for example, if blue text is printed on a blue screen.
2) In line-plotting mode, the cursor doesn't look any different from the rest of the line and may become lost. Press TAB to return to text mode, and remove any excess pixels by printing spaces over them.
3) The line plotting option won't work unless you put graphic colour codes to the left of where the line is to be plotted.

```
10REM
20REM   TELED Teletext Graphics
30REM           Editor
40REM    (C) Shane Murphy 1984.
50REM Thanks to Ashley Saulsbury
60REM       and Jon Cansdale.
70REM Listing from Dr. Challoner's
80REM Grammar School, Amcom E-net.
90REM
100ONERRORGOTO1130
110*FX4,2
120*KEY11"!A"
130*KEY12"!B"
140*KEY13"!C"
150*KEY14"!D"
160*KEY15"!E"
170*KEY0"!!!M"
180*KEY1"!!!J"
190*KEY2"!!!\"
200MODE7
210VDU28,0,24,39,0,23,1,0,0,0,0,
220PROCsetup
230CLS
240PRINTCHR$(132)CHR$(157)CHR$(141)CHR$(134)"TELETEXT GRAPHICS EDITOR"SPC(6)"V
1.4d"
250PRINTCHR$(132)CHR$(157)CHR$(141)CHR$(134)"TELETEXT GRAPHICS EDITOR"SPC(6)"V
1.4d"
260PRINTCHR$(132)CHR$(157)CHR$(134)"  (C) Shane Murphy 1984."''
270PRINTCHR$(134)"Menu options:"'
280PRINTCHR$(134)"(1) Edit existing screen"
290PRINTCHR$(134)"(2) View existing screen"
300PRINTCHR$(134)"(3) LOAD screen from disk"
310PRINTCHR$(134)"(4) SAVE screen to disk"
320PRINTCHR$(134)"(5) Erase screen from memory"
330PRINTCHR$(134)"(6) Show help pages"
340PRINTCHR$(134)"(7) Quit program"
350PRINTCHR$(134)"(*) Execute 'star' command"
360PRINT'CHR$(134)"Type the option you require:"
370REPEAT:A%=GET:UNTILA%>48 ANDA%<56 ORA%=42
380IFA%=42 THENGOTO1410
390PRINTTAB(0,A%-42)CHR$(133);:B%=INKEY(100)
400A%=A%-48
410ONA%GOSUB430,600,630,650,670,1180,690
420GOTO230
430*FX220,0
440CLS:CALL&900
450XC%=0:YC%=0:P%=255
460PROCcursor
470IFXC%>39ORXC%<0THENXC%=0
480IFYC%>24ORYC%<0THENYC%=0
490A%=INKEY(0):IFA%=-1THEN460
500IFA%=127THEN?(XC%+YC%*40+&7C00)=32:XC%=XC%-1:GOTO460
510IFA%=9THENXP%=XC%*2-2:YP%=(23-YC%)*3+3:GOSUB700
520IFA%=13THENGOSUB780
530IFA%=1THEN?(XC%+YC%*40+&7C00)=P%:XC%=XC%+1
540XC%=XC%-(A%=3)+(A%=2)
550YC%=YC%-(A%=4)+(A%=5)
560IF(A%>128ANDA%<138)OR(A%>144ANDA%<160)OR(A%>139ANDA%<142)OR(A%>31ANDA%<128)
THEN?(XC%+YC%*40+&7C00)=A%:XC%=XC%+1
570IFA%<>27 THENGOTO460
580*FX220,27
590CALL&900:RETURN
600CLS:PRINTTAB(0,11)"Press any key to return to the menu,"TAB(0,13)"And any k
ey to continue . . . . . ."
610A%=GET:CALL&900:A%=GET:CALL&900
620RETURN
630CLS:INPUT"Filename ?"A$:A$=7700+"LOAD"""+A$+"""":X%=0:Y%=&77:CALL&FFF7
640CALL&900:RETURN
650CLS:INPUT"Filename ?"A$:A$=7700+"SAVE"""+A$+""" 7C00 7FFF B01F":X%=0:Y%=&77:
CALL&900:CALL&FFF7
660CALL&900:RETURN
670CALL&900:CLS:CALL&900
680RETURN
690MODE7:END
700A%=INKEY(10)
710A%=INKEY(0)
720IFA%=9THENRETURN
730XP%=XP%-(A%=3)+(A%=2)
740YP%=YP%-(A%=5)+(A%=4)
750YP%=ABS(YP%MOD75):XP%=ABS(XP%MOD78)
760PROCplot(XP%,YP%)
770GOTO710
780REPEAT
790A%=INKEY(20)
800IFINKEY(-17)THENP%=P%EOR1
810IFINKEY(-34)THENP%=P%EOR2
820IFINKEY(-66)THENP%=P%EOR4
830IFINKEY(-82)THENP%=P%EOR8
840IFINKEY(-98)THENP%=P%EOR16
850IFINKEY(-67)THENP%=P%EOR64
860?(XC%+YC%*40+&7C00)=P%
870UNTILINKEY(-74)ORINKEY(-113)
880*FX15
890RETURN
900DEFPROCsetup
910DIM S% 7
920!S%=&08040201:S%!4=&4010
930FORT%=0TO2STEP2
940P%=&900
950[OPTT%
960LDA£&7C:STA&71:LDA£0:STA&70:STA&72:LDA£&78:STA&73
970.L2 LDY£0
980.L LDA(&70),Y:STA&75:LDA(&72),Y:STA(&70),Y:LDA&75:STA(&72),Y
990DEY:BNEL
1000LDX&73:INX:STX&73:LDX&71:INX:STX&71:CPX£&80:BNE L2
1010RTS:]
1020NEXT:ENDPROC
1030DEFPROCcursor
1040FORZ%=1TO4:?(XC%+YC%*40+&7C00)=?(XC%+YC%*40+&7C00) EOR255:NEXT
1050ENDPROC
```


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# PROGRAM FILE

```
1060DEFPROCplot(X%,Y%)
1070LOCALC%,A%
1080VDU31,X% DIV2+1,24-Y% DIV3
1090C%=S%?((X% AND1)+(2-Y% MOD3)*2)
1100A%=135
1110VDU (USR&FFF4 AND&FF00) DIV256 ORC% OR128
1120ENDPROC
1130IFERR=17 THENGOTO230
1140PRINT"Read / Write error.":REPORT:PRINT'"Ignore error or Abort program (I/A
) ?";
1150REPEAT:A%=GET:UNTILA%=73 ORA%=65
1160IFA%=65 THENEND
1170GOTO230
1180CLS:PRINTCHR$(132)CHR$(157)CHR$(141)CHR$(134)"TELETEXT GRAPHICS EDITOR HELP
PAGES"
1190PRINTCHR$(132)CHR$(157)CHR$(141)CHR$(134)"TELETEXT GRAPHICS EDITOR HELP PAG
ES"
1200PRINT'CHR$(134)"Move cursor:"'CHR$(130)" Use the arrowed cursor keys"
1210PRINT'CHR$(134)"Insert a colour control code"'CHR$(130)" <SHIFT> plus funct
ion key 'n' gives"'CHR$(130)"  text colour 'n'."
1220PRINTCHR$(130)" <CTRL> plus function key 'n' gives"'CHR$(130)"  graphics co
lour 'n'."
1230PRINT'CHR$(134)"Define a group of six pixels ( one'CHR$(134)" character )
:"'CHR$(130)" <RETURN> to enter and leave the pixel"'CHR$(130)"editor."
1240PRINTCHR$(130)" Q,W,A,S,Z, and X to toggle the pixels"'CHR$(130)" on and of
f"
1250PRINTCHR$(134)"Plot the currently defined pixel group:"CHR$(130)" Press <CO
PY>."
1260PRINT'CHR$(134)"Plot any alphanumeric character:"'CHR$(130)" Type it in dir
ectly from the keyboard."
1270PRINTTAB(0,24)CHR$(132)CHR$(157)CHR$(134)"PRESS ANY KEY FOR THE NEXT PAGE..
.";
1280A%=GET
1290CLS:PRINTCHR$(132)CHR$(157)CHR$(141)CHR$(134)"TELETEXT GRAPHICS EDITOR HELP
PAGE"
1300PRINTCHR$(132)CHR$(157)CHR$(141)CHR$(134)"TELETEXT GRAPHICS EDITOR HELP PAG
E"
1310PRINT'CHR$(134)"Plot a line:"'CHR$(130)" Press <TAB> to enter and leave the
"'CHR$(130)"  line plotter."
1320PRINTCHR$(130)" Arrow keys to draw a line."
1330PRINT'CHR$(134)"Insert a 'new background' character:"'CHR$(130)" Press func
tion key 1."
1340PRINT'CHR$(134)"Insert a 'black background' character:"'CHR$(130)" Press fu
nction key 2."
1350PRINT'CHR$(134)"Insert a 'double height' character:"'CHR$(130)" Press funct
ion key 0."
1360PRINT'CHR$(134)"Save screen to memory and return to"'CHR$(134)" the menu  (
not whilst plotting a line"CHR$(134)" or editing pixels ):"
1370PRINTCHR$(130)" Press <ESCAPE>."
1380PRINTTAB(0,24)CHR$(132)CHR$(157)CHR$(134)"PRESS ANY KEY TO RETURN TO THE ME
NU.";
1390A%=GET
1400GOTO230
1410CLS:INPUT"*"A$:$&7700=A$:X%=0:Y%=&77:CALL&FFF7
1420PRINT'"Press any key to return to the menu...";:A%=GET:GOTO230
```

# Financial Calculations
## by Jim McCartney

'Financial Calculations' is a program of loan, investment and savings calculations for the Sirius. It's written in Microsoft Basic and should run on any machine that uses this version of Basic.

The program is comprehensive, easy to use and will be of interest to those contemplating loans, investments, mortgages and life insurance. The full range of available calculations is as follows:

1) Future value of a single investment.
2) Present value of a future sum.
3) Future value of regular deposits.
4) Regular deposits needed to give future sum.
5) Investment needed to provide regular withdrawals.
6) Regular withdrawals from an investment.
7) Investment needed for inflating withdrawals.
8) Inflating withdrawals from an investment.
9) Loan secured by regular payment.
10) Regular payment on a loan.
11) Mortgage secured by monthly payments.
12) Monthly payments on a mortgage.

Unusual features are: allowance for inflation; and allowances for front-end management fees by investment managers. One word of warning: if you'd rather not know how much you're *really* paying, don't try the program — it can be upsetting.

```
 00     '*********************************************************
 102    '* CALC.BAS program for various financial calculations *
 104    '*         By Jim McCartney       September 1984        *
 106    '*********************************************************

 110    ON ERROR GOTO 60000
 120    GOTO 20000

 200    '***************** UTILITY SUBROUTINES
 290    V%=V%(J%)+LN%: H%=H%(J%)
 300    PRINT FNC$(V%,H%);: RETURN                              'position curs
 310    M% = (74-LEN(M$))/2: M$=SPACE$(M%) + M$ + SPACE$(M%):
        PRINT E$"Y8£"RV$M$NO$HM$: RETURN                        'message
 320    PRINT E$"Y8!"SPACE$(78)HM$;: M$="": RETURN              'clear it
 330    GOSUB 310: FOR J=1 TO 1500: NEXT: GOSUB 320: RETURN
        'message, pause and clear

 400    DP% = DP%(J%)
 405    Q£ = VAL(Q$):
        IF Q£ <> 0 THEN TP = 10^DP%:
```

```
                     Q£ = FIX(Q£ * TP +.5)/TP + RU£:
                     Q$ = MID$(STR$(Q£),2)
                ELSE Q$ = "0"
410     P% = INSTR(Q$,"."):
        IF P%=0 THEN Q$ = Q$ + "." + Z$: GOTO 410
                ELSE D% = LEN(Q$) - P%:
                IF D% < DP% THEN Q$ = Q$ + Z$: GOTO 410
420     IF D% > DP% THEN IF DP% THEN Q$ = LEFT$(Q$,P%+DP%)
                                 ELSE Q$ = LEFT$(Q$,P%-1)
430     IF Q£ < 0 THEN Q$ = "-"+Q$
440     IF LEN(Q$) < L%(J%) THEN Q$ = SPACE$(L%(J%)-LEN(Q$))+Q$
450     RETURN
        'sub to return a numeric string rounded and justified on decimal

500     PRINT HM$CD$CD$CD$CD$SC$SPC(15)MU$(MU%)
505     PRINT SPC(15)STRING$(LEN(MU$(MU%)),45)
510     FOR J%=0 TO EF%:
                IF (MU%=3 OR MU%=4) AND J%=5 THEN J%=6
515             IF J%=3 THEN PRINT FNC$(V%(J%),16)PR$(J%)PX$(MU%)
                        ELSE PRINT FNC$(V%(J%),16)PR$(J%)
520     NEXT J%
525     PRINT FNC$(20,16)AN$(MU%)
530     IF MU%=7 OR MU%=8 THEN PRINT FNC$(21,16)
        "'Value' means real value, allowing for inflation"
535     IF MU%=11 OR MU%=12 THEN PRINT FNC$(21,7)
        "This calculation assumes that interest ias added annually in advance."
540     PRINT FNC$(23,28)"ALT-E  Exit to MENU"HM$
545     RETURN
        'program section titles, prompts and annotations

600     PRINT USING FNC$(20,48)+"££££££££,.££";A£
610     PRINT FNC$(23,20)"ALT-E Exit to Menu  ALT-P to Print"HM$: RETURN
        'print answer & prompts

700     LPRINT,MU$(MU%):
        LPRINT,STRING$(LEN(MU$(MU%)),45):
        LPRINT
710     FOR J%=0 TO EF%
720             IF (MU%=3 OR MU%=4) AND J%=5 THEN J%=7
730             IF J%=0 AND IN$(J%)="" THEN J%=1
740             IF J%=3 THEN LPRINT USING PF1$;PR$(J%);PX$(MU%);VAL(IN$(J%)):
                GOTO 770
745             IF J%=4 THEN LPRINT USING PF4$;PR$(J%);VAL(IN$(J%)): GOTO 770
750             IF J%=7 THEN LPRINT USING PF3$;VAL(IN$(6));VAL(IN$(7)):
                GOTO 770
760             LPRINT USING PF2$;PR$(J%);VAL(IN$(J%))
770     NEXT J%
780     FOR J%=EF% TO 5: LPRINT: LPRINT: NEXT:
        LPRINT USING PF2$;AN$(MU%);A£:
        LPRINT FF$: RETURN
        'printout procedures

800     IF F£ = I£ THEN P1£ = NY£: GOTO 820
810     Q£ = F£/I£: P1£ = (Q£^NY£-1)/(Q£-1)
820     P2£ = (F£^NY£-1)/(F£-1): P3£ = I£^NY£
830     A£ = R£/(I£-1)*(1-1/P3£+(F£-1)/P3£*(P3£*P1£-P2£))
840     RETURN                  'investment for inflating withdrawals

1000    '**************** INPUT SUBROUTINE
1010    J% = SF%: X%=0
1020    WHILE J% <= EF% AND X% = 0      '==========>>>>>>>>>>>>>

1030    Q% = 27
1040    WHILE Q% <> 13 AND X% = 0
1050            IF Q% = 27 THEN         GOSUB 290:
                                        L% = 0: P% = 0:
                                        VP = VARPTR(A$):
                                        PK = PEEK(VP+1) + 256 * PEEK(VP+2)
1060            Q% = ASC(INPUT$(1)): IF Q% > 31 THEN 1130
1070            IF Q% = 13 AND L% = 0 THEN Q$ = IN$(J%)
1080            IF Q% = 27 AND L% = 0 AND J% > SF% THEN J% = J% - 1
1090            IF Q% = 5  AND L% = 0 THEN X% = Q%
1095            IF Q% = 16 AND L% = 0 AND J% = 0 THEN X% = Q%: GOSUB 700
1100            IF Q% = 8  AND P% > 0 THEN P% = P% - 1: PRINT E$"D";
1110            IF Q% = 9  AND P% < L% THEN P% = P% +1: PRINT E$"C";
1120            GOTO 1150
1130            IF Q% > 96 THEN Q% = Q% - 32    'u. case only
1140            IF L% < L%(J%) OR P% < L%(J%) THEN
                                        PRINT CHR$(Q%);:
                                        POKE PK + P%, Q%:
                                        P% = P% + 1:
                                        IF L% < P% THEN L% = P%
1150    WEND
1160    IF X% THEN 2100
1170    IF L% > 0 THEN Q$ = LEFT$((LEFT$(A$,L%) + BL$),L%(J%))

1200    IF J% = 0 AND VAL(Q$) = 0 THEN  IN$(J%) = "":
                                        GOSUB 290: PRINT"      ":
                                        GOTO 2030
        'skip APR
1210    IF J% = 3 AND VAL(Q$) > 99999.99 THEN DP%=0: GOSUB 405
                                         ELSE       GOSUB 400
        'round & justify figures
1220    IF Q£ < LL£(J%) OR Q£ > UL£(J%) THEN 1900 ELSE 2000
        'validate

1900    M$ = WN$(J%): GOSUB 310: GOTO 2100              'invalid

2000    GOSUB 320: GOSUB 290: PRINT Q$;: IN$(J%) = Q$
2010    IF J% = 0 THEN  J% = 1:
                        Q$ = STR$(C% * FNI(VAL(Q$),(1/12))):
                        GOSUB 400:
                        IN$(J%) = RIGHT$(BL$ + Q$,L%(J%)):
                        GOSUB 290: PRINT IN$(J%):
        'calc APR from monthly, print & skip entry.
2020    IF (MU%=3 OR MU%=4) AND J%=4 THEN J%=5
2030    J% = J% + 1
2100    WEND : RETURN           '<<<<<<<<<<<<<<=================

20000   '***************** DATA DIVISION ********************
20010   E$=CHR$(27): CL$=E$+"E": HM$=E$+"H": RV$=E$+"p": NO$=E$+"q":
        'escape,     clear,      home,       reverse,    normal
20020   BE$=CHR$(7): HI$=E$+"(": LO$=E$+")": CD$=E$+"B": CH$=E$+"+":
        'bell,       bright,     dim,          cur down,  clear bright
```


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# PROGRAM FILE

```
20030   NC$=E$+"x5": CU$=E$+"Y5":DL$=E$+"L": SC$=E$+"J": CP$=E$+"A":
        'curs off,   curs on,    del line,   clear down, curs up
20035   PRINT E$"x1"
20040   DEF FNR(X) = INT(X*C%+.5)/C%            'round to 2 places
20050   DEF FNI(X,Y) = EXP((LOG(X/C%+1))/Y)-1   'calc APR from periodic
20055   DEF FNC$(V,H) = E$ + "Y" + CHR$(V + LN% + 31) + CHR$(H + 31)
        'position cursor
20060   Z$ = "000000": C%=100: RU£=1E-08
20070   DIM J%,K%,N%,M%,V%,H%,LN%,D%,P%,DP%,L%,VP%,D%,X%
20080   DIM Q$,M$,T,TP,PK,VP,I£,Y£,P£,A£,Q£,F£,P1£,P2£,P3£,NY£,R£,
        N£,Q,J£,JM£,NP£,A1£,A2£,C£
20090   A$=STRING$(20,32)+""
20100   BL$=SPACE$(20)
20110   FF$=CHR$(12): LF$=CHR$(10)      'form feed & line feed for printer
20120   PF1$=LF$+SPACE$(14)+"\          \\                  \ £££££££,.££"
20130   PF2$=LF$+SPACE$(14)+"\                              \ £££££££,.££"
20140   PF3$=LF$+SPACE$(14)+"Management fee £££.££ % on first ££ deposits"
20145   PF4$=LF$+SPACE$(14)+"\                              \        ££"
20150   SF% = 0: EF% = 0
21000   DIM MU$(12), PX$(12), AN$(12)
21010   DIM L%(7),V%(7),H%(7),LL£(7),UL£(7),DP%(7),WN$(7).IN$(7),PR$(7)


22000   DATA "Future value of Single Investment",
        "Present Value of a Future Sum",
        "Future Value of Regular Deposits",
        "Regular Deposits needed to give Future Sum",
        "Investment needed to provide Regular Withdrawals"
22010   DATA "Regular Withdrawal from an Investment",
        "Investment needed for Inflating Withdrawals",
        "Inflating Withdrawals from an Investment",
        "Loan secured by Regular Payment",
        "Regular Payment on a Loan"
22015   DATA "Mortgage secured by Monthly Payments",
        "Monthly Payments on a Mortgage"
22018   FOR J%=1 TO 12: READ MU$(J%): NEXT

22020   DATA "Monthly Interest Rate %", "True Interest Rate (APR) %",
        "Term in years","Amount of ","Number per annum",
        "Annual Inflation Rate %",
        "Management fee        % on first     deposits"
22025   FOR J%=0 TO 6 : READ PR$(J%): NEXT

22030   DATA
        "investment          £",
        "future sum          £",
        "regular deposit     £",
        "future value        £",
        "regular withdrawal  £",
        "investment          £",
        "withdrawal value    £",
        "investment          £",
        "regular payment     £",
        "loan                £"
22035   DATA
        "monthly payment     £",
        "mortgage            £"
22037   FOR J%=1 TO 12: READ PX$(J%): NEXT

22040   DATA "Future Value is","Present Value is","Future Value is",
        "Regular Deposit is","Investment needed is","Regular Withdrawals are"
22050   DATA "Investment Needed is","Value of withdrawals is",
        "Amount of loan is","Regular Payments are",
        "Mortgage is","Mortgage Payments are"
22060   FOR J%=1 TO 12: READ AN$(J%): NEXT

22100   '********* INPUT DATA
22110   DATA 5,8.54,.099.20.1.2."Must be 0.1 to 20%"
22120   DATA 6,10,53,.249,99.99,2,"Must be 0.25 to 99%"
22130   DATA 6,12,53,0,99.99,2,"Must be 0 to 99 years"
22140   DATA 11,14.48,.009,99999999.99,2,"Must be £0.01 to £99,999,999"
22150   DATA 2,16,57,.99,99.9,0,"Must be 1 to 99 per annum"
22160   DATA 5,18,54,.249,99.99,2,"Must be .25 to 99%"
22170   DATA 5,18,31,0,100.1,2,"Must be 0 to 100"
22180   DATA 2,18.49,0,99.9,0,"Must be 0 to 99"
23000   FOR J%=0 TO 7 : READ L%(J%),V%(J%),H%(J%),LL£(J%),UL£(J%),
              DP%(J%),WN$(J%): NEXT



25000   '********************* MENU
25010   GOSUB 320: PRINT HM$
25020   PRINT CL$SPC(15)RV$"          Financial Calculation Program          "NO$
25030   PRINT CD$SPC(30)RV$" By Jim McCartney "NO$
25040   PRINT CD$CD$SPC(30)"Calculations Menu"CD$
25050   FOR MU%=1 TO 12: PRINT USING SPACE$(14)+"££     &";MU%;MU$(MU%):NEXT
25060   PRINT SPACE$(14)"13    Notes on Interest Calculations
25070   PRINT SPACE$(14)"14    INSTRUCTIONS
25080   PRINT CD$SPC(13)"Please key your option and press <RETURN>";
25090   INPUT" ",O$
25100   MU%=VAL(O$): IF MU%<1 OR MU%>14 THEN M$="Enter 1 to 14 please !":
        GOSUB 330: GOTO 25010
25110   ON MU% GOTO 30010,31010,32010,33010,34010,35010,36010,37010,38010,
        39010,40010,41010,42010
25120   PRINT CL$CD$CD$"You have the option of entering monthly interest rates o
r annual (APR) rates
25130   PRINT"of interest. If you enter monthly rates, the APR will be calculate
d and shown.
25140   PRINT"If you enter 0 or a blank for monthly rates, you will then be able
 to enter APR
25150   PRINT"directly.
25155   PRINT"Any values entered are carried over into any following calculation
s, and may be
25157   PRINT"re-used by pressing RETURN.
25160   PRINT CD$"Cursor Controls:
25170   PRINT"RETURN to finish an entry or to accept existing value
25180   PRINT"ESC to skip back an entry
25190   PRINT"BACKSPACE (left arrow) to backspace within an entry
25200   PRINT"TAB (right arrow) to move forward again within an entry
25210   PRINT CD$"Program Controls:
25220   PRINT"ALT-E to return to Menu
25230   PRINT"ALT-P to print existing calculation - but only if cursor is on the
 first line
25240   PRINT"ALT-C to finish.
25250   PRINT"Since there is are no disk files, you can switch off any time.
25260   PRINT CD$;:INPUT"                          Press <RETURN> for MENU  ",O$
25270   GOTO 25010
30000   '*************** Future value of investment
30010   EF%=3: GOSUB 500
30020   GOSUB 1010: IF X%=5 THEN 25010
30030   I£ = VAL(IN$(1))/C% + 1: Y£ = VAL(IN$(2)): P£ = VAL(IN$(3))
```

# PROGRAM FILE

```
30040   A£ = P£*I£^Y£
30050   GOSUB 600: GOTO 30020


31000   '*************** Investment for future value
31010   EF%=3: GOSUB 500
31020   GOSUB 1010: IF X%=5 THEN 25010
31030   I£ = VAL(IN$(1))/C% + 1: Y£ = VAL(IN$(2)): P£ = VAL(IN$(3))
31040   A£ = P£/I£^Y£
31050   GOSUB 600: GOTO 31020


32000   '*************** Future value of regular deposits
32010   EF%=6: GOSUB 500: EF%=7
32020   GOSUB 1010: IF X%=5 THEN 25010
32030   N£ = VAL(IN$(4)): Q = VAL(IN$(1)): J£ = FNI(Q,N£): Y£ = VAL(IN$(2)):
        R£ = VAL(IN$(3)): J#£ = J£ - FNI(VAL(IN$(6)),N£): NP£ = VAL(IN$(7))
32040   A1£ = R£*((1+J#£)^NP£-1)/J#£:
        A1£ = A1£*(1+J#£)^(N£*Y£-NP£):
        A2£ = R£*((1+J£)^(N£*Y£-NP£)-1)/J£:
        A£  = A1£ + A2£
32050   GOSUB 600: GOTO 32020


33000   '*************** Regular deposit for future value
33010   EF%=6: GOSUB 500: EF%=7
33020   GOSUB 1010: IF X%=5 THEN 25010
33030   N£ = VAL(IN$(4)): Q = VAL(IN$(1)): J£ = FNI(Q,N£): Y£ = VAL(IN$(2)):
        R£ = VAL(IN$(3)): J#£ = J£ - FNI(VAL(IN$(6)),N£): NP£ = VAL(IN$(7))
33040   A1£ = ((1+J#£)^NP£-1)/J#£:
        A1£ = A1£*(1+J#£)^(N£*Y£-NP£):
        A2£ = ((1+J£)^(N£*Y£-NP£)-1)/J£:
        A£  = R£/(A1£ + A2£)
33050   GOSUB 600: GOTO 33020


34000   '*************** Investment for regular withdrawals
34010   EF%=4: GOSUB 500
34020   GOSUB 1010: IF X%=5 THEN 25010
34030   N£ = VAL(IN$(4)): Q = VAL(IN$(1)): J£ = FNI(Q,N£): Y£ = VAL(IN$(2)):
        R£ = VAL(IN$(3))
34040   A£ = R£/J£*(1-1/((1+J£)^(N£*Y£)))
34050   GOSUB 600: GOTO 34020


35000   '*************** Regular withdrawals from an investment
35010   EF%=4: GOSUB 500
35020   GOSUB 1010: IF X%=5 THEN 25010
35030   N£ = VAL(IN$(4)): Q = VAL(IN$(1)): J£ = FNI(Q,N£): Y£ = VAL(IN$(2)):
        R£ = VAL(IN$(3))
35040   A£ = R£*(J£/((1+J£)^(N£*Y£)-1)+J£)
35050   GOSUB 600: GOTO 35020


36000   '*************** Investment for inflating withdrawals
36010   EF%=5: GOSUB 500
36020   GOSUB 1010: IF X%=5 THEN 25010
36030   N£ = VAL(IN$(4)): Q = VAL(IN$(1)): I£ = FNI(Q,N£)+1: Y£ = VAL(IN$(2)):
        R£ = VAL(IN$(3)): Q = VAL(IN$(5)): F£ = FNI(Q,N£)+1: NY£ =N£*Y£
36040   GOSUB 800
36050   GOSUB 600: GOTO 36020


37000   '*************** Inflating withdrawals from investment
37010   EF%=5: GOSUB 500
37020   GOSUB 1010: IF X%=5 THEN 25010
37030   N£ = VAL(IN$(4)): Q = VAL(IN$(1)): I£ = FNI(Q,N£)+1: Y£ = VAL(IN$(2)):
        C£ = VAL(IN$(3)): Q = VAL(IN$(5)): F£ = FNI(Q,N£)+1: NY£ =N£*Y£
37040   R£ = 1: GOSUB 800: A£=C£/A£
37050   GOSUB 600: GOTO 37020


38000   '*************** Loan secured by regular payment
38010   GOTO 34010


39000   '*************** Regular payment on a loan
39010   GOTO 35010


40000   '*************** Mortgage secured by monthly payment
40010   EF%=3: GOSUB 500
40020   GOSUB 1010: IF X%=5 THEN 25010
40030   J£ = VAL(IN$(1))/C%: Y£ = VAL(IN$(2)): R£ = VAL(IN$(3))*12
40040   A£ = R£/J£*(1-1/((1+J£)^Y£))
40050   GOSUB 600: GOTO 40020


41000   '*************** Monthly mortgage payments
41010   EF%=3: GOSUB 500
41020   GOSUB 1010: IF X%=5 THEN 25010
41030   J£ = VAL(IN$(1))/C%: Y£ = VAL(IN$(2)): R£ = VAL(IN$(3))
41040   A£ = R£*(J£/((1+J£)^Y£-1)+J£)/12
41050   GOSUB 600: GOTO 41020


42000   '*************** Notes
42010   PRINT CL$CD$CD$CD$CD$"APR is used for calculation throughout, except in
Mortgage payments.
42020   PRINT "This means, for example, that if the monthly interest is quoted a
s 1%,
42030   PRINT "the Annual Percentage Rate is not 12%, but a rather larger figure
.
42040   PRINT CD$"Calculations assume that interest is adjusted at the time of e
ach transaction,
42050   PRINT "so that if you make monthly payments or withdrawals, the interest
 calculation
42060   PRINT "takes full account of these. This is not usually the case for Mor
tgages,
42070   PRINT "which have interest charged one year in advance, whereas repaymen
ts
```


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# PROGRAM FILE

```
42080   PRINT "are made monthly. The Mortgage calculation takes account of this.
42090   PRINT CD$"In the calculation of withdrawals from a fund, it is assumed t
hat one time
42100   PRINT "period elapses between the deposit and the first withdrawal.
42110   PRINT CD$;:INPUT"                          Press <RETURN> for MENU  ",Q$
42120   GOTO 25010



60000   '********************* ERROR TRAP
60040   IF ERR=6 OR ERR=11 THEN
        M$="Sorry -can't calculate this ! Try different figures.":
        GOSUB 330: RESUME 25010
60050   M$="ERROR MESSAGE: ERROR"+STR$(ERR)+" AT LINE"+STR$(ERL)
60060   GOSUB 310: PRINT HM$: END
```

| Investment needed for Inflating Withdrawals | | Regular Deposits needed to give Future Sum | |
|---|---|---|---|
| Monthly Interest Rate % | 0.80 | True Interest Rate (APR) % | 11.00 |
| True Interest Rate (APR) % | 10.03 | Term in years | 10.00 |
| Term in years | 15.00 | Amount of future value | £ 13,000.00 |
| Amount of withdrawal value | £ 100.00 | Number per annum | 12 |
| Number per annum | 12 | Management fee | |
| Annual Inflation Rate % | 5.00 | 3.50 % on first 24 deposits | |
| Investment Needed is | 12,908.94 | Regular Deposit is | 66.88 |

## Space Trader
### by Sam Redfern

In this BBC program, you must make as much profit as possible by trading in space.

There are four things to take care of:
1) Nine different trading items.
2) Six different planet types.
3) The upkeep of your spaceship.
4) Unexpected encounters.

**1 Trading items** The nine trading items are steel, food, farm machinery, computers, gems, gold, silver, sugar (illegal) and other machinery. You'll gradually get to know the reasonable buying and selling prices of each item.

**2 Planet types** The six different planet types are:
a) High population, industrial.
b) Low population, agricultural (no fuel or spaceships for sale).
c) Low population, industrial.
d) High population, agricultural.
e) Low population, mining (no fuel or spaceships for sale).
f) High population, mining.

Some useful trade links can be used: for example, buying gems, gold and silver cheaply from a mining planet, and selling them at a large profit to an industrial planet.

**3 Spaceships** There are six different types of spaceship. As you begin the game with CR2500 (2500 credits), your main aim initially will be to get a better craft (see table).

Your fuel decreases by two every round in which you move. If it reaches zero, your life support systems fail. Spaceships may be damaged by crash landing on a planet, or by enemy gun fire — this comes off your hull points. When all the hull points are gone, your ship explodes. Spaceships may be traded in for ¾ of cost price (minus cost of bringing the hull points up to full). You can only trade-in your ships when you're buying a new one.

**4 Unexpected encounters** You may meet an asteroid storm (which damages your ship) or the space police (who will attack you if you don't stop to be searched). If you do stop and have sugar in your cargo hold, you'll be jailed. You may also meet space pirates, who'll attack you if you don't give them *all* your cargo and *all* your money. You can either fight attackers or run. You're safe when you change sectors, or when you land on a planet.

The screen is divided into three sections:
1) Dials. This shows the current value of your cargo, ship, money, and so on.
2) Sector map. This is the small-scale map at the top left of the screen, showing your ship's position and direction, and the position of any planets.
3) Galactic map. This is at the top right of the screen, and is made up of stars and numbers. The number refers to the type of planet (only revealed after the planet's been visited). The sector you are currently in is shown by a cross.

All written communication between you and the computer is shown in the text display window. When you're not asked an obvious yes or no question, or prompted to type in a number, you'll be asked to enter a command (from A-G):
A: fire at your attackers. All ships except shuttles have guns of different power.
B: accelerate.
C: decelerate.
D: turn 90 degrees anti-clockwise.
E: turn 90 degrees clockwise.
F: wait.
G: save the game to tape or disk (saves as a file under your name).

