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January 1985 95p

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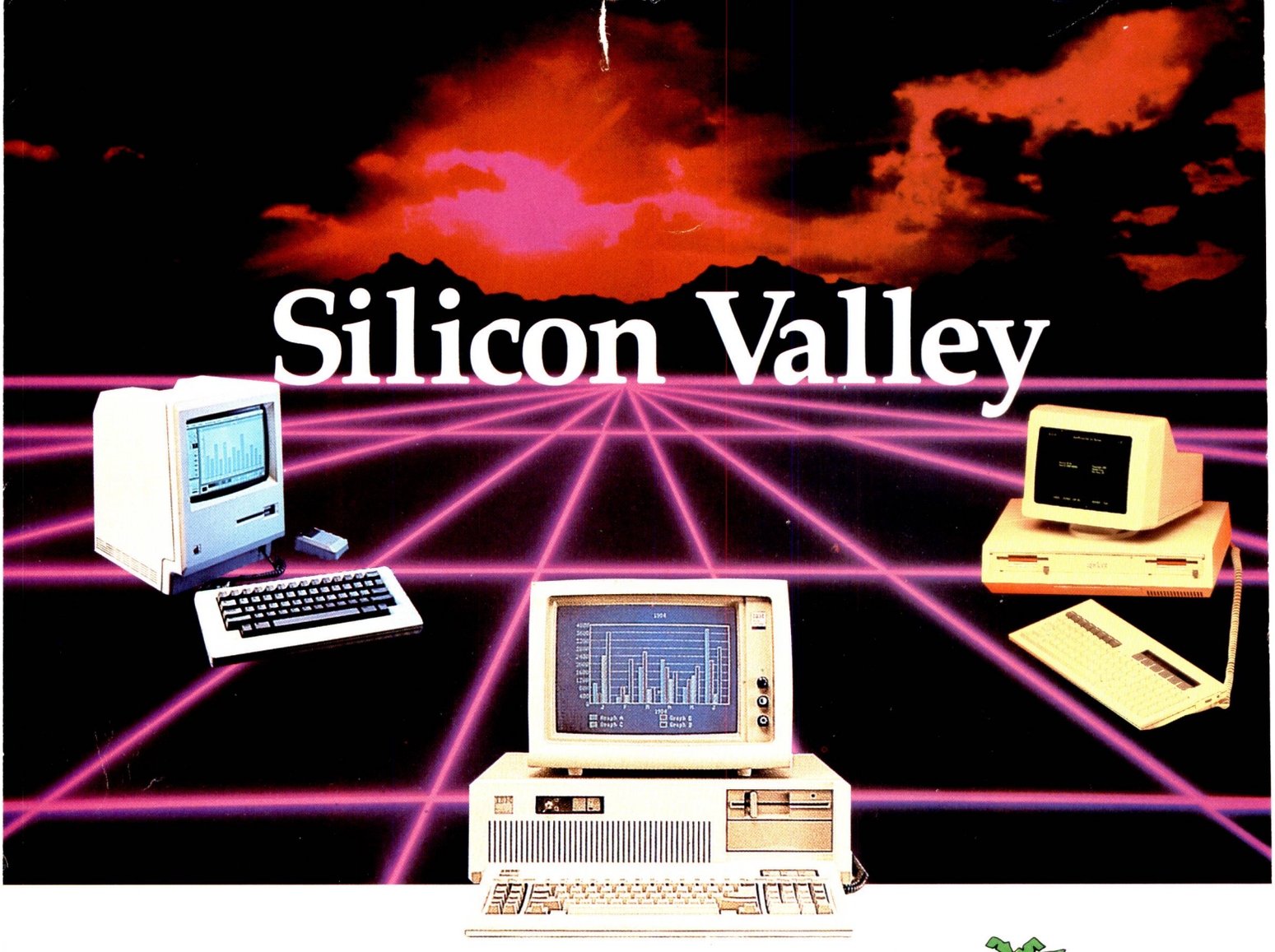


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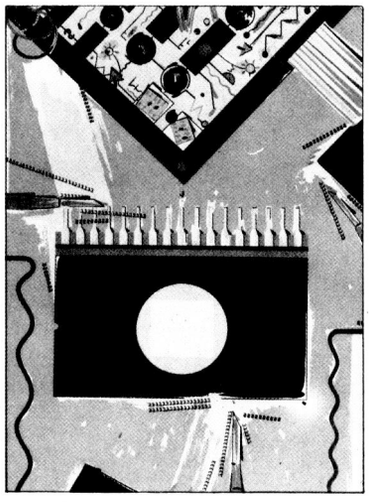

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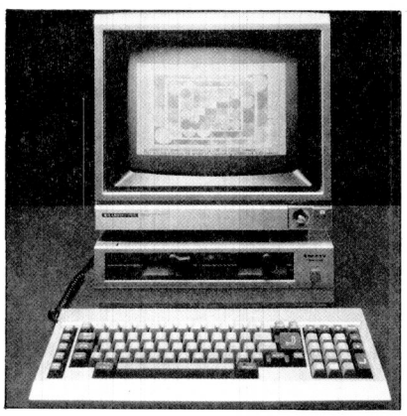


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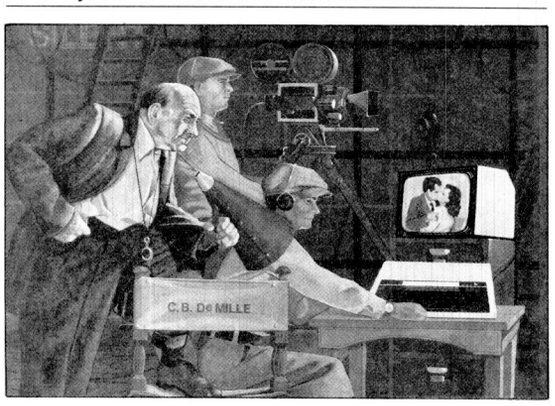



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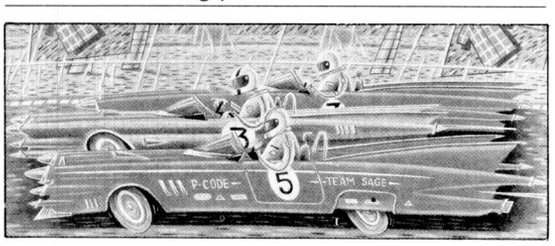



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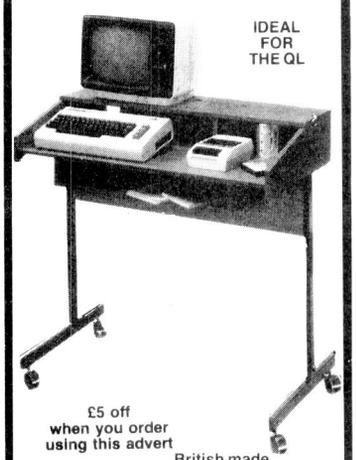

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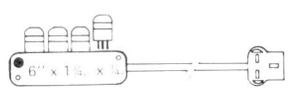

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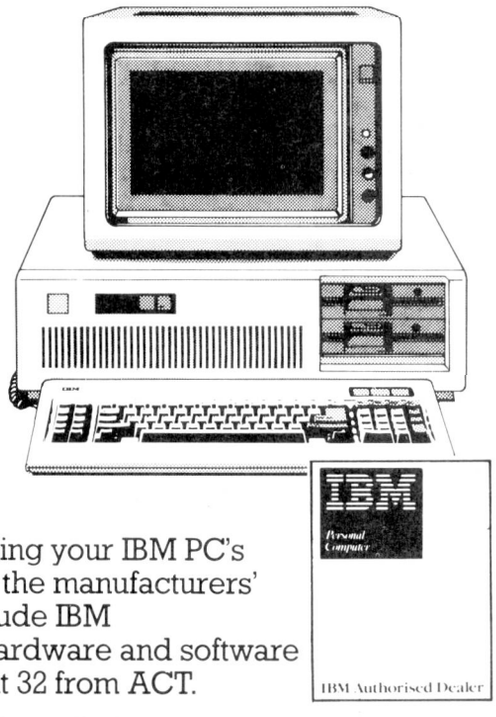


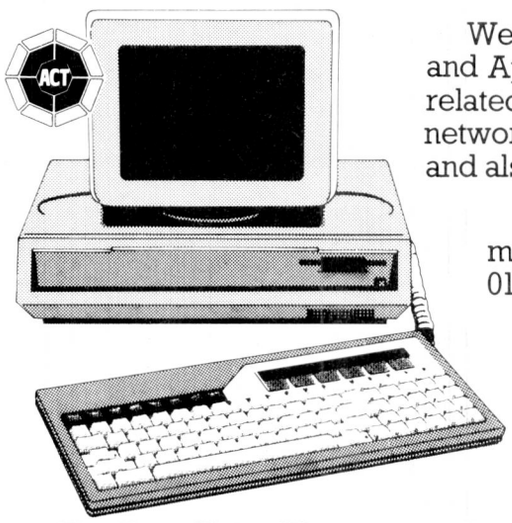


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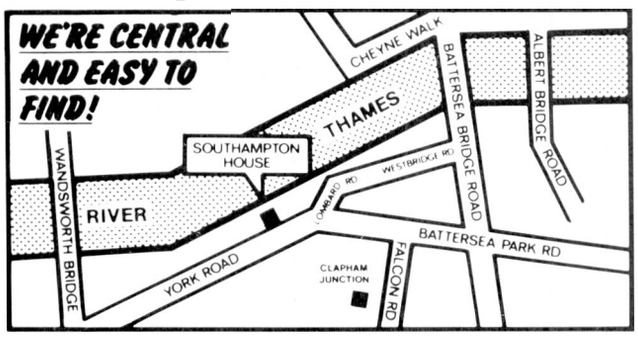


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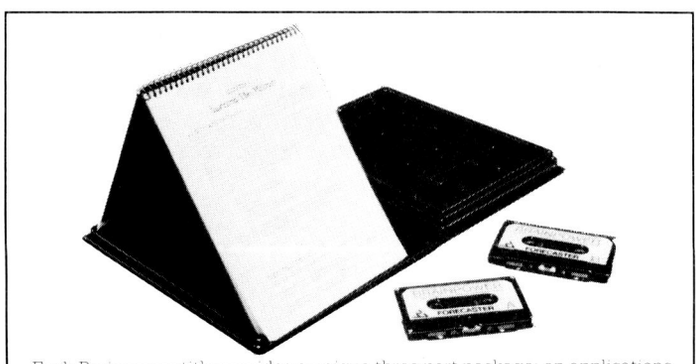

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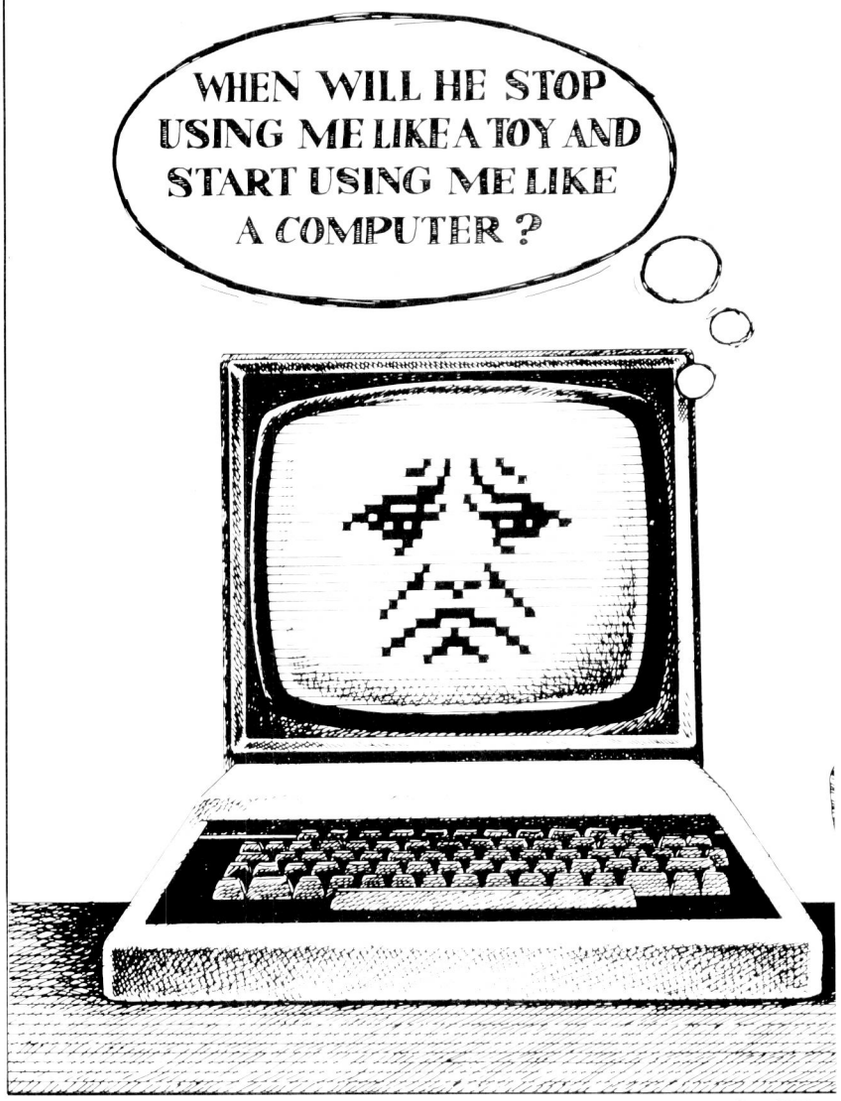