# PROGRAM FILE

| Type | Cost | Max speed | Fuel carried | Hull points | Repair cost/ hull point | Cargo space |
|---|---|---|---|---|---|---|
| Shuttle | 2000 | 5 | 200 | 20 | 50 | 15 |
| Fighter | 1500 | 10 | 80 | 10 | 40 | 5 |
| Trader Mk I | 5000 | 7 | 400 | 25 | 80 | 25 |
| Trader Mk II | 7500 | 8 | 500 | 30 | 100 | 40 |
| Cruiser | 10000 | 12 | 600 | 35 | 150 | 20 |
| Warship | 20000 | 13 | 800 | 50 | 250 | 30 |

```
>BLIST
    1 REM Space Trader
    2 REM
    3 REM By Sam Redfern
    4 REM May '84
    5
   10 ON ERROR GOTO 2960
   20 MODE4:PROCchars
   30 PROCsetup:PROCscreen
   40 IF load%=0 PROCtrade
   50 PROCdraw:PROCgame
   60 MODE7:PROCfinish
   70 PRINT'''"Do you wish to play again (Y/N)?";:REPEAT A$=GET$:UNTIL A$="Y" OR
 A$="N"
   80 IF A$="N" END ELSE RUN
   85
   90 DEF PROCscreen:CLS
  100 PRINTTAB(0,19);CHR$224;STRING$(21,CHR$225);CHR$227;STRING$(16,CHR$225);CHR
$226
  110 VDU28,0,30,39,20
  120 PRINTTAB(0,0);CHR$228;"   Cargo Space :      ";CHR$228;"                ";C
HR$228
  130 PRINTTAB(0,1);CHR$228;"         Steel :      ";CHR$228;"MaxSpeed:       ";C
HR$228
  140 PRINTTAB(0,2);CHR$228;"          Food :      ";CHR$228;"   Speed:       ";C
HR$228
  150 PRINTTAB(0,3);CHR$228;"Farm Machinery :      ";CHR$228;"    Fuel:       ";C
HR$228
  160 PRINTTAB(0,4);CHR$228;"     Computers :      ";CHR$228;"    Hull:       ";C
HR$228
  170PRINTTAB(0,5);CHR$228;"          Gems :      ";CHR$231;STRING$(16,CHR$225);C
HR$233
  180PRINTTAB(0,6);CHR$228;"          Gold :      ";CHR$228;"                ";CH
R$228
  190PRINTTAB(0,7);CHR$228;"        Silver :      ";CHR$228;"CR              ";CH
R$228
  200PRINTTAB(0,8);CHR$228;"Sugar(illegal) :      ";CHR$231;STRING$(16,CHR$225);C
HR$233
  210PRINTTAB(0,9);CHR$228;"OtherMachinery :      ";CHR$228;TAB(39,9);CHR$228;TAB
(0,0);
  220 PRINTTAB(0,10);CHR$229;STRING$(21,CHR$225);CHR$232;STRING$(16,CHR$225);TAB
(0,0);
  230 VDU5:GCOL0,1:MOVE1250,60:PRINTCHR$230:VDU4
  240 VDU26:FOR I%=0 TO 18:PRINTTAB(19,I%);CHR$228:NEXT I%:PRINTTAB(19,19);CHR$2
32
  250 VDU28,20,19,39,0
  260 FOR I%=0 TO 18:PRINTTAB(0,I%);M$(I%);:NEXT I%
  270 VDU28,0,30,39,20
  280 FOR I%=0 TO 8:PRINTTAB(18,I%+1);C%(I%);:NEXT I%:PRINTTAB(18,0);CS%
  290 PRINTTAB(23,0);SN$;TAB(33,1);MAX%;TAB(33,2);S%;TAB(33,3);FUEL%;TAB(33,4);H
PS%;
  300 PRINTTAB(23,6);N$;TAB(25,7);CR%;
  310 VDU28,0,18,18,0
  320 IF PX%>0 PRINTTAB(PX%,PY%);CHR$238
  330 ENDPROC
  335
  340 DEF PROCchars:*FX14,6
  350 VDU23,224,0,0,0,0,7,8,8,8,23,225,0,0,0,0,255,0,0,0
  360 VDU23,226,0,0,0,0,240,8,8,8,23,227,0,0,0,0,247,8,8,8
  370 VDU23,228,8,8,8,8,8,8,8,8,23,229,8,8,8,8,7,0,0,0
  380 VDU23,230,8,8,8,8,240,0,0,0,23,231,8,8,8,8,7,8,8,8
  390 VDU23,232,8,8,8,8,247,0,0,0,23,233,8,8,8,8,240,8,8,8
  400 VDU23,238,60,126,255,255,255,255,126,60
  410 ENDPROC
  415
  420 DEF PROCsetup
  430 VDU19,0,4,0,0,0,19,1,3,0,0,0
  440 DIM S$(3),C%(8),M$(18),C$(8),HP%(2)
  450 CR%=2500:NE%=0:GD%=0:P%=0:BX%=0:BY%=0:SX%=10:SY%=10:DIR%=2:N$="":S%=0:PT%=
1:end=0:PX%=10:PY%=10:load%=0
  460 PRINT"ENTER YOUR NAME:"
  470 PRINT": ";:REPEAT A$=GET$:N$=N$+A$:IF LEN(N$)>16 N$=LEFT$(N$,16):SOUND1,-1
5,150,2
  480 IF INKEY(-90) N$="":PRINTTAB(2,1);STRING$(16," ")
  490 PRINTTAB(2,1);N$:UNTIL INKEY(-74)
  500 PRINTTAB(0,10);"LOAD A SAVED GAME (Y/N)";:REPEAT A$=GET$:UNTIL A$="Y" OR A
$="N":IF A$="Y" PROCload:CLS:GOTO 640
  510 CLS
  520 PRINT"You have CR2500."
  530 PRINT'"You can only buy (1) a Shuttle, or       (2) a Fighter."
  540 PRINT'"Which (1-2) ";:REPEAT INPUT I%:UNTIL I%>0 AND I%<3
  550 IF I%=2 I%=3
  560 PROCship(I%):FOR I%=234 TO 237:S$(I%-234)=CHR$(I%):NEXT I%
  570 CLS:PRINT"You have CR";CR%;" left."
  580 PRINT"How much fuel will you buy, at CR2/unit : ";:REPEAT INPUT I%:UNTIL I
%>0 AND I%<=MFUEL%
  590 FUEL%=I%:CR%=CR%-(I%*2)
  600 PRINTTAB(5,10);"WAIT WHILE I DESIGN THE GALAXY"
  610 FOR I%=0 TO 18:FOR N%=0 TO 19
  620 IF RND(5)=1 M$(I%)=M$(I%)+"*" ELSE M$(I%)=M$(I%)+" "
  630 NEXTN%,I%:M$(0)="1"+MID$(M$(0),2,20)
  640 RESTORE650:FOR I%=0 TO 8:READ C$(I%):NEXT I%
  645 REM DATA FOR NAMES OF ITEMS
  650 DATASteel,Food,Farm Mach.,Computers,Gems,Gold,Silver,Sugar,OtherMach,
  660 ENDPROC
  670
  680 DEF PROCship(L%)
  690 RESTORE (L%*20)+720
  700 READ C%,MAX%,ACC%,MFUEL%,HPS%,DAM%,RC%,CS%,SN$
  710 CR%=CR%-C%:CO%=C%:FUEL%=0:FOR N%=0 TO 8:C%(N%)=0:NEXT N%:THP%=HPS%:FOR M%=
234 TO 237:READA,B,C,D,E,F,G,H:VDU23,M%,A,B,C,D,E,F,G,H:NEXT M%
  720 SN%=L%
  730 ENDPROC
  731
  732 REM DATA FOR SPACESHIPS
  734 REM 1st LINE: COST,MAX SPEED,ACCELERATION,FUEL SPACE,HULL PTS,DAMAGE OF GU
NS(1-X),COST TO REPAIR 1 HULL PT,CARGO SPACE,SHIP TYPE
```


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# PROGRAM FILE

```
  736 REM 2nd LINE: DATA FOR PICTURES OF SPACESHIP IN THE 4 DIRECTIONS
  740 DATA2000,5,1,200,20,0,50,15,Shuttle
  750 DATA24,60,60,60,24,60,0,0,0,0,46,63,63,46,0,0,0,0,60,24,60,60,60,24,0,0,0,
116,252,252,116,0
  760 DATA5000,7,1,400,25,2,80,25,Trader MK I
  770 DATA24,60,189,255,189,0,0,0,28,8,30,31,31,30,8,28,0,0,0,189,255,189,60,24,
56,16,120,248,248,120,16,56
  780 DATA1500,10,2,80,10,5,40,5,Fighter
  790 DATA24,90,126,24,0,0,0,0,0,4,4,15,15,4,4,0,0,0,0,0,24,126,90,24,0,96,32,24
0,240,32,96,0
  800 DATA10000,12,2,600,35,7,150,20,Cruiser
  810 DATA24,153,153,189,219,153,0,0,62,16,8,63,63,8,16,62,0,0,153,219,189,153,1
53,24,124,8,16,252,252,16,8,124
  820 DATA20000,13,2,800,50,10,250,30,Warship
  830 DATA24,189,189,255,189,189,60,126,62,136,254,255,255,254,136,62,126,60,189
,189,255,189,189,24,124,17,127,255,255,127,17,124
  840 DATA7500,8,1,500,30,3,100,40,Trader MK II
  850 DATA24,189,189,255,189,189,0,0,62,8,62,63,62,8,62,0,0,0,189,189,255,189,18
9,24,124,16,124,252,252,124,16,124
  855
  860 DEF PROCtrade
  870 VDU28,0,30,39,20
  880 PRINTTAB(23,9);"Sell anything?";:REPEAT A$=GET$:UNTIL A$="Y" OR A$="N"
  890 PRINTTAB(23,9);STRING$(14," ");
  900 IF A$="N" THEN 940
  910 FOR I%=0 TO 8
  920 IF C%(I%)>0 PRINTTAB(23,9);C$(I%);"?";:REPEAT A$=GET$:UNTIL A$="Y" OR A$="
N";PRINTTAB(23,9);STRING$(14," "):IF A$="Y" PROCsell
  930 NEXT I%
  940 I%=RND(9)-1:PRINTTAB(23,9);"Buy ";C$(I%);:C%=FNcost:A$=GET$:PRINTTAB(23,9)
;STRING$(10," ");:PRINTTAB(23,9);"at ";C%;"/unit?";:REPEAT A$=GET$:UNTIL A$="Y" O
R A$="N":IF A$="Y" PROCbuy
  950 PRINTTAB(23,9);STRING$(16," ");
  960 ENDPROC
  965
  970 DEF FNcost
  980 C%=RND(40)+80:RESTORE (1170+(10*PT%))
  990 IF I%=0 THEN 1010
 1000 FOR N%=1 TO I%:READ A:NEXT N%
 1010 READ C
 1020 RESTORE 1300:IF I%=0 THEN 1040
 1030 FOR N%=1 TO I%:READ A:NEXT
 1040 READ A
 1050 =A*((C%+C)/100)
 1055
 1060 DEF PROCsell
 1070 C%=FNcost1
 1080 PRINTTAB(23,9);"How many at ";C%;"?";:REPEAT A=GET:UNTIL A>47 AND A<58 AND
(A-48)<=C%(I%):A=A-48:C%(I%)=C%(I%)-A:CS%=CS%+A:CR%=CR%+(C%*A):PRINTTAB(23,9);S
TRING$(16," ");:ENDPROC
 1085
 1090 DEF FNcost1
 1100 C%=RND(40)+80:RESTORE (1230+(10*PT%))
 1110 IF I%=0 THEN 1130
 1120 FOR N%=1 TO I%:READ A:NEXT N%
 1130 READ C
 1140 RESTORE1300:IF I%=0 THEN 1160
 1150 FOR N%=1 TO I%:READ A:NEXT
 1160 READ A
 1170 =A*((C%+C)/100)
 1172
 1175 REM DATA FOR BUYING OF EACH ITEM
 1177 REM AT EACH PLANET TYPE (1-6)
 1180 DATA10,10,30,10,0,10,10,10,10
 1190 DATA20,-20,30,50,0,0,0,60,0
 1200 DATA0,-5,30,10,10,10,10,30,10
 1210 DATA20,-5,20,30,0,0,0,15,10
 1220 DATA-10,10,30,20,-30,-20,-30,20,10
 1230 DATA-20,10,30,20,-40,-20,-30,20,10
 1235 REM DATA FOR SELLING OF EACH ITEM
 1237 REM TO EACH PLANET TYPE (1-6)
 1240 DATA10,20,-50,10,0,10,10,40,10
 1250 DATA-20,-40,40,-30,0,0,0,-30,10
 1260 DATA5,0,-50,10,10,10,10,10,20
 1270 DATA20,0,60,-5,0,0,0,15,20
 1280 DATA30,0,-30,-10,-30,-30,-40,-20,10
 1290 DATA50,20,-40,10,-50,-30,-40,20,10
 1295 REM DATA FOR BASE COST OF EACH
 1297 REM ITEM (1-9)
 1300 DATA10,8,40,200,300,250,150,200,50
 1305 REM DATA FOR AMOUNTS AVAILABLE
 1307 REM OF EACH ITEM (1-9)
 1310 DATA9,9,5,5,2,3,5,3,6
 1315
 1320 DEF PROCbuy
 1330 PRINTTAB(23,9);STRING$(16," ");
 1340 RESTORE 1310:IF I%=0 THEN 1360
 1350 FOR N%=1 TO I%:READ A:NEXT N%
 1360 READ B:B=RND(B):PRINTTAB(23,9);B;" units.How many":REPEAT A=GET:UNTIL A>47
 AND A<(B+49) AND (C%*(A-48))<=CR% AND (A-48)<=CS%:A=A-48:CR%=CR%-(C%*A):C%(I%)=
C%(I%)+A:CS%=CS%-A
 1370 PRINTTAB(23,9);STRING$(16," ");
 1380 ENDPROC
 1385
 1390 DEF PROCgame
 1400 REPEAT
 1410 PROCcommand:IF P%>0 PROCenemy
 1420 IF RND(50)=1 AND P%=0 PROCstrange
 1430 *FX15,1
 1440 PROCmove
 1450 PROCdraw
 1460 IF HPS%<1 end=2 ELSE IF FUEL%<0 end=3
 1470 *FX15
 1480 UNTIL end>0
 1490 ENDPROC
 1495
 1500 DEF PROCcommand
 1510 PRINTTAB(23,9);"Command (A-G)?";:REPEAT A=GET:UNTIL A>64 AND A<72:C$=CHR$(
A)
 1520 IF C$="G" PROCsave
 1530 PRINTTAB(23,9);STRING$(14," ");
 1540 IF C$="A" AND P%=0 THEN 1510
 1550 IF C$="A" PROCfire
 1560 IF C$="B" AND S%=MAX% THEN 1510
 1570 IF C$="B" PROCaccelerate
 1580 IF C$="C" AND S%<1 THEN 1510
 1590 IF C$="C" PROCdecelerate
 1600 IF C$="D" DIR%=DIR%-1:IF DIR%=0 DIR%=4
 1610 IF C$="E" DIR%=DIR%+1:IF DIR%=5 DIR%=1
 1620 ENDPROC
 1625
```

# PROGRAM FILE

```
1630 DEF PROCstrange
1640 FOR N%=0 TO 10:SOUND1,-15,150,2:SOUND1,0,0,2:NEXT N%
1645 *FX15,1
1650 ON RND(3) GOTO 1660,1680,1770
1660 PRINTTAB(23,9);"ASTEROID STORM!":D=RND(10):HPS%=HPS%-D:A$=GET$:PRINTTAB(23
,9);STRING$(15," ");PRINTTAB(23,9);D;" hits taken!!":T=TIME:REPEAT UNTIL TIME>T+
300
1670 PRINTTAB(23,9);STRING$(16," ");:ENDPROC
1680 P%=1:P=RND(3):IF P=1 NE%=RND(3):ST$="Fighter":GD%=5:FOR N%=0 TO (NE%-1):HP
%(N%)=10:NEXT N% ELSE IF P=2 NE%=RND(2):ST$="Cruiser":GD%=7:FOR N%=0 TO (NE%-1):
HP%(N%)=35:NEXT N% ELSE NE%=1:ST$="Warship":GD%=10:HP%(0)=50
1690 IF NE%>1 ST$=ST$+"s"
1700 PRINTTAB(23,9);NE%;" Pirate";:IF NE%>1 PRINT"s";:
1710 PRINT" in":A$=GET$:PRINTTAB(23,9);STRING$(16," ");:PRINTTAB(23,9);ST$;" Pa
y?";:REPEAT A$=GET$:UNTIL A$="Y" OR A$="N"
1720 PRINTTAB(23,9);STRING$(16," ");
1730 IF A$="N" THEN 1760
1740 PRINTTAB(23,9);"Thank you!";:A$=GET$:CR%=0:FOR N%=0 TO 8:CS%=CS%+C%(N%):C%
(N%)=0:NEXT N%
1750 P%=0:PRINTTAB(23,9);STRING$(16," ");:ENDPROC
1760 D=0:FOR N%=1 TO NE%:D=D+RND(GD%):NEXT N%:PRINTTAB(23,9);"You take ";D;" hi
ts";:T=TIME:REPEAT UNTIL TIME>T+300:PRINTTAB(23,9);STRING$(16," ");:HPS%=HPS%-D:
ENDPROC
1770 P%=2:PRINTTAB(23,9);"2 PoliceCruisers";:A$=GET$:PRINTTAB(23,9);STRING$(16,
" ");:PRINTTAB(23,9);"Do you stop?";:REPEAT A$=GET$:UNTIL A$="Y" OR A$="N":PRINT
TAB(23,9);STRING$(16," ");
1780 NE%=2:GD%=7:FOR N%=0 TO 1:HP%(N%)=35:NEXT N%
1790 IF A$="N" THEN 1830
1800 S%=0:IF C%(7)>0 end=1
1810 P%=0:IF end=0 PRINTTAB(23,9);"OK, You can go.";:A$=GET$:PRINTTAB(23,9);STR
ING$(16," ");
1820 ENDPROC
1830 D=RND(7)+RND(7):PRINTTAB(23,9);"You take ";D;" hits";:HPS%=HPS%-D:T=TIME:R
EPEAT UNTIL TIME>T+300:PRINTTAB(23,9);STRING$(16," ");:ENDPROC
1835
1840 DEF PROCfire
1850 IF DAM%=0 PRINTTAB(23,9);"No guns you fool";:A$=GET$:PRINTTAB(23,9);STRING
$(16," ");:ENDPROC
1860 D=RND(DAM%):HP%(0)=HP%(0)-D:PRINTTAB(23,9);D;" hits scored!";:A$=GET$:PRIN
TTAB(23,9);STRING$(16," ");
1870 IF HP%(0)<1 PRINTTAB(23,9);"Enemy exploded!!";:NE%=NE%-1:T=TIME:REPEAT UNT
IL TIME>T+250:PRINTTAB(23,9);STRING$(16," ");:GOTO 1890
1880 ENDPROC
1890 IF NE%<1 THEN 1930
1900 FOR N%=0 TO NE%
1910 HP%(N%)=HP%(N%+1)
1920 ENDPROC
1930 P%=0:PRINTTAB(23,9);"All ";:IF P%=1 PRINTTAB(27,9);"Pirates dead"; ELSE PR
INTTAB(27,9);"Police dead!";
1940 A$=GET$:PRINTTAB(23,9);STRING$(16," ");:ENDPROC
1945
1950 DEF PROCaccelerate
1960 IF ACC%=1 OR (S%+1=MAX%) S%=S%+1:ENDPROC
1970 PRINTTAB(23,9);"How much (1-2)?";:REPEAT A=GET:UNTIL A>47 AND A<51:A=A-48:
S%=S%+A:PRINTTAB(23,9);STRING$(16," ");:ENDPROC
1975
1980 DEF PROCdecelerate
1990 PRINTTAB(23,9);"How much (1-";:IF S%>8 PRINTTAB(35,9);"9"; ELSE PRINTTAB(3
5,9);S%;
2000 PRINTTAB(36,9);")?";:REPEAT A=GET:UNTIL A>47 AND A<(S%+49):A=A-48:S%=S%-A:
PRINTTAB(23,9);STRING$(16," ");:ENDPROC
2005
2010 DEF PROCenemy
2020 D=0:FOR N%=1 TO NE%
2030 D=D+RND(GD%):NEXT N%:HPS%=HPS%-D
2040 PRINTTAB(23,9);"You take ";D;" hits";:A$=GET$:PRINTTAB(23,9);STRING$(16,"
");:ENDPROC
2045
2050 DEF PROCmove
2060 IF S%=0 ENDPROC
2070 FUEL%=FUEL%-2
2080 VDU28,0,19,18,0
2090 FOR N%=1 TO S%
2100 OX%=SX%:OY%=SY%
2110 IF DIR%=1 SY%=SY%-1:IF SY%<0 SY%=18:PROCchangesector
2120 IF DIR%=2 SX%=SX%+1:IF SX%>18 SX%=0:PROCchangesector
2130 IF DIR%=3 SY%=SY%+1:IF SY%>18 SY%=0:PROCchangesector
2140 IF DIR%=4 SX%=SX%-1:IF SX%<0 SX%=18:PROCchangesector
2150 IF SX%=PX% AND SY%=PY% AND SX%>0 PROClanding:N%=S%:S%=0:GOTO 2170
2160 PRINTTAB(OX%,OY%);" ";TAB(SX%,SY%);S$(DIR%-1);
2170 NEXT N%
2180 VDU28,0,30,39,20
2190 ENDPROC
2195
2200 DEF PROCchangesector
2210 VDU28,20,19,39,0
2220 PRINTTAB(0,BY%);M$(BY%);
2230 IF DIR%=1 BY%=BY%-1:IF BY%<0 BY%=18
2240 IF DIR%=2 BX%=BX%+1:IF BX%>19 BX%=0
2250 IF DIR%=3 BY%=BY%+1:IF BY%>18 BY%=0
2260 IF DIR%=4 BX%=BX%-1:IF BX%<0 BX%=19
2270 VDU28,0,18,18,0:CLS:IF MID$(M$(BY%),BX%+1,1)<>" " PX%=RND(17):PY%=RND(17):
PRINTTAB(PX%,PY%);CHR$238
2280 VDU28,20,19,39,0
2290 PRINTTAB(BX%,BY%);"+";
2300 VDU28,0,19,18,0
2310 IF MID$(M$(BY%),BX%+1,1)<>"*" AND MID$(M$(BY%),BX%+1,1)<>" " PT%=VAL(MID$(
M$(BY%),BX%+1,1)):ENDPROC
2320 PX%=0:IF MID$(M$(BY%),BX%+1,1)="*" AND BX%>0 AND BX%<19 PT%=RND(6):M$(BY%)=
LEFT$(M$(BY%),BX%)+STR$(PT%)+RIGHT$(M$(BY%),20-(BX%+1)):ENDPROC
2330 IF MID$(M$(BY%),BX%+1,1)=" " PX%=0:ENDPROC
2340 PT%=RND(6):IF BX%=0 M$(BY%)=STR$(PT%)+RIGHT$(M$(BY%),19) ELSE M$(BY%)=LEFT
$(M$(BY%),19)+STR$(PT%)
2350 ENDPROC
2355
2360 DEF PROClanding
2370 VDU28,0,19,18,0:PRINTTAB(OX%,OY%);" ";
2380 VDU28,0,30,39,20:IF S%>1 HPS%=HPS%-S%:PRINTTAB(23,9);"Crash landing!";:A$=
GET$:PRINTTAB(23,9);STRING$(16," ");
2390 IF HPS%<1 ENDPROC
2400 P%=0:PROCtrade:IF PT%<>2 AND PT%<>5 PROCnewship
2410 VDU28,0,19,18,0
2420 ENDPROC
2425
2430 DEF PROCnewship
2440 VDU28,23,29,38,29
2450 PRINT"Buy a new ship?";:REPEAT A$=GET$:UNTIL A$="Y" OR A$="N":CLS
2460 IF A$="N" THEN 2560
2470 L%=0:OC=CR%:CR%=CR%+((CO%-(RC%*(THP%-HPS%)))*.75)
2480 FOR N%=1 TO 6
2490 RESTORE (720+(20*N%)):READ C
```


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# PROGRAM FILE

```
  2500 IF C>CR% THEN 2530
  2510 READA,A,A,A,A,A,A,A$
  2520 PRINT A$;"?";:REPEAT A$=GET$:UNTIL A$="Y" OR A$="N":CLS:IF A$="Y" L%=N%:N%
=6
  2530 NEXT N%
  2540 IF L%>0 PROCship(L%):OC=CR%
  2550 CR%=OC
  2560 REPEAT INPUT"Fuel units:",A:UNTIL A>=0 AND CR%>=(A*2) AND (A+FUEL%)<=MFUEL
%:CR%=CR%-(2*A):FUEL%=FUEL%+A
  2570 IF HPS%<THP% REPEAT INPUT"Repair:",A:UNTIL A>=0 AND (A*RC%)<=CR% AND A<=(T
HP%-HPS%):CR%=CR%-(A*RC%):HPS%=HPS%+A
  2580 VDU28,0,30,39,20
  2590 PRINTTAB(23,0);STRING$(14," ");TAB(23,0);SN$;TAB(33,1);MAX%;
  2600 PRINT:VDU28,0,19,18,0
  2610 ENDPROC
  2615
  2620 DEF PROCdraw
  2630 PRINTTAB(25,7);STRING$(14," ");
  2640 FOR I%=0 TO 8:PRINTTAB(18,I%+1);C%(I%);" ";:NEXT I%:PRINTTAB(18,0);CS%;" "
;TAB(33,2);S%;" ";TAB(33,3);FUEL%;" ";TAB(33,4);HPS%;" ";TAB(25,7);CR%;TAB(33,1)
;MAX%;" ";
  2650 VDU28,0,19,18,0:IF load%=1 load%=0:VDU28,0,18,18,0:CLS:VDU28,0,19,18,0
  2660 PRINTTAB(SX%,SY%);S$(DIR%-1)
  2670 IF PX%>0 PRINTTAB(PX%,PY%);CHR$238;
  2680 VDU28,0,30,39,20
  2690 ENDPROC
  2695
  2700 DEF PROCfinish
  2710 IF end=1 PRINT"You aren't allowed to smuggle sugar,you  have been jailed f
or life!"
  2720 IF end=2 PRINT"You got blown to bits!"
  2730 IF end=3 PRINT"You fool! You ran out of fuel, and your  life support faile
d!?!"
  2740 ENDPROC
  2745
  2750 DEF PROCload
  2760 X=OPENIN N$
  2770 INPUT#X,NE%,GD%,CR%,MAX%,S%,ACC%,FUEL%,MFUEL%,HPS%,CO%,THP%,DAM%,RC%,CS%,P
X%,PY%,BX%,BY%,SX%,SY%,DIR%,PI%,P%,SN$,SN%
  2780 FOR I%=0 TO 8:INPUT#X,C%(I%):NEXT
  2790 FOR I%=0 TO 18:INPUT#X,M$(I%):NEXT
  2800 FOR I%=0 TO 2:INPUT#X,HP%(I%):NEXT
  2810 CLOSE#X
  2820 load%=1
  2830 RESTORE(20*SN%)+730:FOR I%=234 TO 237:READ A,B,C,D,E,F,G,H:VDU23,I%,A,B,C,
D,E,F,G,H:S$(I%-234)=CHR$(I%):NEXT I%
  2840 ENDPROC
  2845
  2850 DEF PROCsave
  2860 PRINTTAB(23,9);"Saving.........";
  2870 VDU21
  2880 X=OPENOUT N$
  2890 PRINT#X,NE%,GD%,CR%,MAX%,S%,ACC%,FUEL%,MFUEL%,HPS%,CO%,THP%,DAM%,RC%,CS%,P
X%,PY%,BX%,BY%,SX%,SY%,DIR%,PI%,P%,SN$,SN%
  2900 FOR I%=0 TO 8:PRINT#X,C%(I%):NEXT
  2910 FOR I%=0 TO 18:PRINT#X,M$(I%):NEXT
  2920 FOR I%=0 TO 2:PRINT#X,HP%(I%):NEXT
  2930 CLOSE#X
  2940 VDU6:PRINTTAB(23,9);STRING$(16," ");
  2950 ENDPROC
  2955
  2960 MODE7:IF ERR=187 THEN 2990
  2970 REPORT:PRINT" at line ";ERL
  2980 END
  2990 PRINT"There is no file under your name!!"
  3000 END
```

# Brimstone Part Two

## by Paul Gallagher

To play 'Brimstone Part Two' you'll need some adventure characters created with 'Brimstone Part One', which was published in last month's *PCW*. Having equipped yourself with a character or an adventure party of up to four characters, you can now begin your first scenario — The Dungeon.

The rules should be familiar to Advanced Dungeons and Dragons players as the game follows AD&D's format; non AD&D players needn't worry as full instructions are included and the program uses simple menu selections. As in the role-playing games, you have to make any maps you feel are necessary.

The rooms are contained in a data block, thus permitting new dungeons to be readily created by other dungeon 'masters'. The dungeon in this program has 75 rooms, and corridors on seven floor levels. There's an option to save the game at any room position providing you are not involved in combat, but if you wish to progress to part three, The Tavern, you must save the game at the exit (room one).

The program runs in over 30k, so before loading, the following command must be entered:

POKE 25,6:NEW

```
  10 'BRIMSTONE PART II:copywrite P.Gallagher 1984
  20 CLEAR700:DIM TF$(66),M$(80):CLS:PRINT"NEW GAME OR CURRENT ADVENTURE.":GOSUB40
:IFK$="C"THENGOSUB3180ELSEGOSUB3250
  30 L=1:R=75:Q=96:P=107:M=1288:FORX=1TOXX:FORY=1TO8:SV$(X,Y)=S$(X,Y):NEXTY:LP=LP+
L(X):NEXTX:LP=LP/XX:GOSUB3340:GOSUB3740:GOSUB3870:GOTO270
  40 K$=INKEY$:IFK$=""THEN40ELSERETURN
  50 FORK=1TO2000:NEXT:RETURN
  60 FORC=17TO241STEP32:PRINT@C,STRING$(15,32),:NEXT:RETURN
  70 FORC=288TO448STEP32:PRINT@C,STRING$(32,32),:NEXT:PRINT@480,STRING$(31,32),:RE
TURN
  80 PRINT@416,"";:INPUTN$:FORX=1TOXX:IFN$=N$(X)THENRETURNELSENEXT
  90 PRINT@448,N$;" IS NOT WITH YOUR PARTY.",:GOSUB50:PRINT@448,"":GOTO80
 100 X1=1024+(INT((8-YR)/2))*32+INT((16-XR)/2):X2=X1+XR:X3=X1+YR*32
 110 CLS:FORX=X1 TOX2:POKEX,191:POKEX+YR*32),191:NEXT: FORX=X1 TOX3 STEP32:POKEX
,191:POKE(X+XR),191:NEXT
 120 XN=X1+INT(XR/2):IFDN>0THENPOKEXN,255:POKE(XN+1),255
 130 XS=X3+INT(XR/2):IFDS>0THENPOKEXS,175:POKE(XS+1),175
```

# PROGRAM FILE

```
140 XW=X1+(INT(YR/2))*32:IFDW>0THENPOKEXW,239
150 XE=XW+XR:IFDE>0THENPOKEXE,128
160 IFDU<0THENPOKE(X1+33),150
170 IFDU>0THENPOKE(X1+33),214
180 IFLC=1THENM=X1+66:LC=0
190 IFRN=1THENPOKEXS,Q:POKE(XS+1),Q:DS=0 '
200 GOSUB60:PRINT@20,"LEVEL";L;:PRINT@50,"ROOM";XR;"*";YR;:PRINT@83,"CONTENTS:";
:PRINT@115,F$(2);:PRINT@147,F$(3);:PRINT@179,F$(4);
210 IFLF=1 ORA=6 ORR=FR THEN250
220 IFR=R2 THENGOSUB1670:GOTO250
230 RS=RND(6):IFR=1THENRS=1
240 IFRS>3THENGOSUB1640
250 PRINT@288,"ACTION OPTIONS:-":PRINT"wEAPONS READIED.":PRINT"PARTY STATUS. cAR
RIED TREASURE.";PRINT"eXPLORE ROOM."
260 PRINT"dOORS(SECRET) & TRAPS(HIDDEN).":PRINT"sAVE ADVENTURE.":PRINT@480,"lOCK
ED DOORS:PICK OR FORCE.";:RETURN
270 R=1:GOSUB3340:GOSUB100
280 FORZZ=1TO2STEP0:W=M:POKEM,P
290 RS=RND(6):K$=INKEY$:IFK$=""THEN290
300 IFK$="W"THENGOSUB1030
310 IFK$="P"THENGOSUB2240
320 IFK$="E"THENGOSUB1070
330 IFK$="D"THENGOSUB1530
340 IFK$="L"THENGOSUB870
350 IFK$="C"THENGOSUB2270
360 IFK$="S"THENGOSUB3100
370 IFK$="Y"THENM=M-32
380 IFK$="U"THENM=M-31
390 IFK$="J"THENM=M+1
400 IFK$="M"THENM=M+33
410 IFK$="N"THENM=M+32
420 IFK$="B"THENM=M+31
430 IFK$="G"THENM=M-1
440 IFK$="T"THENM=M-33
450 IFFT>0ANDCM=FT ORM=FT+1ORM=FT+32 ORM=FT+33)THENGOSUB980
460 P1=PEEK(M)
470 P1=PEEK(M):IFP1=191THENM=W:GOTO570
480 POKE W,Q:IFOL=1THEN RS=1
490 IFP1=255THENGOSUB630
500 IFP1=175THENGOSUB670
510 IFP1=239THENGOSUB710
520 IFP1=128THENGOSUB750
530 IFP1=150ORP1=214THENGOSUB790
540 IFP1=19THENGOSUB810
550 IFP1=159THENGOSUB980
560 TN=TN+1:IFTN>100THENGOSUB580
570 NEXTZZ
580 FORX=X1+33TOX3-31STEP32:FORY=X TOX+XR-2:POKEY,128:NEXTY,X
590 TN=0:GOSUB40:IFK$<>"T"THEN590
600 CL=0:LH=0:S=S+1:IFS>8THENFORX=1TOXX:FORY=1TO8:SV$(X,Y)=S$(X,Y):NEXTY,X:S=0
610 IFLI=1THENFORX=1TOXX:FORY=1TO5:T$(X,Y)="":NEXTY,X:PRINT"YOU MANAGE TO FIGHT
YOUR WAY    BACK TO THE ENTRANCE BUT LOSE   MOST OF YOUR TREASURE IN THE    DARK
.":GOSUB40:R=1:GOSUB3340:GOSUB100:RETURN
620 CLS:LI=LI-1:PRINT@230,LI;" TORCHES LEFT":PRINT" (INC.LANTERNS:OIL=10TORCHES)
":GOSUB40:LF=1:GOSUB100:RETURN
630 IFPN=R OR OL=1THEN650
640 MF=0:IFRS>3ORLN=1THEN LN=1:PN=0:GOTO860
650 PR=R:PS=DN:R=DN:GOSUB3340
660 GOSUB100:IFM=1160THENRETURNELSEM=XS-32:RETURN
670 IFPS=R OR OL=1THEN690
680 MF=0:IFRS>3ORLS=1THEN LS=1:PS=0:GOTO860
690 PR=R:PN=DS:R=DS:GOSUB3340
700 GOSUB100:IFM=1160THENRETURNELSEM=XN+32:RETURN
710 IFPW=R OR OL=1THEN730
720 MF=0:IFRS>3ORLW=1THEN LW=1:PW=0:GOTO860
730 PR=R:PE=DW:R=DW:GOSUB3340
740 GOSUB100:IFM=1160THENRETURNELSEM=XE-1:RETURN
750 IFPE=R OR OL=1THEN770
760 MF=0:IFRS>3ORLE=1THEN LE=1:PE=0:GOTO860
770 PR=R:PW=DE:R=DE:GOSUB3340
780 GOSUB100:IFM=1600THENRETURNELSEM=XW+1:RETURN
790 LR$=STR$(DU):L$=MID$(LR$,2,1):R$=MID$(LR$,3):L=VAL(L$):R=VAL(R$):LC=1
800 GOSUB3340:GOSUB100:RETURN
810 PR=R:IFSD=XN THENGOSUB3340:GOSUB100:M=XS-32
820 IFSD=XS THENGOSUB3340:GOSUB100:M=XN+32
830 IFSD=XW THENGOSUB3340:GOSUB100:M=XE-1
840 IFSD=XE THENGOSUB3340:GOSUB100:M=XW+1
850 RETURN
860 M=W:GOSUB70:PRINT@389,"*** DOOR LOCKED ***":RETURN
870 GOSUB70:P1=PEEK(M-32):P2=PEEK(M+32):P3=PEEK(M-1):P4=PEEK(M+1):IF(P1=191ORP1=
96)AND(P2=191ORP2=96)AND(P3=191ORP3=96)AND(P4=191ORP4=96)THENPRINT@320,"WHICH DO
OR? YOU ARE NOT STANDINGNEAR A  DOOR.":GOSUB40:RETURN
880 GOSUB70:PRINT@323,"WHO WILL TACKLE THE DOOR":GOSUB80
890 IFC$(X)<>"THIEF"THEN910
900 IF OL=-1 THENGOSUB70:PRINT@353,"HAS YOUR THIEF GOT SUCH A LOW   INTELLIGENCE
 THAT HE DOESN'T    REALISE WHEN HE'S FAILED !!!!":RETURN
910 IFC$(X)="THIEF"THEN OL=21+L(X)*4:IFP$(X)="DWARF"THEN OL=OL+10
920 IFC$(X)="THIEF"ANDR$(X)="HALFLING"THEN OL=OL+5
930 RP=RND(100):IF C$(X)="THIEF"ANDRP>OL THENPRINT"YOUR THIEF IS UNSUCCESSFUL.
   NO FURTHER ATTEMPTS ALLOWED!";:OL=-1:RETURN
940 IFC$(X)="THIEF"ANDRP<OL THENPRINT" * YOUR THIEF IS SUCCESSFUL **";:OL=1:RETU
RN
950 IFOL=-2THENGOSUB70:PRINT@320,"YOUR FIGHTERS ARE UNABLE TO MOVETHE VERY SOLID
 DOOR !!!";:RETURN
960 IFS(X)>RND(30)OR VAL(B$(X))>RND(100)THEN PRINT"*YOUR FIGHTER SMASHES THE DOO
R   OPEN.....";:OL=1:RETURN
970 PRINT"* UNSUCCESSFUL-DOOR TOO SOLID*";:OL=-2:RETURN
980 GOSUB70:PRINT@288,"A TRAP DOOR OPENS IN THE FLOOR- THE WHOLE PARTY FALL THRO
UGH.."
990 FORX=1TOXX:IFH(X)<1THEN1020ELSED=INT(9*RND(6)/(S(X)+C(X)+D(X))):IFH(X)-D<1 T
HEND=H(X)-1
1000 FORY=1TO5:IFT$(X,Y)=TF$(53)THEND=0:NEXTY
1010 H(X)=H(X)-D:PRINTN$(X);" SUFFERS";D;" HP DAMAGE"
1020 NEXTX:R=TR:L=L+1:GOSUB40:GOSUB3340:GOSUB100:RETURN
1030 GOSUB70:PRINT@288,"PREPARE WEAPONS FOR -":FORX=1TOXX
1040 PRINT@448,"":PRINT@(320+X*32),N$(X);:INPUTW$(X)
1050 IFW$(X)=WI$(X)ORW$(X)=W2$(X)ORW$(X)=W3$(X)THEN1060ELSEPRINT@448,N$(X);" DOE
S NOT HAVE A ";W$(X);:GOSUB50:GOTO1040
1060 NEXTX:WD=L:GOSUB250:RETURN
1070 IFFF=R THENGOSUB70:PRINT@320,"YOU HAVE ALREADY SEARCHED THIS  ROOM. YOUR CO
NTINUED EXAMINATIONREVEALS NOTHING MORE.";:GOSUB40:RETURN
1080 FF=R:GOSUB70:PRINT@320,"WHO IS SEARCHING";:GOSUB80:RP=RND(100)
1090 IFRP>I(X)*1.5+D(X)*1.5THENPRINT@450,"** NOTHING OF VALUE FOUND **";:GOSUB50
:RETURN
1100 GOSUB1180:GOSUB70:FORZZ=1TO2STEP0
1110 GOSUB70:PRINT@288,"tAKE. DETECT mAGIC. dROP ITEM.":PRINT@320,"aGREE TO LEAV
E ROOM.";:GOSUB40:K1$=K$
1120 IFK$="T"ANDAT=0THENGOSUB1240
1130 IFK$="T"ANDAT=1THENPRINT@422,"*ALREADY TAKEN*";:GOSUB50
1140 IFK1$="M"THENGOSUB1320
1150 IFK1$="D"THENGOSUB1370
1160 IFK1$="A"THENRETURN
```


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# PROGRAM FILE

```
1170 NEXTZZ
1180 G=0:T=0:F(0)=0:F(1)=0:T$="":RT=RND(20):GOSUB70:IFRT>10THENG=RT*7:PRINT@320,"YOU HAVE UNCOVERED A LEATHER BAGCONTAINING.....";G;"GP.":GOSUB40:F$(0)="GOLD":F(0)=G:RETURN
1190 IFRT>3THENG=RT*10:PRINT@320,"YOU'VE FOUND A CACHE OF":RT;"GEMS  WORTH 50GP EACH PLUS";G;"GOLD   COINS.":G=RT*50+G:GOSUB40:F$(0)="GOLD":F(0)=G:RETURN
1200 T=RND(3+L*9):T$=LEFT$(TF$(T),9)
1210 PRINT@320,"A GOOD FIND....YOU'VE DISCOVERED";:IFT$<>"CHAINMAIL"ORT$<>"PLATE MAIL"THENPRINT"A ";
1220 IFTF$(T)="GOLDEN CROWN"ORLEFT$(TF$(T),2)="SC"THENPRINTTF$(T)ELSEPRINTT$
1230 GOSUB40:RETURN
1240 GOSUB70:PRINT@320,"WHICH ITEM DO YOU INTEND TAKING":GOSUB40:F$(1)=T$:RP=RND(100):F(2)=200+RP:F(3)=900+RP:F(4)=100+RP
1250 FORZ=0TO4:IFK$=LEFT$(F$(Z),1)THEN1270ELSENEXTZ
1260 PRINT"THAT ITEM IS NOT HERE !!":GOSUB50:RETURN
1270 PRINT"WHO WILL CARRY THE ";F$(Z);:GOSUB80
1280 IFWE(X)<F(Z)THENPRINT"IT'S TOO HEAVY FOR ";N$;".....OVERLOADED?";:GOSUB50:RETURNELSEIFK$="G"THEN1310
1290 FORY=1TO5:IFT$(X,Y)=""ANDZ=1THENT$(X,Y)=TF$(T):GOTO1310
1300 NEXTY:PRINT@448,N$;" IS CARRYING TOO MANY ITEMS TO MANAGE ANYMORE.";:GOSUB50:RETURN
1310 PRINTN$;" TAKES THE ";F$(Z):GOSUB50:WE(X)=WE(X)-F(Z):G(X)=G(X)+F(0):AT=1:RETURN
1320 DM=0:GOSUB70:PRINT@320,"WHO CASTS THE SPELL?";:GOSUB80
1330 FORY=1TO8:IFS$(X,Y)="DETECT MAGIC"THEN1350ELSENEXT
1340 PRINT"YOU DO NOT HAVE DETECT MAGIC!";:GOSUB50:RETURN
1350 PRINT@352,"WHAT ITEM DO YOU CAST IT ON?";:GOSUB40:IFK$=LEFT$(T$,1)THENPRINT@352,"THE ITEM GLOWS.....YOU HOLD A ";TF$(T):GOSUB40:DM=1:RETURN
1360 GOSUB70:PRINT@358,"**NOTHING HAPPENS**":GOSUB50:RETURN
1370 GOSUB70:PRINT@288,"WHICH ITEM ARE YOU DISCARDING";:GOSUB40
1380 IFK$="G"THEN1410
1390 FORX=1TOXX:FORY=1TO5:IFK$=LEFT$(T$(X,Y),1)ORK$=LEFT$(F$(Y),1)THEN1520ELSENEXT Y,X
1400 PRINT@352,"NO-ONE IN YOUR PARTY APPEARS TO HAVE THIS OBJECT.";:GOSUB50:RETURN
1410 PRINT@320,"WHO IS DISCARDING GOLD":GOSUB80
1420 PRINT@352,"DO YOU WISH TO GIVE THE GOLD TO SOME-ONE ELSE OR LEAVE IT IN THE ROOM.":GOSUB40
1430 IFK$="G"ORK$="L"THENPRINT"HOW MUCH";:INPUTG:ELSE1420
1440 IFG>G(X)THENPRINT@448,"THIS IS MORE THAN YOU HAVE FOUND";:GOSUB50:RETURN
1450 IFK$="G"THENPRINT@448,"WHO TO";:INPUTN2$:ELSE GOTO1500
1460 FORY=1TOXX:IFN2$=N$(Y)THEN1480ELSENEXT
1470 PRINTN2$;" IS NOT IN YOUR PARTY":GOSUB50:RETURN
1480 IFG>WE(Y)THENPRINT"THIS IS MORE THAN";N$(Y);"CAN CARRY":GOSUB50:RETURN
1490 G(X)=G(X)-G:WE(X)=WE(X)+G:G(Y)=G(Y)+G:WE(Y)=WE(Y)-G:PRINT@448,"TRANSACTION COMPLETED.";:GOSUB50:RETURN
1500 IFK$="L"THEN G(X)=G(X)-G:WE(X)=WE(X)+G:PRINT@448,"THE GOLD VANISHES ON SCATTERING ACROSS THE FLOOR.";:GOSUB50:RETURN
1510 PRINT"HUH!":GOSUB50:RETURN
1520 RP=RND(XX):F$(3)=T$(X,Y):PRINT@384,"O.K.";N$(RP);" PUTS THE ";F$(Y);" ONTO THE FLOOR.":GOSUB50:F(3)=0:T$(X,Y)="":RETURN
1530 Z=0:GOSUB70
1540 FORX=1TOXX:IFR$(X)="ELF"THENZ=Z+1
1550 NEXT:RS=RND(6+2*Z/3)
1560 IFFT>0ANDRS>5THENPRINT@356,"##FLOOR TRAP DETECTED##":POKEFT,159:POKE(FT+1),159:POKE(FT+32),159:POKE(FT+33),159:GOSUB40:RETURN
1570 P1=PEEK(M-32):P2=PEEK(M+32):P3=PEEK(M-1):P4=PEEK(M+1):IFP1=96ANDP2=96ANDP3=96ANDP4=96THENPRINT@352,"THERE ARE NO SECRET TRAP-DOORS  DETECTED HERE.":GOSUB40:RETURN
1580 SD=M-32:IFSD=XN ANDDN<0 ANDRS>5.5THENPOKESD,19:R=-1*DN:GOTO1630
1590 SD=M+32:IFSD=XS ANDDS<0 ANDRS>5.5THENPOKESD,19:R=-1*DS:GOTO1630
1600 SD=M-1:IFSD=XW ANDDW<0 AND RS>5.5THENPOKESD,19:R=-1*DW:GOTO1630
1610 SD=M+1:IFSD=XE ANDDE<0 AND RS>5.5THENPOKESD,19:R=-1*DE:GOTO1630
1620 PRINT@448,"NOTHING SENSED OR DETECTED.":GOSUB40:GOSUB250:RETURN
1630 PRINT@448,"SECRET DOOR DISCOVERED...":RETURN
1640 MM=RND(10+10*L):IFL>2THENMM=INT(MM*LOG(L)):IFMM>80THEN1640
1650 MF=0:NM=RND(XX+2):IFMM>70THENNM=1
1660 IFMM>40ANDMM<51THENNM=1
1670 IFMF=1THENNM=M1:MM=M2
1680 MA=8-L:MP=8*L:FORY=1TONM:MP(Y)=RND(MP):HE=HE+MP(Y):IFL>2THENMP(Y)=INT(MP(Y)*LOG(L))
1690 NEXT:M1=NM:MD=L:IFL>2THENMD=INT(L*LOG(L))
1700 HE=((0.7*MD^3+15)*NM+HE*MD)*L/LP
1710 IFNM=0THENNM=1
1720 GOSUB70:PRINT@320,"you are attacked by ~":PRINTNM;" ";M$(MM)
1730 PRINT@416,"FIGHT    cOMMUNICATE    rUN":GOSUB40:K1$=K$
1740 IFK1$="R"THEN MF=1:M1=NM:M2=MM:R2=R:R=PR:GOSUB3340:GOSUB100:M=1160:W=1160:RETURN
1750 IFK1$="C"ANDMM<6THENGOSUB1790:RETURN
1760 IFK1$="C"ANDMM>5THENPRINT"THEY IGNORE YOUR SPEECH & ATTACK";:GOSUB50:GOSUB1890:RETURN
1770 IFK1$="F"THENGOSUB1890:RETURN
1780 IFA=6THENGOSUB100:RETURNELSEGOTO1730
1790 GOSUB70:PRINT@320,"WHO ATTEMPTS TO COMMUNICATE":GOSUB80
1800 IFRND(100)>I(X)*1+R(X)*2THENPRINT"THEY'RE NOT INTERESTED-attack":GOSUB50:GOSUB1890:RETURN
1810 GOSUB70:FL=0:PRINT@288,"THE ";M$(MM);" RECOGNISE YOUR":PRINT"FRIENDLY GESTURES AND YOUR      SUPERIOR STRENGTH !"
1820 RS=RND(4)+RND(4):IFRS=8THENPRINT"THEY TELL YOU OF A LEGEND OF A  POWERFUL GOLDEN CROWN AND SEVEN MAGICAL GEMS,SCATTERED & LOST INTHE DEPTHS BELOW!!!";
1830 IFRS=7THENPRINT"THEY TELL YOU THERE IS A HIDDEN REAR EXIT WHICH THEY'VE HEARD OFFROM AN OLD HOBGOBLIN !!!";
1840 IFRS=6THENPRINT"THE ";M$(MM);" CONFIDE":PRINT"IN YOU THAT THEY'VE HEARD OF A  JEWEL OF FABULOUS WEALTH LOST   SOME-WHERE IN THE COMPLEX BELOW";
1850 IFRS=5ORRS=4THENPRINT"THEY SAY THAT THEY ARE JUST     TRAVELLING BY AND HAD STOPPED TOLOOK INSIDE.THEY BACK OUT SLOWLY";
1860 IFRS=3THENPRINT"TERRIFIED,THEY TELL YOU OF FOUL DEMONS & DRAGONS LURKING BELOW, AND THEN LEAVE YOU HASTILY !!";
1870 IFRS=2THENPRINT"THEY RELUCTANTLY HINT AT A TALE OF A MAGICAL STONE WHICH IS     RUMOURED TO GRANT ANY WISH !!";
1880 GOSUB40:RETURN
1890 N=XX
1900 GOSUB70:PRINT@288,"USE WEAPON, MAGIC OR DISENGAGE":GOSUB40:IFK$="M"THENGOSUB2690:GOSUB50:LF=1:GOSUB100:IFA=6THENRETURNELSEGOSUB70
1910 IFK$="D"THENMF=1:M1=NM:M2=MM:R=PR:FORZ=1TONM:MP(Z)=MP(Z):NEXTZ:GOSUB3340:GOSUB100:M=1160:FL=0:RETURN
1920 IFNM>0THENGOSUB1950
1930 IFNM=0THENGOSUB70:PRINT@322,"THE OPPOSITION IS VANQUISHED.":GOSUB50:GOSUB2290:RETURN
1940 GOSUB2080:GOTO1900
1950 PRINT@288,"":FORZ=1TOM1:IFMP(Z)<1THEN1960ELSEPRINT@320+3*Z),Z
1960 NEXT:FORX=1TOXX:PRINT@352,"":PRINT:PRINT:IFH(X)<1THEN2070ELSEPRINT@352,"WHICH DOES ";N$(X);" STRIKE"
1970 GOSUB40:Y=VAL(K$):IFY<1ORY>M1 ORMP(Y)<1 THEN1970
1980 CH=20-L(X)-SB(X)-MA:RT=RND(20):D=RND(6)+DB(X)+WD:IFA=4ANDDX=I THEND=D+20
1990 IFRT>CH THEN MP(Y)=MP(Y)-D ELSE ON RND(2)GOTO2040,2050
2000 IFMP(Y)<1THENPRINTM$(MM);Y;" SLAIN";:NM=NM-1:PRINT@(320+3*Y),"  ";:GOTO2060
2010 ON RND(2)GOTO2020,2030
2020 PRINT"A HIT,CAUSING";D;"DAMAGE.":GOTO2060
2030 PRINT"A MIGHTY STRIKE-";D;"DAMAGE.":GOTO2060
2040 PRINT"YOUR BLOW IS DEFLECTED !":GOTO2060
2050 PRINT"YOUR WILD SWING TOTALLY MISSES."
```

# PROGRAM FILE

```
2060 GOSUB50
2070 IFNM>0THENNEXT:RETURN
2080 FORY=1TOM1:Y1=Y:D=0
2090 IFY>XX ORH(Y1)<1THENY1=RND(XX)
2100 IFMF(Y)<1THEN2230ELSEMH=20-MD-AC(Y1):RT=RND(20):D=RND(INT(4*LOG(L)+4-L)):IF
A=5ANDY1=I THEND=0
2110 IFH(Y1)<1THEN2230ELSEPRINT@384,"":PRINT@352,M$(MM),Y;" STRIKES AT ";N$(Y1):
PRINT@416,"";
2120 IFRT>MH THENH(Y1)=H(Y1)-D:ON RND(4)GOTO2140,2150,2160
2130 ON RND(3)GOTO2170,2180,2190
2140 PRINT"A BLOW TO THE HEAD-";D;"DAMAGE":GOTO2200
2150 PRINT"YOUR CHEST IS STRUCK!";D;"DAMAGE":GOTO2200
2160 PRINT"A STRIKE TO YOUR ARM:";D;"DAMAGE":GOTO2200
2170 PRINT"YOU SKILLFULLY DEFLECT THE BLOW":GOTO2220
2180 PRINT"SAVED BY YOUR ARMOUR!":GOTO2220
2190 PRINT"YOU DEFTLY AVOID THE BLOW":GOTO2220
2200 IFH(Y1)<1THENPRINT@480,N$(Y1);" -dead!";:N=N-1:GOSUB50
2210 IFN=0THENCLS:PRINT@227,"YOUR PARTY ARE ALL DEAD.":END
2220 GOSUB50
2230 NEXTY:RETURN
2240 GOSUB70:PRINT@296,"*PARTY STATUS*":PRINT@330,"L  HP  AC  GP   WT":FORX=1TOX
X:PRINTN$(X):PRINT@(329+XX*32),"";:PRINTUSING"##";L(X);:PRINT"  ";
2250 PRINTUSING"##";H(X);:PRINT"  ";:PRINTUSING"##";A(X);:PRINT" ";:PRINTUSING"
####";G(X);:PRINT" ";:PRINTUSING"####";WE(X)
2260 NEXTX:PRINT@480,"TOTAL COMBAT EXPERIENCE:";MT;:GOSUB40:GOSUB250:RETURN
2270 FORX=1TOXX:CLS:PRINTN$(X):FORY=1TO5:PRINTT$(X,Y):NEXT:GOSUB40:NEXT:IFCC=1TH
ENPRINT@384,"* DEAD COMRADE BEING CARRIED *":GOSUB502280 LF=1:GOSUB100:RETURN
2290 MT=INT(MT+HE):HE=0:FORZZ=1TO2STEP0
2300 GOSUB70:PRINT@288," HEAL WOUNDED.   SEARCH BODIES.  LEAVE.";
2310 GOSUB40:IFK$="L"THENRETURN
2320 IFK$="S"THENGOSUB2350
2330 IFK$="H"THENGOSUB2420
2340 NEXTZZ
2350 IFSB=1THENPRINT@384,"YOU'VE ALREADY SEARCHED THE     BODIES - NOTHING MORE
IS FOUND.":GOSUB50:RETURN
2360 FORZ=1TOM1:RT=RND(20):RP=L*RND(100)
2370 PRINT@384,"WHO SEARCHES ";M$(MM);Z;:GOSUB80
2380 IFRT<8THENPRINT@416,"NOTHING FOUND ON ";M$(MM);Z:GOTO2410
2390 RS=INT(RT*L/2):PRINT@416,RS;" GOLD";:IFRT<20THENRP=0ELSEPRINT"+ A GEM WORTH
";RP;"GP"
2400 PRINT" FOUND ON ";M$(MM);Z;:IFRP+RS<WE(X)THENWE(X)=WE(X)-RP-RS:G(X)=G(X)+RP
+RS
2410 GOSUB50:PRINT@384,"":PRINT:PRINT:NEXTZ:SB=1:RETURN
2420 H1=0:PRINT@384,"WHO DO YOU WISH TO ADMINISTER TO":GOSUB80:N1$=N$:U=X
2430 FORZ=1TOXX:FORY=1TO5:IFH(U)<1ANDT$(Z,Y)=TF$(50)THENPRINT@416,N$(Z);" HAS A
SCROLL OF RAISE DEAD":H1=2:Z1=Z:Y1=Y
2440 IFH(U)<1ANDT$(Z,Y)=TF$(63)THENPRINT@416,N$(Z);" HAS A RING OF REGENERATION"
:H1=1
2450 IFH(U)<1ANDL(Z)>8ANDC$(Z)="CLERIC"THENPRINT@384,"YOUR";L(Z);"TH LEVEL CLERI
C HAS THE POWER TO BRING ";N$;" BACK TO LIFE.":H1=3
2460 IFH(U)<1ANDL(Z)>11AND(C$(Z)="DRUID"ORC$(Z)="MAGICIAN")THENPRINT@384,N$(Z);"
 HAS THE POWER TO RE-INCARNATE ";N$:H1=4
2470 NEXTY,Z:IFH1>0THENGOSUB50:GOTO2530
2480 IFH(X)<1ANDM1=0THENPRINT@352,"YOUR PARTY HAVE NO MEANS TO HELP YOUR DEAD COM
RADE.WILL YOU CARRYYOURFRIEND,TAKE ITEMS FROM THE  BODY OR LEAVE IT AS FALLEN.";
:GOSUB40:GOSUB2590:RETURN
2490 GOSUB70:PRINT@320,"WHO WILL TEND TO ";N1$;:GOSUB80:IFC$(X)="CLERIC"OR(C$(X)
="DRUID"ANDL(X)>1)ANDCL(L(X)THENCL=CL+1:GOSUB2670:RETURN
2500 IFC$(X)="PALADIN"ANDLH<L(X)THENLH=LH+1:GOSUB2670:RETURN
2510 FORZ=1TOXX:FORY=1TO5:IFT$(Z,Y)=TF$(1)ORT$(Z,Y)=TF$(2)ORT$(Z,Y)=TF$(39)THENH
(U)=H(U)+RND(8)ELSEIFT$(Z,Y)=TF$(16)THENH(U)=H(U)+3*RND(8):IFH(U)>HP(U)THENH(U)=
HP(U):PRINT" ";N1$;" NOW AT";H(U);"HIT POINTS.":GOSUB50:T$(Z,Y)=""
2520 NEXTY,Z:IFCL=0THENPRINT@448,"YOU HAVE NO FACILITY TO HEAL":GOSUB50:RETURNEL
SERETURN
2530 PRINT@448,"DO YOU WISH TO UTILISE THIS     FACILITY(Y/N)";:GOSUB40:IFK$="Y"
THENGOSUB70:H(U)=HP(U):ON H1 GOTO2540,2550,2560,2570 ELSERETURN
2540 N=N+1:PRINT@416,"THE RING GLOWS A BLOOD RED.....";N1$;" BEGINS TO STIR..."
;:GOSUB50:PRINT@480,"alive again";:GOSUB50:RETURN
2550 N=N+1:PRINT@384,"AS YOU FINISH INTONING FROM THE SCROLL ";N1$;" BEGINS TO B
REATH AGAIN AND THEN....";:T$(Z1,Y1)="":GOSUB50:PRINT"GETS UP,SHAKILY!!";:GOSUB5
0:RETURN
2560 N=N+1:PRINT@416,"YOU ARE SUCCESSFUL ";N$(Z):PRINTN1$;" RISES TO FIGHT AGAIN
 ALTHOUGH WEAK AT PRESENT!":GOSUB50:RETURN
2570 RI$(1)="DWARF":RI$(2)="ELF":RI$(3)="GNOME":RI$(4)="GOBLIN":RI$(5)="HALFLING
":RI$(6)="HALF-ORC":RI$(7)="HUMAN":RI$(8)="CENTAUR":RI$(9)="ORC"
2580 N=N+1:RP=RND(9):PRINT@416,"AS YOU FINISH RECITING YOUR     RE-INCARNATION S
PELL ";N1$;" RISES AGAIN AS.....":GOSUB50:PRINT"A ";RI$(RP);:R$(U)=RI$(RP):GOSU
B50:RETURN
2590 IFK$="F"ANDCC=1THENPRINT" overloaded   YOU ALREADY CARRY  ONE OF YOUR LATE
COMRADES."
2595 IFK$="F"ANDCC=0THENCC=1:FORY=1TOXX:WE(Y)=0:NEXT:GOTO2660
2600 IFK$<>"F"ANDK$<>"I"THEN2650
2610 FORZ=1TOXX:FORY=1TO5:IFT$(U,Y)=""ORZ=U THEN2630
2620 IFT$(Z,Y)=""THENT$(Z,Y)=T$(U,Y):T$(U,Y)=""
2630 NEXTY,Z:FORX=1TOXX:IFX=U THEN2640ELSELF=INT(G(U)/3):G(X)=G(X)+LF:WE(X)=WE(X
)-LF:IFWE(X)<0THENWE(X)=0
2640 NEXT:G(U)=0
2650 N$(U)="":C$(U)="":R$(U)="":W1$(U)="":W2$(U)="":W3$(U)="":A$(U)=""
2660 L(U)=0:S(U)=0:I(U)=0:W(U)=0:C(U)=0:D(U)=0:R(U)=0:B$(U)="":GP(U)=0:HP(U)=0:S
B(U)=0:DB(U)=0:WA(U)=0:AC(U)=0:WE(U)=0:RETURN
2670 RS=RND(6)+2:IFRS+H(U)>HP(U)THENRS=HP(U)-H(U)
2680 IFCF=1THENPRINT@352,"YOUR SPELL IS NOT YET RECHARGED YOU MUST RECOVER YOUR
STRENGTH!":RETURNELSEPRINT@352,C$(X);" YOU HAVE CURED":PRINTRS;" DAMAGE FOR ";N$
(U);:H(U)=H(U)+RS:GOSUB50:CF=1:RETURN
2690 PRINT@320,"WHO CASTS MAGIC...?":GOSUB80:IFH(X)<1THENPRINT"he is dead";:R=R2
:RETURN
2700 CLS:PRINTN$(X);",YOU KNOW:":FORY=1TO8:PRINTSV$(X,Y):NEXT
2710 PRINT"YOU CARRY:":FORY=1TO5:PRINTT$(X,Y):NEXT
2720 PRINT@480,"sPELL OR aRTIFACT?";:GOSUB40:IFK$="S"ORK$="A"THEN2730ELSER=R2:RE
TURN
2730 IFK$="A"THENLF=1ELSELF=0
2740 IFLF=0THENGOSUB70ELSEFORY=0TO7:PRINT@(32*Y),"":NEXT
2750 PRINT@480,"WHICH.....?";:GOSUB40
2760 K=ASC(K$)-64:A$=CHR$(K+96):FORY=1TO5:IFLF=1ANDLEFT$(T$(X,Y),6)="POTION"ORL
EFT$(T$(X,Y),6)="SCROLL")ANDINSTR(9,T$(X,Y),A$)>0THENT$(X,Y)=""
2770 IFRND(100)>94ANDINSTR(9,T$(X,Y),A$)>0AND(LEFT$(T$(X,Y),4)="RING"ORLEFT$(T$(
X,Y),4)="WAND")THENT$(X,Y)="":PRINT" last charge":GOSUB50
2780 NEXT:IFLF=0THENFORY=1TO8:IFINSTR(1,SV$(X,Y),A$)>0THENSV$(X,Y)="":ELSENEXT
2790 IFLF=0THENFORY=1TO8:IFRND(100)>90ANDINSTR(1,SV$(X,Y),A$)>0AND(LEFT$(SV$(X,Y
),4)="RING"ORLEFT$(SV$(X,Y),4)="WAND")THENS$(X,Y)="":PRINT"last charge":GOSUB50E
LSENEXT
2800 FORSS=1056TO1500:IFPEEK(SS)=K THEN2820ELSENEXT
2810 PRINT@480,"NOT AVAILABLE.....":R=R2:GOSUB50:RETURN
2820 A=0:C$=LEFT$(C$(X),1):CLS
2830 IFK=2AND(C$="I"ORLF=1)THENPRINT"A BLINDNESS AFFLICTS THE ";M$(MM);",ALLOWIN
G YOU TO DESPATCH THEM":A=1
2840 IFK=3AND(C$="I"ORC$="D"ORLF=1)THENPRINT"THE ";M$(MM);" ARE THROWN INTO DISA
RRAY ALLOWING YOU TO STRIKE UNHINDERED.":A=1
2850 IFK=4ANDRIGHT$(M$(MM),6)="DRAGON"THENPRINT"THE DRAGON BECOMES DOCILE AND
LIES DOWN QUIETLY.":A=2
2860 IFK=5AND(C$="D"ORLF=1)THENPRINTTHE ";M$(MM);" SUDDENLY BECOME ENTANGLED IN
```