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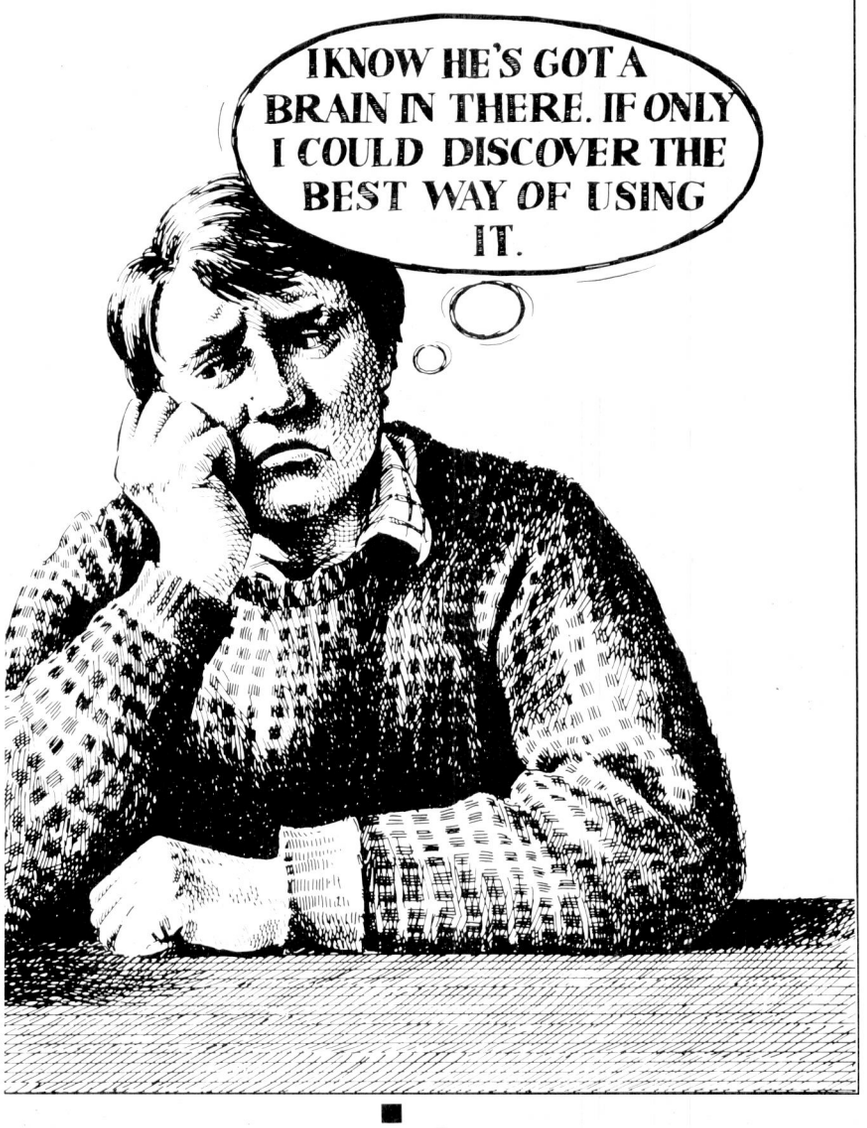


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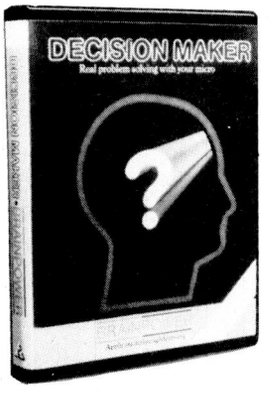


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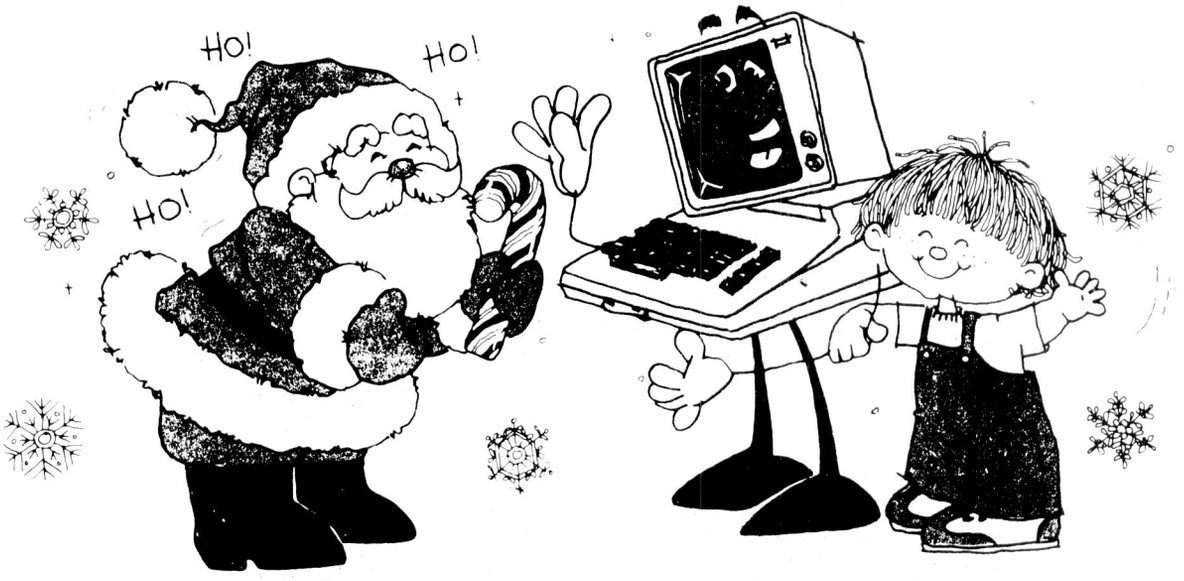


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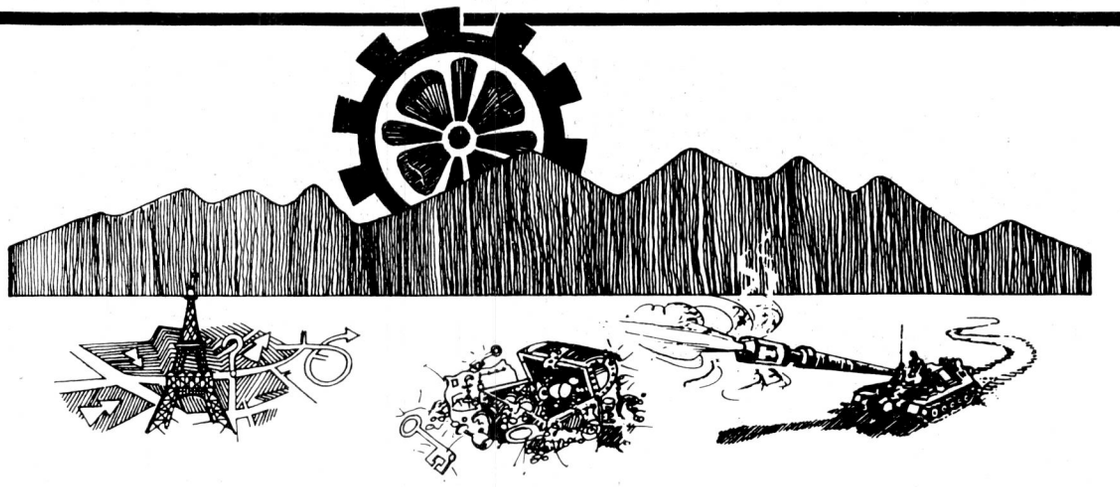

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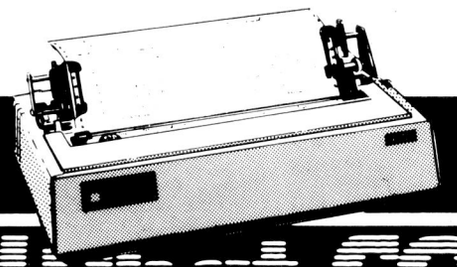

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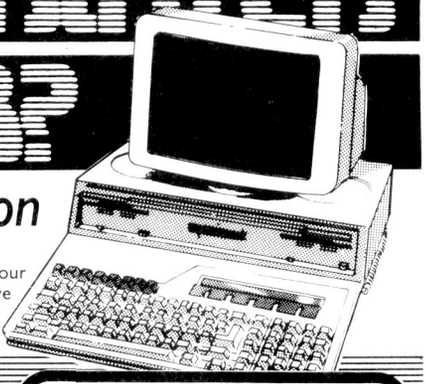

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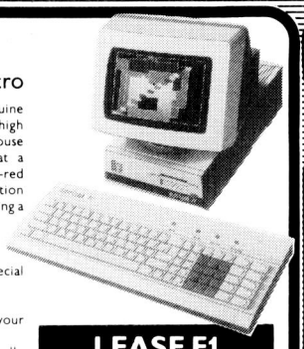

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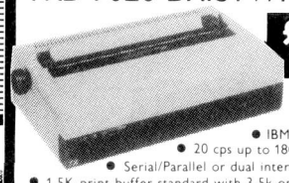

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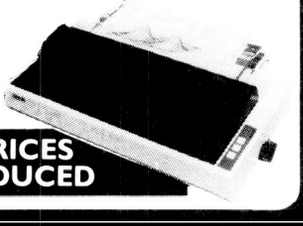

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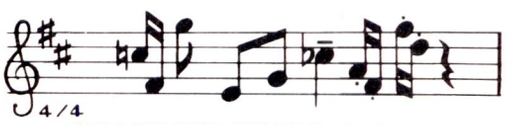

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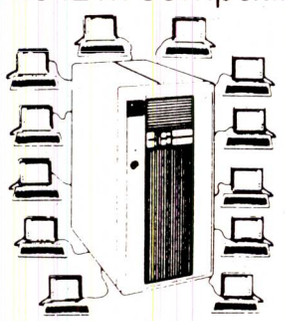

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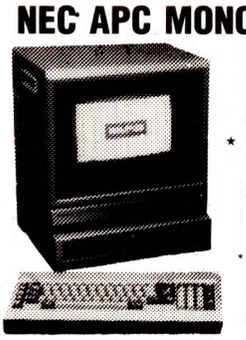

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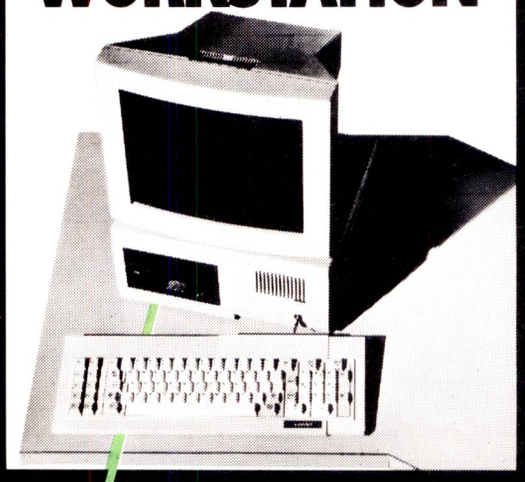

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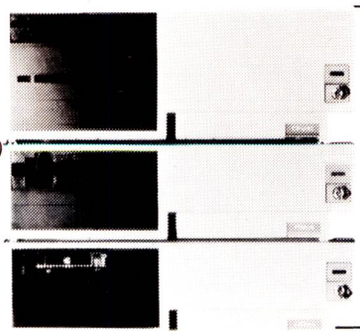

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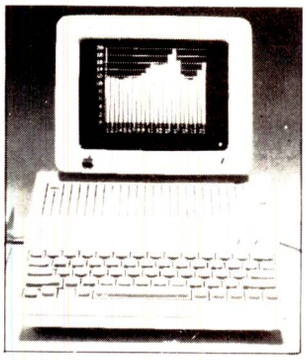

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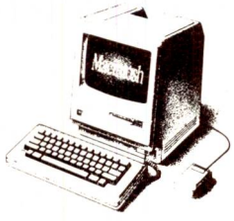

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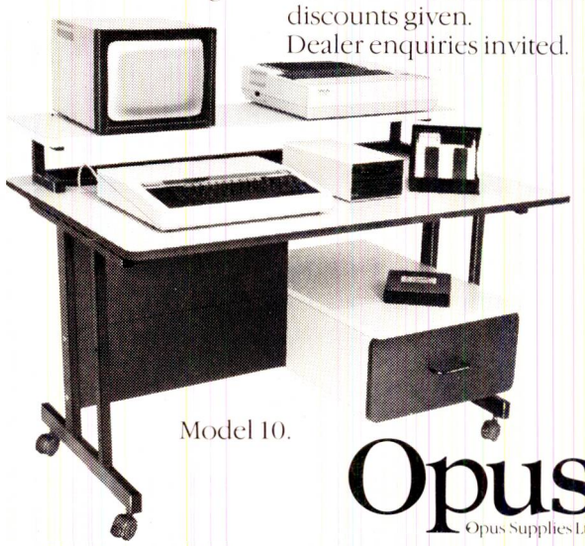

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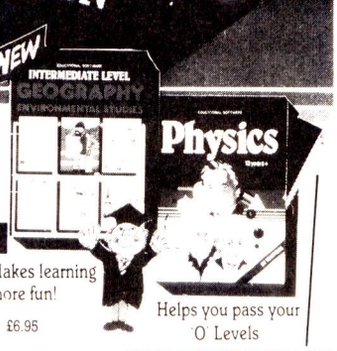


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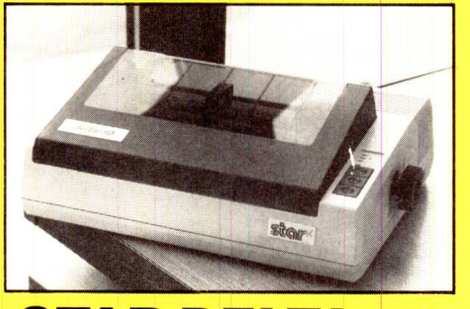

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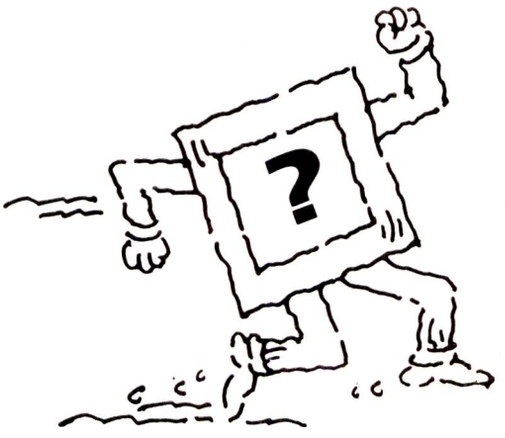





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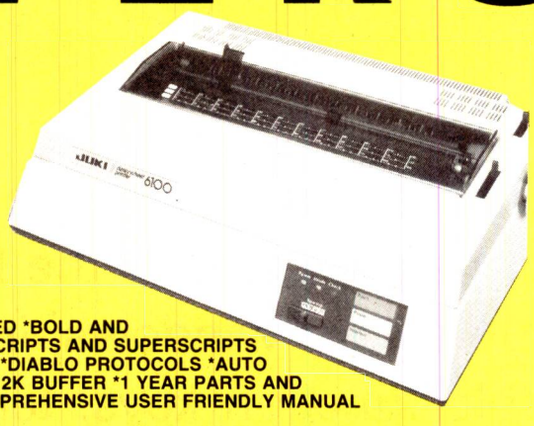


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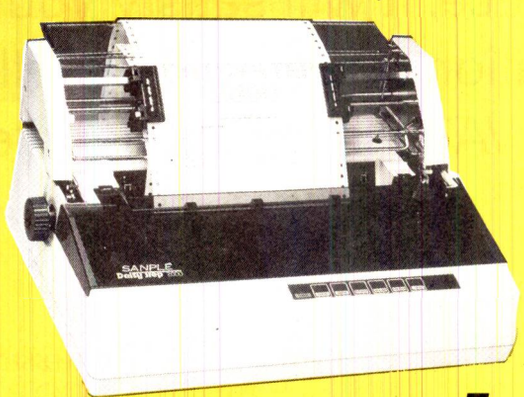

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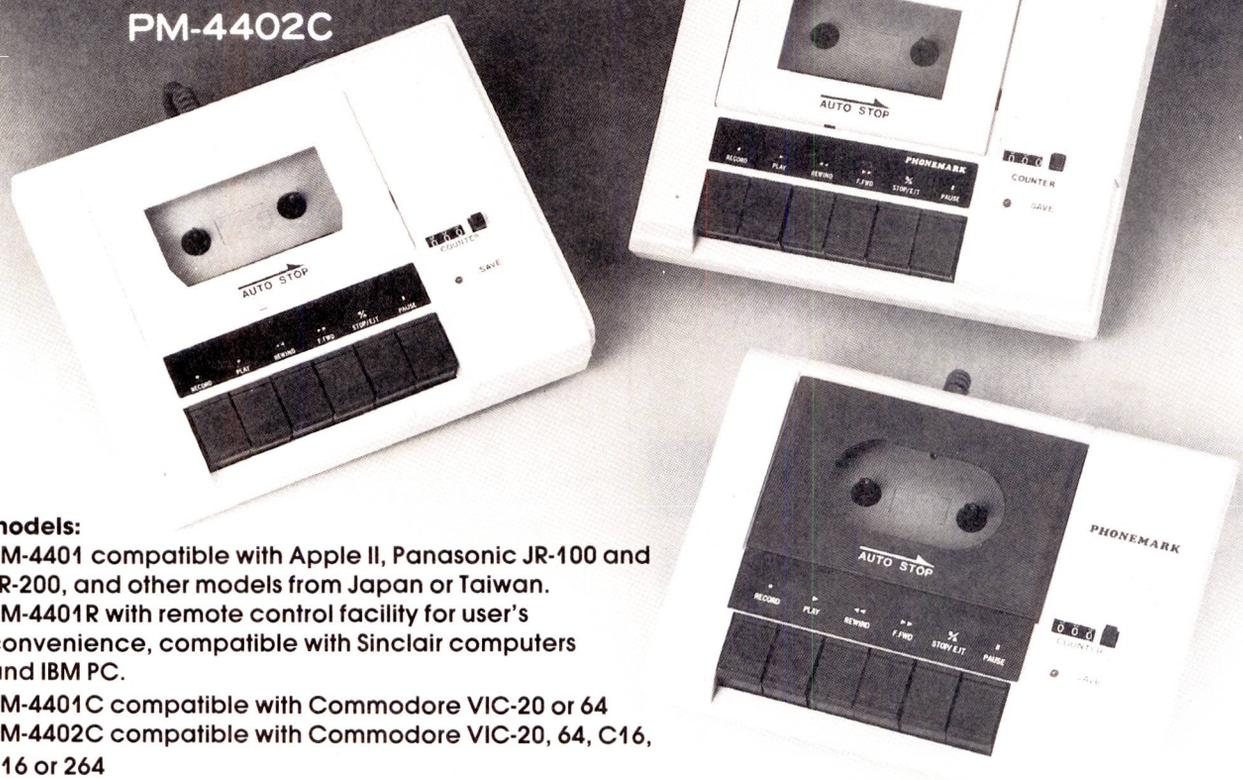


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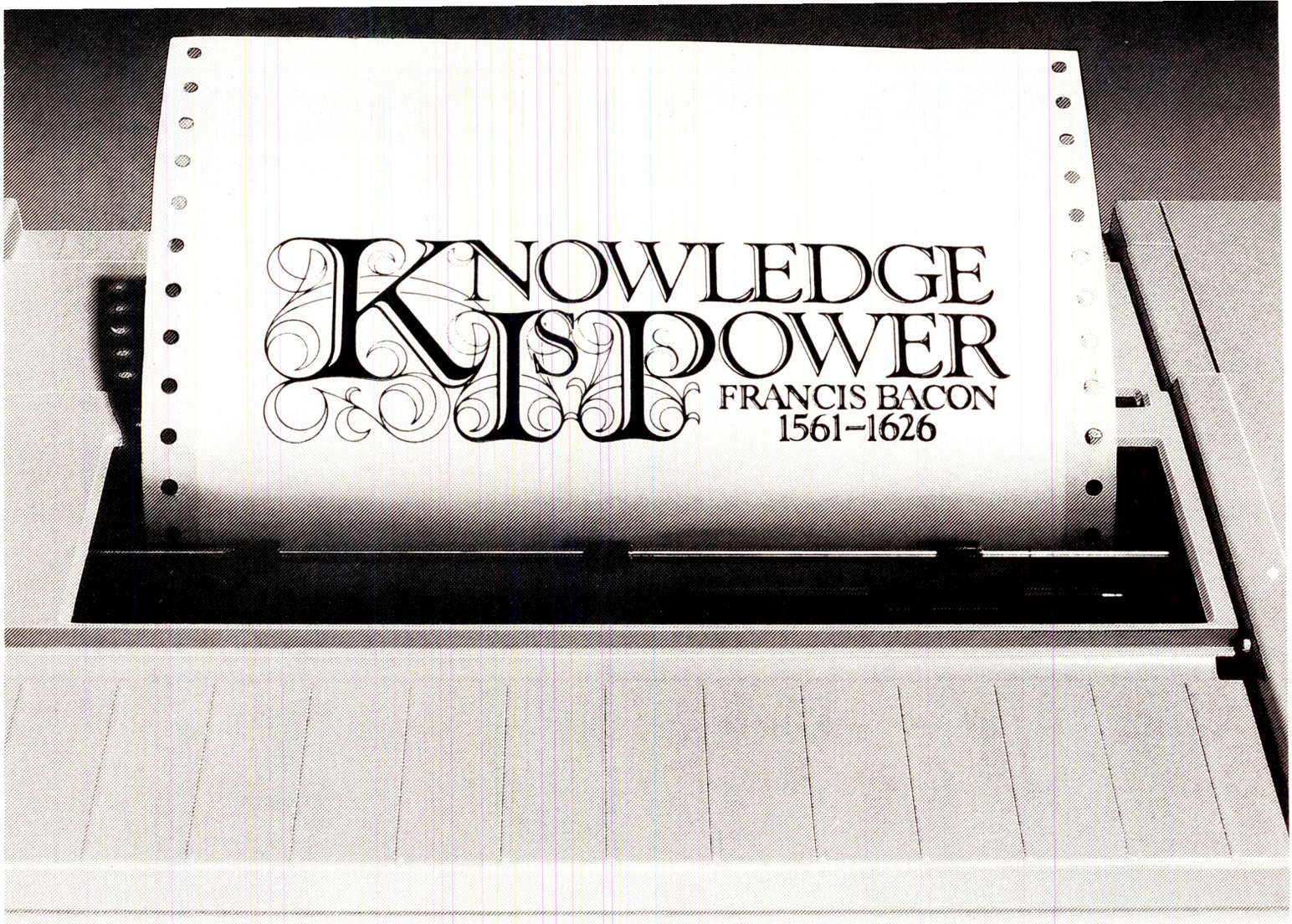


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| BBC B, DFS | £469 |
| BBC B with Econet | £446 |
| Spectrum 48K (£57 software free) | £125 |
| Spectrum Plus (£60 software free) | £175 |
| Memotech 512 | £275 |
| Apple IIe + 2 Disk Drives & Cont | £985 |
| Amstrad (Green Screen) | £239 |
| Amstrad (Colour Monitor) | £349 |
| QL | £399 |
| Electron | £189 |

### PRINTERS

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| Canon PW1156A NLQ | £425 |
| Canon PJ1080A | £399 |
| Epson RX80 | £269 |
| Epson RX80 F/T | £299 |
| Epson FX80 | £389 |
| Epson FX100 | £520 |
| Epson DX100 | £475 |
| Brother HR5 | £155 |
| Brother HR15 (Centronics or RS232) | £445 |
| Brother EP44 | £235 |
| Juki 6100 (Centronics) | £375 |
| Shinwa CPA80 (Centronics) | £215 |
| Shinwa CPA80 RS232 | £236 |
| Commodore 1520 Printer/Plotter | £95 |
| Commodore MPS801 | £210 |
| MCP40 | £125 |
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| Stack Centronics — Commodore | £20 |
| Trippler-Centronics — Commodore | £45 |
| IEEE — Epson (Centronics) | £45 |
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| Microvitec 1451 | £290 |
| Microvitec 1451 — QL (Med Res) | £275 |
| Microvitec 1431 AP Composite | £235 |
| Fidelity Monitor | £199 |
| Microvitec 1451 AP Composite | £335 |
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| Commodore 1701 | £210 |
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| CSX400 400K 80T | £181 |

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| CD400S 2×200K 40/80T | £339 |
| CD800S 2×400K 40/80T | £402 |

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| 5402 200K 40T DS | £155 |
| 5802 400K 40/80T | £180 |

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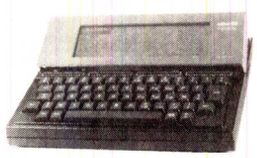

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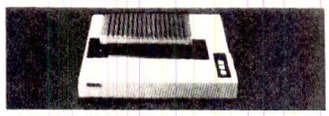

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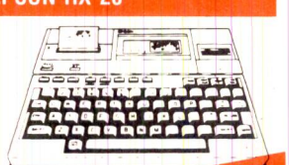

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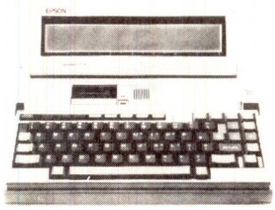

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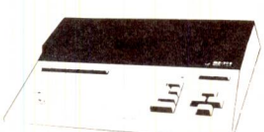

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This CPU controlled Emulator Programmer is a powerful tool for both Eprom programming and development work. EP8000 can emulate and program all eproms up to 8K × 8 bytes, can be used as stand alone unit for editing and duplicating EPROMS, as a slave programmer or as an eprom emulator **£695(a).**

**GANG OF EIGHT PRODUCTION PROGRAMMER**
This is a smart, fast programmer with an audible alarm and a 'conversational' liquid crystal display. Single key operation discourages mistakes whilst performing BLANK CHECK, VERIFY and PROGRAM functions automatically. Programming voltage selectable 12.5/21/25V. Will program all popular 5V single rail eproms. It will program 8 eproms at a time **£395(a)**

**P9000 Range**
These new range which will handle ALL current 5V single rail eproms and copy 8 eproms at a time comprise three following models:
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:
P9010: A low cost duplicator..... **£795(a)**
P9020: With serial interface with 8 different formats and 8K buffer (expandable to 33K)..... **£995(a)**
P9030: Top of the range with serial interface with 16 formats, baud rate up to 19.2K, 8K expandable buffer, editing functions, printing facility, remote control from a computer..... **£1295(a)**

**UV ERASERS**
UVIT Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins **£59 + £2 p&P.**
UV12 as above but without the timer **£47 + £2 p&p.**
For industrial users, we offer UV140 & UV141 erasers with handling capacity of 14 eproms. UV14 has a built in timer. Both offer full built in safety features UV140 **£61;** UV141 **£79, p&P £2.50.**

**ALL PRICES EXCLUDE VAT**
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**We also stock a full range of TTLs CMOS, CPU's, RAMs, EPROMS.**
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## DISC DRIVES

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2 × 100K 40T SS: TD55A with psu **£250(a)**
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BBC compatible disc drives, fully cased and supplied complete with cables, manual and formatting disc for operation with the BBC micro. These drives can operate in both single and double density modes and are suitable for use with any micro with Shuggart A400 interface. Mechanisms available separately.

### 3M FLOPPY DISCS

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**Industry standard high quality discs with guaranteed error free performance for life.**
**Discs in packs of 10:**

40T SSDD **£15(c)** 40T DSDD **£18(c)**
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1441 Hi Resolution ..... **£399(a)**

**MICROVITEC 14" RGB with PAL & Audio**
These monitors can receive TV programs thru a Video Recorder
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2040CS Hi Res..... **£685(a)**

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Microvitec..... **£3.50(d)**
Monochrome..... **£3.50(d)**

## PRINTER SHARER/BUFFER

A unique printer sharer/buffer that provides a simple way to improve the utilisation of the installed equipment by reducing the waiting time for printing documents. All but the smallest documents tie up the computer while being printed and the computer remains out of use until the printing is complete. This is more so in a network which does not have a dedicated computer for printer operation. This buffer/sharer would free the computers almost immediately for other uses and in many cases make the use of dedicated printer server machines unnecessary.