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# PROGRAM FILE

```
A MASS OF VINES,ALLOWING YOU TO KILL THEM.";:A=1
2870 IFK=6AND(C$="M"ORC$="D"ORLF=1)THENPRINT"FIRE SHOOTS AT THE MONSTERS AND DAM
AGES THEM CONSIDERABLY.";:A=3
2880 IFK=7THENPRINT"YOU FEEL A SUDDEN SURGE OF GREATSTRENGTH & CHARGE THE FOE.";
:A=4
2890 IFK=8AND(C$="C"ORLF=1)THENPRINT"THE OPPOSITION IS HELD FAST.....UNABLE TO A
TTACK OR DEFEND.";:A=2
2900 IFK=9THENPRINTN$(X);" SUDDENLY DISAPPEARS FROM VIEW..";:A=5
2910 IFK=12AND(C$="M"ORC$="D"ORLF=1)THENPRINT"LIGHTNING BURSTS FORTH FROM YOU.";
:A=3
2920 IFK=13AND(C$="M"ORLF=1)THENPRINTL(X);"MAGIC MISSILES SPEED FROM  YOUR H
ANDS & STRIKE THE ";M$(MM);:A=3
2930 IFK=14THENPRINT"THE STAFF OF STRIKING CRACKLES  WITH POWER - BLUE FLAME BUR
STINGFORTH.";A=3
2940 IFK=15AND(C$="M"ORLF=1)THENPRINT"AN ICE STORM ENVELOPES THE ";M$(MM);" FEEZI
NG THEM SOLID.";:A=2
2950 IFK=16AND(C$="M"ORLF=1)THENPRINT"THE ";M$(MM);" FALL UNDER YOUR SPELL.";:A=
2
2960 IFK=18THENPRINT"THE ";M$(MM);" ARE STRUCK WITH FEAR AND FLEE THE ROOM.";:A=
6
2970 IFK=19AND(C$="M"ORLF=1)THENPRINT"THE ";M$(MM);" SUDDENLY FALL TO THE FLOOR.
..ASLEEP!";:A=2
2980 IFK=20AND(C$="M"ORLF=1)THENPRINT"STRENGTH FLOODS INTO YOU.";:A=4
2990 IFK=22THENPRINT"YOU FEEL INVULNERABLE AS AN AURAOF POWER ENVELOPS YOU.";:A=
5
3000 IFK=24AND(C$="M"ORLF=1)THENPRINT"AS YOU COMPLETE THE SPELL THE "M$(MM);" FA
3010 IFK=25AND(C$="I"ORLF=1)THENPRINT"A COLOUR SPRAY CONFUSES THE ";M$(MM);" AND
 YOU ARE ABLE TO STRIKE UNHINDERED.";:A=1
3020 IFK=26AND(C$="I"ORLF=1)THENPRINT"THE ";M$(MM);" ARE PARALYZED.";:A=2
3030 IFA=1THENNM=0
3040 IFA=2THENRT=(L%LOG(L)%RND(20))/L(X):IFRT>15THENPRINT" BUT THEY QUICKLY RECO
VER...";:ELSENM=0
3050 IFA=3THENFORY=1TOM1:MP(Y)=MP(Y)-RND(6)%L(X):IFMP(Y)<1THENNM=NM-1:NEXT
3060 IFA=4THENI=X
3070 IFA=5THENI=X
3080 IFA=6THENRETURN
3090 LF=1:RETURN
3100 CLS:PRINT@5,"*DO YOU WISH TO SAVE*":PRINT@39,"*THESE CHARACTERS*":PRINT@80,
"&":PRINT@104,"*THIS ADVENTURE*"
3110 GOSUB40:IFK$="N"THENGOSUB100:RETURN
3120 PRINT:PRINT" PREPARE TAPE & THEN PRESS       ANY KEY.....":GOSUB40
3130 CLS:PRINT@234,"**SAVING**":OPEN"O",#-1,"DUNGEON":PRINT#-1,XX:FORX=1TOXX
3140 PRINT#-1,N$(X),R$(X),C$(X),L(X),S(X),I(X),W(X),C(X),D(X),R(X),B$(X),GP(X),H
P(X),SB(X),DB(X),WA(X),W1$(X),W2$(X),W3$(X)
3150 PRINT#-1,A$(X),AC(X),LI(X),E(X),Q(X),G(X),H(X),A(X),WE(X)
3160 FORY=1TO8:PRINT#-1,E$(X,Y),S$(X,Y):NEXTY:FORY=1TO5:PRINT#-1,T$(X,Y):NEXTY,X
:PRINT#-1,MT,R,L,CC,DD
3170 CLOSE#-1:CLS:PRINT@234,"*DUNGEON*":PRINT@267,"*SAVED*":END
3180 '* LOAD ADVENTURE *
3190 CLS:PRINT@32,"YOU'RE IN MID-ADVENTURE..!":PRINT"PREPARE TAPE & PRESS ANY KE
Y.":GOSUB40:CLS:PRINT@234,"* LOADING *":PRINT@266,"* DUNGEON *"
3200 OPEN"I",#-1,"DUNGEON":INPUT#-1,XX:FORX=1TOXX
3210 INPUT#-1,N$(X),R$(X),C$(X),L(X),S(X),I(X),W(X),C(X),D(X),R(X),B$(X),GP(X),H
P(X),SB(X),DB(X),WA(X),W1$(X),W2$(X),W3$(X)
3220 INPUT#-1,A$(X),AC(X),LI(X),E(X),Q(X),G(X),H(X),A(X),WE(X)
3230 FORY=1TO8:INPUT#-1,E$(X,Y),S$(X,Y):NEXTY:FORY=1TO5:INPUT#-1,T$(X,Y):NEXTY,X
:INPUT#-1,MT,R,L,CC
3240 CLOSE#-1:FORZ=1TOXX:LI=LI+LI(Z):NEXT:RETURN
3250 'LOAD INITIAL CHARACTERS
3260 CLS:PRINT:PRINT"  ** WELCOME TO BRIMSTONE **":PRINT:PRINT" YOU MAY ADVENTUR
E WITH UP TO   FOUR MEMBERS.":PRINT:PRINT" HOW MANY CHARACTERS WILL YOUR  PART
Y COMPRISE:";:INPUTXX
3270 IFXX<1ORXX>4THEN3260
3280 FORX=1TOXX:PRINT:PRINT" PREPARE THE TAPE TO LOAD YOUR  CHARACTER.THEN ENTE
R THE NAME  OF YOUR CHARACTER...";:INPUTN$
3290 CLS:PRINT@234,"**LOADING**":OPEN"I",#-1,N$(X):IFEOF(-1)THEN3330
3300 INPUT#-1,N$(X),R$(X),C$(X),L(X),S(X),I(X),W(X),C(X),D(X),R(X),B$(X),GP(X),H
P(X),SB(X),DB(X),WA(X)
3310 INPUT#-1,W1$(X),W2$(X),W3$(X),A$(X),AC(X),LI(X),E(X),Q(X)
3320 FORY=1TO8:INPUT#-1,E$(X,Y),S$(X,Y):NEXTY:FORY=1TO5:INPUT#-1,T$(X,Y):NEXTY
3330 CLOSE#-1:H(X)=HP(X):WE(X)=WA(X):PRINT@234,"***DONE***":NEXTX:FORZ=1TOXX:LI=
LI+LI(Z):NEXTZ:RETURN
3340 HE=0:LF=0:CF=0:AT=0:QL=0:LN=0:LS=0:LW=0:LE=0:TR=30:SB=0
3350 RESTORE:FORX=1TOR:READ XR,YR,RN,DN,DS,DW,DE,DU,FT,F$(2),F$(3),F$(4):NEXT:RE
TURN
3360 DATA6,7,1,2,0,3,0,0,0,,ENTRANCE,CHAMBER,16,8,2,-5,1,4,0,0,0,,EMPTY,ROOM
3370 DATA10,6,3,4,0,0,1,0,0,,TABLE,CHAIRS,12,6,4,0,3,0,2,0,0,,,BENCHES
3380 DATA4,8,5,6,-2,0,0,0,0,,,CORRIDOR,8,8,6,7.5,0,0,0,0,,GUARD,ROOM
3390 DATA8,8,7,0,6,-8,0,0,0,,,NOTHING,8,8,8,0,0,9,-7,0,0,,,ARMOURY
3400 DATA8,8,9,10,0,19,8,0,1126,,EMPTY,ROOM,4,8,10,11,9,0,0,0,0,,,CORRIDOR
3410 DATA8,8,11,0,10,0,0,0,0,TABLE,AND,BENCHES,8,8,12,-19,-13,0,0,0,0,,SECRET,RO
OM
3420 DATA8,8,13,-12,0,14,0,0,0,STORE,ROOM,ARMOUR,8,4,14,0,0,15,13,0,0,,,CORRIDOR
3430 DATA14,7,15,0,16,18,14,0,0,,RECEPTION,ROOM,12,6,16,15,0,-17,0,0,0,,THRONE,R
OOM
3440 DATA6,6,17,0,0,0,-16,-221,0,BARE,STONE,CHAMBER,10,4,18,0,0,0,15,0,0,,GUARD,
ROOM
3450 DATA8,8,19,0,-12,-20,9,0,0,,EMPTY,CORRIDOR,13,5,20,0,0,0,-19,0,0,,WASH,ROOM
3460 DATA7,7,21,22,0,0,0,117,0,DANK,STAIR,WELL,4,8,22,23,21,0,0,0,0,,,CORRIDOR
3470 DATA14,8,23,-24,22,0,0,0,0,ROOM,OF,MIRRORS,14,6,24,0,-23,0,25,0,0,,STUDY,RO
OM
3480 DATA12,6,25,-26,0,24,0,0,0,,LIBRARY,,6,6,26,0,-25,0,0,-338,0,,EMPTY,ROOM
3490 DATA12,8,27,0,0,0,28,0,0,,LABORATORY,,12,6,28,29,0,27,0,0,0,OFFICE,WITH,DES
K
3500 DATA12,6,29,-30,28,0,-31,0,0,,ANTE,CHAMBER,12,6,30,0,-29,0,0,0,0,DAMP,& DIR
TY,CELL
3510 DATA16,4,31,0,0,-29,32,0,0,,CORRIDOR,,14,8,32,33,0,31,0,0,0,BENCHES,AND,TAB
LES
3520 DATA8,6,33,0,32,0,0,-334,0,,SMALL,CHAPEL,8,6,34,0,0,-35,0,233,0,EMPTY,STAIR
,WELL
3530 DATA16,6,35,0,0,36,-34,0,0,,ROBING,ROOM,16,8,36,0,-39,37,35,0,0,LARGE,THRON
E,ROOM
3540 DATA8,8,37,0,0,-38,36,0,0,SMALL,DRESSING,ROOM,8,7,38,0,0,0,-37,226,0,GUARD,
ROOM,& STAIRS
3550 DATA10,8,39,-36,40,0,0,0,0,,TROPHY,CHAMBER,8,8,40,39,0,0,0,0,441,0,SMALL,SITT
ING,ROOM
3560 DATA8,8,41,0,42,0,-52,340,0,STORE,(FOOD),ROOM,16,8,42,41,43,0,0,0,0,,LARGE,
KITCHEN
3570 DATA14,8,43,42,44,0,0,0,0,,BANQUET,ROOM,16,8,44,43,0,0,45,0,0,,GREAT,HALL
3580 DATA14,8,45,0,0,44,46,0,0,LARGE,DINING,ROOM,12,7,46,0,0,45,-47,0,0,COMBINED
,PANTRY,& KITCHEN
3590 DATA8,8,47,48,0,-46,0,-557,0,,LOUNGE,,5,8,48,49,47,0,0,0,0,,,CORRIDOR
3600 DATA12,8,49,-50,48,0,0,0,0,SERVANT'S,DORMITORY,,8,8,50,0,-49,0,0,-553,0,,ST
ORE,ROOM
3610 DATA16,4,51,0,0,52,-50,0,0,,CORRIDOR,,14,8,52,0,0,-41,51,0,0,,LARGE,REFRECT
ORY
3620 DATA8,8,53,0,56,0,54,450,0,STORE,ROOM,,8,8,54,0,55,53,0,0,0,,UNTIDY,WORKSHO
P
3630 DATA8,8,55,54,0,56,0,-658,0,,EMPTY,ROOM,8,8,56,53,0,0,55,0,0,SMALL,WEAPONS,
SMITHY
3640 DATA10,8,57,0,0,0,0,447,0,,EMPTY,CELL,8,8,58,0,64,0,-59,555,0,,EMPTY,CELL
```

# PROGRAM FILE

```
3650 DATA16,5,59,0,0,-58,60,0,0,,CORRIDOR,,14,8,60,61,0,59,0,0,0,,,BARRACKS
3660 DATA14,8,61,0,60,62,0,0,0,SEVERAL,CRUDE,BEDS,16,8,62,0,0,-63,61,0,0,TRAININ
G,EXERCISE,ROOM/GYM
3670 DATA8,8,63,0,0,0,-62,-771,0,EMPTY,STAIR,WELL,4,8,64,58,65,0,0,0,0,,,CORRIDO
R
3680 DATA8,8,65,64,0,0,66,0,0,,TORTURE,CHAMBER,8,8,66,0,67,65,0,0,0,,PRISON-CELL
S
3690 DATA8,8,67,66,0,0,68,0,0,,GUARD'S,ROOM,8,8,68,0,69,67,0,0,0,MORE,PRISON,CEL
LS
3700 DATA8,8,69,68,0,0,-70,0,0,,STRONG,ROOM,8,8,70,0,0,-69,0,0,0,,SECRET,CHAMBER
3710 DATA8,8,71,72,74,73,75,663,0,DARK,EERIE,ROOM,8,8,72,0,71,0,0,0,0,SLIME,COVE
RED,WALLS
3720 DATA8,8,73,0,0,0,71,0,0,FOUL,SMELLING,BESTIARY,8,8,74,71,0,0,0,0,0,DARK,GLO
OMY,CRYPT
3730 DATA8,8,75,0,0,71,0,0,0,,SEVERAL,TOMBS
3740 FORX=1TO66:READTF$(X):NEXT:RETURN
3750 DATA POTION...OF HEALING,SCROLL...OF CURE LIGHT WOUNDS,SCROLL...OF eNTANGLE
,SCROLL...OF mAGIC MISSILE
3760 DATA SCROLL...OF CHARM PERSON,SCROLL...OF sLEEP,SCROLL...OF COLOUR SPRAy,RI
NG...OF wARMTH,WAND.....OF mAGIC MISSILES
3770 DATA CHAINMAIL+1,SHIELD...+1,SWORD....+1,AXE.....+1,DAGGER...+1,MACE....+1
3780 DATA POTION...OF EXTRA-HEALING,SCROLL...OF hOLD PERSON,SCROLL...OF INVULNER
ABILITY,SCROLL... OF bLINDNESS,RING.....OF iNVISIBILITY,CLOAK....OF PROTECTION+1
3790 DATA DAGGER...+2,SWORD....+2,AMULET OF GOLD & PLATINUM,BAG.....OF DEVOURING
3800 DATA POTION...OF iNVISIBILITY,SCROLL...OF CALL LIGHTNING,SCROLL...OF iNVISI
BILITY,SCROLL...OF PARALYzATION,RING.....OF PROTECTION+1,WAND.....OF FIRE
3810 DATA CHAINMAIL+2,SHIELD...+2,AXE.....+2,SPEAR....+2,RED PEARL,SAPPHIRE
3820 DATA POTION...OF INVULNERABILITY,SCROLL...OF CURE DISEASE,SCROLL...OF StREN
GTH,SCROLL...OF LIGTHNING BOLT,SCROLL...OF FIREBALL,SCROLL...OF cHAOS,WAND.....O
F FEAr
3830 DATA PLATEMAIL+1,SWORD....+3,EMERALD,STAR RUBY
3840 DATA POTION...OF GIANT STRENGTH,SCROLL...OF RAISE DEAD,SCROLL...OF WALL OF
FIRE,SCROLL...OF ICE STORM,RING.....OF FEATHER FALL,WAND.....OF STRIKING
3850 DATA AXE.....+3,DAGGER...+3,MACE.....+2,FIRE OPAL,DIAMOND
3860 DATA POTION...OF dRAGON CONTROL,SCROLL...OF cONFUSION,SCROLL...OF DEATH SPE
LL(x),RING.....OF REGENERATION,PLATEMAIL+2,MOONSTONE,CROWN OF GOLD
3870 FORX=1TO80:READM$(X):NEXT:RETURN
3880 DATA BANDIT,BERSERKER,ORC,GOBLIN,KOBOLD,GHOUL,GNOLL,IMP,GIANT ANT,BUGBEAR
3890 DATA LIZARDMEN,CARRION CRAWLER,GIANT RAT,SKELETON,STIRGE,GIANT CENTIPEDE,WO
LVEN/TROGLODYTE,EVIL DWARVES,SHRIEKER
3900 DATA HOBGOBLIN,FIRE-IMP,GIANT TICK,HARPIES,MUMMIES,NANE,LEMURE,LARVA,FIRE B
EETLE,WEREWOLVES
3910 DATA OGRE,OWLBEAR,GIANT SPIDER,TROLL,ZOMBIE,BASILISK,CAVE BEAR,BLINK DOG,CE
NTAUR,COCKATRICE
3920 DATA SUCCUBUS,ANHKHEG,ERINYES,LAMIA,SPECTRE,HYDRA,GELATINOUS CUBE,GHOST,STO
NE GIANT,STONE GOLEM
393A DATA CHIMERA,COUATL,GIANT APE,GIANT SNAKE,ETTIN,GORGON,GRIFFON,GARGOYLE,MAN
TICORE,MINOTAUR
3940 DATA ROPER,RUST MONSTER,VAMPIRE,UMBER HULK,WIGHT,XORN,WYVERN,WRAITH,DJINNI,
OTYUGH,MIND FLAYER,LICH
3950 DATA IRON GOLEM,BALROG,DRAGONNE,BLACK DRAGON,CHROMATIC DRAGON,GREEN DRAGON,
RED DRAGON,WHITE DRAGON
```

## Spectrum Golf
### by Chic James

As if to show that anything the BBC can do the Spectrum can do better, I received this golf simulation shortly after publishing 'Golf' for the Beeb last month. Instructions are included in the program for nine- and 18-hole games.

If two people want to play simultaneously, you'll need a microdrive in which to store the hole design. One-player games can be run on cassette-based systems.

One word of warning — the game is won or lost on the putting green.

```
  1 REM "golf" BY CHIC JAMES
  5 BRIGHT 1
  8 BORDER 5: PAPER 4: INK 0
  9 CLS : GO SUB 9100
 10 GO SUB 9900
 15 GO SUB 9700
 30 PRINT  PAPER 7; BRIGHT 1; I
NVERSE 1;AT 20,0;"HOW MANY HOLES
 DO YOU WISH TO   PLAY ?
                  "
 40 INPUT  PAPER 7; INK 0; BRIG
HT 1;"ENTER 9 or 18 ";h
 45 CLS
 50 INPUT  PAPER 7; INK 0; BRIG
HT 1;"ENTER 1 or 2 PLAYERS ";pla
yers
 60 IF players>2 THEN  GO TO 50
 90 GO SUB 1000
 100 REM ** play one hole **
 105 INPUT  PAPER 2; INK 7;"PLAY
ER ";(p1);" ENTER ANGLE:";a
 107 IF a>180 THEN  GO TO 3003
 110 PRINT AT 1,0; PAPER 2; INK
7;"ANGLE ";a;"   "
 120 INPUT  PAPER 1; INK 7;"PLAY
ER ";(p1);" ENTER SWING:";d
 125 IF d>200 THEN  GO TO 120
 130 PRINT AT 2,0; PAPER 1; INK
7;"SWING ";d;"   "
 135 LET d=d/2
 140 LET x=INT (d*COS (a/180*PI)
)+q
 150 LET y=INT (d*SIN (a/180*PI)
)+r
 155 GO SUB 6080
 160 CIRCLE  INK 7;x,y,1
 163 IF x>=c-20 AND x<=c+20 AND
y>=b-20 AND y<=b+20 THEN  GO TO
170
 165 PLOT q,r: DRAW x-q,y-r
 170 LET q=x
 180 LET r=y
 190 IF x>=c-1 AND x<=c+1 AND y>
=b-1 AND y<=b+1 THEN  GO TO 3000
 200 GO SUB 6000
 290 LET s=s+1
 295 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. ";s
 320 GO TO 105
 999 REM *** set out hole ***
1000 IF p1=2 THEN  GO TO 1600
1002 CLS : FOR n=0 TO 2: PRINT A
T n,0; PAPER 0;"
                 ": NEXT n
1005 LET z=z+1: PRINT AT 1,16; P
APER 0; INK 7;"HOLE No. ";z
1010 LET q=10: LET r=10
1030 LET s=1
1100 FOR n=1 TO 30
1110 LET a=3+INT (RND*18)
1120 LET b=1+INT (RND*31)
1130 PRINT AT a,b; PAPER 8; INK
0;"."
1140 NEXT n
1150 FOR n=1 TO 5
1160 LET a=3+INT (RND*13)
1170 LET b=1+INT (RND*27)
1180 LET c=1+INT (RND*5)
1190 FOR m=1 TO c
1200 PRINT AT a+m,b; PAPER 8; IN
K 0;"#"
1210 NEXT m
```


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| | | |
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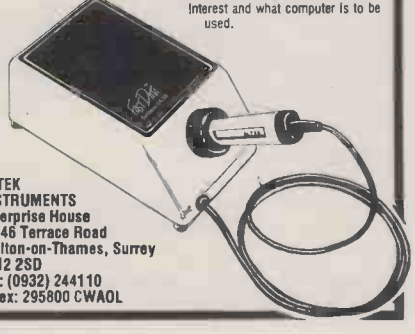

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# PROGRAM FILE

```
1220 NEXT n
1230 LET i=3+INT (RND*15)
1240 LET j=1+INT (RND*27)
1245 PRINT AT i-1,j-1; PAPER 3; INK 2;"   "
1250 PRINT AT i,j-1; PAPER 3;"    "
1260 PRINT AT i+1,j-1; PAPER 3;"    "
1270 PRINT AT i+2,j-1; PAPER 3;"    "
1275 PRINT AT i+3,j-1; PAPER 3;"    "
1280 LET c=j*8+12
1290 LET b=175-(i*8+10)
1300 CIRCLE c,b,2
1310 GO SUB 5000
1320 PRINT AT i+1,j+1; PAPER 3;"  "
1330 CIRCLE c,b,2
1370 PRINT AT 0,16; PAPER 0; INK 7;"TOTAL STROKES:";e(pl)
1390 PRINT AT 1,0; PAPER 2; INK 7;"ANGLE      ";AT 2,0; PAPER 1; INK 7;"SWING      "
1395 PRINT AT 0,0; PAPER 0; INK 7;"STROKE No. ";s
1400 LET l=c+b
1405 IF l>=10 THEN  LET p=2
1410 IF l>=100 THEN  LET p=3
1420 IF l>=200 THEN  LET p=4
1430 IF l>=300 THEN  LET p=5
1440 PRINT AT 2,16; PAPER 0; INK 7;"PAR:";p;" ";l;"Yds."
1450 FOR n=19 TO 21
1460 PRINT AT n,0; PAPER 6;"    "
1470 NEXT n
1480 PRINT AT 19,0; PAPER 6; INK 0;"T"
1490 PRINT  PAPER 8;AT 10,15;"▼";AT 11,16;"▼";AT 17,15;"▼";AT 11,22;"▼"
1500 PRINT  PAPER 8;AT 8,4;"▼";AT 8,11;"▼";AT 8,18;"▼";AT 8,26;"▼"
1510 PRINT  PAPER 8;AT 15,4;"▼";AT 15,11;"▼";AT 15,18;"▼";AT 15,26;"▼"
1520 CIRCLE  INK 7;q,r,1
1530 IF players=1 THEN  GO TO 100
1549 REM *** SAVE HOLE ***
1550 ERASE "m";1;"hole"
1560 SAVE *"m";1;"hole"SCREEN$
1565 VERIFY *"m";1;"hole"SCREEN$
1570 GO TO 100
1599 REM *** LOAD HOLE ***
1600 LOAD *"m";1;"hole"SCREEN$
1610 LET q=10: LET r=10
1620 LET s=1
1630 PRINT AT 0,16; PAPER 0; INK 7;"TOTAL STROKES:";e(pl)
1640 GO TO 100
2999 REM *** holed shot ***
3000 LET e(pl)=e(pl)+s: PRINT AT 21,8; PAPER 2; INK 7; FLASH 1;"  H O L E D  "
3005 GO SUB 7300
3010 PRINT AT 0,16; PAPER 0; INK 7;"TOTAL STROKES:";e(pl)
3015 PAUSE 100
3016 IF pl=1 THEN  LET t(z)=s
3017 IF pl=2 THEN  LET i(z)=s
3018 LET v(z)=p
3020 PRINT AT 10,6; PAPER 6; INK 0;s;" STROKES FOR HOLE No.";z
3021 IF players=1 THEN  GO TO 3025
3022 IF pl=1 THEN  LET pl=2: PAUSE 100: GO TO 1000
3025 LET k=k+p
3030 PRINT AT 2,16; PAPER 0; INK 7;"PAR:";p;" ";l;"Yds."
3035 PAUSE 100
3040 LET p=0: LET l=0
3050 IF z=h THEN  GO TO 4000
3055 LET pl=1
3060 GO TO 1000
3999 REM *** end of round ***
4000 CLS : PRINT  BRIGHT 1;AT 0,3; PAPER 7; INK 0;"PAR FOR THIS COURSE WAS:";k
4002 GO SUB 4500
4005 LET pl=1
4010 IF k=e(pl) THEN  GO TO 4100
4020 IF k>e(pl) THEN  GO TO 4200
4030 IF k<e(pl) THEN  GO TO 4300
4100 IF pl=1 THEN  LET x1=0
4102 IF pl=2 THEN  LET x1=16
4105 PRINT AT 1,x1; PAPER 3; INK 7;" PLAYER ";pl;AT 21,x1;e(pl);": LEVEL PAR "
4115 IF players=1 THEN  GO TO 4400
4120 IF pl=1 THEN  LET pl=2: GO TO 4010
4130 GO TO 4400
4200 LET u=k-e(pl)
4202 IF pl=1 THEN  LET x1=0
4203 IF pl=2 THEN  LET x1=16
4210 PRINT AT 1,x1; PAPER 1; INK 7;" PLAYER ";pl;AT 21,x1;e(pl);":";u;" UNDER PAR "
4225 IF players=1 THEN  GO TO 4400
4230 IF pl=1 THEN  LET pl=2: GO TO 4010
4240 GO TO 4400
4300 LET o=e(pl)-k
4302 IF pl=1 THEN  LET x1=0
4303 IF pl=2 THEN  LET x1=16
4310 PRINT AT 1,x1; PAPER 2; INK 7;" PLAYER ";pl;AT 21,x1;e(pl);":";o;" OVER PAR  "
4325 IF players=1 THEN  GO TO 4400
4330 IF pl=1 THEN  LET pl=2
4410 INPUT  BRIGHT 1; INK 7; PAPER 0; FLASH 1;"ANOTHER ROUND? (Y or N) ";c$
4420 IF c$="y" THEN  GO TO 15
4430 IF c$<>"y" THEN  STOP
4500 PRINT AT 1,11;"PAR";AT 1,28;"HOLE"
4505 FOR n=1 TO h
4510 PRINT AT n+1,5;t(n);AT n+1,12;v(n);AT n+1,21;i(n);AT n+1,29;n
4520 NEXT n
4530 RETURN
4998 REM ** set up hazards **
4999 REM ** cap's in " " =
                U.D.G's. **
5000 FOR n=1 TO 3
5002 LET q(n)=3+INT (RND*12)
5003 GO SUB 7000
5005 FOR m=q(n) TO q(n)+2
5010 PRINT AT m,ch; PAPER 8; INK 5;"▀"
5020 NEXT m
5022 NEXT n
5025 FOR n=4 TO 5
5030 LET q(n)=3+INT (RND*12)
5032 GO SUB 7000
5035 FOR m=q(n) TO q(n)+2
5040 PRINT AT m,ch; PAPER 8; INK 2;"▲▲▲"
5050 NEXT m
5055 NEXT n
5100 FOR n=7 TO 10
5110 LET q(n)=1+INT (RND*28)
5120 LET w(n)=q(n)*8
5125 LET f(n)=w(n)+23
5127 GO SUB 7100
5130 PRINT AT ch,q(n); PAPER 8; INK 6;"▒▒▒▒"
5140 NEXT n
5150 LET n=6
5160 LET q(n)=4+INT (RND*25)
5170 LET w(n)=q(n)*8
5180 LET f(n)=w(n)+23
5190 GO SUB 7100
5200 FOR m=ch TO ch+2
5210 PRINT AT m,q(n); PAPER 8; INK 2;"▲▲▲"
5220 NEXT m
5230 IF n=11 THEN  RETURN
5240 LET n=11: GO TO 5160
5999 REM ** check hazards **
6000 GO TO 8000
6005 IF x>=64 AND x<=71 AND y>=w(1) AND y<=f(1) THEN  GO TO 6100
6010 IF x>=136 AND x<=143 AND y>=w(2) AND y<=f(2) THEN  GO TO 6100
6020 IF x>=192 AND x<=199 AND y>=w(3) AND y<=f(3) THEN  GO TO 6100
6030 IF x>=w(10) AND x<=f(10) AND y>=40 AND y<=47 THEN  GO TO 6200
6035 IF x>=w(7) AND x<=f(7) AND y>=112 AND y<=119 THEN  GO TO 6200
6040 IF x>=w(8) AND x<=f(8) AND y>=96 AND y<=103 THEN  GO TO 6200
6050 IF x>=w(9) AND x<=f(9) AND y>=56 AND y<=63 THEN  GO TO 6200
6060 IF x>=8 AND x<=31 AND y>=w(4) AND y<=f(4) THEN  GO TO 6300
```

# PROGRAM FILE

```
6065 IF x>=w(11) AND x<=f(11) AN
D y>=0 AND y<=23 THEN  GO TO 630
0
6070 IF x>=w(6) AND x<=f(6) AND
y>=128 AND y<=151 THEN  GO TO 63
00
6075 IF x>=224 AND x<=247 AND y>
=w(5) AND y<=f(5) THEN  GO TO 63
00
6077 RETURN
6079 REM * check out of bounds *
6080 IF x<1 THEN  GO TO 6400
6085 IF x>254 THEN  GO TO 6500
6087 IF y>=152 THEN  GO TO 6600
6090 IF y<1 THEN  GO TO 6700
6095 RETURN
6099 REM ** inform penalty's **
6100 PRINT AT 21,0; PAPER 6; INK
 0; FLASH 1;" IN THE WATER:LOSE
TWO STROKES "
6105 GO SUB 7200
6110 LET s=s+2
6120 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. ";s
6130 PAUSE 50
6140 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
          "
6145 PRINT AT 21,q(11); PAPER 4;
 INK 2;"♦♦♦"
6150 RETURN
6200 PRINT AT 21,5; PAPER 6; INK
 0; FLASH 1;" BUNKERED:LOSE ONE
STROKE "
6205 GO SUB 7200
6210 LET s=s+1
6220 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. ";s
6230 PAUSE 50
6240 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
          "
6245 PRINT AT 21,q(11); PAPER 4;
 INK 2;"♦♦♦"
6250 RETURN
6300 PRINT AT 21,0; PAPER 6; INK
 0; FLASH 1;" IN THE WOODS :LOSE
 ONE STROKE "
6305 GO SUB 7200
6310 LET s=s+1
6320 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. ";s
6330 PAUSE 50
6340 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
          "
6345 PRINT AT 21,q(11); PAPER 4;
 INK 2;"♦♦♦"
6350 RETURN
6400 PRINT AT 21,0; PAPER 6; INK
 0; FLASH 1;" OUT OF BOUNDS:LOSE
 ONE STROKE "
6405 GO SUB 7200
6410 LET s=s+1
6420 LET x=1
6430 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. ";s
6435 PAUSE 50
6440 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
          "
6445 PRINT AT 21,q(11); PAPER 4;
 INK 2;"♦♦♦"
6450 RETURN
6500 PRINT AT 21,0; PAPER 6; INK
 0; FLASH 1;" OUT OF BOUNDS:LOSE
 ONE STROKE "
6505 GO SUB 7200
6510 LET s=s+1
6520 LET x=254 *
6530 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. ";s
6535 PAUSE 50
6540 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
          "
6545 PRINT AT 21,q(11); PAPER 4;
 INK 2;"♦♦♦"
6550 RETURN
6600 PRINT AT 21,0; PAPER 6; INK
 0; FLASH 1;" OUT OF BOUNDS:LOSE
 ONE STROKE "
6605 GO SUB 7200
6610 LET s=s+1
6620 LET y=151
6630 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. ";s
6635 PAUSE 50
6640 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
          "
6645 PRINT AT 21,q(11); PAPER 4;
 INK 2;"♦♦♦"
6650 RETURN
6700 PRINT AT 21,0; PAPER 6; INK
 0; FLASH 1;" OUT OF BOUNDS:LOSE
 ONE STROKE "
6705 GO SUB 7200
6710 LET s=s+1
6720 LET y=1
6730 PRINT AT 0,0; PAPER 0; INK
7;"STROKE No. ";s
6735 PAUSE 50
6740 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
          "
6745 PRINT AT 21,q(11); PAPER 4;
 INK 2;"♦♦♦"
6750 RETURN
6999 REM ** check hazards sub **
7000 IF q(n)=3 THEN  LET w(n)=12
8: LET f(n)=w(n)+23: GO TO 7100
7001 IF q(n)=4 THEN  LET w(n)=12
0: LET f(n)=w(n)+23: GO TO 7100
7002 IF q(n)=5 THEN  LET w(n)=11
2: LET f(n)=w(n)+23: GO TO 7100
7003 IF q(n)=6 THEN  LET w(n)=10
4: LET f(n)=w(n)+23: GO TO 7100
7004 IF q(n)=7 THEN  LET w(n)=96
: LET f(n)=w(n)+23: GO TO 7100
7005 IF q(n)=8 THEN  LET w(n)=88
: LET f(n)=w(n)+23: GO TO 7100
7006 IF q(n)=9 THEN  LET w(n)=80
: LET f(n)=w(n)+23: GO TO 7100
7007 IF q(n)=10 THEN  LET w(n)=7
2: LET f(n)=w(n)+23: GO TO 7100
7008 IF q(n)=11 THEN  LET w(n)=6
4: LET f(n)=w(n)+23: GO TO 7100
7009 IF q(n)=12 THEN  LET w(n)=5
6: LET f(n)=w(n)+23: GO TO 7100
7010 IF q(n)=13 THEN  LET w(n)=4
8: LET f(n)=w(n)+23: GO TO 7100
7011 IF q(n)=14 THEN  LET w(n)=4
0: LET f(n)=w(n)+23: GO TO 7100
7100 IF n=1 THEN  LET ch=8
7105 IF n=2 THEN  LET ch=17
7110 IF n=3 THEN  LET ch=24
7115 IF n=4 THEN  LET ch=1
7120 IF n=5 THEN  LET ch=28
7125 IF n=6 THEN  LET ch=3
7130 IF n=7 THEN  LET ch=7
7135 IF n=8 THEN  LET ch=9
7140 IF n=9 THEN  LET ch=14
7145 IF n=10 THEN  LET ch=16
7150 IF n=11 THEN  LET ch=19
7160 RETURN
7199 REM *** beep ***
7200 FOR n=1 TO 3
7205 BEEP .50,-10
7210 BEEP .75,-20
7220 NEXT n
7230 RETURN
7300 FOR n=1 TO 16
7305 BEEP .02,n
7310 NEXT n
7320 RETURN
7999 REM ** hit tree routine **
8000 IF x>=32 AND x<=39 AND y>=1
04 AND y<=111 THEN  GO TO 8100
8005 IF x>=88 AND x<=95 AND y>=1
04 AND y<=111 THEN  GO TO 8100
8010 IF x>=144 AND x<=151 AND y>
=104 AND y<=111 THEN  GO TO 8100
8015 IF x>=208 AND x<=215 AND y>
=104 AND y<=111 THEN  GO TO 8100
8020 IF x>=208 AND x<=215 AND y>
=48 AND y<=55 THEN  GO TO 8100
8025 IF x>=144 AND x<=151 AND y>
=48 AND y<=55 THEN  GO TO 8100
8030 IF x>=88 AND x<=95 AND y>=4
8 AND y<=55 THEN  GO TO 8100
8035 IF x>=32 AND x<=39 AND y>=4
8 AND y<=55 THEN  GO TO 8100
8040 IF x>=120 AND x<=127 AND y>
=88 AND y<=95 THEN  GO TO 8100
8045 IF x>=120 AND x<=127 AND y>
=32 AND y<=39 THEN  GO TO 8100
8050 IF x>=128 AND x<=135 AND y>
=80 AND y<=87 THEN  GO TO 8100
8055 IF x>=176 AND x<=183 AND y>
=80 AND y<=87 THEN  GO TO 8100
8060 GO TO 6005
8100 FOR n=5 TO 10
8105 BEEP .01,n
8110 NEXT n
8120 LET y=y+INT (d/3)
8130 PRINT AT 21,0; PAPER 6; INK
 0;" HIT TREE : BALL REBOUNDED
          "
8140 PAUSE 50
8150 PRINT AT 21,0; PAPER 6;"
"; PAPER 4;"
```