- 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.
- PAUSE switch allows printing to be stopped temporarily to allow paper change, adjust form feed etc. or allows temporary storage for large number of small files which can all be printed together.
- RESET allows all buffer memory to be cleared without having to hard break on the computer.

* 64K buffer capacity. * Mains powered * Compact 7cm × 17cm × 24cm

TSB 64 Buffer/Sharer **£245(a)**
Cable Set **£30**

## CONNECTOR SYSTEMS

### I D CONNECTORS

| | Headers | Receptacles | Edge Conns | Grey Cable /m |
|---|---|---|---|---|
| 10 Way | 90p | 85p | 120p | 40p |
| 20 Way | 145p | 125p | 195p | 85p |
| 26 Way | 175p | 150p | 240p | 120p |
| 34 Way | 200p | 160p | 320p | 160p |
| 40 Way | 220p | 190p | 340p | 180p |
| 50 Way | 235p | 200p | 390p | 200p |

### RS 232 JUMPER LEADS WITH 25 WAY CONNECTORS

24" Single end Male ..... **£5.00**
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*Other lengths available*

### TEXTOOL ZIF SOCKETS

24 pin..... **£5.75**
28 pin..... **£8**
40 pin..... **£9.75**

### GENDER CHANGERS

*25 Way D type*
Male to Male..... **£10**
Female to Female..... **£10**
Male to Female ..... **£10**

### AMPHENOL CONNECTORS

| | Solder | IDC |
|---|---|---|
| 36 Way Centronics Plug | 500p | 475p |
| 36 Way Centronics Socket | 550p | 500p |
| 24 Way IEEE Plug | 475p | 475p |
| 24 Way IEEE Socket | 500p | 500p |

PCB Mtg Skt
Ang. Pin 36 Way **750p** 24 Way **700p**

### D CONNECTORS

| | No of Ways 9 | 15 | 25 | 37 |
|---|---|---|---|---|
| *Male* | | | | |
| Solder | 60p | 85p | 125p | 170p |
| Angled Pins | 120p | 180p | 240p | 350p |
| IDC | 175p | 275p | 325p | — |
| *Female* | | | | |
| Solder | 90p | 130p | 195p | 290p |
| Angled Pins | 160p | 210p | 290p | 440p |
| IDC | 195p | 325p | 375p | — |
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| Epson PX8 Computor | £715 |
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| HX Expansion | £ 80 |
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| MX 100 | £275 |
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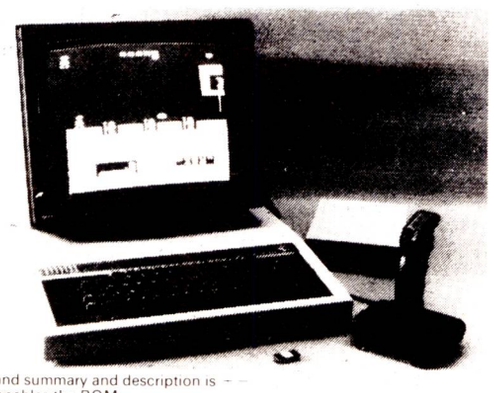
# New Issue Microtest Starstick & Joystick Package.

announcing the arrival of the new issue 2 + ROM.



Available now the NEW issue 2 + ROM Joystick comes in three forms:

OPTION 1 The Starstick ROM and Quickshot I Joystick
*Price £22.85 + £1.00 P&P.*

OPTION 2 The Starstick ROM and Quickshot II Joystick
*Price £25.50 + £1.00 P&P*

OPTION 3 The Starstick ROM and Patch Lead (choose your own Atari/Spectrum style joystick)
*Price £20.50 + £1.00 P&P*

OPTION 4 Send your old version STARSTICK ROM back to us for reprogramming to issue 2+
*Price £3.50 + £0.50 P&P*

VI.4 STARSTICK was 4K the new version has been squashed into 8K.

The NEW ISSUE ROM is compatible with latest* ACORNSOFT programs as well as REPLICA II.

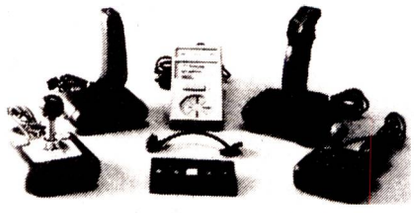
As with the VI41 issue of ROM you can at last connect good "self centring", "rapid action" joysticks to the BBC Computer via the user port. (Model A owners please note that you do not need the analogue interface fitted to your computer but you will need the user port and IC76).

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 V2+.

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 compatibility). |
| *PLONK | relocate area of work memory used. |
| *PROP1 | proportional joystick emmulator 1 |
| *PROP2 | proportional joystick emmulator 2 |
| *ANA | patches joysticks via the analogue port. |



| | |
|---|---|
| *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 | dissable *PAUSE. |
| *NAME | predefined key protocols. |
| *HELP KEYS | display current key protocols. |
| *REPEAT | enables ROM based auto repeat. |
| *NREPEAT | dissables *REPEAT. |

Should a contention state occur when two roms or more try to use the same *command prefixing any of the above with M will help solve the problem.

*DEALER ENQUIRIES and EXPORT ORDERS WELCOME*

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VISA

Access

Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE

**All MICROTEST ROMs are fully TUBE ® compatible.(TUBE ® is a reg. trademark of Acorn Computers).**

# 3 TIME-SAVERS

## CACHE

**MicroCache** is a highly intelligent disk buffering system (cache) that dramatically boosts the performance of your microcomputer. It is totally transparent to the user, automatically monitoring your use of disks and quickly 'learning' what to hold in RAM. In this way disk accesses are very substantially reduced, saving you time and reducing frustration. **MicroCache** is available for most CP/M and MSDOS machines including IBM, Sirius, Apricot, DEC, NEC etc.

## PRINTER BUFFER

Also included in **MicroCache** is a printer buffer. This enables printing to apparently occur immediately by 'printing to RAM'. Actual output to the printer occurs in background mode without delaying the user. The RAM used by the disk cache is dynamically shared with the printer buffer; whichever is causing you most delay automatically gets the most RAM. This is a much more cost-effective way of saving time than purchasing expensive add-on printer buffer boxes.

## RAM DISK

**Silicon Disk** is the original 'RAM-disk'. It provides you with an extra 'disk' in RAM which is extremely fast and reliable. As with **MicroCache,** the **Silicon Disk** software will operate with any RAM that is suitable for your machine.

| | |
|---|---|
| **MicroCache** | |
| (including printer buffer) | £195 |
| Demonstration copy | £25 |
| **Silicon Disk** | £95 |

**WARNING: ONCE YOU HAVE TRIED THESE PRODUCTS YOU WILL NOT BE HAPPY USING YOUR MACHINE WITHOUT THEM.**

microcosm research

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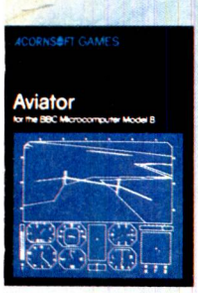
# ACORNSOFT PRESENTS

# THE AVIATOR

*One man's flight to save his home town!*




This new and sensational production will leave you breathless as you master the art of flying a Spitfire. You'll have to think fast as you battle with the controls. And the suspense will be unnerving as you try out your new-found skills on increasingly difficult manoeuvres.

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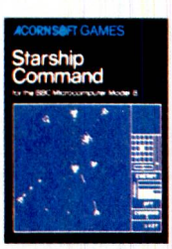
*Plus full supporting programs.*




## Starship Command:

Are your reactions quick enough to fight off invading enemy spaceships? Will your performance report to the Star Fleet Admirals be good enough for them to warrant you another craft?

As Captain of a battle starship, only you and your skill can answer those questions. £9.95 cassette. £11.50 disc.

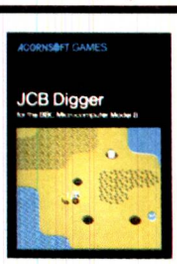



## Free Fall:

You've been attacked in outer space. All your crew members are dead after the Alphoids injected the air supply to the space station with cyanide.

You managed to get your space suit on in time, now defend the vital computer tapes from the Alphoids.

But, be quick, you've only a limited amount of air. £9.95 cassette. £11.50 disc.




## JCB Digger:

Get the Meanies before they get you! Dig holes for them to fall in, then fill them. Or scoop them up in your shovel and dump them in the sea.

The Meanies will become meaner and harder to destroy as your skill develops, testing you even further. £9.95 cassette. £11.50 disc.

Disc versions are available in the new dual 40/80 track format. These and many more Acornsoft BBC Model B programs are available from your local Acorn stockist.

Alternatively, you can order programs by sending a cheque or credit card details to Acornsoft at the address below. Credit card holders can also order by telephoning ☎ 0933-79300. Ring the same number for a free Acornsoft catalogue and Aviator poster.

Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL.

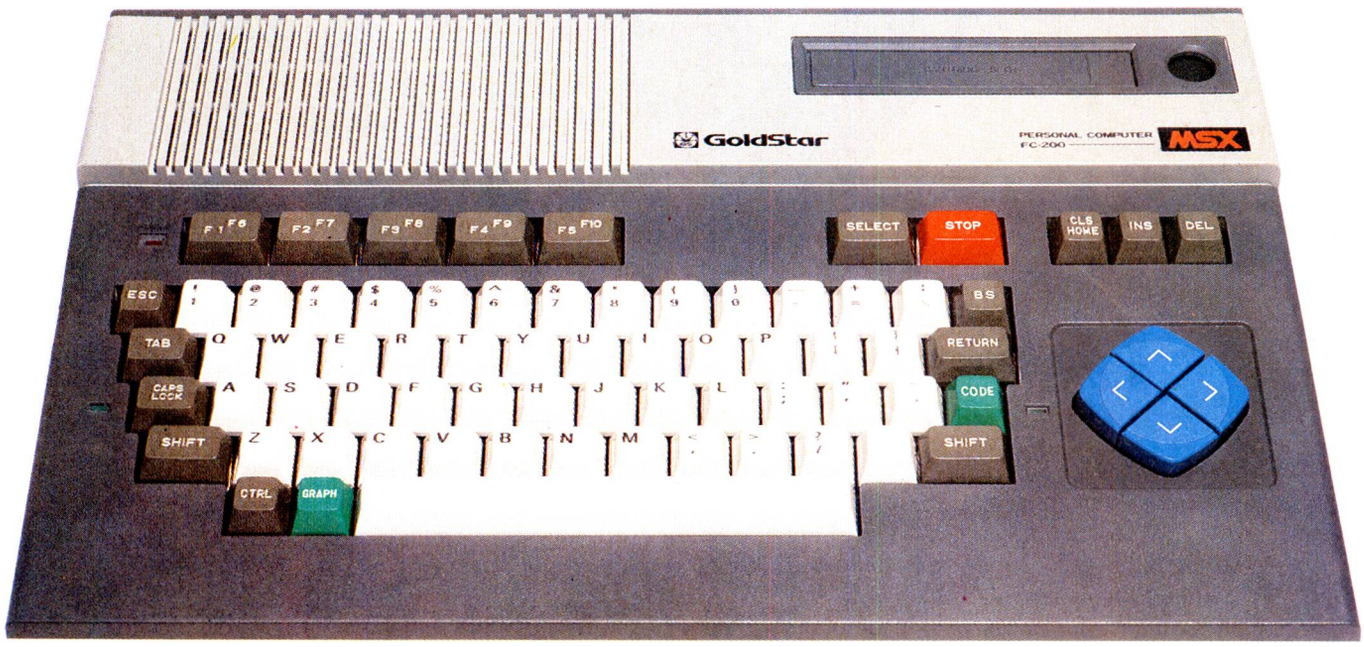
The price tag. It's something rather special.

When you take a look at the new Goldstar MSX you'll find an asking price of around £240

Quite a bit less than most of the others. And since you're choosing a micro that's designed and built to one standard, that'll leave you a whole lot more for the super new MSX games or business software.

What is standard, of course, is the superb MSX specification.

# There's one thing about this MSX that isn't quite standard.




State-of-the-art feature like 64K of 'user' RAM and 32K of ROM and 16K Video RAM place the Goldstar right at the top of the MSX league.

Sixteen vivid colours and eight octaves of sound make it a great games player's micro.