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# PROGRAM FILE

```
8160 PRINT AT 21,q(11); PAPER 4;
 INK 2;"♥♥♥"
8190 GO TO 160
9099 REM *** golf rules ***
9100 PRINT AT 0,0;" GOLF "
9110 PRINT AT 1,0; PAPER 6; INK
0;"T  "; PAPER 7; INK 0;" THE TE
E WILL BE AT THE      "
9120 PRINT AT 2,0; PAPER 6; INK
0;"   "; PAPER 7; INK 0;" BOTTOM
 LEFT OF YOUR SCREEN  "
9130 PRINT AT 3,0; PAPER 6; INK
0;"   "
9140 CIRCLE 10,156,1
9150 PAUSE 100
9160 PRINT AT 3,1; PAPER 6; INK
2;"^t"; PAPER 7; INK 2;"he ball"
9170 PAUSE 200
9180 PRINT AT 5,0; PAPER 3; INK
2;" ▀ "; PAPER 7; INK 0;" THE GR
EEN WILL BE AT A      "
9190 PRINT AT 6,0; PAPER 3; INK
0;" o "; PAPER 7;" RANDOM POSITI
ON ON THE      "
9200 PRINT AT 7,0; PAPER 3; INK
0;"   "; PAPER 7;"
          COURSE"
9205 PAUSE 100
9210 PRINT AT 7,1; PAPER 3; INK
2;"^t"; PAPER 7; INK 2;"he hole"
9215 PAUSE 100
9220 PRINT AT 9,0;"YOU DECIDE TH
E STRENGTH AND      ANGLE OF YOUR
 SHOTS      "
9230 PRINT AT 12,0;"AVOIDING THE
 HAZARDS"
9235 PAUSE 100
9240 PRINT AT 13,0;"WATER "; PAP
ER 8; INK 5;"▚"; PAPER 7; INK 0;
"  LOSES TWO STROKES      "
9250 PRINT AT 14,0;"BUNKERS "; P
APER 8; INK 6;"▄▄▄"; PAPER 7; IN
K 0;"  LOSE ONE STROKE      "
9260 PRINT AT 15,0;"WOODS "; PAP
ER 8; INK 2;"♣♣♣"; PAPER 7; INK
0;"  LOSE ONE STROKE      "
9270 PRINT AT 17,0;"OUT OF BOUND
S LOSES ONE STROKE "
9280 PRINT AT 18,0;"THE FENCES #
##  AND OTHER TREES  ♣ DO NOT LOS
E YOU STROKES BUT    YOU MAY REBO
UND OFF SOME OF THE TREES."
9290 PRINT  INVERSE 1;)0;"PRESS
 ANY KEY TO CONTINUE"
9300 PAUSE 0
9310 CLS
9320 PRINT AT 0,0;"STRENGTH AND
ANGLE OF SHOT"
9330 PRINT AT 2,0; PAPER 1; INK
7;"STRENGTH"
9340 PAUSE 50: PRINT AT 4,1; PAP
ER 7; INK 0;"10": CIRCLE 10,132,
1: DRAW 5,0: CIRCLE 15,132,1
9350 PAUSE 50: PRINT AT 6,1; PAP
ER 7; INK 0;"25": CIRCLE 10,116,
1: DRAW 12,0: CIRCLE 22,116,1
9360 PAUSE 50; PRINT AT 8,1; PAP
ER 7; INK 0;"50": CIRCLE 10,100,
1: DRAW 25,0: CIRCLE 35,100,1
9370 PAUSE 50: PRINT AT 10,1; PA
PER 7; INK 0;"100": CIRCLE 10,84
,1: DRAW 50,0: CIRCLE 60,84,1
9380 PAUSE 50: PRINT AT 12,1; PA
PER 7; INK 0;"150": CIRCLE 10,68
,1: DRAW 75,0: CIRCLE 85,68,1
9390 PAUSE 50: PRINT AT 14,1; PA
PER 7; INK 0;"200": CIRCLE 10,52
,1: DRAW 100,0: CIRCLE 110,52,1
9400 PRINT AT 17,0;"YOU CAN USE
ANY STRENGTH"" 1 TO 200";)0; IN
VERSE 1;"PRESS ANY KEY TO CONTIN
UE"
9410 PAUSE 0
9420 CLS : PRINT AT 0,0;"STRENGT
H AND ANGLE OF SHOT"
9430 PRINT AT 2,0; PAPER 2; INK
7;"ANGLE"
9440 PAUSE 50: PLOT 119,96: DRAW
 40,0: PRINT AT 10,20;"0"
9450 PAUSE 50: PLOT 119,96: DRAW
 32,32: PRINT AT 5,19;"45"
9460 PAUSE 50: PLOT 119,96: DRAW
 0,40: PRINT AT 4,14;"90"
9470 PAUSE 50: PLOT 119,96: DRAW
 -32,32: PRINT AT 5,9;"135"
9480 PAUSE 50: PLOT 119,96: DRAW
 -40,0: PRINT AT 9,7;"180"
9490 PAUSE 50: PLOT 119,96: DRAW
 32,-32: PRINT AT 14,18;"-45"
9500 PAUSE 50: PLOT 119,96: DRAW
 0,-40: PRINT AT 15,13;"-90"
9510 PAUSE 50: PLOT 119,96: DRAW
 -32,-32: PRINT AT 14,9;"-135"
9520 PRINT AT 17,0;"YOU MAY USE
ANY ANGLE 0 TO 180"
9530 PAUSE 100
9540 PLOT 151,96: DRAW -64,0,PI:
 DRAW 4,4: DRAW -4,-4: DRAW -4,4
9550 PRINT AT 19,0;"OR 0 TO -179
"
9555 PAUSE 100
9560 PLOT 151,96: DRAW -64,0,-PI
: DRAW -4,-4: DRAW 4,4: DRAW 4,-
4
9570 PRINT  INVERSE 1;)0;"PRESS
ANY KEY TO CONTINUE"
9580 PAUSE 0
9600 CLS : PRINT AT 0,0; INK 2;"
WARNING"
9610 PRINT AT 2,0;"EXTRA CAUTION
 MUST BE TAKEN IF  THE GREEN IS
OVER A HAZARD eg:"
9620 PRINT AT 6,14; PAPER 3;"
";AT 7,14; PAPER 3; INK 6;"▟";AT
 7,15; PAPER 3; INK 0;"o"; PAPER
 3; INK 6;"▙"
9630 PRINT AT 8,14; PAPER 3;"
"
9640 PRINT AT 10,0;"AS A MISSED
SHOT COULD RESULT INTHE LOSS OF
STROKES"
9650 PRINT AT 13,0;"NOTES""1:A
line will be drawn between  each
 shot until you land on the gree
n"
9660 PRINT AT 18,0;"2:If you fin
d the hole too smallat first you
 can widen it by    altering the
 No's in line 190"
9670 PRINT  INVERSE 1;)0;" PRESS
 ANY KEY TO CONTINUE      "
9680 PAUSE 0
9690 CLS
9695 RETURN
9699 REM ** set up variables **
9700 LET k=0: LET u=0: LET o=0
9710 LET a=0: LET b=0
9720 LET p1=1
9730 LET z=0
9740 LET p=0: LET l=0
9750 DIM t(18)
9760 DIM i(18)
9770 DIM v(18)
9780 DIM q(11)
9790 DIM w(11)
9800 DIM f(11)
9810 DIM e(2)
9820 RETURN
9899 REM *** set up U.D.G's. ***
9900 FOR j=USR "a" TO USR "h"-1
9910 READ a: POKE j,a: NEXT j
9912 RETURN
9915 REM a=▟
9920 DATA 0,7,15,127,127,127,255
,255
9925 REM b=▙
9930 DATA 0,199,239,255,255,255,
255,255
9935 REM c=▚
9940 DATA 0,224,248,254,254,254,
255,255
9945 REM d=▚
9950 DATA 126,124,120,60,124,124
,62,62
9955 REM e=#
9960 DATA 34,254,34,34,34,254,34
,34
9965 REM f=▛
9970 DATA 0,126,126,126,126,64,6
4,64
9975 REM g=♥
9980 DATA 24,124,126,124,60,24,2
4,52
```

## BBC Sector Mapper
### by Joe Arrowsmith

This program provides a graphical System organises files on a disk: each display of the way the Disk Filing file is depicted as a number of coloured

# PROGRAM FILE

blocks containing an integer. The program could be used as an educational program illustrating disk organisation or as a type of graphical directory.

Line 170 contains the screendump routine for a printer. This should be omitted if you only want a graphic display. Note that sectors 0 and 1 of track 0 are never used for storage as they contain the disk directory.

```
  10 REM ************************************
  20 REM **                                **
  30 REM **   S E C T O R   M A P P E R    **
  40 REM **                                **
  50 REM **       For 40 Track Discs       **
  60 REM **                                **
  70 REM ************************************
  80
  90 MODE1
 100
 110 PROCnumbers
 120 PROCparameters
 130 CALL read
 140 IF cat?7 + &100*(cat?6 AND 3)>400 THEN CLS
     : PRINT"40 Track Discs Only"
     : END
 150 PROCgrid
 160 PROCmap
 170 *SDUMP
 180 END
 190
 200 DEF PROCgrid
 210 col=0
     : GCOL 0,3
 220 MOVE 0,0
     : DRAW 0,1023
     : DRAW 1279,1023
     : DRAW 1279,0
     : DRAW 0,0
 230 VDU 29,0;-20;
 240 FOR X=0 TO40 STEP2
 250 MOVE 100+X*25,100
     : DRAW 100+X*25,500
 260 MOVE 100+X*25,600
     : DRAW 100+X*25,1000
 270 NEXT
 280 FOR X=0 TO10
 290 MOVE 100,X*40+100
     : DRAW 1100,X*40+100
 300 MOVE 100,X*40+600
     : DRAW 1100,X*40+600
 310 NEXT
 320 VDU5
     : FORX=0TO9
 330 MOVE 60,632+X*40
     : PRINT;X;
 340 MOVE 60,132+X*40
     : PRINT;X;
 350 NEXT
 360 FOR X=0 TO39
     : bank%=90
     : IF X<20 bank%=590
 370 MOVE 108+(X MOD20)*50,bank%
     : VDU240+(X DIV10)
 380 MOVE 108+(X MOD20)*50+20,bank%
     : VDU240+(X MOD10)
 390 NEXT
     : VDU4
     : ENDPROC
 400
 410 DEF PROCfill(S%,T%)
     : base%=100
     : IF T%<20 base%=600
 420 GCOL 0,col
```


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# PROGRAM FILE

```
  : VDU 19,2,6;0;
430 x=100+(T% MOD20)*50
  : y=base%+S%*40
440 MOVE x+8,y+8
450 MOVE x+8,y+32
460 PLOT 85,x+42,y+32
470 MOVE x+8,y+8
480 PLOT 85,x+42,y+8
490 GCOL 0,0
  : VDU 5
  : MOVE x+20,y+34
  : VDU fn,4
500 ENDPROC
510
520 DEF PROCdisplay(st%,lg%)
  : col=(col+1)AND3
  : IFcol=0 col=1
530 ln%=(lg%+255)DIV256
540 FOR z=1 TOln%
  : PROCfill((st%+z-1)MOD10,(st%+z-1)/10)
  : NEXT
  : ENDPROC
550
560 DEF PROCnumbers
570 VDU 23,240,0,&E0,&A0,&A0,&A0,&E0,0;
580 VDU 23,241,0,&40,&C0,&40,&40,&E0,0;
590 VDU 23,242,0,&E0,&20,&E0,&80,&E0,0;
600 VDU 23,243,0,&E0,&20,&60,&20,&E0,0;
610 VDU 23,244,0,&A0,&A0,&E0,&20,&20,0;
620 VDU 23,245,0,&E0,&80,&E0,&20,&E0,0;
630 VDU 23,246,0,&E0,&80,&E0,&A0,&E0,0;
640 VDU 23,247,0,&E0,&20,&20,&20,&20,0;
650 VDU 23,248,0,&E0,&A0,&E0,&A0,&E0,0;
660 VDU 23,249,0,&E0,&A0,&E0,&20,&E0,0;
670 ENDPROC
680
690 DEF PROCparameters
700 DIM block 20,cat 255
710 block?0=0
  : REM Drive 0,Track 0,Sector 1
720 block!1=cat
730 block?5=3
  : block?6=&53
  : block?7=0
  : block?8=1
740 block?9=&21
  : block?10=0
750 P%=block+11
  : [       OPT 0
  : .read
760         LDX £block AND255
770         LDY £block DIV256
780         LDA £&7F      \Read Track 0 Sector 1
  :         JMP &FFF1     \Via OSWORD &7F
  : ]
790 ENDPROC
800
810 DEF PROCmap
820 files=cat?5/8
830 FOR n=files TO1 STEP-1
  : sc=8*n
  : fn=240+(files-n+1) MOD 10
840 length=cat?(sc+4)+&100*cat?(sc+5)
  : start=cat?(sc+7)
850 hi=cat?(sc+6)
  : length=length+&10000*(hi AND&30)
860 start=start+&100*(hi AND&3)
870 PROCdisplay(start,length)
  : NEXT
  : VDU29,0;0;
  : ENDPROC
```

# PROGRAM FILE

## Sort At Input

### by Tom Ithell

Sorting is probably the most written-about topic in software literature. Reams and reams have been written about chopping a few extra microseconds off a sort time.

When the data to be sorted is typed at a keyboard, the most obvious and frequently overlooked method is to sort at input. During the pause between pressing RETURN and the next data item, there's usually sufficient time to place the data item in a sorted array. The impressive aspect of this method of sorting is that a sorted output is immediately available after entering the last item.

The routines were written on a TRS-80 Model 1, although little modification is needed to run the routines in any dialect of Basic. Listing one is a sort of numbers into ascending order, listing two is a sort of strings into ascending order, and listings three and four show the changes needed to make the sort in descending order.

```
1 REM LISTING 1
10 REM NUMBER SORT ON INPUT
20 REM (C) T.A.ITHELL 1984
30 REM USEFUL FOR UPTO 200 NUMBERS
40 REM DELETE REM STATEMENTS FOR FASTEST OPERATION
100 CLS
109 REM SPECIFY READINGS
110 INPUT"STATE NUMBER OF ITEMS TO BE SORTED";NR
119 REM DIMENSION ARRAY
120 DIM ARRAY(NR+1)
129 REM INITIALISE ARRAY(0) WITH LARGE DUMMY NUMBER
130 ARRAY(0)=1000000000000000000
139 REM ZERO ARRAY
140 FORZ=1 TO NR+1
150 ARRAY(Z)=0
160 NEXTZ
169 REM NUMBER INPUT LOOP
170 FOR LOOP=1 TO NR
180 PRINTLOOP;:INPUT"STATE NUMBER";V
189 REM CHECK IF INPUT IS LESS THAN DATA ALREADY IN ARRAY
190 FOR CHECK=0 TO LOOP
200 IF V(=ARRAY(CHECK)THEN220
210 NEXT CHECK
218 REM MOVE ALL EXISTING SORTED NUMBERS FORWARD ONE ARRAY
219 REM ELEMENT TO CREATE SPACE FOR NEW NUMBER
220 FOR MOVE = LOOP TO CHECK STEP-1
230 ARRAY(MOVE+1)=ARRAY(MOVE)
240 NEXT MOVE
249 REM PUT NEW NUMBER INTO THE ARRAY
250 ARRAY(CHECK)=V
260 NEXT LOOP
269 REM PRINTOUT THE SORTED NUMBERS
270 FOR PR=0 TO NR-1
280 PRINT ARRAY(PR);" ";
290 NEXT
```

```
1 REM LISTING 2
10 REM STRING SORT ON INPUT
20 REM (C) T.A.ITHELL 1984
30 REM USEFUL FOR UPTO 100 STRING DATA ITEMS
40 REM DELETE REM STATEMENTS FOR FASTEST OPERATION
100 CLEAR2000:CLS
109 REM SPECIFY READINGS
110 INPUT"STATE NUMBER OF STRINGS TO BE SORTED";NR
119 REM DIMENSION ARRAY
120 DIM ARRAY$(NR+1)
129 REM INITIALISE ARRAY$(0) WITH LARGE DUMMY STRING
130 ARRAY$(0)="ZZZZZZZZZZZZZZZZZZZZ"
139 REM ZERO ARRAY
140 FORZ=1 TO NR+1
150 ARRAY$(Z)=""
160 NEXTZ
169 REM STRING INPUT LOOP
170 FOR LOOP=1 TO NR
180 PRINTLOOP;:INPUT"STATE STRING";V$
189 REM CHECK IF INPUT STRING IS LESS THAN DATA ALREADY IN ARRAY
190 FOR CHECK=0 TO LOOP
200 IF V$(=ARRAY$(CHECK)THEN220
210 NEXT CHECK
218 REM MOVE ALL EXISTING SORTED STRINGS FORWARD ONE ARRAY
219 REM ELEMENT TO CREATE SPACE FOR NEW STRING
220 FOR MOVE = LOOP TO CHECK STEP-1
230 ARRAY$(MOVE+1)=ARRAY$(MOVE)
240 NEXT MOVE
249 REM PUT NEW STRING INTO THE ARRAY
250 ARRAY$(CHECK)=V$
260 NEXT LOOP
269 REM PRINTOUT THE SORTED STRINGS
270 FOR PR=0 TO NR-1
280 PRINT ARRAY$(PR)
290 NEXT
```


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# PROGRAM FILE

```
1 REM LISTING 3
10 REM NUMBER SORT ON INPUT (DESCENDING ORDER)
!
DELETE LINES 129 AND 130
!
139 REM ZERO ARRAY
140 FORZ=0 TO NR+1
150 ARRAY(Z)=0
160 NEXTZ
!
189 REM CHECK IF INPUT IS GREATER THAN DATA ALREADY IN ARRAY
190 FOR CHECK=0 TO LOOP
200 IF V=)ARRAY(CHECK)THEN220
210 NEXT CHECK
1 REM LISTING 4
10 REM STRING SORT ON INPUT (DESCENDING ORDER)
!
DELETE LINES 129 AND 130
!
139 REM ZERO ARRAY
140 FORZ=0 TO NR+1
150 ARRAY$(Z)=""
160 NEXTZ
!
189 REM CHECK IF INPUT STRING IS GREATER THAN DATA ALREADY IN AR
RAY
190 FOR CHECK=0 TO LOOP
200 IF V$=)ARRAY$(CHECK)THEN220
210 NEXT CHECK
```

# Commodore 64 Defkeys

## by M Hibbet

With this program it's possible to define each of the eight function keys on the Commodore 64 to any string of text up to 60 characters in length. Its obvious use is to define the most commonly-used Basic commands and statements, such as PRINT, POKE, LIST, RUN, and so on. RETURN may be included at the end of the text so that direct commands will be executed immediately. Sixty characters gives plenty of scope to produce more complicated operations, as a number of statements can be linked together using semicolons.

The text for the keys may be defined in two ways: by a direct command, or as a line in Basic. The method of doing this is as follows:

1) By direct command —
n= text
where n is the function key number 1 to 8. To set function key 3 to the text 'PRINT' you type:
3= PRINT
2) In a Basic line —
REM n= text

In both cases, if RETURN is required at the end of the text, then the last character before the '' should be a shifted R.

When a key has been defined, whenever the key is pressed its associated text is printed from the current cursor position.

To run the program, type it in and then RUN and SYS 49312. If, for any reason, you want to return the function keys to their normal operation, this can be done with SYS 49328.

Once the program has been run and loaded into memory, it's convenient to save it to tape as a machine code file. This is done as follows:
POKE 44,196:POKE 43,0
POKE 46,195:POKE 45,129
SAVE "DEFKEY MC"

It can be loaded back into memory with:
LOAD "DEFKEY MC",1,1

When loaded type:
NEW

The machine code must be loaded before any Basic program which uses it.

```
10 FOR A= 49152 TO 49340
20 READ B
30 POKE A,B
40 NEXT
50 FOR A= 49920 TO 50048
60 READ B
70 POKE A,B
80 NEXT
90 FOR A= 49408 TO 49919
100 POKE A,0
110 NEXT
1000 DATA160,0,185,14,192,153,115,0,200,
192,6,208,245,96,32,20,192
1010 DATA32,65,192,32,43,192,201,33,208,
15,32,65,192,32,43,192,141
1020 DATA72,192,32,73,192,32,65,192,96,1
```

# PROGRAM FILE

```
65,122,141,62,192,165,123,141
1030 DATA63,192,238,62,192,208,3,238,63,
192,173,0,8,96,230,122,208
1040 DATA2,230,123,96,234,169,193,141,15
8,192,173,72,192,56,233,49,141
1050 DATA72,192,162,0,41,3,240,12,162,64
,74,240,7,162,192,106,48
1060 DATA2,162,128,142,157,192,173,72,19
2,201,4,48,3,238,158,192,162
1070 DATA0,32,65,192,32,65,192,32,65,192
,32,43,192,201,210,208,2
1080 DATA169,13,201,93,240,8,32,156,192,
232,224,63,208,232,169,0,32
1090 DATA156,192,96,157,0,193,96,32,0,19
2,120,169,5,141,20,3,169
1100 DATA195,141,21,3,88,96,120,169,49,1
41,20,3,169,234,141,21,3
1110 DATA88,96
1120 DATA6,0,2,4,0,8,165,197,205,4,195,2
08,3,76,114,195,201
1130 DATA3,16,8,169,0,141,4,195,76,114,1
95,201,7,16,244,141,4
1140 DATA195,56,233,3,170,189,0,195,24,1
09,141,2,72,162,0,41,3
1150 DATA240,12,162,64,74,240,7,162,192,
106,48,2,162,128,142,84,195
1160 DATA169,193,141,85,195,104,201,4,48
,3,238,85,195,160,0,185,0
1170 DATA193,201,0,240,24,201,13,240,24,
132,254,174,134,2,41,191,32
1180 DATA19,234,32,182,230,164,254,200,1
92,63,208,225,40,76,49,234,141
1190 DATA119,2,169,1,133,198,40,76,49,23
4
```

## NewBrain Prog-Editor

### by Colin Smith

One of the NewBrain's better features is its editing facilities. However, even good features can be improved, and the following search routine will make program editing even easier.

Load the program on which you wish to work and MERGE the 'Prog-Editor' routine, or *vice versa*, then type GOTO 60000. When the prompt 'FIND?' is displayed, enter anything you wish the program to contain. For example, you may wish to find every occurrence of 'GOSUB 2300' in order to make some amendment; simply type GOSUB 2300 and the program will be listed with every occurrence of that string highlighted.

When working on very long programs, it will be necessary to make a change in line 60030 in order to narrow the range of the search. Line 60030 can be thus amended several times for successive line ranges.

```
60000 REM *** PROG-EDITOR jcds ***
60010 PUT31:?"PROGRAMME EDITOR FOR UP TO 225 LINES":?"AMEND LINE 60030 FOR LONGE
R PROGRAMMES":?:?"PRESS NL TO CONTINUE":GET9
60020 PUT31:CLEAR:FORI=1TO255:CLOSE#I:NEXTI:OPEN#0,4,"255":OPEN#100,0:PUT23,65:P
UT#100,23,65
60030 LIST 1 - 59999:PUT21:GETX,YM:REM *** Line numbers should be changed for ve
ry long programmes
60040 PUT21:GETX,YM
60050 ?#100,"FIND ? ":INPUT#100,F$:IFF$=""GOTO60030
60060 X=1:Y=1:ZZ=1
60070 YT=1:PUT22,1,Y+1:PUT5:LINPUT(*)B$
60080 L2=LEN(B$)
60090 IFL2>40THENYT=YT+INT((L2-40)/39):GOTO60110
60100 GOTO60120
60110 IF L2-40-INT((L2-40)/39)*39>0THENYT=YT+1
60120 IN=INSTR(B$,F$,ZZ):IFIN=0THENPUT22,1,Y+1:?B$:B$="":ZZ=1:GOTO60140
60130 PUT22,1,Y+1:B$=LEFT$(B$,IN-1)+CHR$(ASC(LEFT$(F$,1))+128)+MID$(B$,IN+1):ZZ=
ZZ+1:GOTO60120
60140 X=1:Y=Y+YT:IFY>YMGOTO65000
60150 GOTO60070
60160 GOTO61120
65000 END
```

END


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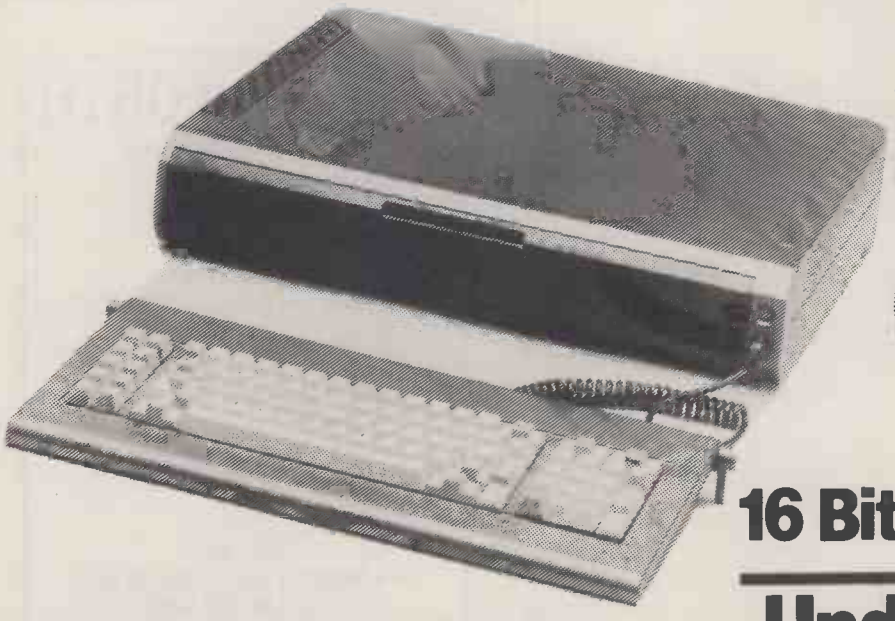

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| | |
|---|---|
| **CPU Type** | True 16-bit 8086 running at 4.77 MHz. |
| **RAM** | 128K or 256K with parity plus 16K video |
| **Languages Included** | Basic |
| **Type of Keyboard** | Full 84 keys tactile |
| **Keyboard Facilities** | 10 programmable keys |
| **Character Set** | 256 in ROM |
| **Method of Display** | TV, RGB, Comp/Sync colour or monochrome monitor |
| **Display Facilities** | Full screen handling, 4 screen paged |
| **Text** | 80 x 25 or 40 x 25 |
| **Graphics Resolution** | 320 x 200 or 640 x 200 |
| **Colours Available** | 16 |
| **Graphics Facilities** | Scroll, reverse image |
| **Cassette Recorder** | Audio |
| **Interfaces Included** | Cassette port, light pen, joystick, Centronics |
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| **Printers** | Any using Centronics parallel interface |
| **Comments** | Hardware and software compatible with IBM PC Upgradeable to Model B Provision for 8087 Arithmetic Processor |
| Warranty | 12 months |

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The standard Benchmarks were run using Advance Basic, which is the equivalent of Microsoft GWBasic and Basica on the IBM PC.

| Machine | BM1 | BM2 | BM3 | BM4 | BM5 | BM6 | BM7 | BM8 | Av. |
|---|---|---|---|---|---|---|---|---|---|
| **Advance 86 — 8086** | 0.8 | 3.3 | 7.3 | 7.4 | 8.1 | 14.6 | 23.9 | 26.0 | 11.4 |
| **ACT Apricot — 8086** | 1.6 | 5.2 | 10.6 | 11.0 | 12.4 | 22.9 | 35.4 | 34.4 | 16.7 |
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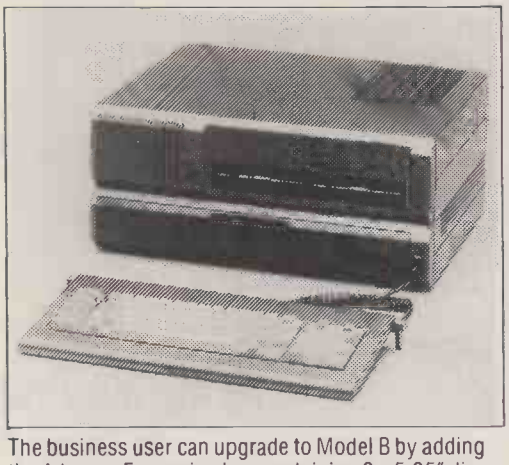

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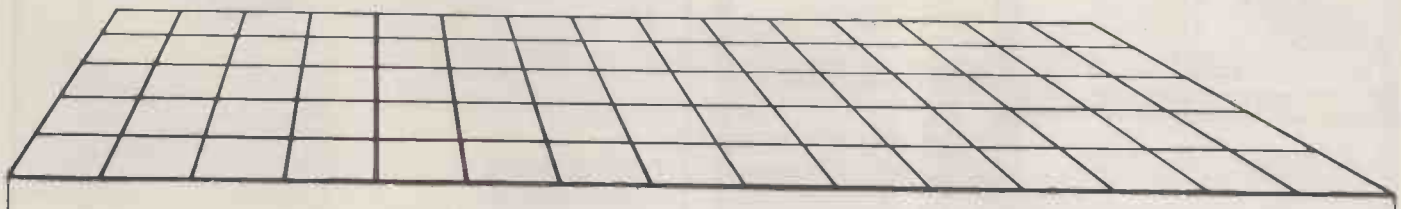

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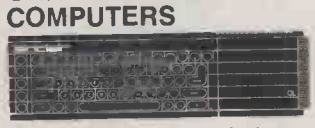

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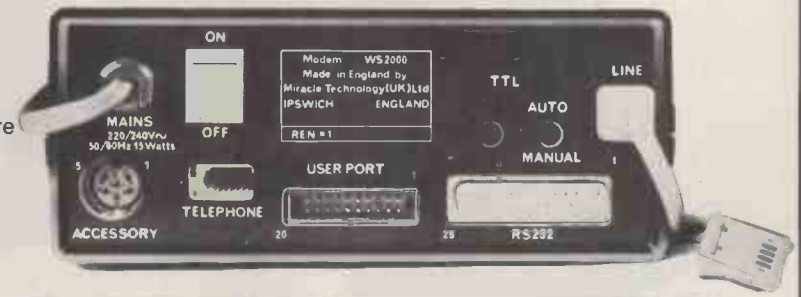


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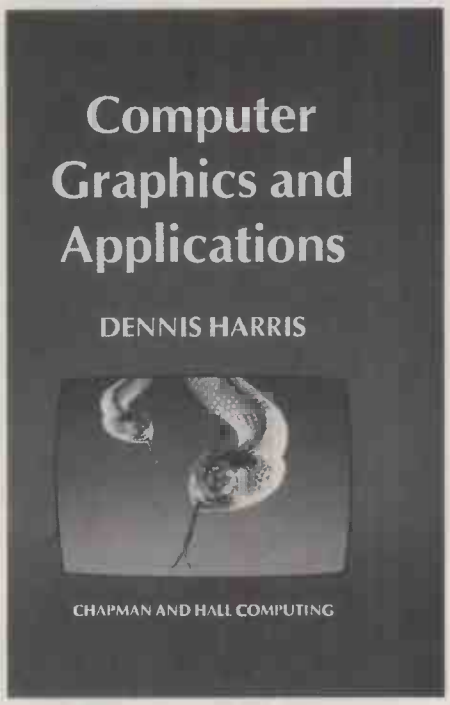


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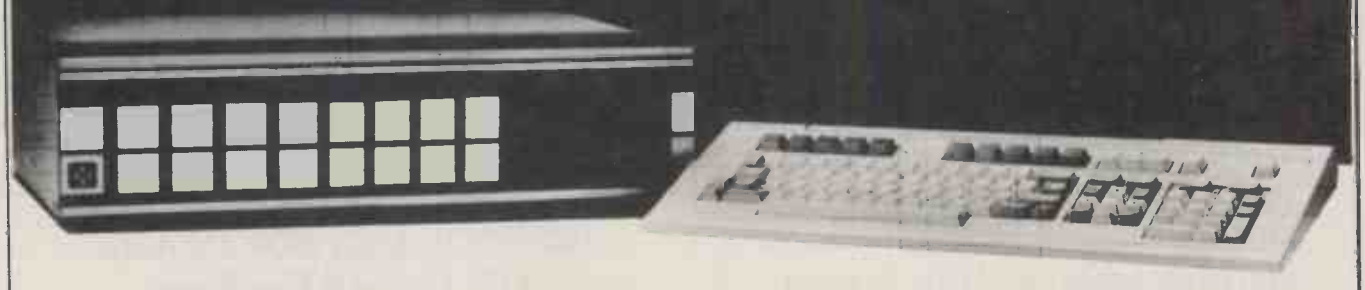

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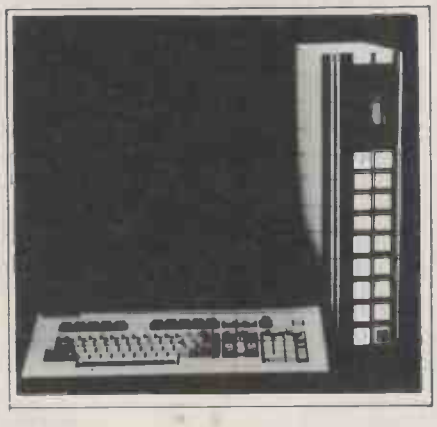

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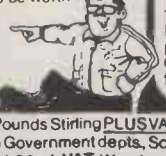

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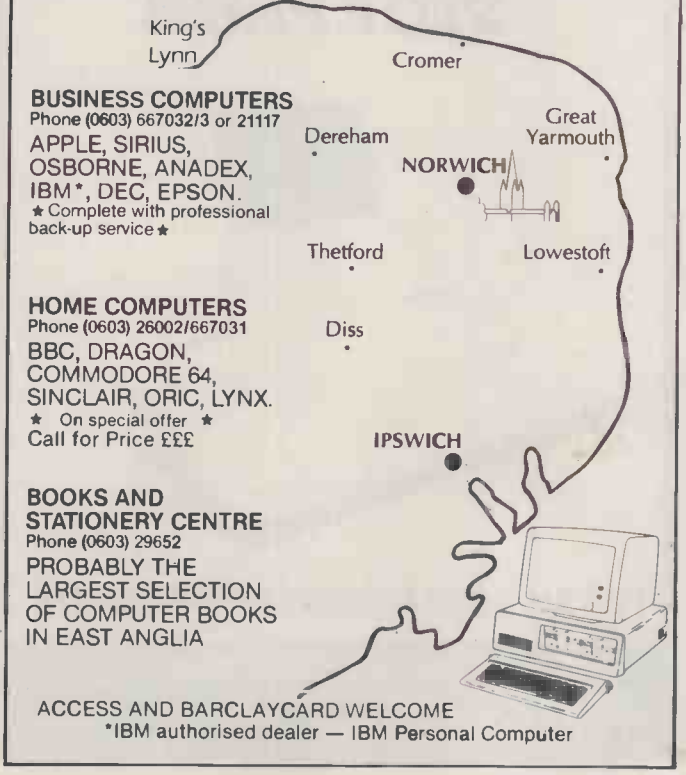


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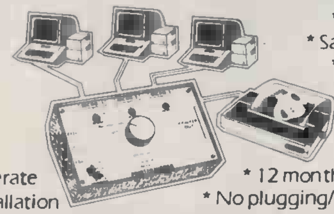

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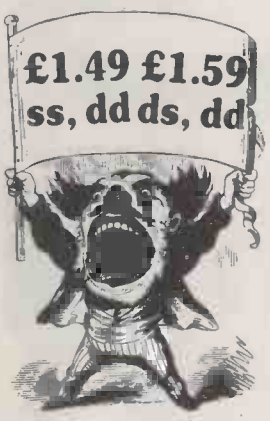


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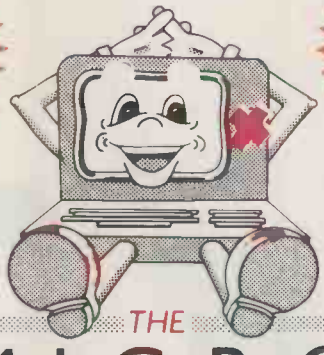

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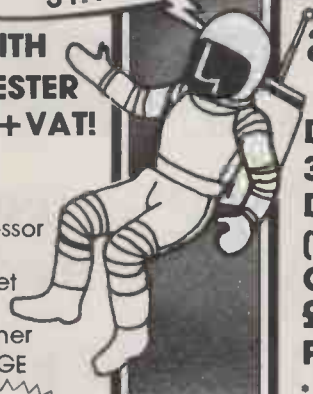

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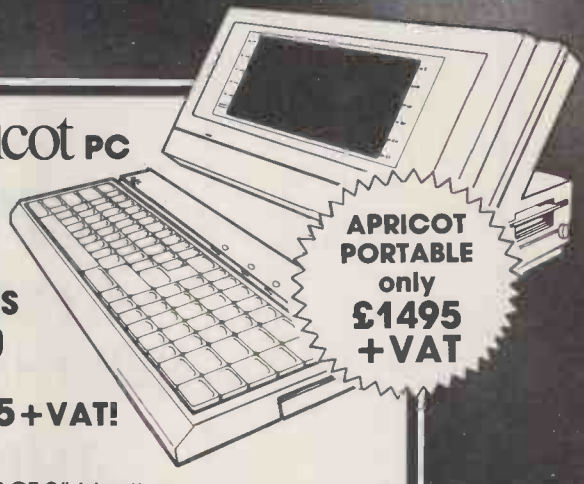

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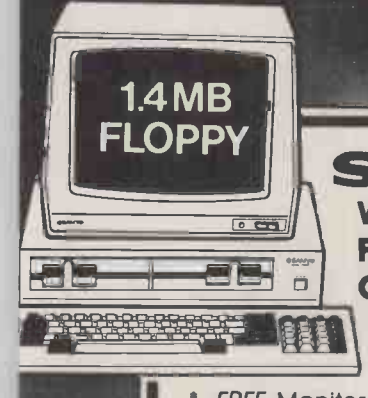