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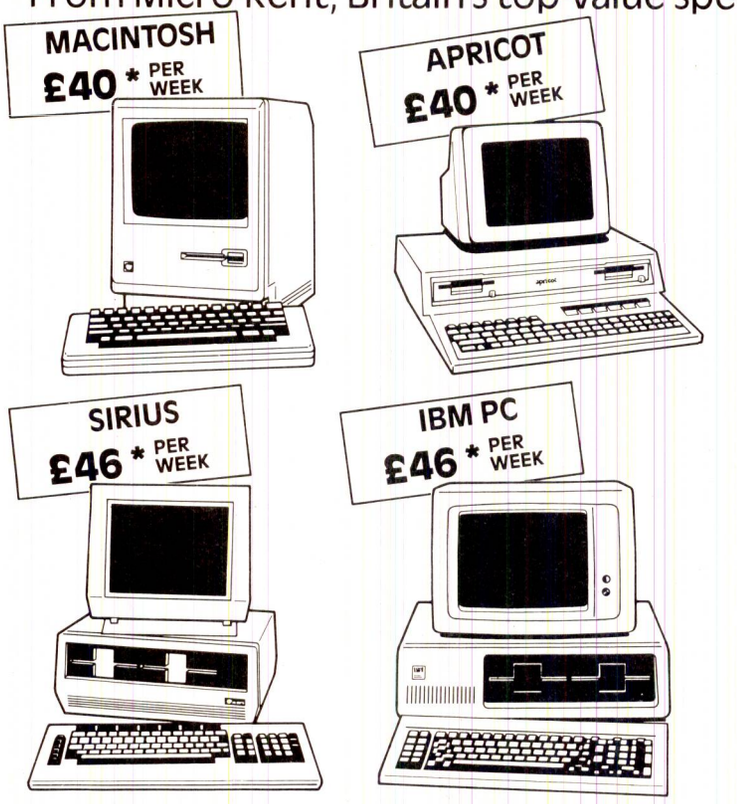


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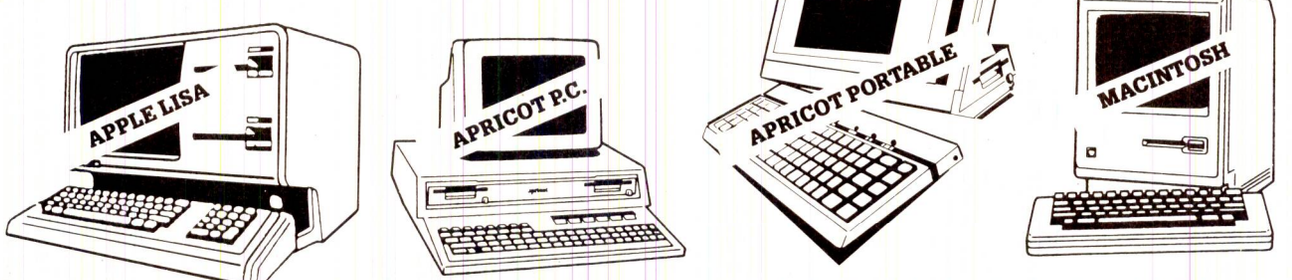


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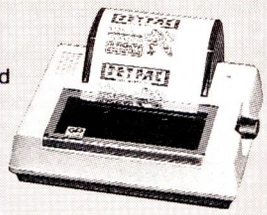
**Designed for the hobbyist.**

- Printing speed—40cps
- 5 inch, 46 columns • Friction feed
- Centronics parallel interface
- Plain paper—low running cost

**GP-50S—Sinclair compatible model**
**GP-55AS—RS-232C serial model... available soon.**



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**Built exclusively for COMMODORE VIC-20/C-64 Personal Computer.**

- Printing speed—30cps/50cps
- 10 inch, 80 columns
- Pin feed

**GP-100A—Centronics parallel model**
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• Printing speed—50cps • Pin feed • Centronics parallel interface • Low noise level

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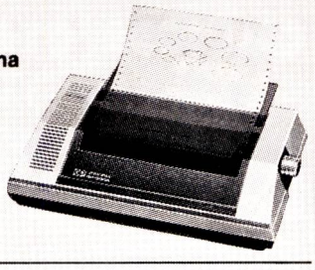

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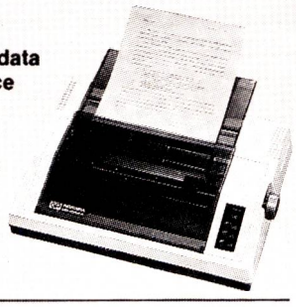

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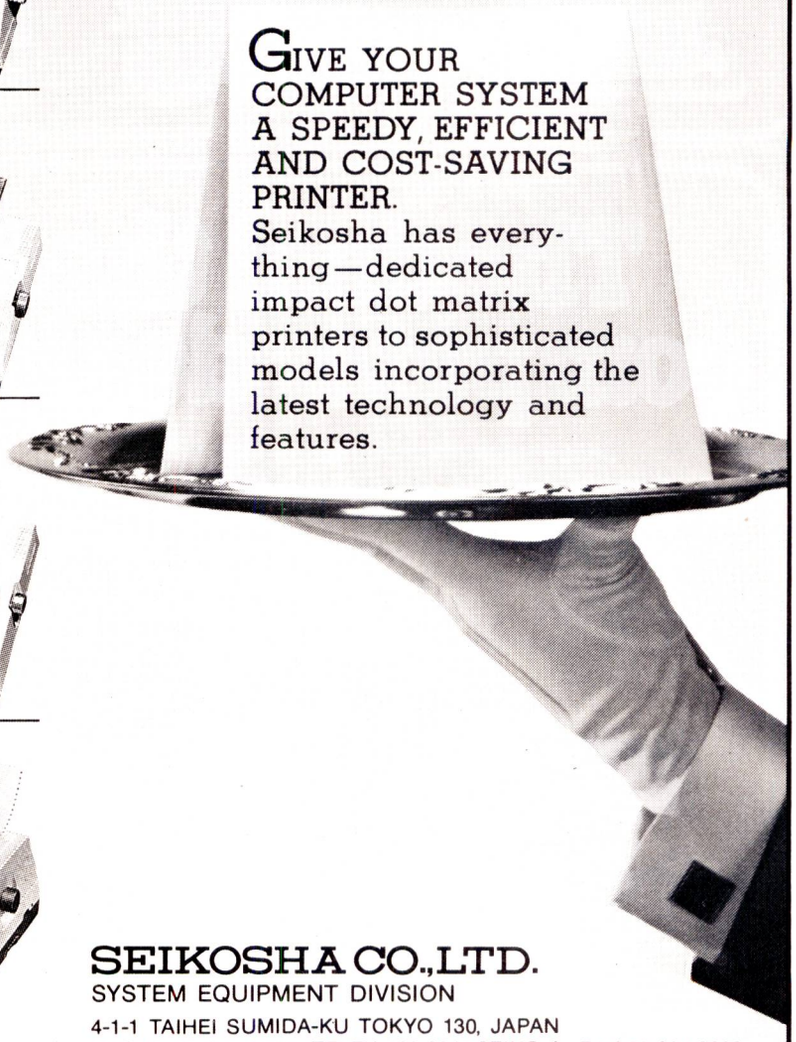


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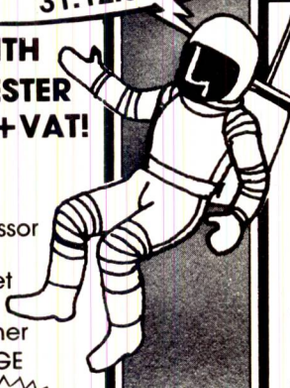

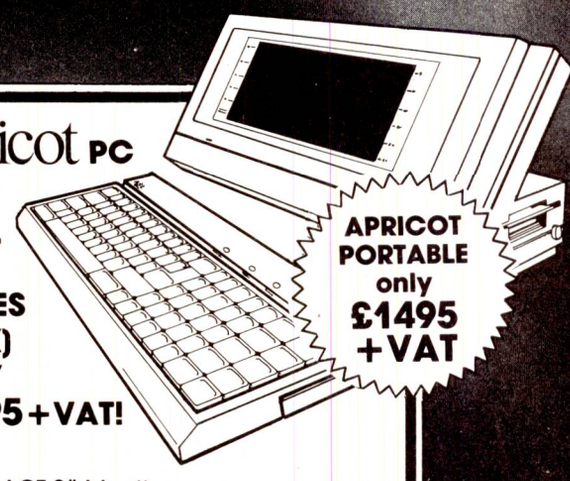

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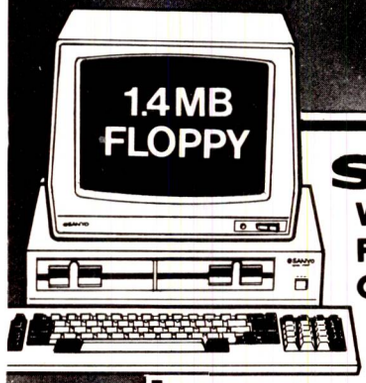


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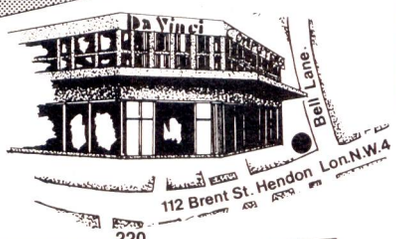


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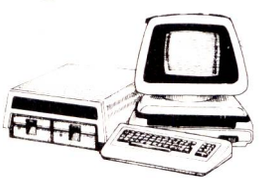

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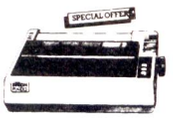

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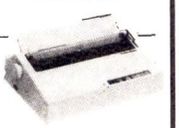

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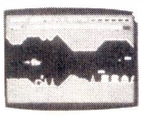



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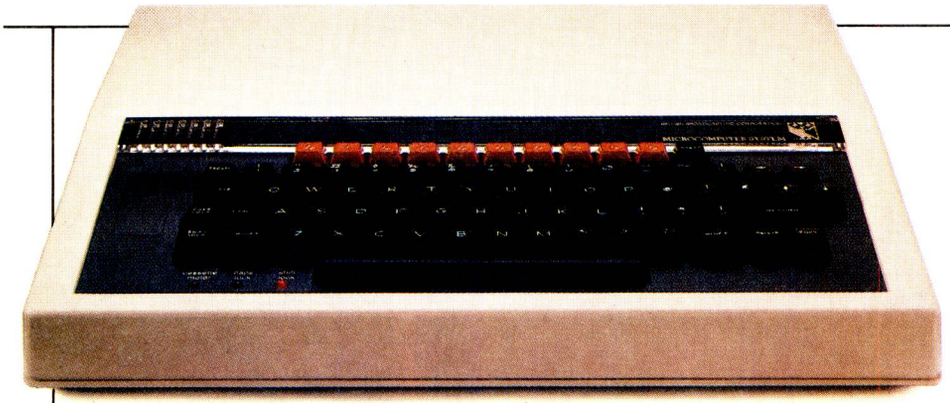
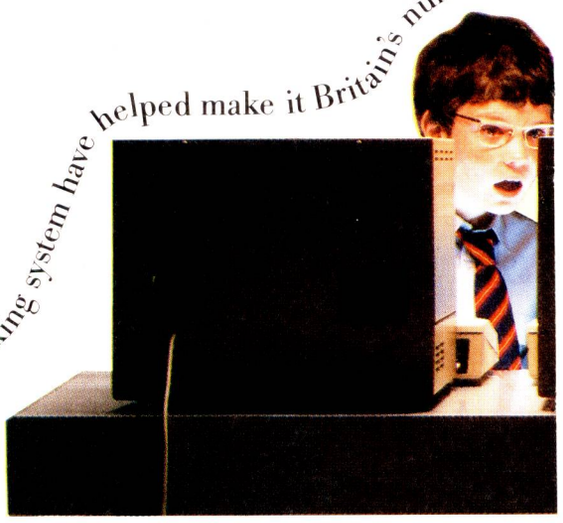
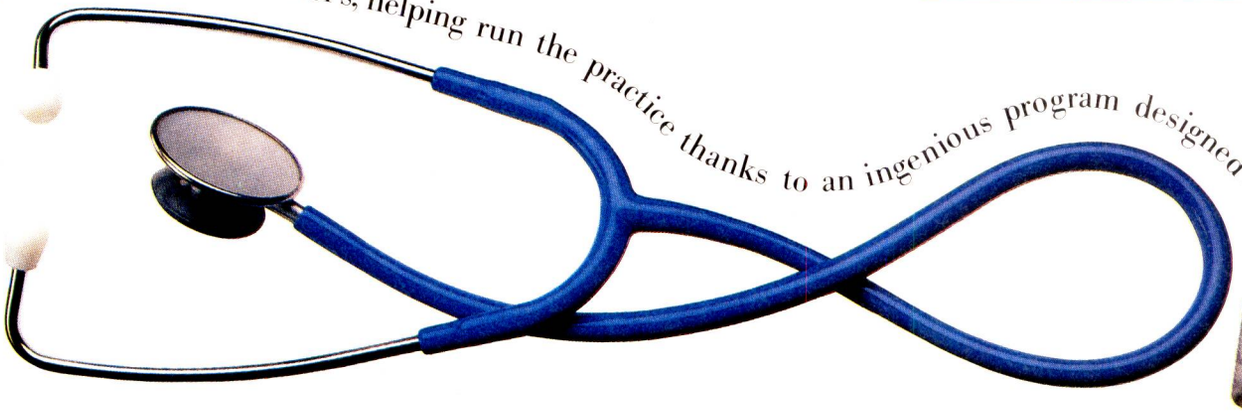
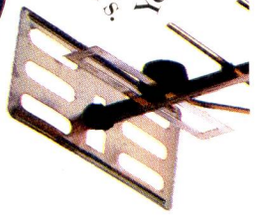


It stretches into schools where BBC Basic and the Econet networking system have helped make it Britain's number one

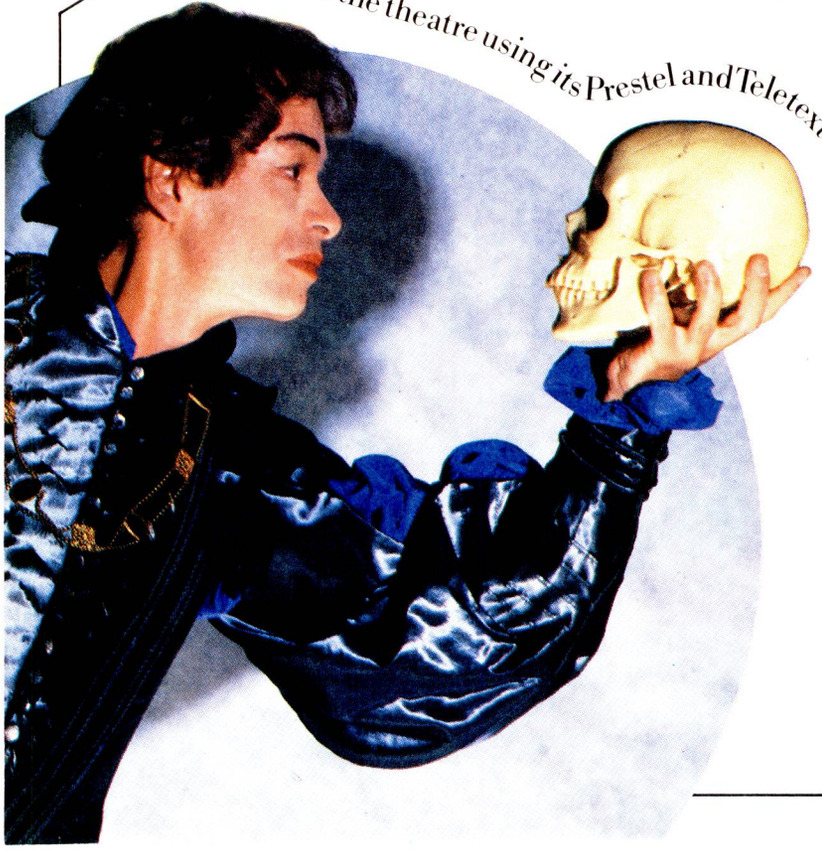


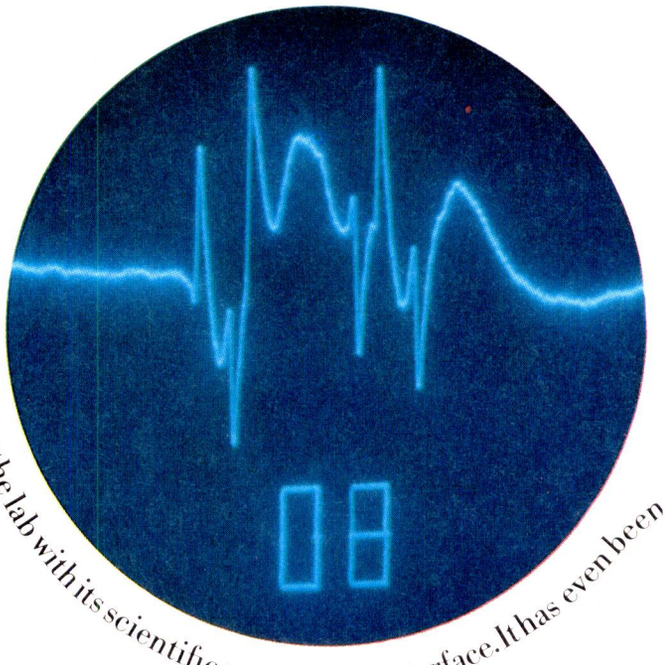
It's down at the doctor's, helping run the practice thanks to an ingenious program designed by two GPs. You'll catch it

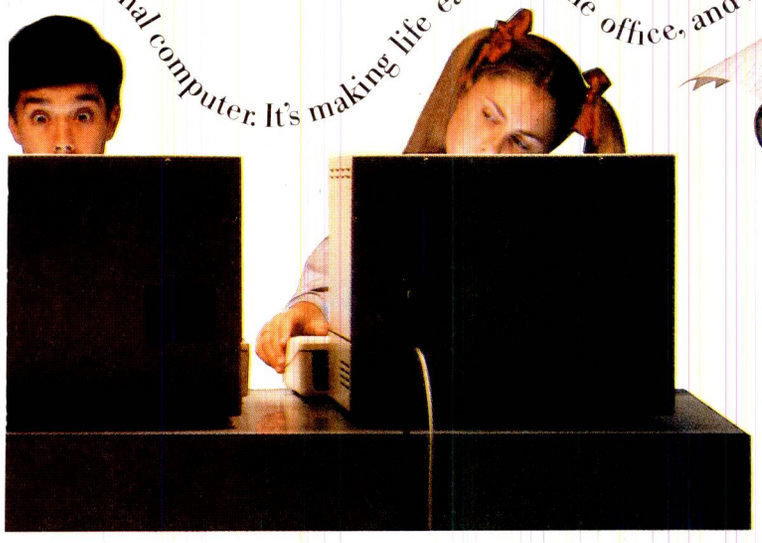




It can take you to the theatre using its Prestel and Teletext adaptors. While helping out at the lab with its scientific monitoring interface. It has even been







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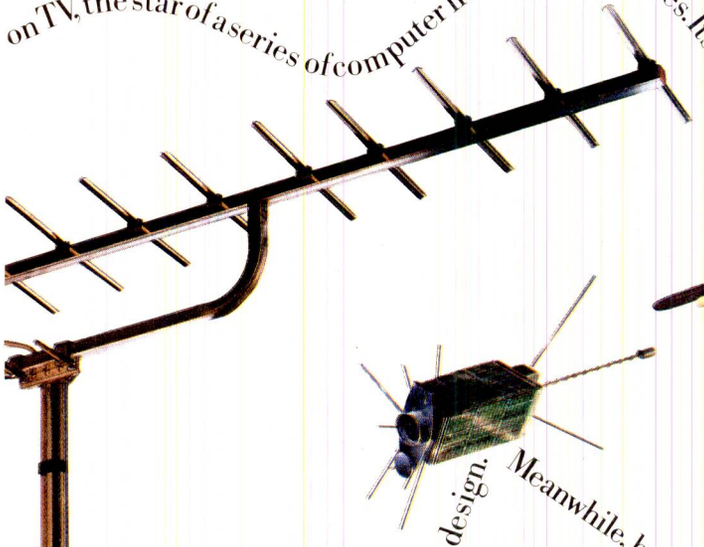
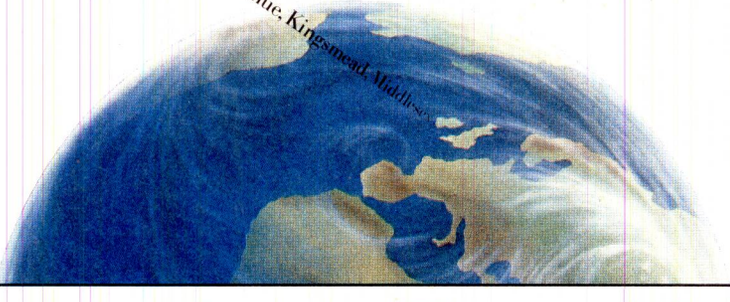
on TV, the star of a series of computer literacy programmes. Its colour graphics and new Bitstik make it welcome in design studios.







working in space, tracking a satellite it also helped design. Meanwhile, back on Earth at 49 Acacia Avenue, Kingsmead, Middlesex.



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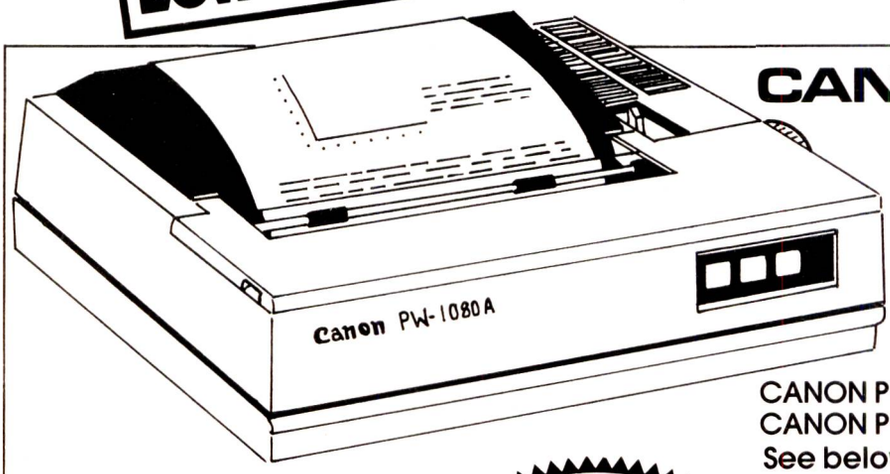


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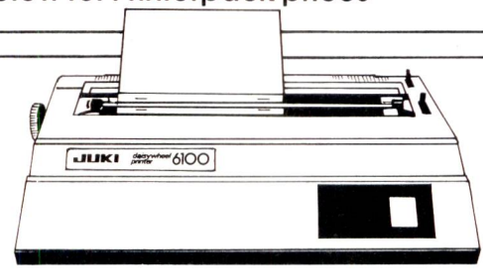


## JUKI 6100

One Year Warranty
20 CPS: BiDirectional & Logic Seeking
10, 12, 15 & Proportional Spacing
Wordstar Compatible
2K Buffer: 13 Inch Platen
Underline: Backspace + Lots more
Centronics Interface Standard
RS 232 Interface £54.00 + VAT Extra
Tractor Feed £99.00 + VAT Extra
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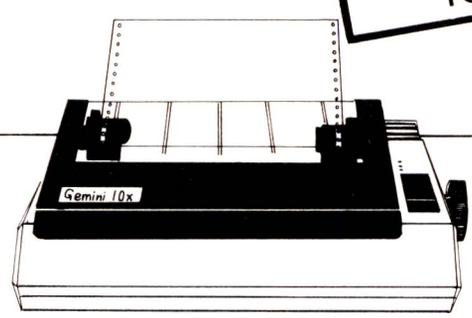
**JUKI 6100 £330.43 + VAT = £380.00**
**See left for Printerpack prices**

**OTHER PRINTERPACKS AVAILABLE FOR DRAGON & ORIC**

**Special RS 232 Printer Bargain**
STAR DP8480 (8" Printing) £187.00 Inc VAT
Ideal for BBC/Newbrain/HX20 & Spectrum Int. 1
Phone for full specification




## STAR GEMINI 10X

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Downloadable Character Set
Hi-Resolution & Block Graphics
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10 x 10" Carriage, 15 x 15" Carriage
**See above for Printerpack prices**

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**COMPUTING SECTION What's in it?**
**Software you can't buy yet - yours for the asking:** Profitlogic's on-line Computing section contains programs ready to run on your computer.

If you have statistical, mathematical or financial analysis problems to solve, Profitlogic's computing section contains the necessary tools. All the programs in this section are yours free without any other than connect time charge.

The **FREE SOFTWARE** is organised into several groups. **cWARE** programs include utilities such as: 'sounds like' (see description on dBASE section below), Indexers, Sorters, right into unix-like programs you can run under CP/M or MS-DOS and unix of course. Examples: diff, grep, unrotate, a complete editor, d-filer, pipe and filtering gear.

Programs in cWARE allow the creation of your own tailor-made database including the latest knowhow on building B-tree indexes for fast access.

**dBASE:** This file contains anything from utilities (ie. upper to lower case functions for version 2.3 and 2.4, 35% faster than 2.4 rank function) to complete turnkey systems.

You can download complete commercial mailing list applications, order handling, mailmerging and foreign language mailhandling and investment and statistical utilities from the cWARE section re-written in dBASE code, all speed optimised and ready to run.

One of the latest additions is the 'soundslike' utility, which finds names on their sound rather than on spelling. Having your customer on the 'phone, you will instantly retrieve his name whether the spelling is English, French, Italian, German, Spanish or any other language.

Further programs include statistics, investment analysis software and speed up and structure checking utilities; square roots and plotting, charts on the screen or printer and foreign language characters. Whatever you thought dBASE couldn't handle is here for you to download.

**Apart from the cWARE and dBASE sections there are special SIG's (special interest groups) for BBC, CP/M (80 & 86), MS-DOS, IBM and unix operating systems.**

Other Computing information: if you need to keep abreast in the Hi-tech and Computing field, Profitlogic provides you with instant information about new hard and software, technological breakthroughs and the latest news on artificial intelligence; without any need to sift through tons of paper. You just enter a few, but powerful search commands.

The Smartware Index answers questions like: Where to get a dBASE compiler? How to read and write dozens of disk formats from a BBC? How to run dBASE under unix. Whose buffer allows you to random print and mailmerge for days, while your machine does something else. Do you need a buffer that controls 4 printers with input from several micros? Does Framework really beat Symphony? How user friendly are the programs of tomorrow?

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# 32 bit personal supermicro 68000 based.



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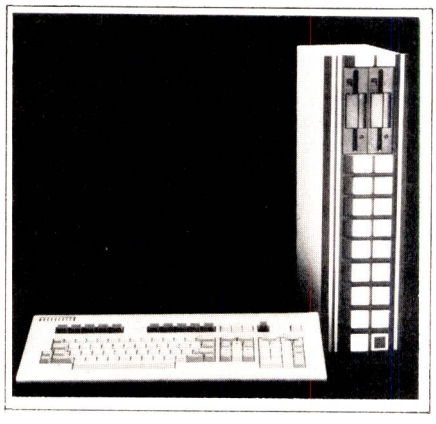
**Remarkable value for money:** From £2500 for the 192K dual floppy machine or £7500 for 1MB RAM with 40MB Winchester + 800K floppy. Optional mono or colour monitors. Works with virtually any printer.

Bench or Floor Mounting.



**Software NOW!** – The UCSD p-system comes complete with development tools, Pascal compiler and 68000 assembler. FORTRAN 77 and BASIC compilers also available. The CP/M68K includes a 'C' compiler (compatible with UNIX systems) and 68000 assembler while CBASIC and Pascal MT+ are also available.

The U-MAN Series 1000 was developed and is being manufactured in Warrington, England.

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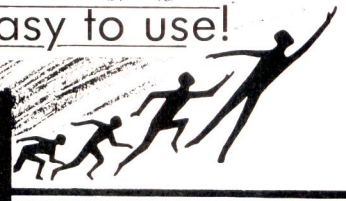

Distributor, OEM and dealer enquiries welcomed.