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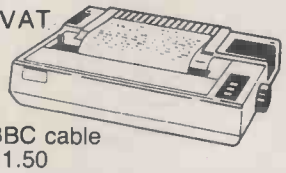

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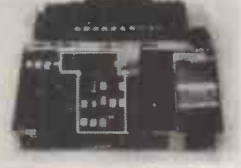

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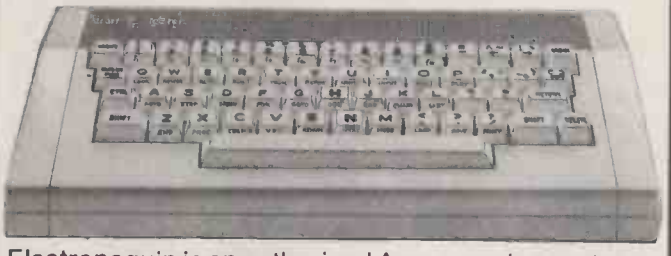

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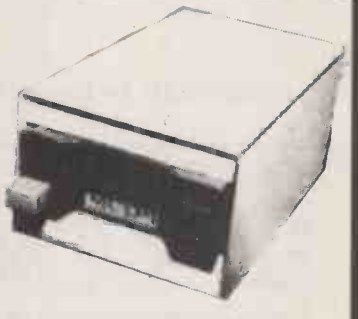

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| Epson MX/FX100 | £8 |
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| Seikosha GP80 | £4.50 |
| Canon PW1080A | £11 |
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| MPS801 | £6.50 |
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| Shinwa CP80 | £6.50 |
| Mannesman Tally MT80 | £6.50 |
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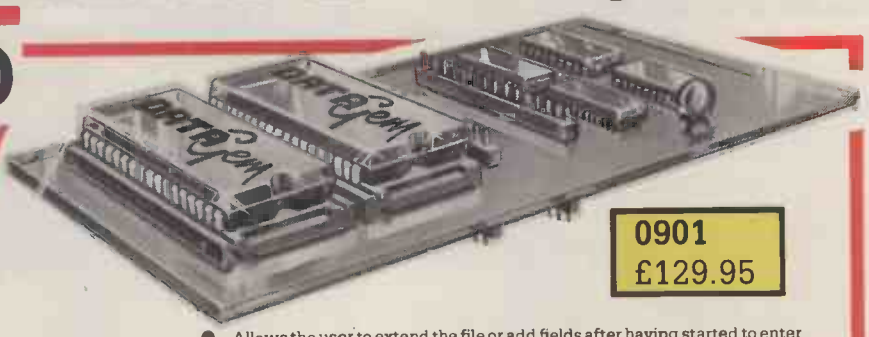


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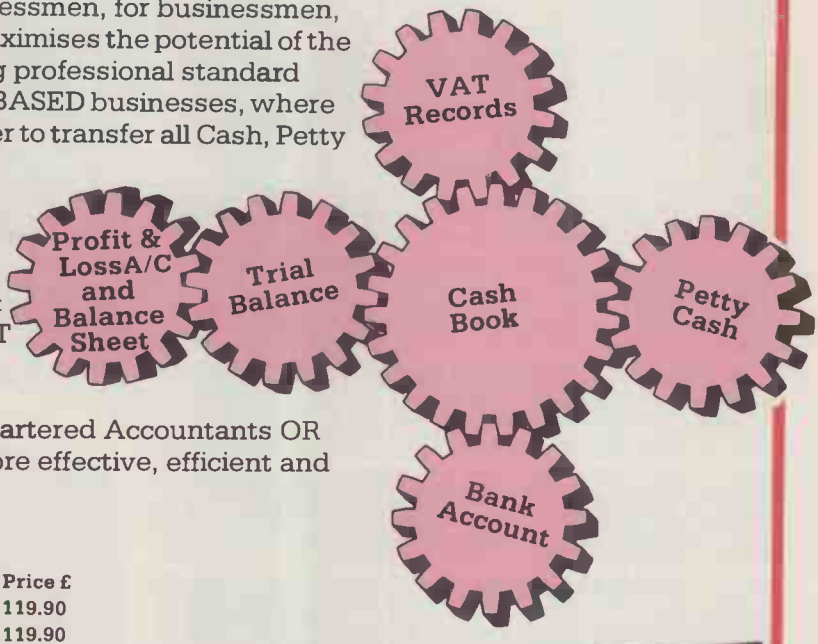


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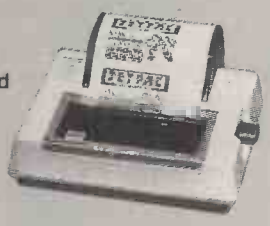

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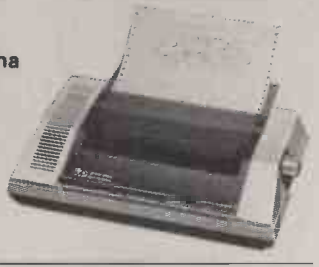

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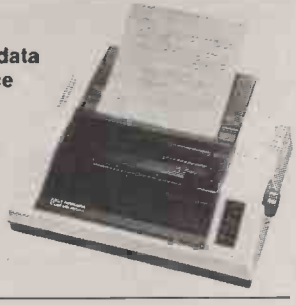

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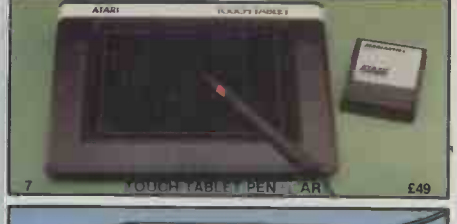
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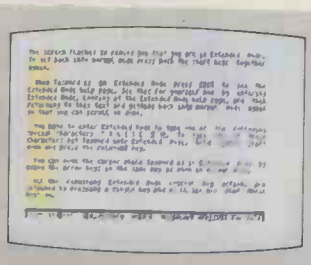

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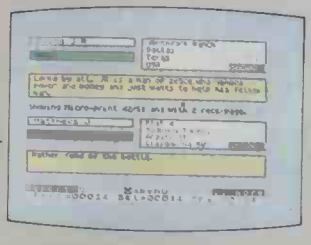

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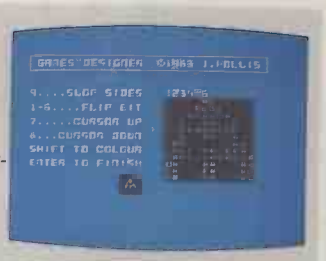

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Now, the complete Microdrive system comes in one package – together with four of the best-ever Spectrum programs, on Microdrive cartridges.

This software alone would normally cost you over £50. Yet the Sinclair price for the complete ZX Spectrum Expansion Pack is just £99.95!

You'll find full details of its contents in the panel opposite.

### ZX Microdrives – another Sinclair first!

The ZX Microdrive is a revolutionary fast access / mass storage device. And it's the only truly affordable alternative to disc drives ...

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### ZX Interface 1 – adds powerful new capabilities to your Spectrum.

ZX Interface 1 connects to the back of your Spectrum and controls up to 8 Microdrives. (Additional Microdrives are available for £49.95 each.)

It also gives you:

- An RS 232 interface – to link your Spectrum with full-size printers, other computers using RS 232 (the industry-standard interface) and provide data transmission over telephone lines, via modems.
- ZX Net – lets you set up a local area network of up to 64 Spectrums, for high-speed data communications between you and Spectrum-owning friends.

### At your local Sinclair stockist – today!

The ZX Spectrum Expansion System adds an exciting new dimension to Spectrum and Spectrum + computing. At £99.95 it's superb value too.

To find out more, call in at your local Sinclair stockist now!

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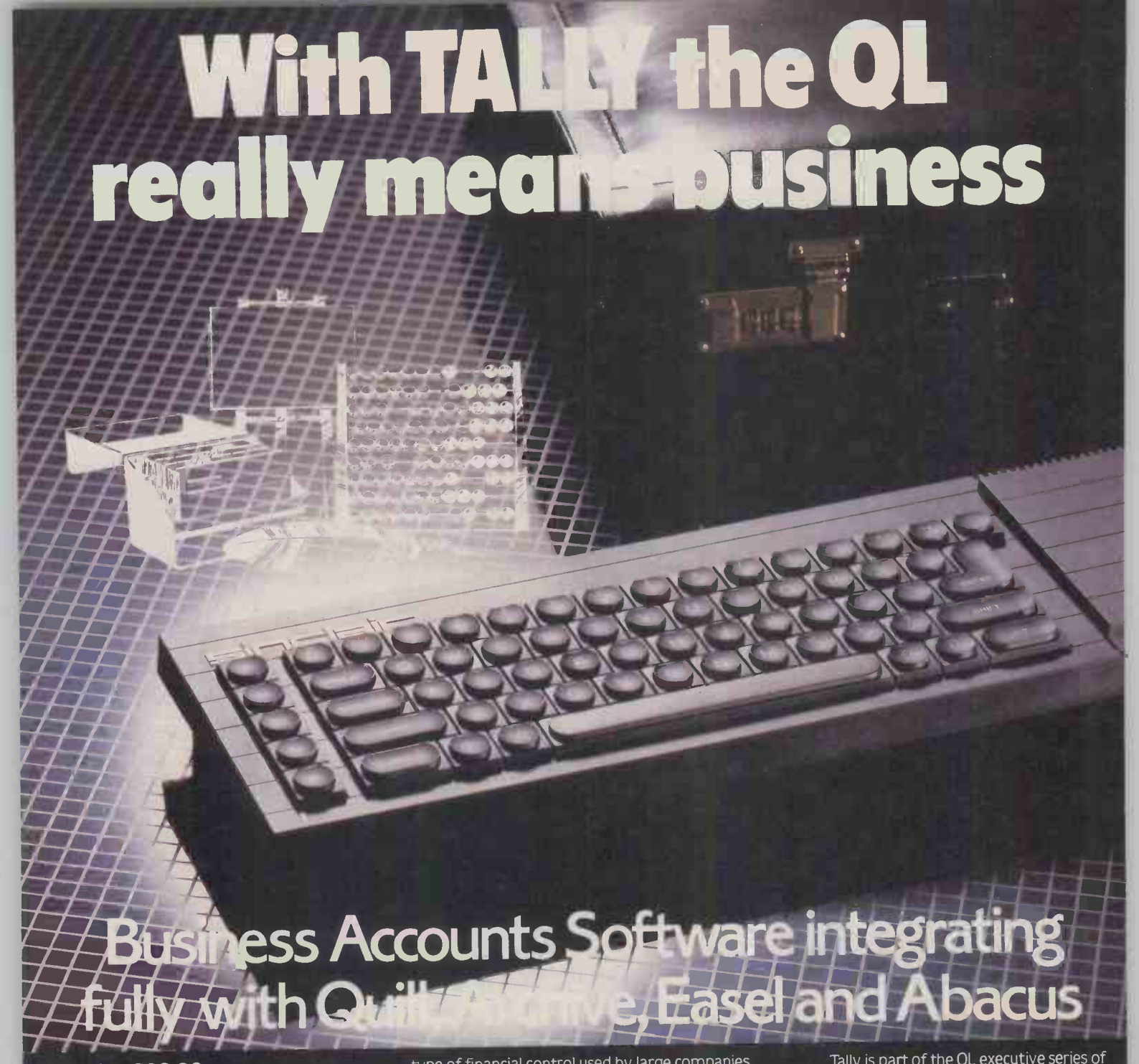

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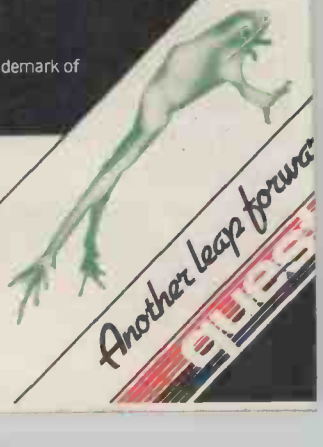

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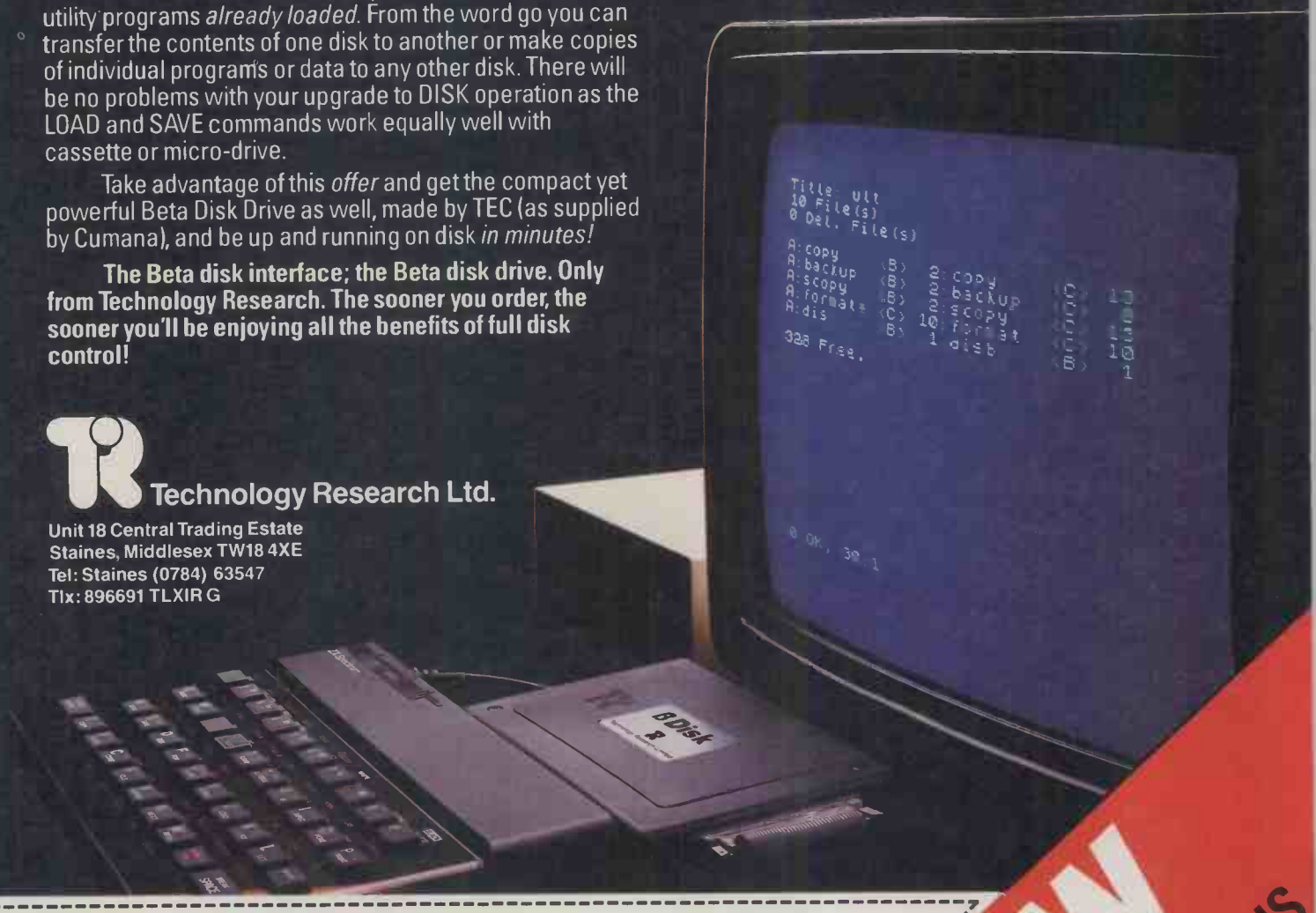



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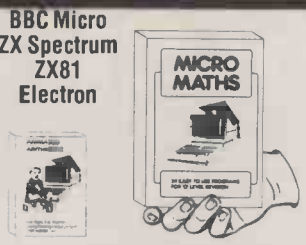


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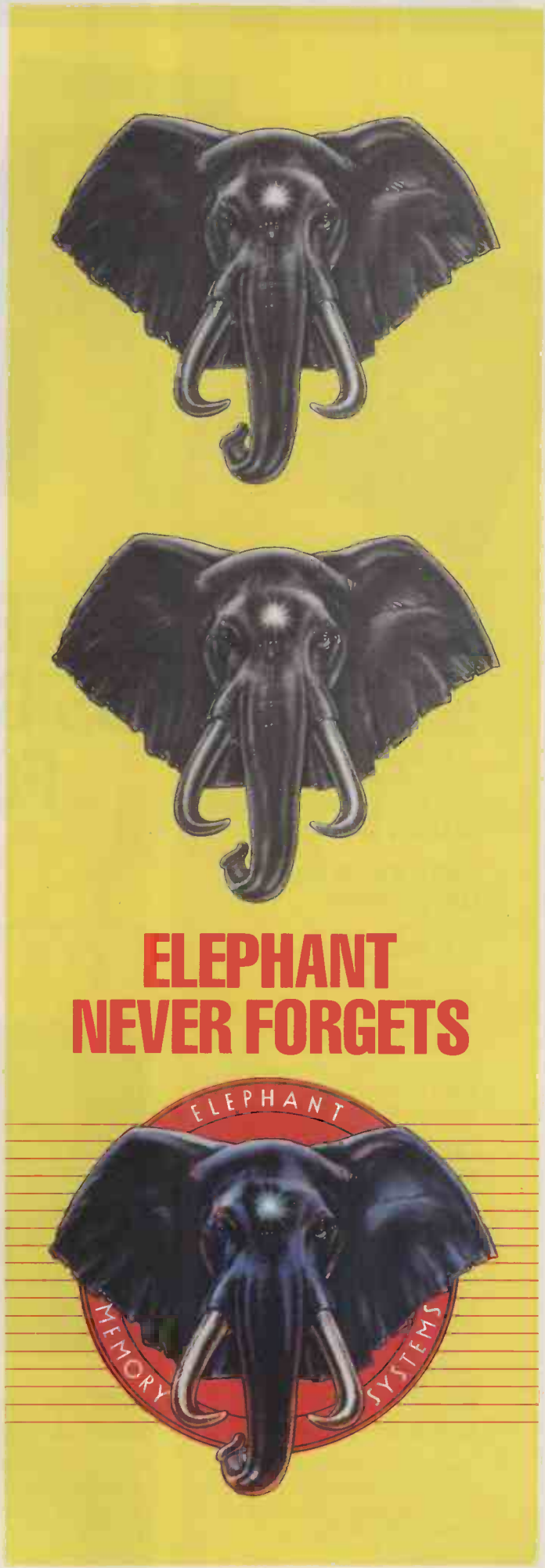

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Very limited Quantities!

Yes-the exciting new world of MSX computing is now here, and with the superb new Goldstar MSX micro, from Spectrum It's at a sensational low price too!

MSX micros are made to a standard specification-but some things do vary and that's where the Goldstar comes out on top. It's POWERFUL-a full 64K of user RAM, 32K of ROM AND a 16K video RAM. The sixteen vivid colours and eight octaves of sound make it a great games player's micro, and a powerful Z-80A processor to take on a world of home office tasks.

But it's the price tag that's really special-just £239.99, a lot less than most of the others. Take a look at the superb Goldstar MSX at your local Spectrum dealer NOW!

- General purpose MSX micro
- Powerful 64K user RAM
- 32K ROM, 16K video RAM
- Hi-resolution colour graphics
- Full typewriter keyboard and cursor controls

SENSATIONAL VALUE

**£239.99**

## New! Canon V20 MSX

A64K MSX micro with 32K ROM and 16K video RAM. All the benifits of standardised MSX software, 8-octave sound and super colour graphics.

SPECTRUM PRICE

**£279.95**

Not all stores carry every advertised item, please phone before making a journey - prices correct at time of going to press E&OE

spectrum CHARGE CARD

## Up to £1000 Instant Credit

- There's up to £1,000 worth of Instant Credit available on a Spectrum Chargecard. See your local SPECTRUM dealer for written details (UK mainland only) Typical APR -29.8%

## Latest News

for up to date news, information & offers from SPECTRUM - see PRESTEL page 600181 for details

# Sensational New Products

## Rotronics Wafadrive
### for the ZX Spectrum

At last - a versatile, flexible twin data drive for the ZX Spectrum! The Wafadrive features twin 128K drives that take the compact wafers (choose from 16K, 64K or 128K sizes) - The dual drive means professional-style ease of use, with easy copying of files or whole wafers. There are no cables to connect - and there's RS232 PLUS Centronics ports to take a host of extra peripherals. For super reliability, the tape has been designed for extra long life and top data integrity. And it's incredible value-for-money!

**Plus! FREE Softeks Special Writer - an excellent word processor program.**

SPECTRUM PRICE

**£129.95**

## Just arriving the super new ZX Spectrum+

Here's the brand new Spectrum micro. The 'Plus' boasts a new, professional typewriter-action keyboard, plus all the Spectrum's top selling features like powerful 48K RAM, 8 colours, 10-octave sound and full compatibility. AND you get a super 80-page User Guide PLUS SIX FREE SOFTWARE PACKAGES - unbeatable value-for-money!

SPECTRUM PRICE

**£179.95**

# Super Value Shado Add-Ons

## Shado
### BBC Compatible Data Recorder

Also suitable for most other Micros.

This neat, stylish data cassette recorder is a terrific value-for- money way to save your program and data from your BBC Acorn or Electron micro. The Shado connects easily, offers reliable and consistent performance and features a Tape Position Indicator for easier data access.

SPECTRUM PRICE

**£32.50**

## Commodore 64
### Compatible Data Recorder

Directly compatible with the Commodore 64 and VIC-20 micros, this excellent data recorder eliminates the problems of using ordinary cassette recorders - at a top value price too!

SPECTRUM PRICE

**£34.97**

## Shado Joysticks for the BBC

SPECTRUM PRICE

Designed as direct replacements for the Acorn originals, these superfast joysticks (connected to the Analogue port) feature much improved hand action with sprung response. L & R are identified by the colour of the fire buttons.

**£16.95 per pair**

## Blank Data Cassettes

| | |
|---|---|
| C12 Standard Data Cassette | £0.50 |
| C15 Standard Data Cassette | £0.58 |
| C15 Computatape Reel to Reel Cassette | £0.75 |

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

## Computer Dealers

or prospective dealers. If you would like to know more about becoming a SPECTRUM APPOINTED DEALER on an exclusive area basis please write to: Bob Cleaver, Spectrum Group PLC, Hunting Gate, Hitchin, Herts SG4 0TJ Tel: (0462) 37171

## More from Spectrum...

# spectrum

## Micro Dealers UK's Top 50

### Britain's No.1 Software Chart

| | | | |
|---|---|---|---|
| Elite | Acornsoft | BBC | £14.95 |
| Beachead | Access | Spectrum | £7.95 |
| Sherlock | Melbourne House | Spectrum | £14.95 |
| Daley Thompson's Decathlon | Ocean | Spectrum | £6.90 |
| NEW Jet Set Willy | Software Projects | CBM 64 | £7.95 |
| Summer Games | Quicksilva | CBM 64 | £14.95 |
| Pitfall II | Activision | CBM 64 | £9.99 |
| Zaxxon | Synsoft | CBM 64 | £9.95 |
| Braxx Bluff | Micromega | Spectrum | £6.95 |
| Havoc | Dynavision | CBM 64 | £9.95 |
| Zim Sala Bim | Melbourne House | CBM 64 | £9.95 |
| Kentilla | Micromega | Spectrum | £6.95 |
| Kokotoni Wilf | Elite | Spectrum | £5.95 |
| Daley Thompson's Decathlon | Ocean | CBM 64 | £7.90 |
| World Cup 64 | Artic | CBM 64 | £6.95 |
| NEW Deuce ex Machina | Automata | Spectrum | £15.00 |
| Hampstead | Melbourne House | Spectrum | £9.95 |
| 3D Grand Prix | Software Invasion | BBC | £9.95 |
| NEW Combat Lynx | Durell | Spectrum | £8.95 |
| Battle for Midway | PSS | Spectrum | £9.99 |
| Mr Robot | Beyond | CBM 64 | £8.95 |
| High Noon | Ocean | CBM 64 | £7.90 |
| Decathlon | Activision | CBM 64 | £9.99 |
| Aztec | Beyond | CBM 64 | £8.95 |
| Ankh | Beyond | CBM 64 | £8.95 |
| NEW Quo Vadis | The Edge | Spectrum | £9.95 |
| Stunt Bike | Ocean | CBM 64 | £6.90 |
| Psytron | Beyond | CBM 64 | £8.95 |
| NEW Flak | Funsoft | CBM 64 | £9.95 |
| Jack & the Beanstalk | Thor | CBM 64 | £6.95 |
| Dark Star | Design Design | CBM 64 | £7.50 |
| Zombi Zombi | Quicksilva | Spectrum | £6.95 |
| NEW Sub Hunter | Micromart | Spectrum | £6.95 |
| NEW Boulder Dash | State Soft | CBM 64 | £8.95 |
| Strangeloop | Virgin | Spectrum | £6.95 |
| The perils of Willy | Software Projects | VIC 20 | £6.95 |
| NEW Nato Commander | Microprose | CBM 64 | £9.95 |
| Falcon Patrol 2 | Virgin | CBM 64 | £7.95 |
| NEW Snookie | Funshot | CBM 64 | £9.95 |
| NEW Halls of the Things | Design Design | CBM 64 | £8.50 |
| NEW Pyjamarama | Micro Gen | Spectrum | £6.95 |
| NEW Pystraxx | The Edge | Spectrum | £7.95 |
| Toy Bazarre | Activision | CBM 64 | £9.99 |
| NEW Sorcerer of Clamorgue Castle | Adventrure International | Spectrum | £9.95 |
| Enduro | Activision | Spectrum | £7.99 |
| NEW Mine Shaft | Durell | BBC/Electron | £6.95 |
| Strontium Dog | Quicksilva | CBM 64 | £7.95 |
| Full Throttle | Micromega | Spectrum | £6.95 |
| Lords of Midnight | Beyond | Spectrum | £9.95 |
| Twin Kingdom Valley | Bug-Byte | Spectrum | £7.95 |

## Sensational value for money!

# Timex 2040

### Thermal Printer for the SPECTRUM 48K

SPECTRUM PRICE **£77.50**

This top-value thermal dot matrix printer is designed especially for use with the Spectrum 48K computer. With a print rate of 80cps on no-ribbon thermal paper and a maintenance-free life, plus 80 dpi graphics capability, the 2040 really is a terrific buy at our low price!

**Includes FREE! Roll of Thermal Paper**

## Super Value!

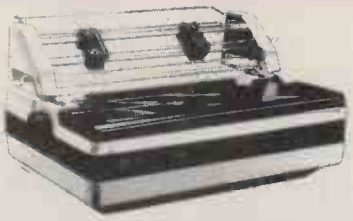
# Juki 6100

### Daisy wheel printer

● Daisywheel printing ● 20cps (av. 18cps Shannon Text) ● 10/12/15 or Proportional character spacing ● Bi-directional friction-feed ● Tractor feed or cut paper ● Centronics as standard; RS232C optional ● 2K byte print buffer

SPECTRUM PRICE **£399**

# Quendata



Just look at this for value - a true daisy-wheel printer offering top quality printing at a remarkably low price. Print speed is 18/20cps, uni- or bi-directional printing (depends on software), variable pitch.

SPECTRUM PRICE **£289.95**

Tractorfeed optional extra

## Other Printer Bargains

| | | | | | |
|---|---|---|---|---|---|
| SEIKOSHA | | GP100VC VIC 20/64 | £199.95 | BROTHER | |
| GP50A | £99.95 | Friction Feed GP100/250X | £28.75 | HR-5 | £159.95 |
| GP50S Spectrum | £99.95 | EPSON | | HR-15 | £458.85 |
| GP500A | £179.95 | FX80 | £503.70 | EP-44 | £249.95 |
| GP550A | £299.00 | RX80T | £286.35 | SMITH CORONA | |
| GP100A MkII | £199.95 | RX80FT | £327.75 | D100 | £286.35 |

**Not all stores carry every advertised item, please phone before making a journey - prices correct at time of going to press E&OE**

spectrum CHARGE CARD

## Up to £1000 Instant Credit

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## Latest News

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# Superb value and Service in
# Business Computers
## from selected Spectrum Stores Nationwide

# Sanyo 550/555

Among the very best value in personal computers is the excellent Sanyo 550/555 Series. They feature high performance, 16-bit CPU that runs on MS/DOS, with a RAM that's expandable up to 256K bytes. The 550 has one 160K byte 5¼" floppy disk drive while the 555 has dual drives for professional flexibility. There's a choice of superb hi-resolution Colour or B&W Monitors too (not included). Both come with a comprehensive package of business software, and a very special free maintenance offer. - Take a look at these superb micros at Spectrum NOW!

**Sanyo 550**
Monitor Extra
SPECTRUM PRICE
**£749**
Excluding VAT.

**Sanyo 555**
Monitor Extra
SPECTRUM PRICE
**£990**
Excluding VAT.

## Plus Free!

### On-site service contract worth £175

**Spectrum give you peace of mind with your new computer! There's a twelve month on-site service contract, worth £175, ABSOLUTELY FREE when you buy either a Sanyo 550/555 computer or an Apricot F1E/F1.**

### Plus Free Business Software.

**Both the Sanyo and Apricot computers come complete with a superb pack of comprehensive business software worth hundreds of pounds. The packs contain virtually everything you're likely to need to get the very best from your computer -from Day one!**
**SEE YOUR NEAREST SPECTRUM BUSINESS COMPUTER STOCKIST FOR DETAILS OF BOTH OFFERS.**

Monitor as illustrated extra

# Apricot
## F1/F1E System

These stylish new personal computers are among the best of the new generation of business micros. Powerful and versatile, the F-1 features a standard 256K OF RAM (expandable to 768K), with a 16-bit 8086 CPU running MS-DOS and Concurrent CP/M. That's backed up by a built-in 3½" floppy disk drive providing 720K on double-sided disks (you can add another floppy or Winchester drive later). The economical F1E has a 128K RAM and a single-sided 360K disk drive -with the same 92-key professional infra-red keyboard on the F1. And don't forget - when you buy from Spectrum you get the assurance of our trained, expert staff to help and advise you!

**F1E**
SPECTRUM PRICE **£970**
**F1**
SPECTRUM PRICE **£1095**
Excluding VAT. Monitor extra.

## Your local Spectrum Business Computer Stockist

Aberystwyth **Aberdata Ltd**
Accrington **P.V.Tubes**
Alfreton **Gordon Harwood**
Bexhill-On Sea **Computerware**
Bognor Regis **Bits & Bytes**
Bromley **Computers Today**
Canterbury **Jones Computers Ltd**
Chelmsford **Maxton Hayman**
Crawley **Gatwick Computer Services**
Darlington **McKenna & Brown**
Epsom **The Micro Workshop**
Exmouth **Open Channel**
Guernsey **Gruts**
Hull **Computer Centre**
Ipswich **Brainwave Micros Ltd**
Kidderminster **Central Computers**
London NW11 **Computers Inc.**
London **Devron**
London SE1 **Vic Odden**
London SE9 **Square Deal**
London N14 **Logic Sales**
Lowestoft **John Wells Limited**
Liverpool **Hargreaves**
Luton **Terry-More Photo**
Morpeth **Telerants (Northern)**
Norwich **Norwich Camera Centre**
Norwich **Fastview**
Nuneaton **Micro City**
Potters Bar **Software Agents Ltd**
Rainham **Microway Computer**
Seven Oaks **Ernest Fielder**
Shrewsbury **Computerama**
Sittingbourne **Computers Plus**
Southampton **L.T.C. Ltd**
St Austell **A B & C Computers**
Stevenage **D.J Computers**
Thetford **Thetford C.B & Micro**
Walsall **New Horizon Computer**
Watford **SRS Microsystems Ltd**
West Bromwich **Bell & Jones**
Whitehaven **P.D.Hendren**
Wigan **Wildings**
Woking **Harpers Computers**
York **York Computer Centre**

See our address page for full addresses and phone Numbers

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## More from Spectrum...

# spectrum

## Spectrum's Top 20 Best Sellers

The pick of the best in micro computing - every month from Britain's No. 1 computer specialists.

| | |
|---|---|
| C15 Standard Data Cassette | £0.58 |
| Commodore 64 Computer | £229.00 |
| Commodore 1541 Single Disc Drive | £229.00 |
| Commodore 1701 Colour Monitor | £230.00 |
| Currah Micro Speech Synthesizer for Spectrum | £29.95 |
| DK Tronics Dual Port Kempston Comp. | £13.00 |
| DK Tronics Spectrum Light Pen | £19.95 |
| DK Tronics Spectrum Keyboard | £45.00 |
| Kempston Centronics I/face (E Promtype) | £55.00 |
| RAM Turbo | £22.95 |
| Rotronics Wafadrive (Floppy Tape) | £129.95 |
| Sanyo CTP 3132 14' CTV | £199.95 |
| Shado BBC Compatable Data Recorder with lead | £32.50 |
| Sinclair ZX Spectrum 48K | £129.95 |
| Spectravideo Quickshot MKII | £11.95 |
| Stonechip Programmable Joystick Interface | £24.95 |
| Supersaver 20/64 Cassette Recorder | £34.95 |
| Timex 2040 Thermal Printer for ZX Spectrum | £77.50 |
| Vixen 16K switchable RAM pack (3,8,11,16K) | £34.95 |
| ZX Microdrive (Floppy Tape Cartridge) | £49.95 |

This list is alphabetical

## New! Microvitec Monitor for the QL

Microvitech's 'Cub' monitor is probably the best monitor you can buy for the new QL computer. This stylish new monitor is designed around a superior medium-resolution/high contrast tube that gives outstanding focus and 'viewability'. Highly efficient electronics give low-power consumption - and, of course, there's a full 12 month Warranty. And the 'Cub' is superbly finished in an attractive, QL-style black casing . . . at a super value Spectrum price.

SPECTRUM PRICE £275

## Super value-for-money Package Deals

(while stocks last!)

**BBC Model B**
with 5 Games & Data Recorder
£399.99

**Commodore 64**
with joystick, C2N, 4 Games program
£249.99

**Commodore MPS801 Printer**
with FREE 2000 sheets paper
£230.00

**Commodore 16**
with Data Recorder, Intro to Basic & Games Software
£139.99

**Commodore SX64**
with MPS801, 3 Business Programs
£799.00

**Atari 800XL**
with 4 Atari Games
£199.99

**Spectrum 48K**
with 6 Program pack
£129.99

**Sinclair Interface 1**
with Microdrive & program cartridges
£199.99

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spectrum CHARGE CARD

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## Latest News

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# There's a Spectrum near you...

## SUSSEX

**BATH** Software Plus, 12 York St Tel: (0225) 61676
**WESTON-S-MARE** K & K Computers, 32 Alfred St Tel: (0934)419324

## BEDFORDSHIRE

**DUNSTABLE** Dormans 7-11 Broad Walk Tel: (0582) 65515
**LEIGHTON BUZZARD** The Computer Ctr at Milton Keynes Music, 17 Bridge St Tel: (0525)376622
**LUTON** Terry-More, 49 George St Tel: (0582) 23391/2

## BERKSHIRE

**BRACKNELL** Computer Centre, 44 The Broadway. Tel: (0344) 427317
**NEW! WINDSOR Gadgets 30 Peascod Str., Tel: (07535) 67211**
**SLOUGH** MU Games and Computers 245 High St. Tel: (0753) 21594

## BUCKINGHAMSHIRE

**BLETCHLEY** Rams Computer Centre, 117 Queensway. Tel: (0908) 647744
**CHESHAM** Reed Photography & Computers, 113 High St. Tel: (0494) 783373

## CAMBRIDGESHIRE

**CAMBRIDGE** K P Computers Ltd. 19/20 Market St. Tel: (0223) 312240 (Open 6 Days)
**HUNTINGDON** T.S.C. Electronics. 3 All Saints Passage, High St. Tel: (0480) 411579
**PETERBOROUGH** Ptrbrgh Communications, 91 Midland Rd. (0733) 41007

## CHANNEL ISLANDS

**GUERNSEY** Gruts, 3-5 The Pollett, St Peter Port. Tel: (0481) 24682
**JERSEY** Audio & Computer Centre. 7 Peter St, St Helier. Tel: (0534) 74000

## CHESHIRE

**ALTRINCHAM** Mr Micro 28 High St. Tel: (061) 941 6213
**NEW! CHESTER Computer Link 21 St Werburgh St Tel: (0244) 316516**
**CREWE** Microman Unit 2, 128 Nantwich Rd. Tel: (0270) 216014
**ELLESMERE PORT** RFR Computers, 1 Pooltown Rd. Whitby. Tel: 051 356 4150
**STOCKPORT** Wildlng Ltd. 1 Little Underbank Tel: (061) 480 3435
**WARRINGTON** Wildings, 111 Bridge St Tel: (0925) 38290
**WIDNES** Computer City, 78 Victoria Road. Tel: (051) 420 3333
**WILMSLOW** Swift of Wilmslow, 4-6 St Annes Parade. Tel: (0625) 526213

## CLEVELAND

**MIDDLESBOROUGH** McKenna & Brown, 206 Linthorpe Rd. Tel: (0642) 222368

## CORNWALL

**ST AUSTELL** A B & C Computers, Duchy House, 6 Lower Aylmer Sq. Tel: (0726) 67337
**TRURO** Truro Micro Ltd, Unit 1, Bridge Ho., New Bridge St. Tel: (0872) 40043

## CUMBRIA

**BARROW-IN-FURNESS** Barrow Computer Centre. 2/4 The Mall. Tel: (0229) 38353
**CARLISLE** The Computer Shop, 56-58 Lowther St. Tel: (0228) 27710
**PENRITH** Penrith Communications, 14 Castlegate. Tel: (0768) 67146 Open Mon-Fri till 8pm
**WHITEHAVEN** P D Hendren 15 King St. Tel: (0946) 2063

## DERBYSHIRE

**ALFRETON** Gordon Harwood 69-71 High St. Tel: (0773) 832078
**CHESTERFIELD** The Computer Centre, 14 Stephenson Place Tel: (0246) 208802
**NEW! NEW MILLS New Mills Micro Centre 388 Market Street, Tel: (0663) 47332**

## DEVON

**EXETER** Seven Counties (Computers) Ltd., 7 Paris Street. Tel: (0392) 211211
**EXMOUTH** Open Channel, 30 The Strand. Tel: (0395) 264408
**PLYMOUTH** Syntax Ltd., 76 Cornwall St. Tel: (0752) 28705
**TIVERTON** Actron Micro Computers, 37 Bampton St. Tel: (0884) 252854

## DORSET

**BOURNEMOUTH** Lansdowne Computer Ctr 1 Lansdowne Crescent. Tel: (0202) 20165
**NEW! DORCHESTER Seven Counties Cptrs. 20 High Street East Tel: (0305) 66022**
**NEW! POOLE Lansdowne Cptr Centre 14 Arndale Centre Tel: (0202) 670901**

## DURHAM

**DARLINGTON** McKenna & Brown, 102 Bondgate. Tel: (0325) 459744

## ESSEX

**BASILDON** Godfrey's 28-32 East Walk, Tel: (0268) 289379
**BASILDON** Godfrey's Computer Centre, 5 Laindon Main Centre Laindon. Tel: (0268) 416747
**NEW! CANVEY ISLAND Tower Radio Ltd. 43 High Str., Tel: (0268) 682211**
**CHELMSFORD** Maxton Hayman Ltd., 5 Broomfield Rd. Tel: (0245) 354595
**COLCHESTER** Brainwave 51 Head St. Tel: (0206) 561513
**GRAYS** H Reynolds. 79 Orsett Rd. Tel: (0375) 5948
**ILFORD** Woolfmans, 76 Ilford Lane. Tel: (01) 478 1307
**SOUTHEND** Computer Centre 332 London Rd. Tel: (0702) 337161

## HAMPSHIRE

**BASINGSTOKE** Fisher's, 2-3 Market Place. Tel: (0256) 22079
**PORTSMOUTH (Waterlooville)** G B Microland, London Rd., (Opp. Co-op) Tel: (0705) 259911
**SOUTHAMPTON** L.T.C. Ltd., 112 East St., Tel: (0703) 333958/24703
**WINCHESTER** Winchester Camera & Computer Centre. 75 Parchment St. Tel: (0962) 53982

## HEREFORD

**HEREFORD** Melgray Hi-Tech Ltd., 53/54 Commercial Str., Tel: (0432) 275737

## HERTFORDSHIRE

**HITCHIN** GK Photographic & Computers, 68A Hermitage Rd., Tel: (0462) 59285
**POTTERS BAR** The Computer Shop, 197 High St. Tel: (0707) 44417
**ST ALBANS (Herts)** Clarks Computer Centre 14-16 Hollywell Hill. Tel: (0727) 52991
**STEVENAGE** D J Computers, 11 Town Square. Tel: (0438) 65501
**WATFORD** SRS Microsystems Ltd., 94 The Parade, High St. Tel: (0923) 26602
**WELWYN GARDEN CITY** D J Computers, 40 Fretherne Rd., Tel (07073) 28435/28444

## HUMBERSIDE

**BEVERLEY** Computing World, 10 Swaby's Yard Dyer Lane. Tel: (0482 881831
**GRIMSBY** R C Johnson Ltd., 22 Friargate, Riverhead Centre. Tel: (0472) 42031
**HULL** The Computer Centre, 26 Anlaby Rd. Tel: (0482) 26297

## ISLE OF MAN

**DOUGLAS** T H Colebourn Ltd., 57-61 Victoria St. Tel: (0624) 3482

## ISLE OF WIGHT

**COWES** Beken & Son. 15 Bath Rd. Tel: (0983) 297181

## KENT

**BECKENHAM** Supa Computers Ltd., 425 Croydon Rd., Tel: (01) 650 3569
**BROADSTAIRS** Video Vision 19/20 Willow Court, St. Peters Park Road Tel: (0843) 63284 (No Early Closing Day)
**BROMLEY** Computers Today 31 Market Square Tel: (01) 290 5652
**CANTERBURY** Ctbury Computer Centre 56/57 Palace St. Tel: (0227) 62101
**DOVER** Kent Photos & Computers, 4 King St. Tel: (0304) 202020
**GRAVESEND** Marshalls Computers & Cameras, 3 Windmill St. Tel: (0474) 65930
**RAINHAM** Microway Computers Ltd., 39 High St. Medway Towns. Tel: (0634) 376702
**SEVENOAKS** Ernest Fielder Computers, Dorset St. Tel: (0732) 456800
**SITTINGBOURNE** Computers Plus, 65 High St. Tel: (0795) 25677
**NEW! TUNBRIDGE WELLS Modata Computers Ltd. 28-30 St Johns Rd. Tel: (0892) 41555**

## LANCASHIRE

**ACCRINGTON** PV Computers, 104 Abbey St. Tel: (0254) 36521/32611
**PRESTON** Wilding's, 49 Fishergate. Tel: (0772) 556250

## LEICESTERSHIRE

**MARKET HARBOROUGH** Harborough Home Computers, 7 Church St. Tel: (0858) 63056

## LONDON

**E6** Percivals, 85 High St. North, East Ham. Tel: (01) 472 8941
**E17** Erol Computers Ltd., 125 High Street Walthamstow Tel: (01) 520 7763
**EC1** Pedro Computer Services Ltd., 47 Clerkenwell Road Tel: (01) 251 8635
**EC2** Devron Computer Centre, 155 Moorgate Tel: (01) 638 3339/1830
**N14** Logic Sales, 19 Broadway, The Bourne, Southgate. Tel: (01) 882 4942
**N20** Castlehurst Ltd. 1291 High Rd. Tel: (01) 446 2280
**NW4** Da Vinci Computer Store, 112 Brent St., Hendon Tel: (01) 202 2272
**NW11** Computers Inc., 86 Golders Green Rd. Tel: (01) 209 0401/0279
**SE1** Vic Odden's 6 London Bridge Walk. Tel: (01) 403 1988
**SE9** Square-Deal, 373-375 Footscray Rd., New Eltham. Tel: (01) 859 1516
**SE15** Castlehurst Ltd., 152 Rye Lane, Peckham. Tel: (01) 639 2205
**SW16** Buffer Micro Shop, 310 Streatham High Rd. Tel: (01) 769 2887
**W1** Computers of Wigmore St., 104 Wigmore St. Tel: (01) 935 2452
**W1** Sonic Foto & Micro Centre, 256 Tottenham Court Rd. Tel: (01) 580 5826
**NEW! W1 Ramsons 4 Edgware Rd., Tel: (01) 724 2373**

## GREATER MANCHESTER

**BOLTON** Wilding Ltd., 23 Deansgate. Tel: (0204) 33512
**MANCHESTER** Lomax Ltd., 11 St Mary's Gate Tel: (061) 832 6167
**OLDHAM** Home & Business Computers Ltd., 54 Yorkshire St. Tel: (061) 6331608
**ROCHDALE** Home & Business Computers, 75 Yorkshire St. Tel: (0706) 344654
**SWINTON** Mr Micro Ltd., 69 Partington Lane. Tel: (061) 728 2282 Late Night Friday
**WIGAN** Wilding Ltd., 11 Mesnes St. Tel: (0942) 44382

## MERSEYSIDE

**BIRKENHEAD** Fairs Cameras & Hi-Fi, Dacre Hill, Rock Ferry. Tel: (051) 645 5000
**HESWALL** Thornguard Computer Systems, 46 Pensby Rd. Tel: (051) 342 7516
**HUYTON** Ian Houghton 5 Huyton Hey Rd. Tel: (051) 489 5785
**LIVERPOOL** Beaver Radio, 20-22 Whitechapel. Tel: (051) 709 9898
**LIVERPOOL (Aintree)** Hargreaves, 31-37 Warbreck Moor. Tel: (051) 525 1782

## MIDDLESEX

**HARROW** Camera Arts, (Micro Computer Division) 42 St Ann's Rd. Tel: (01) 427 5469
**TEDDINGTON** Andrews, Broad St. Tel: (01) 977 4716
**UXBRIDGE** J K L Computers, 7 Windsor St. Tel: (0895) 51815

## NORFOLK

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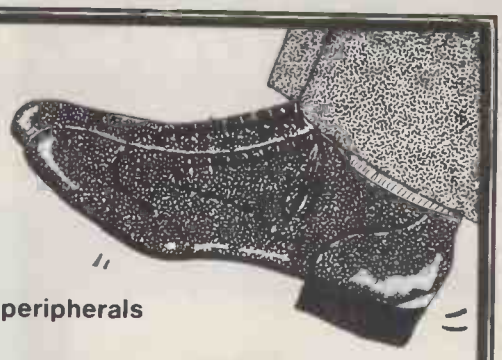

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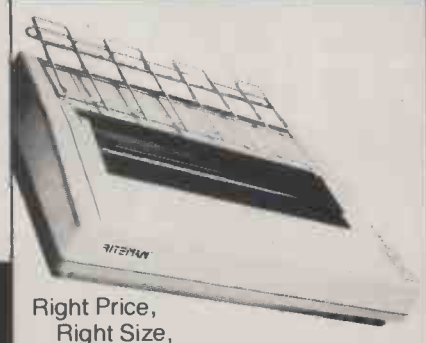

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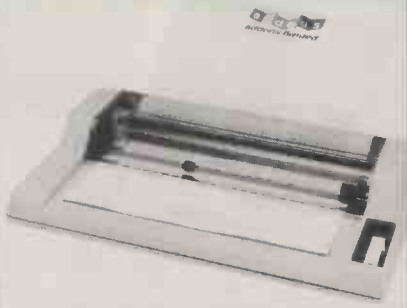

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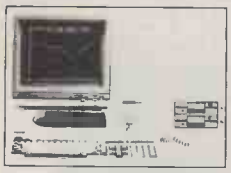

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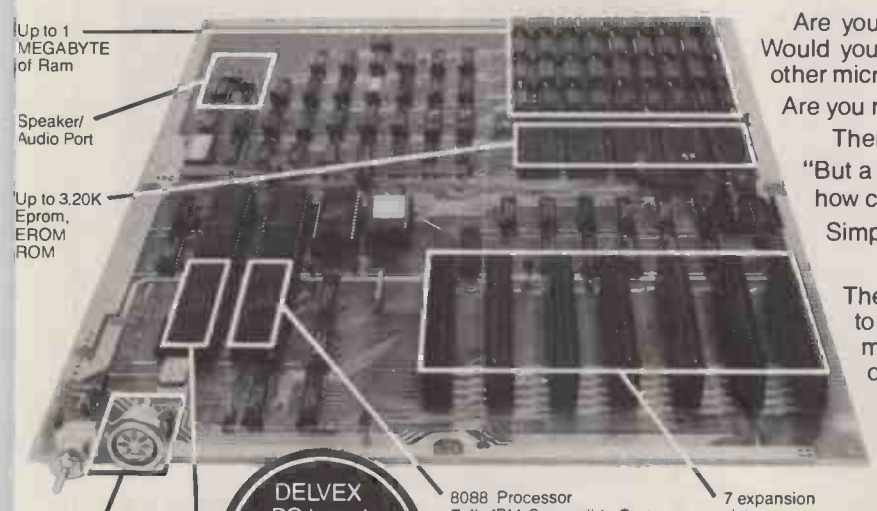


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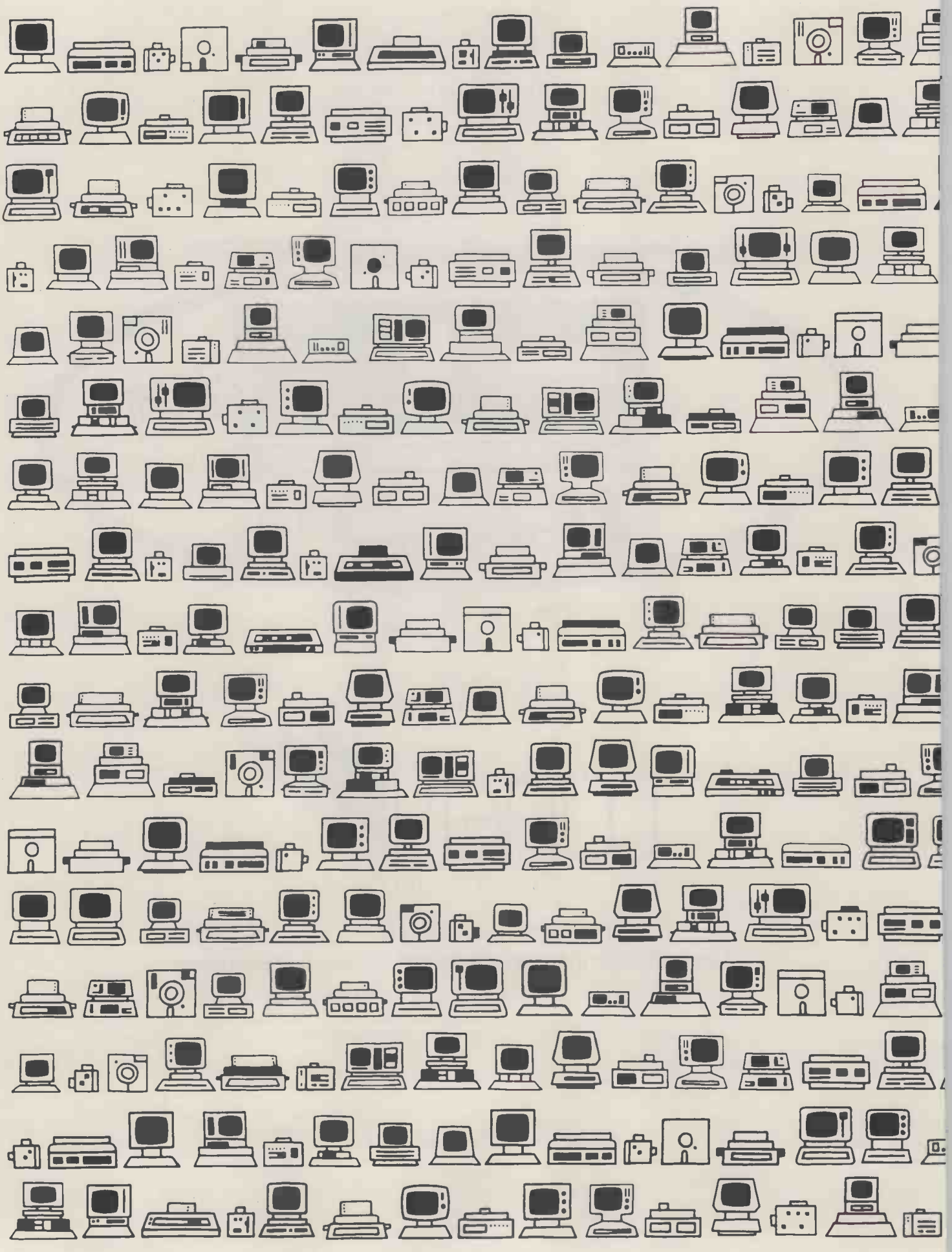

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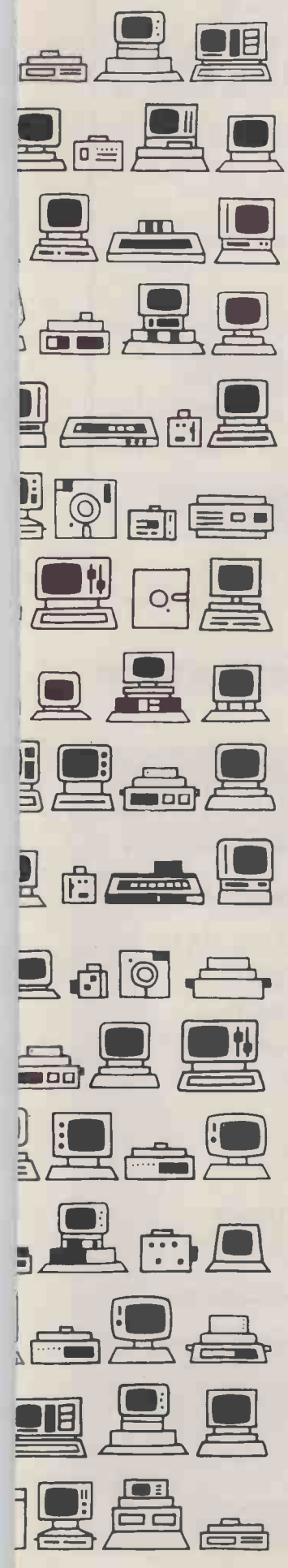

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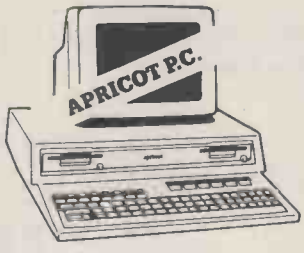


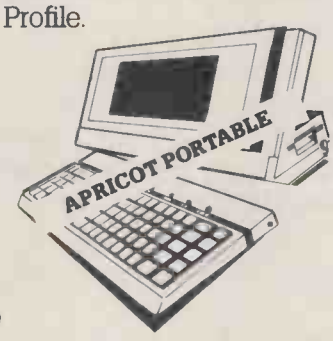

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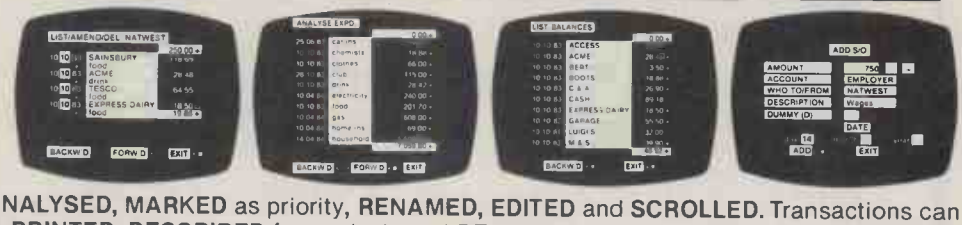


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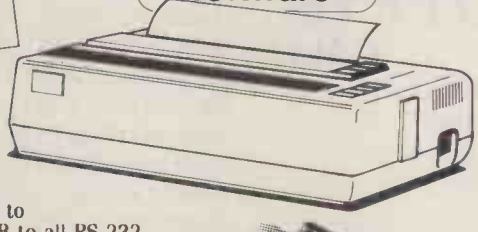

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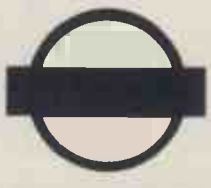

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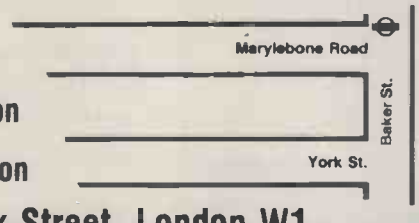


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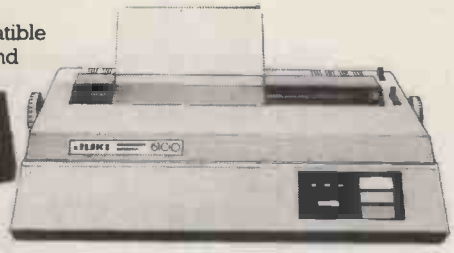

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| Commodore MPS801 50 cps | CALL |
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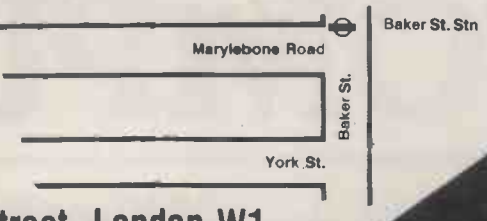


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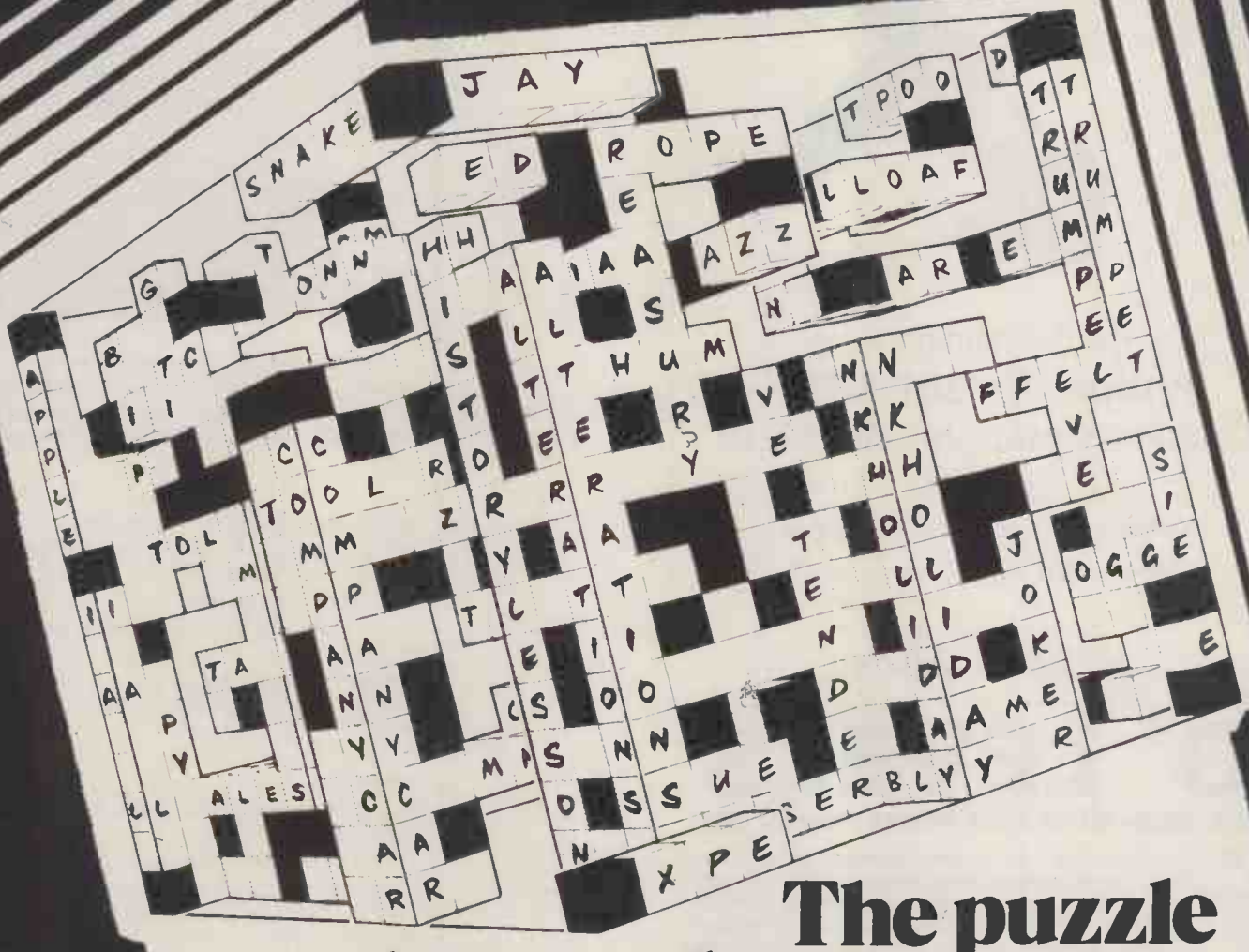


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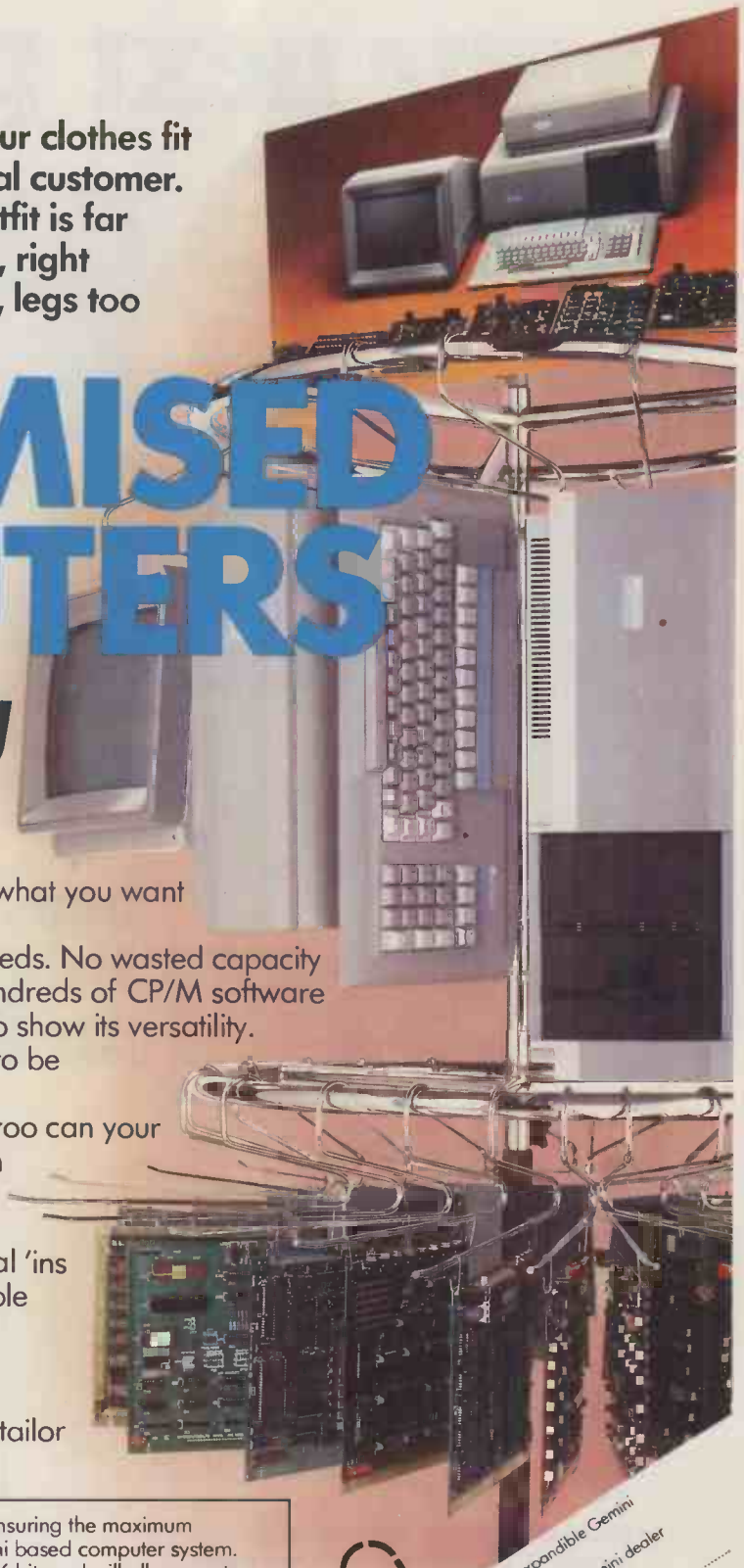

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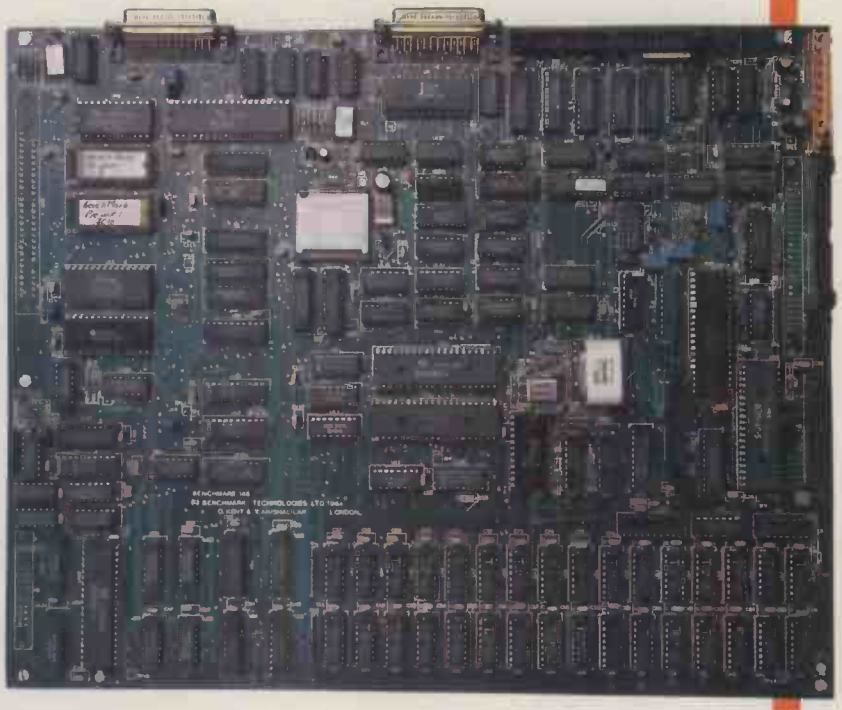

Right now you are probably planning your next product. A workstation. An intelligent terminal. A network file server. Or perhaps an embedded control system.

Whatever your application, benchMark 186 is the computer you need never design.

Because we've done it for you.

It is so resourceful, you are only bound by your imagination. It is blessed with an elegant architecture and abundant computing power. Its superb high resolution graphics and text display are unheard of in this price range. Yet it only costs around £750 in quantity.

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## benchMark 186 single board computer for OEMs

**HARDWARE SPECIFICATIONS**

| | |
|---|---|
| CPU | 80186 6 or 8 MHz |
| EPROM | 32K |
| | RAM128K to 1M on board. |
| VIDEO | 16K separate character buffer |
| | upto 1280 x 800 pixels bit resolution |
| | upto 160 x 60 characters text resolution |
| | upto 16 x 32 bits character resolution |
| | Fully bit mapped graphics. |
| | Soft character set of upto 2000 characters. |
| | Full attributes and soft scroll. |
| | Composite or direct video drive. |
| COMMUNICATIONS | Two full RS232 channels with independent baud rate generation and with loop-in loop-out capability |
| | Asynchronous and synchronous protocols. |
| FLOPPY | Controller for a upto 4 double sided, double density 8,5.25 or 3 5 inch drives. |
| HARD DISC | On board SASI bus and support for 2 hard disc drives. (fixed + removable). |
| KEYBOARD | Parallel or serial keyboard interface. |
| PRINTER | Centronics compatible parallel keyboard interface. |
| REAL-TIME CLOCK | Battery backed clock with time, calendar and alarm functions |
| CMOS RAM | 50 bytes of battery backed RAM |
| IEEE 488 | Full electrical implementation of the IEEE 488 instrument control bus. |
| DMA CHANNELS | 2 floating DMA channels. Most peripherals can be DMA and/or interrupt driven. |
| TIMER COUNTERS | 3 uncommitted timer counters with external trigger and clock inputs. |
| EXPANSION BUS | Fully buffered expansion bus with access to interrupts, DMA channels and TIMERs |
| ADD-ONs | 8087 floating point module (November 84) |
| | Proximity string correlator module (January 85) |
| PCB | CAD/CAM 4 layer PCB (330mm x 280mm). |

**SOFTWARE**

| | |
|---|---|
| MS-DOS 2 11 | Multitasking implementation of MS-DOS operating system. The operating system itself also runs as a task. |
| 'C' COMPILER | Specific support for the Lattice 'C' compiler and tools with benchMark specific libraries |
| bRTX | benchMark multitasking real-time executive. |
| bCD | benchMark concurrent debugger |
| bVT220 | benchMark VT220, VT100, VT52 emulation. |
| bSAS | benchMark signature analysis stimuli. |
| bDEF | benchMark hardware definition libraries |

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The KP810 has a built in roll paper holder. The KP910 will accept extra wide paper (up to 17") – printing 156 char/line normal print.

## VALUE

With all these features you might expect to pay more. But at around **£319** for the KP810 and **£399** for the KP910, these printers give excellent value for money.

All prices ex-VAT and correct at time of going to press.