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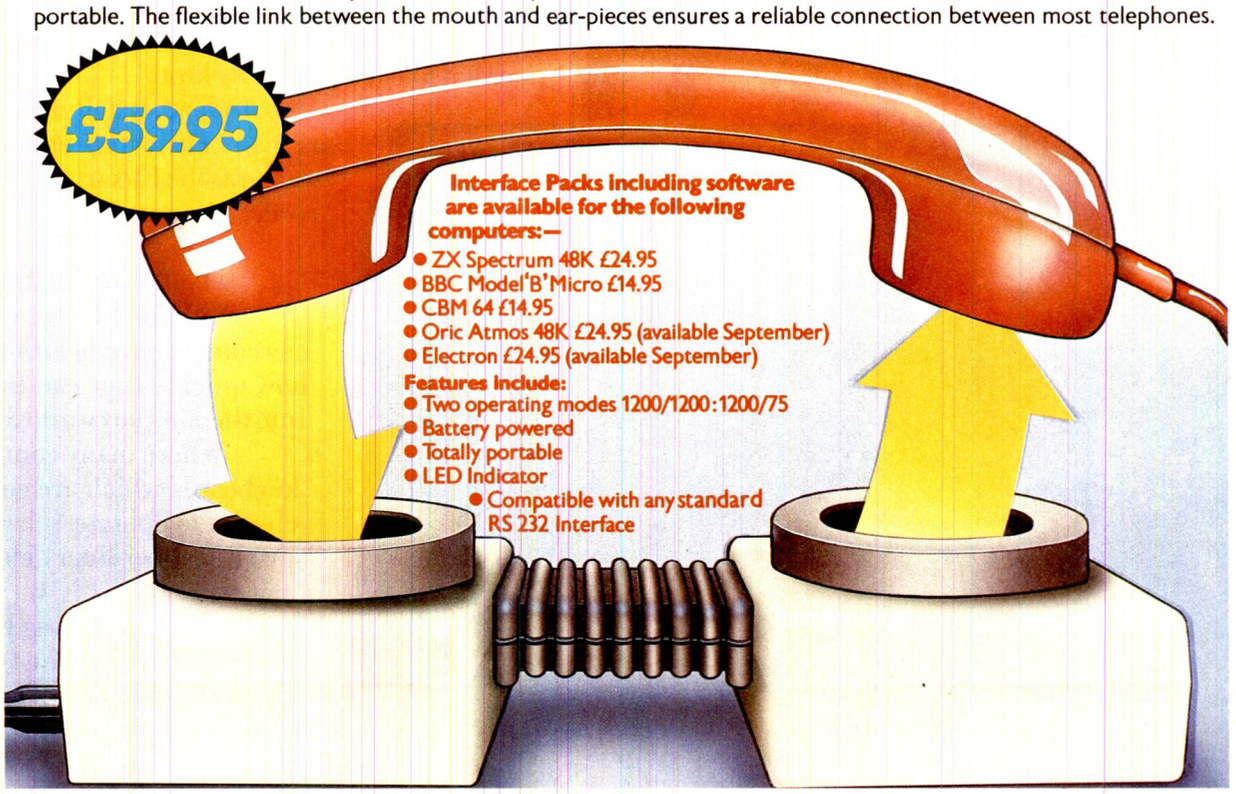
# MODEM.

# HIGH-SPEED COMPUTER TALK FROM PROTEK

Inter-computer communication is easy in anyone's language, thanks to the Protek Modem. Acoustic coupling provides a reliable link between the computer and the telephone line. There are no connection charges, the unit is totally portable. The flexible link between the mouth and ear-pieces ensures a reliable connection between most telephones.

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VISA

Protek

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

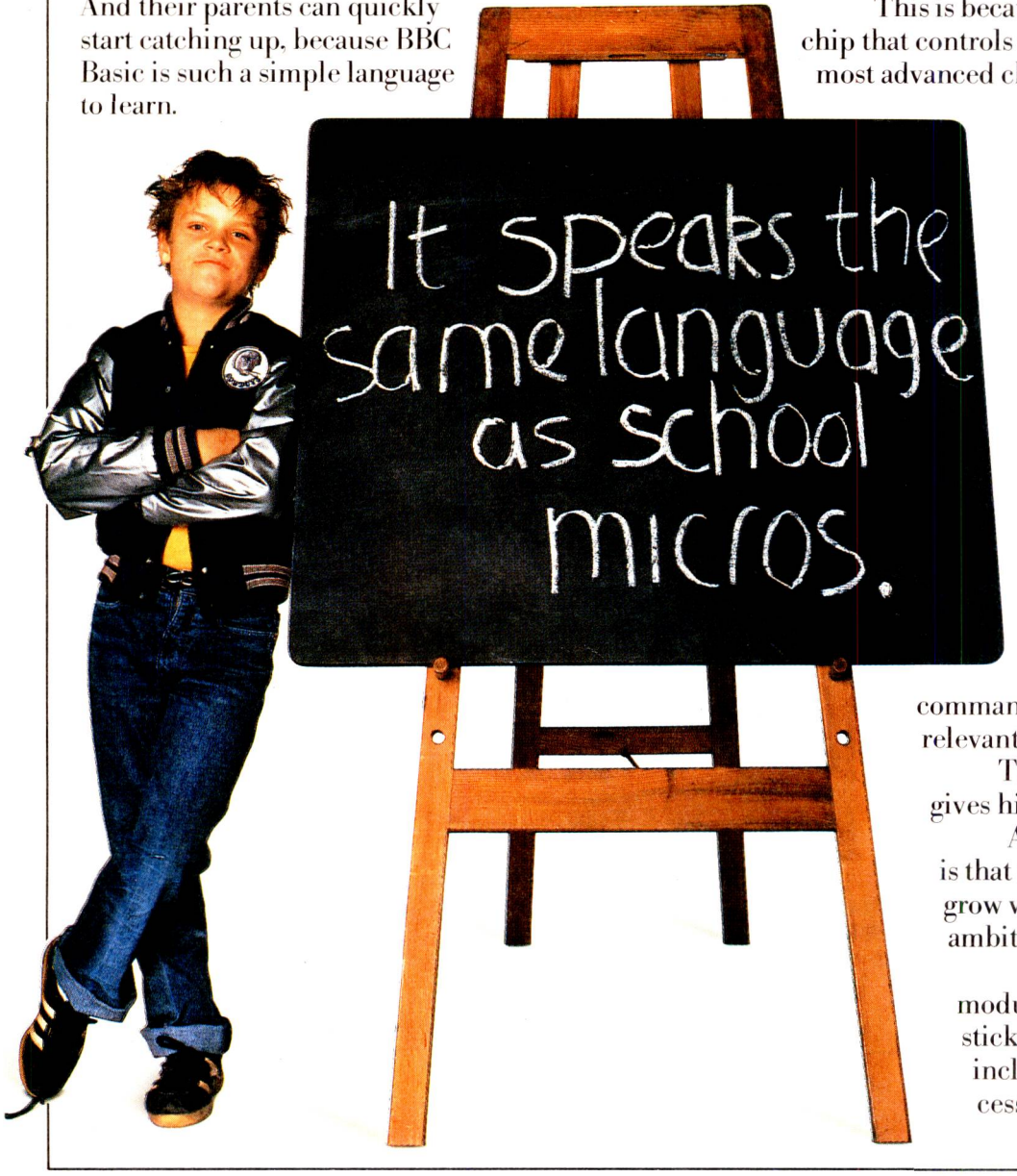
Most schoolchildren will tell you that one computer prevails in British classrooms today. Acorn's BBC Micro.

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.

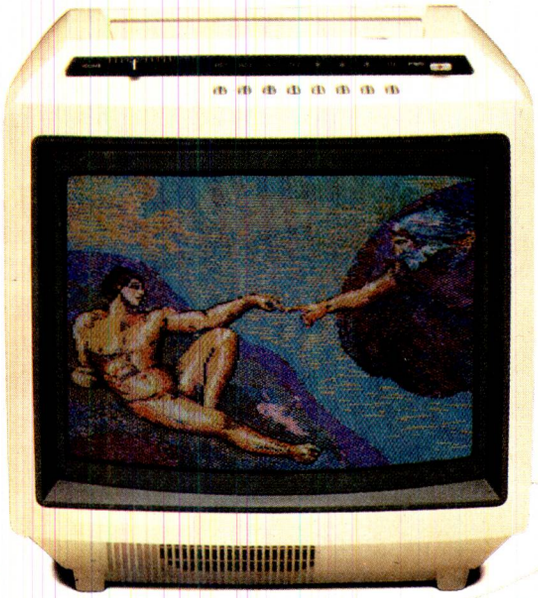
With Acorn's Plus 1 expansion module, it can link up with a printer, joy sticks and fast-load cartridge software including View and Viewsheet word processing and spread sheet programs.



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

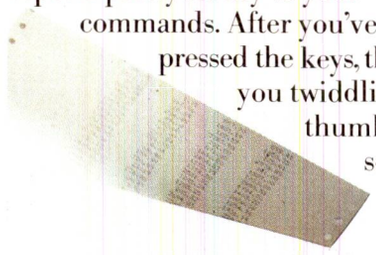
But let's not get carried away oo quickly. You can start using and njoying your Electron as soon as ou get it home.

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



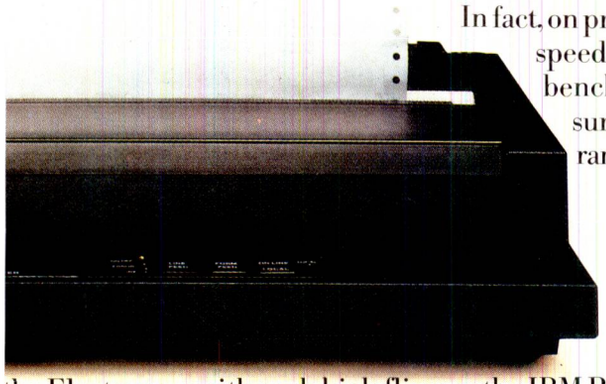
## The speed of a business micro.

Some home computers espond 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.

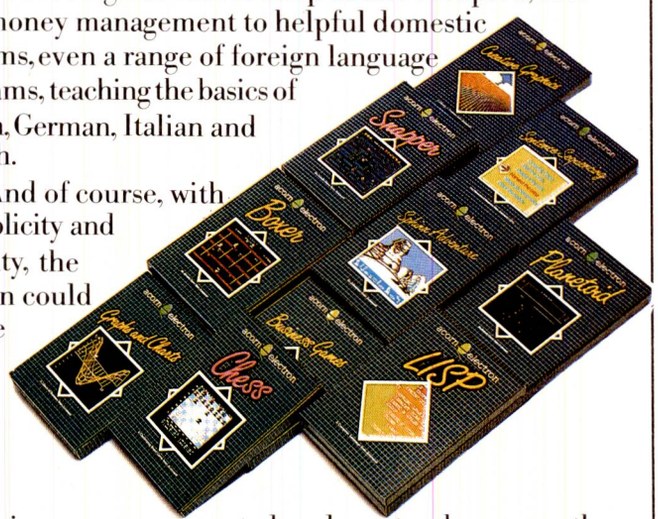
Because the potential is as infinite as your own imagination.

## 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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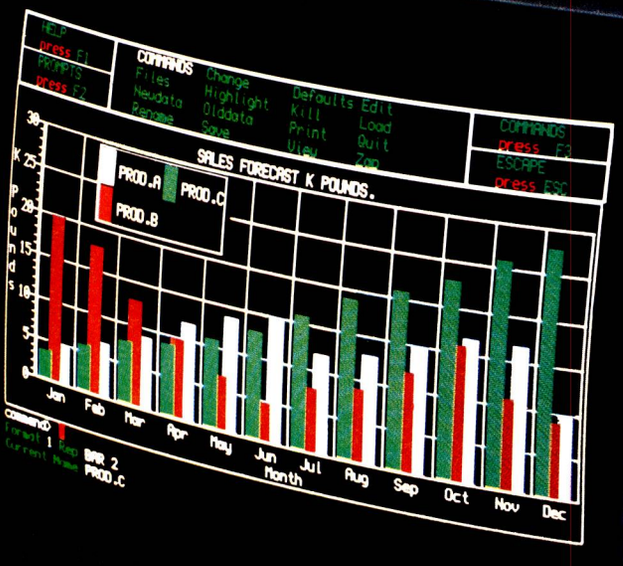


## Specification

*Model:*
*CUB 1451/DQ3*
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*653(H) x 585(V)*
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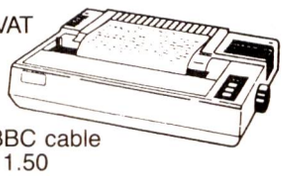
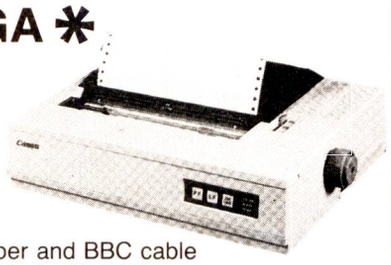
**RX-80FT** £208.00 + VAT

**FX-80** £312.42 + VAT



Printer price includes paper and BBC cable
Screen dump rom available for £11.50

## TAXAN/KAGA *
## KP810
**£ Call**



Printer price includes paper and BBC cable
Screen dump rom available for £11.50

## VOLTMACE JOYSTICKS

### *10% off list prices



| | | Discounted price |
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**SIDEWISE**

"SIDEWAYS" rom board for BBC Micro. No soldering required

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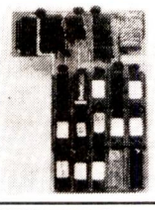
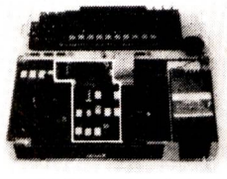
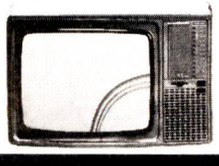


**SIDEWISE FITTED**

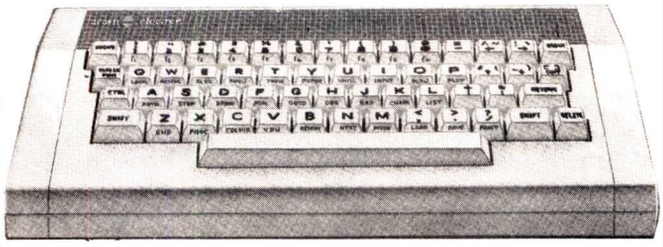


**NORDMENDE**

14" TV/Monitor
**£173.04** + VAT



## BBC MODEL B
## £359.10 inc VAT



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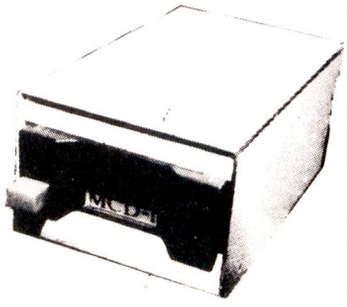
**3" Micro Disc £89.00** (inc. VAT)

**Disc Interface & Drive**
**£181.30** (inc. VAT)

Micro Disc Drive for the BBC Micro



The Micro disc drive offers a method of low cost quick access to programs. The drive is essentially a small version of a 5¼" disc drive and offers similar features to the larger drive.
The data is stored on a 3" disc, this is enclosed in a protective hard plastic cassette which features a write protect switch.
The micro drive requires the standard Acorn disc interface, but a new disc filing system rom. Acorn DFS may be exchanged for the micro DFS for £2.30. The new micro disc filing system can read and write to Acorn DFS discs.
Thus if a 5¼ inch and a micro floppy were connected on the same cable files could be transferred between them.
**Capacity:** 80.64 K bytes **Transfer Rate:** 125k bit/s.