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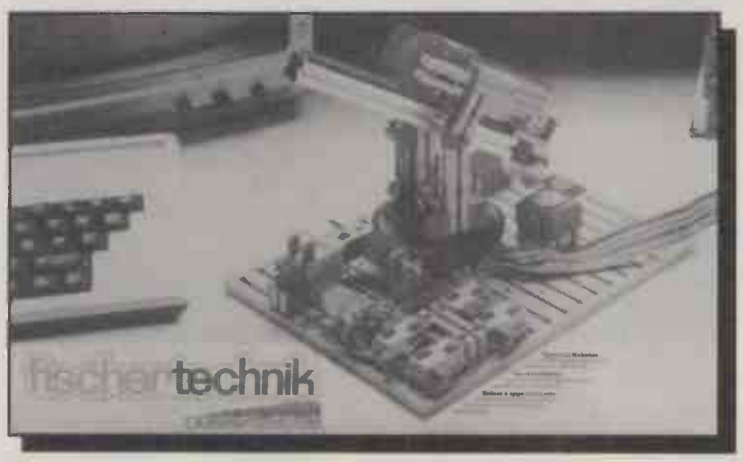


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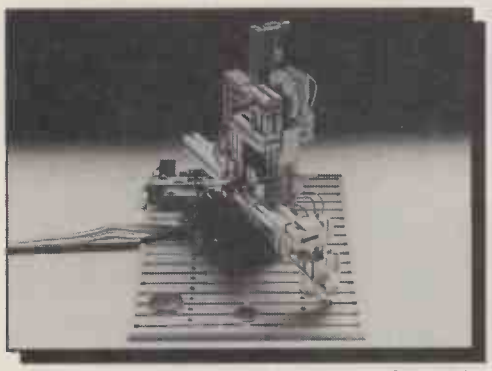
*The Fischertechnik kit contains detailed instructions and all materials, including microswitches, motors, relays and potentiometers required to build any of the 6 robots described. Once built the device can be broken down and made into another. With a little imagination many other exciting projects can be developed with this kit.*

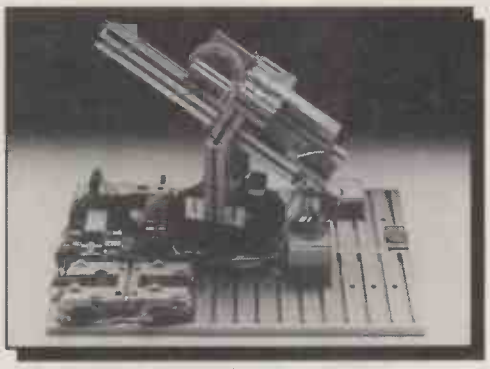
*Micro Robotics System's easy-to-connect interface package, compatible with most popular home and educational computers including BBC, Apple, Spectrum, Commodore and Oric, adds the exciting new dimension of computer control to the Fischertechnik kit. Supporting software and a comprehensive instruction manual together with suggested experiments are included.*

*This unique and flexible package introduces the fundamentals of mechanical engineering, practical software applications and provides an ideal medium for teaching robotic concepts and simple control theory.*

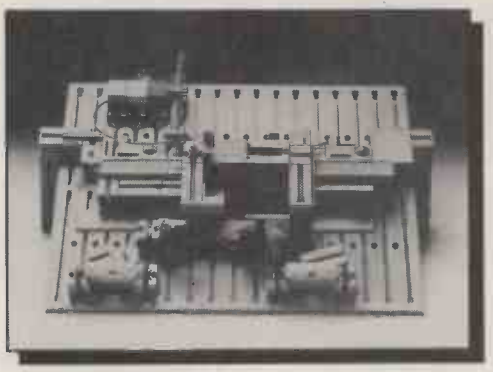
# )L 6 ROBOTS £112



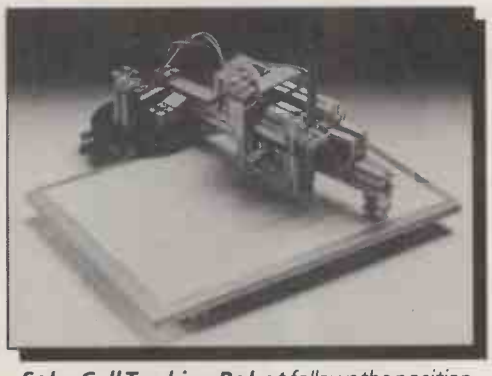
***Robot Tower of Hanoi*** *an adaption of the task set, according to Buddhist tradition, to determine the end of the world.*



***The Teach-In Robot*** *learns movement sequences and repeats them to your command.*

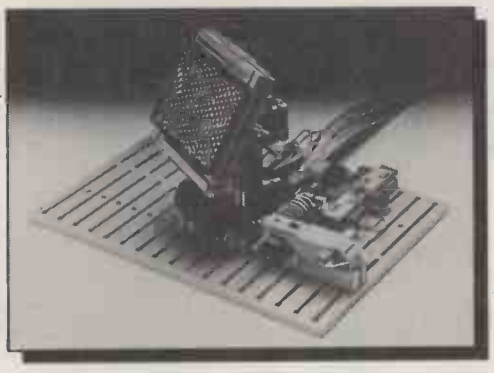


***Robot Sorting System*** *sorts modules according to size.*



***Solar Cell Tracking Robot*** *follows the position of the sun according to light intensity.*

***Robot Plotter*** *draws graphics under computer control.*



***Graphic Panel Input Unit*** *(not illustrated) allows almost unlimited design possibilities to create your own graphics on a TV screen or monitor.*

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PCW 333

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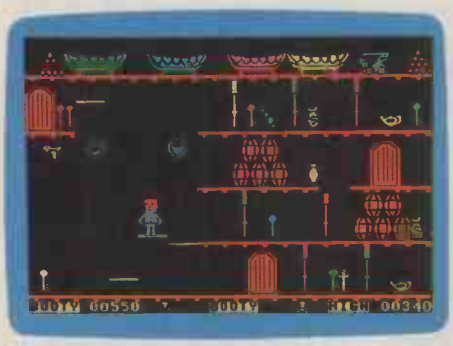

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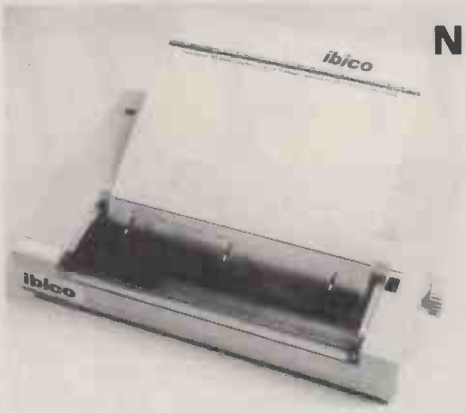


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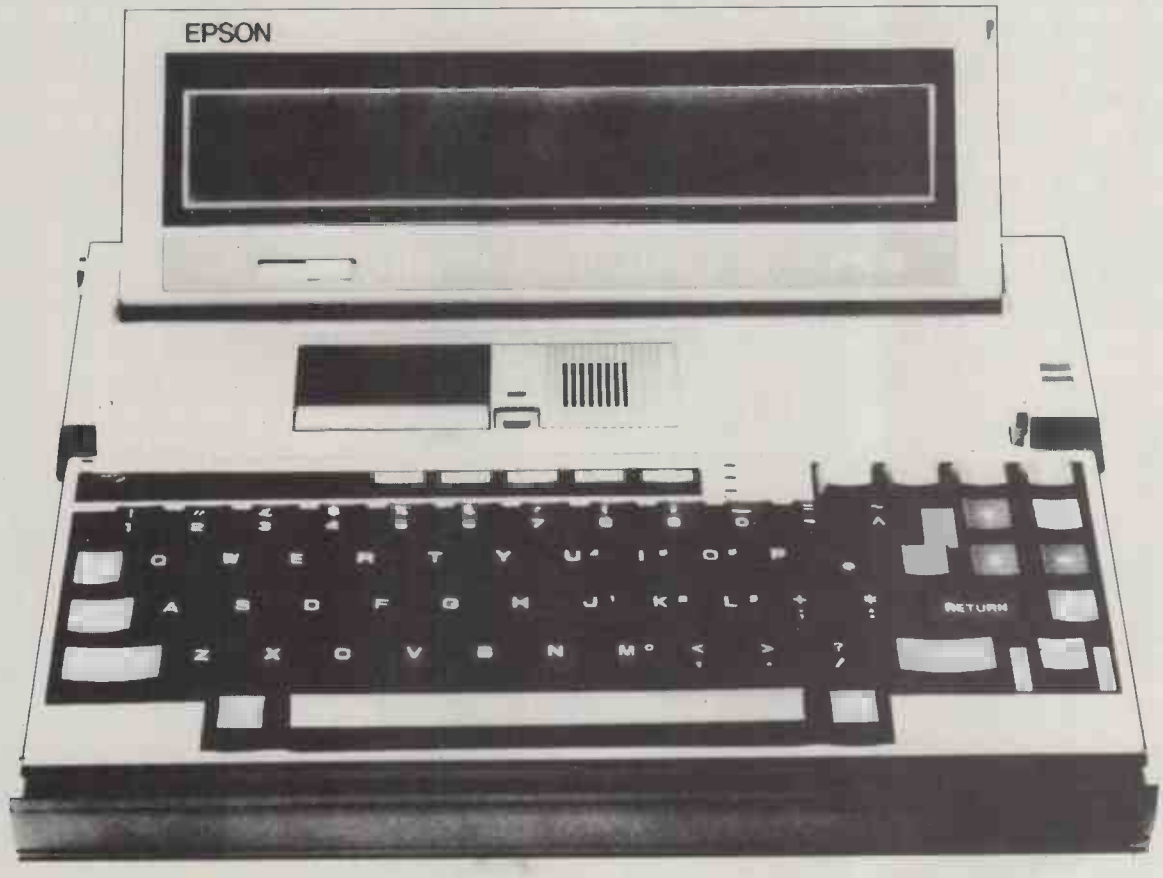


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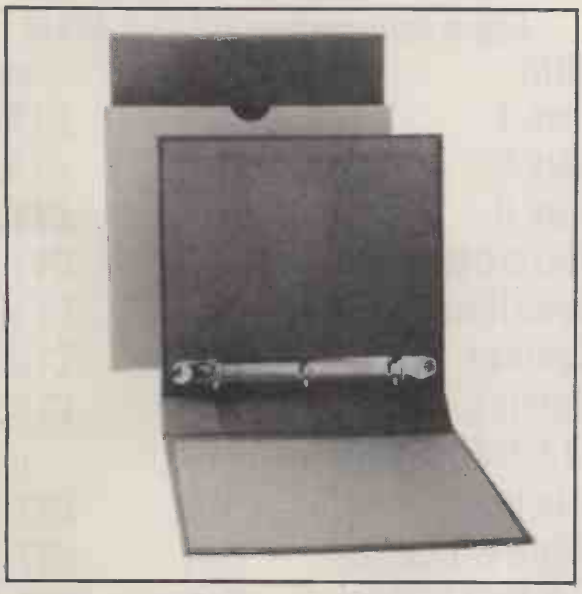

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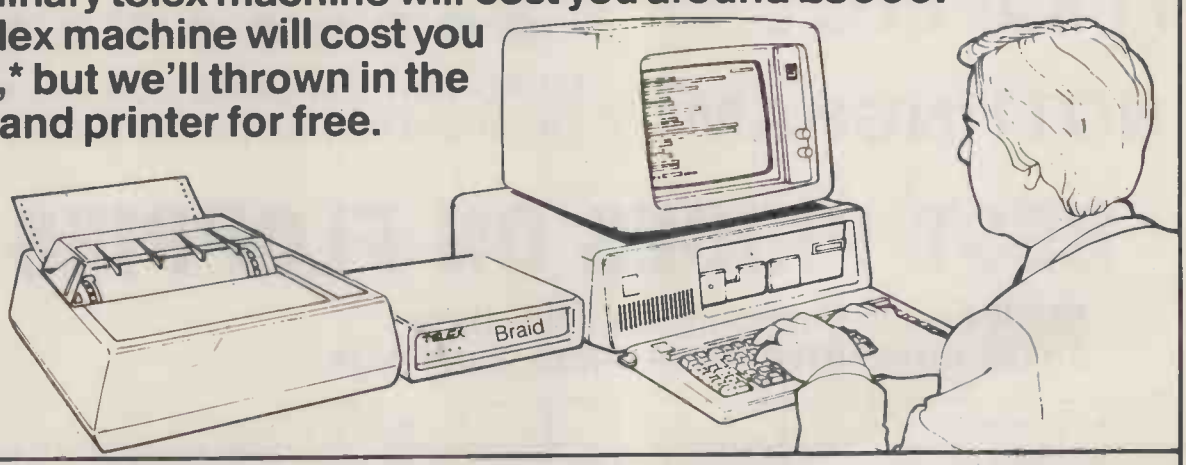


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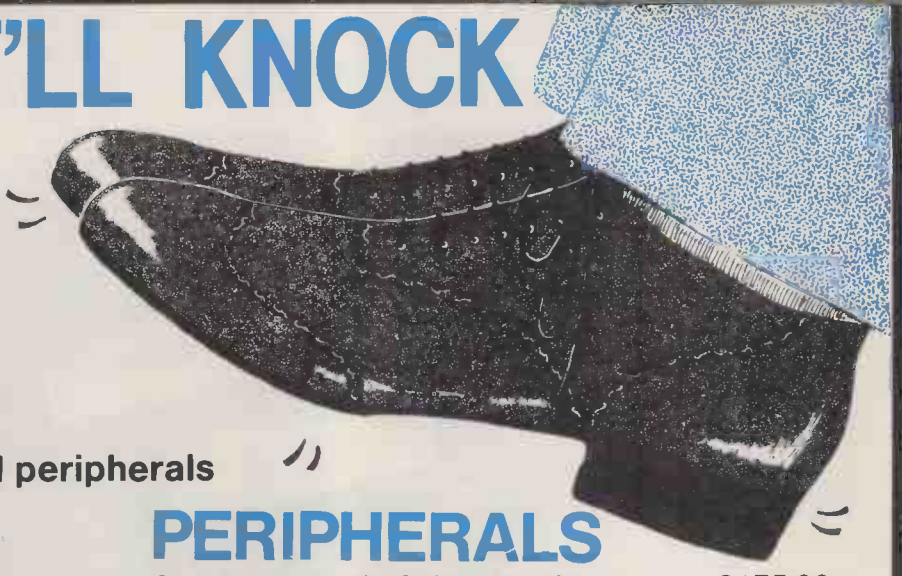

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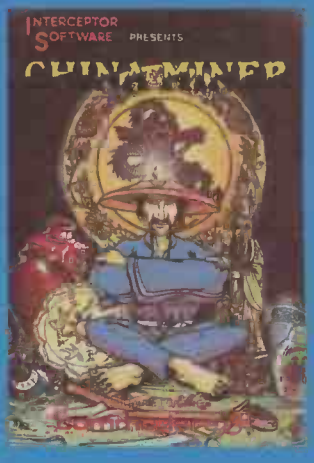


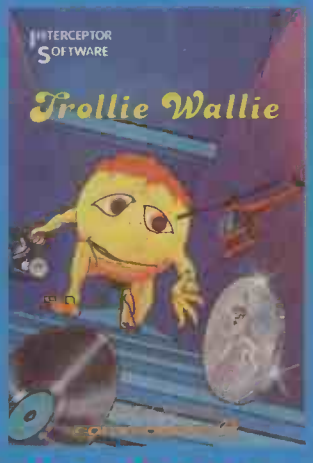

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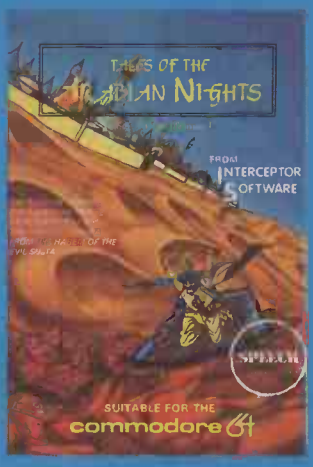


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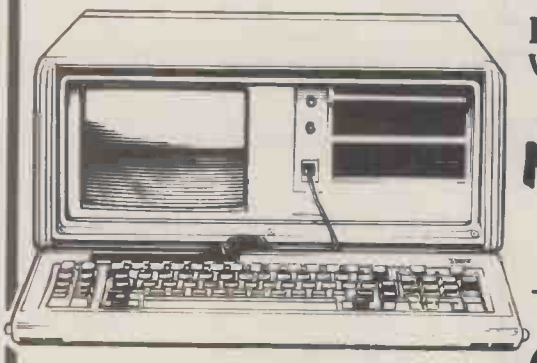

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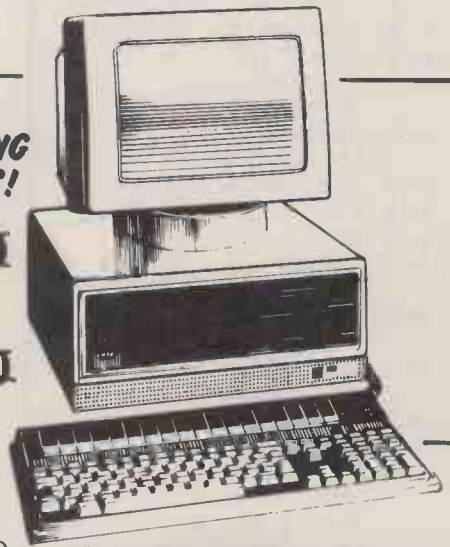

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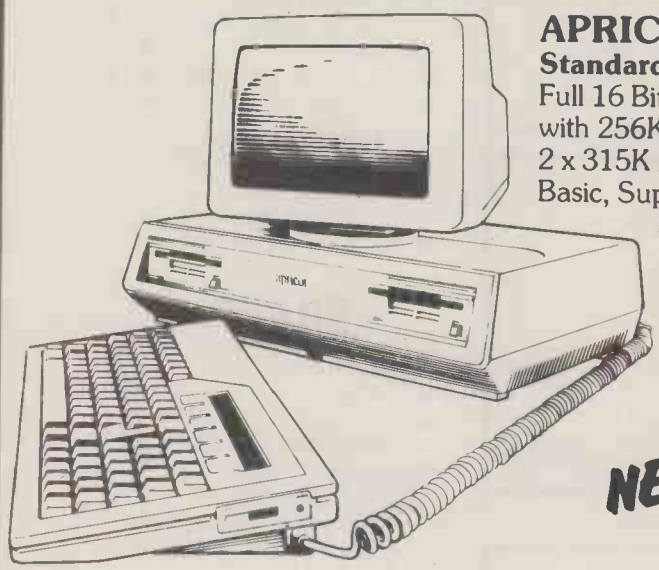

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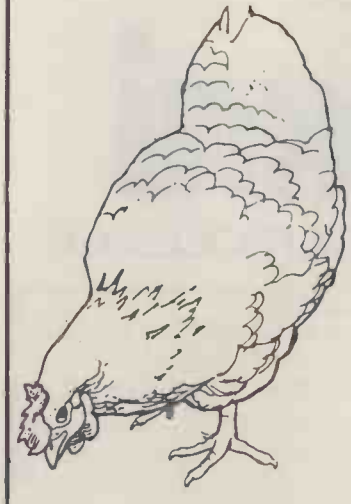

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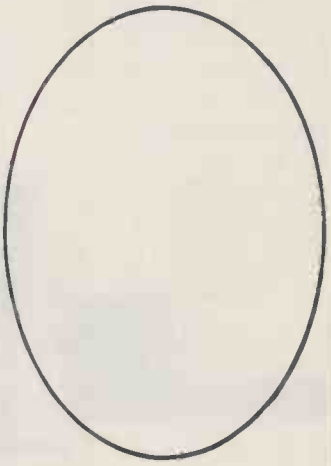

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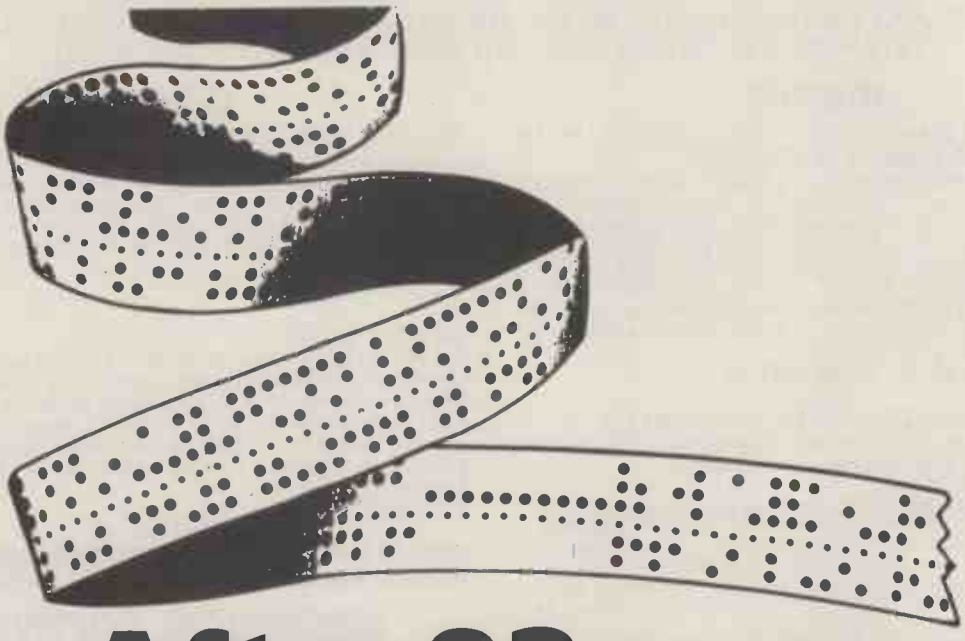

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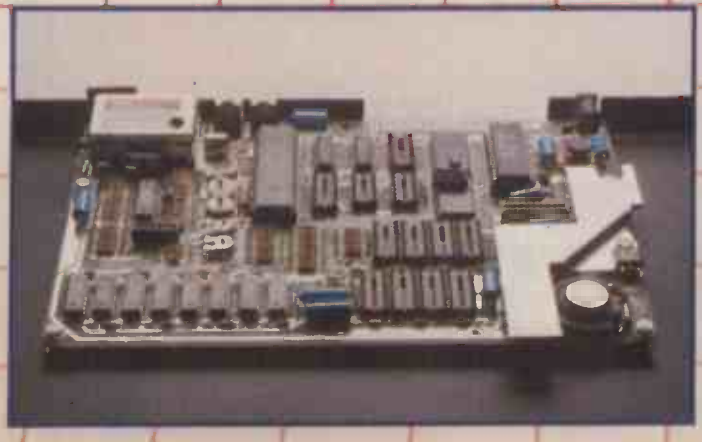

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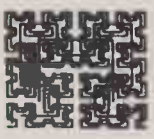

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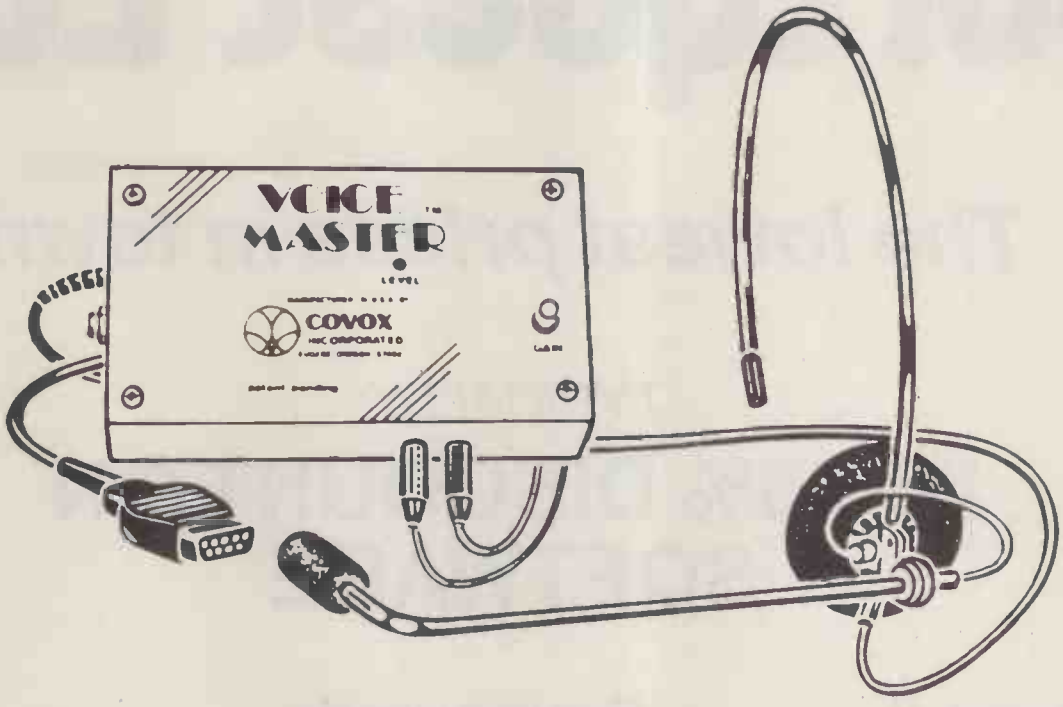


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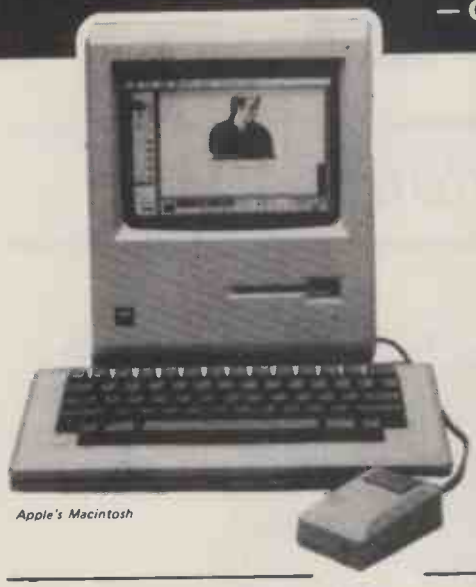

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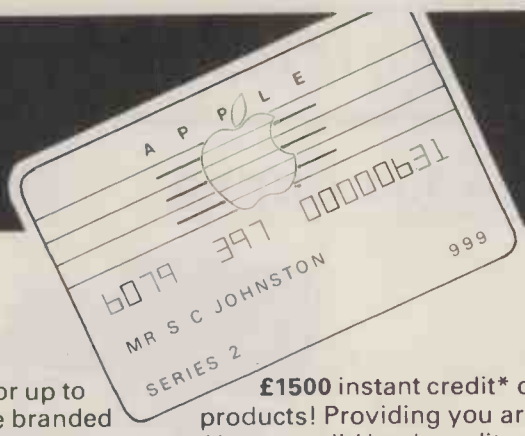


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# CHIP CHAT

**Poors dears**: IBM and British Telecom obviously feel they deserve some sympathy following the decision against their joint networking proposals. The two issued a statement saying that they were 'very disappointed'. Notes of consolation, wreaths, and so on, should be sent to BT, 2-12 Gresham Street, London EC2.

**Bon appetit**: *PCW*'s reporter at the Vidcom trade show in Cannes noticed a particularly interesting dish on the menu at the Palm Beach Restaurant — Déjeuner au grill Commodore. He wasn't tempted.

**Maxwell mania**: spurred on by Fleet Street, ChipChat is proud to announce the results of two recent *PCW* competitions. The prizes may not be as grand as Robert Maxwell's but unfortunately we're not as rich as him. Jennifer Carter of Reading wins an Apple IIc in our Show Catalogue competition, while SG Jacobs' name was the first out of the hat from the replies to our Reader Survey. An Epson PX-8 is on its way to Mr Jacobs in Colchester. Unsurprisingly, nearly 10 per cent of the readers who replied fancied upgrading to an Epson lapheld, but we didn't let that influence our decision on the winner. More surprisingly, nearly one per cent wanted to upgrade to a ZX81. ChipChat hopes their Christmas stockings bulge appropriately.

**Party games**: the Labour Party is now running its own private area on Micronet. Neil Kinnock obviously had problems controlling his enthusiasm when he announced: 'This is an example of the creative use of technology in favour of democracy rather than against, and is therefore in the mainstream of the Labour Party's political objectives' — doubtless a very reassuring attitude as the year of Big Brother draws to a close.

**Beware, patrolling BT vans**: British Telecom has obviously decided that its records need a little updating. We received a call from the Scottish branch wondering if we knew how many micro owners had bought a modem. It's good to know they're keeping in touch with the market.

**Guess who?**: ChipChat's annual quiz is upon you all again, courtesy of our American correspondent David Ahl. There are no prizes, so, on with the questions.

(1) Who used to be in charge of the largest microcomputer manufacturer (some years ago), and is now farming and taking courses in medicine?
(2) Which Hollywood film editor wrote a word processing package with customisation for 72 different hardware configurations?
(3) Which expert blackjack player is now making a living writing computer books?
(4) Who held key positions at Commodore, Apple, and Victor, and is now with NNA?
(5) Who founded or financed Chuck E. Cheese Pizza Time Theater, Sente Software Distribution, Androbot, and one other company?

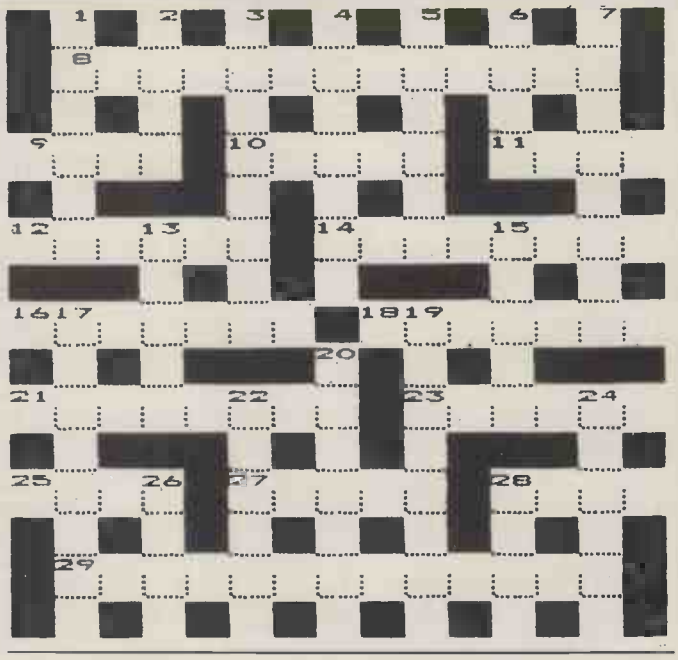
And now the answers:

(1) Ed Roberts — founder and chief executive officer of MITS, maker of the Altair 8800, the first mass-produced microcomputer (1975).
(2) Michael Shrayer — the Electric Pencil package had to be customised for different processors, video boards, and memory sizes.
(3) Ken Uston — he is banned at most casinos throughout the world and turned to computers two years ago.
(4) Chuck Peddle — his brief stint at Apple in 1980 didn't work out; now he has founded NNA (No Name Available, so called because every name he tried to get was already registered).
(5) Nolan Bushnell — after founding Atari and selling out to Warner in 1980, his later ventures haven't fared so well. END

***This month's question comes from the above entrant in the PCW Show's Knobbly Knees contest. What exactly is Tarzan up to now? The wittiest answer — which is fit for publication — will receive a prize of £10.***

***Send your entries on the back of a postcard to ChipChat, PCW, 62 Oxford Street, London W1. Don't forget to include your name and address so we know where to send the money. The closing date is 31 December.***

## PRIZE CROSSWORD



CLUES ACROSS

8 Sweet company's sales figures (5,8)
9 Key in type of channel errors (4)
10 Sound apparatus: arson unlikely (5)
11 f when added to the score (4)
12 Power change puts Conservative in new light (6)
14 Works in entertainment, set shifting (8)
16 Ponder a change: do something with it! (7)
18 Not necessarily an elegant programming aid? (7)
21 Representative of mass Elan distribution (8)
23 Such infringement is both sanctimonious and spicy (6)
25 It's commemorative of zero memory (4)
27 Type style backfires (5)
28 Increase/decrease in waste paper (4)
29 Knight moves in circles via 'L' (5,8)

CLUES DOWN

1 Not like a computer guide (6)
2 Operations interrupted by university work (4)
3 By no means a sign (4,4)
4 Activates the computer — gets excited (5,2)
5 Basically of zero value, being disloyal? (6)
6 Figure where to watch a game (4)
7 Variable row (8)
13 –10 = ? (5)
15 Right lead: wrong make of typewriter! (5)
17 Re-run of what umpire may say to player (8)
19 It gives letters a certain style (8)
20 The human face of automation? (7)
22 Overcome the difficulties of stream output (6)
24 Novice races wildly but jumps successfully (6)
26 Small width in metal type of disk drive (4)
28 Symbol of a TRS (4)

**Cut out or photocopy your entry and submit it to *PCW* by 21 December. You could win £10!**

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**Name**_____

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✂----------

***October winner: Ruth Lambert, London***

**October solutions:**

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* DIABLO is a trade mark of Diablo Systems Inc.
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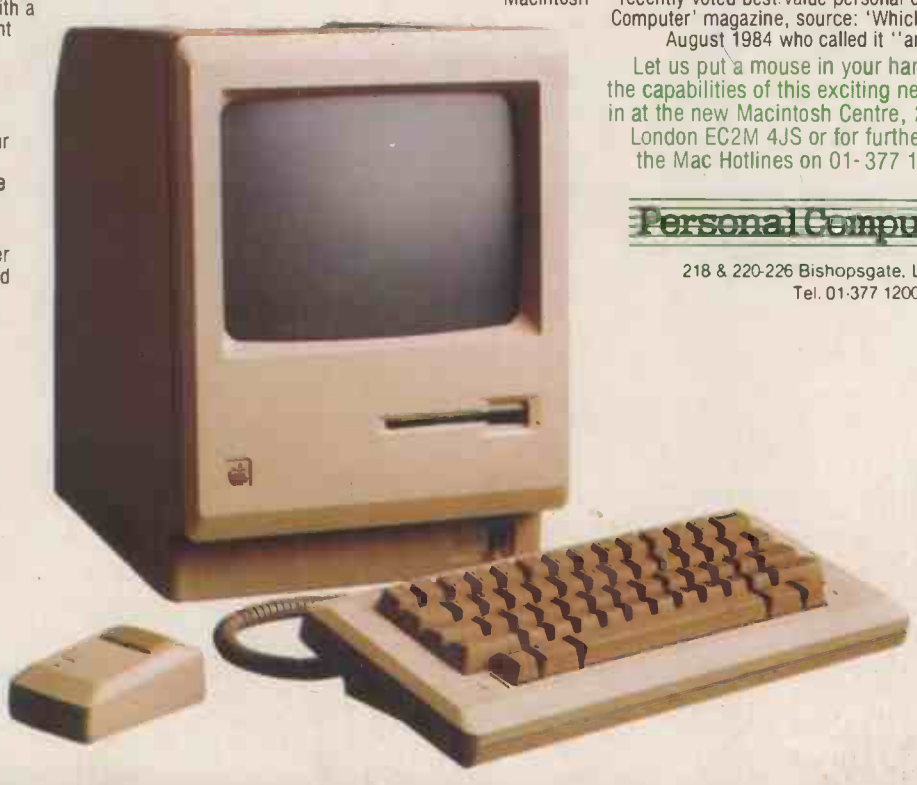

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