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Prices subject to variation without prior notification
Prices for monitors & printers include BBC cable

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**BBC**

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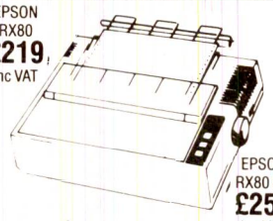

EPSON RX80 F/T **£255** inc VAT

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|---|---|---|---|
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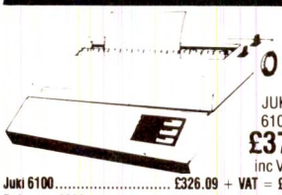

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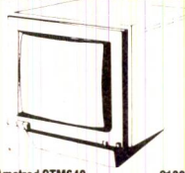

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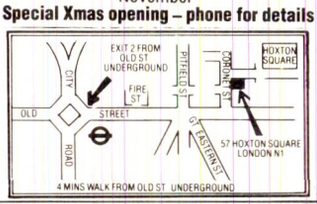


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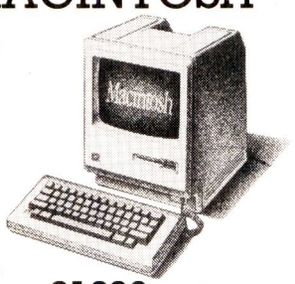

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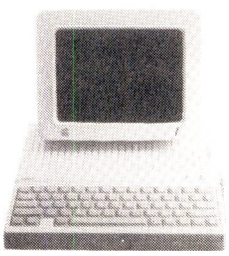

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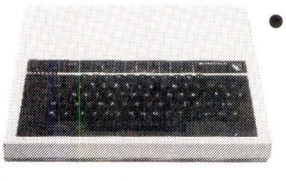

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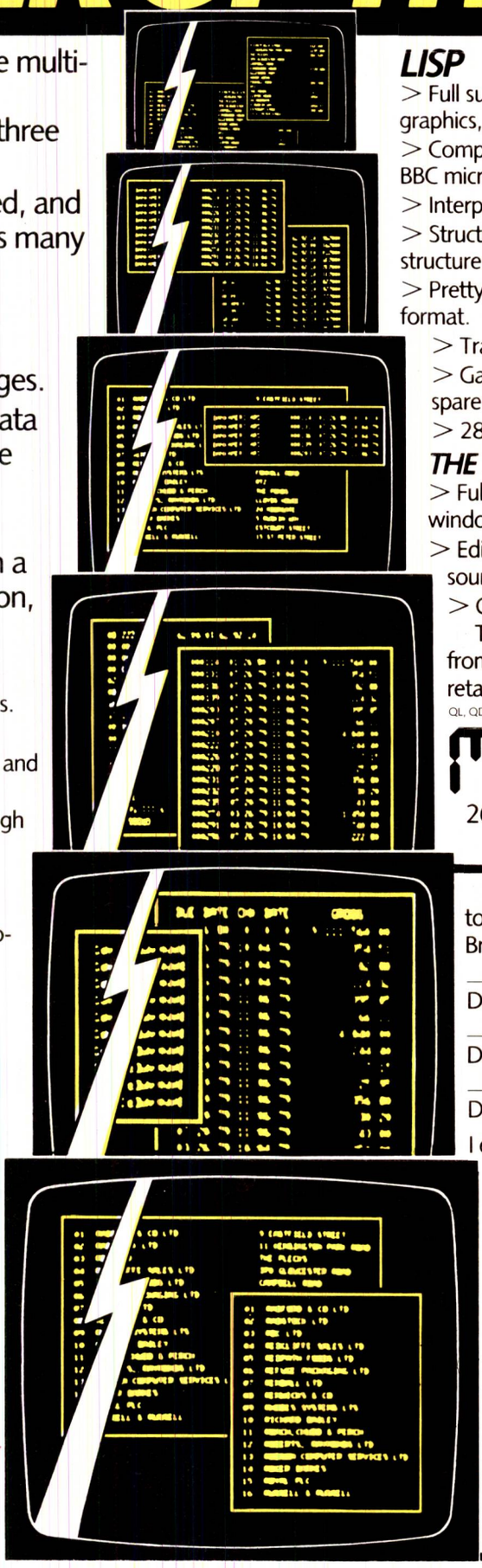

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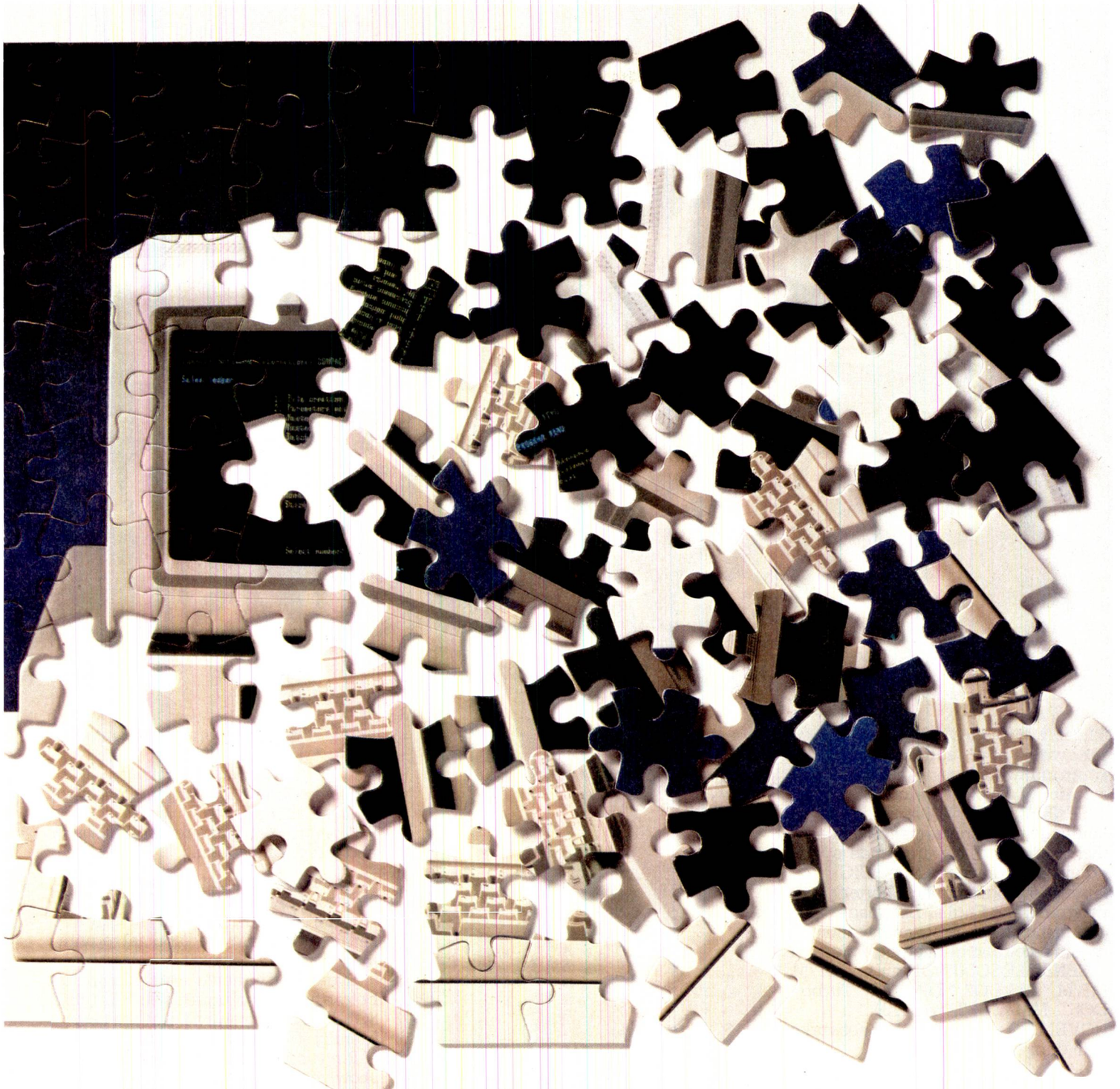

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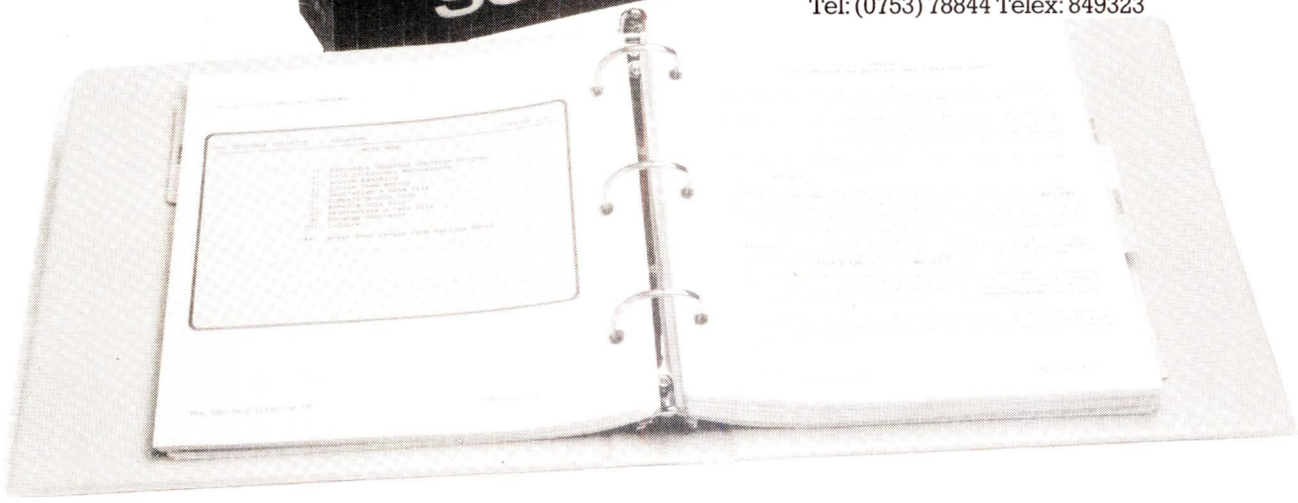

***The reasons single people join Dateline are often very varied, but come down to one thing — they are simply not meeting the sort of people they would like to meet.***



# 'We are going to get on!'

Tim Stagg, a 31-year old engineer from Pangbourne, found that the break-up of his marriage two years previously and the ending of another relationship since, had left his confidence rather dented. 'So I thought I'd try Dateline because at least that gives you a starting point for meeting people.'

At first Tim could not bring himself to actually telephone any of the girls whose names he received through Dateline; instead he made the initial approach by letter. He was delighted when girls started to telephone him, after receiving his name on their lists. For Tim it made the whole thing a lot easier, and a series of pleasant dates soon saw the return of his confidence. Fortunately, because on his third list from Dateline appeared the name of Christine Terry.

### *'Many of my colleagues were married'*

Tim and Chris agreed to meet at a point halfway between his home and Basingstoke, where Chris worked as a student midwife. Having just moved to Basingstoke, and working unsocial hours, Chris found it very difficult to meet people. 'Many of my colleagues were married and I was getting very low,' said Chris, an articulate 29-year old. 'I saw Dateline advertised and decided to give it a try.'

Chris had only been a member of Dateline for two weeks when Tim contacted her. Nevertheless, she managed to meet four people before that! But she was immediately taken with Tim when he phoned and was delighted when he suggested that they meet.

They agreed to meet in the car park of a pub and swopped car registration numbers as a means of identifying each other. Chris liked Tim immediately. 'Even seeing him sitting in his car, I thought 'We're going to get on!' Mind you, I thought that when he phoned up first of all. He was quite cheeky on the phone and I liked that.'

### *'Time just flew by...'*

Tim was also very taken with Chris and their first evening was extremely successful. 'The time just flew by. It seemed we had only just met and then it was time to go again. I can't even remember what we talked about!'

They decided to meet again a week later ('or sooner if you prefer,' Tim had said, hopefully), and Chris went home to her parents for the weekend. She returned to Basingstoke rather earlier than anticipated on the Sunday and felt like seeing Tim again, so she phoned him and they met again at 'their' pub that evening. They've met nearly every night since!

Within two or three weeks, Chris realised that she was falling in love with Tim and they were beginning to talk about the possibility of a future together. 'We went to London for a few days,' remembered Chris, 'and Tim said, 'Why don't we go to Hatton Garden and get a ring?!' So we did! It was a lovely day.'

Within three months of meeting each other, Chris and Tim were engaged and are planning a wedding in a year's time when Chris has qualified. Their families are very happy for them and Tim has found his friends very supportive. 'I thought they would laugh at me joining Dateline, but they didn't,' he said. 'After a while, especially after I met Chris, it made such a tremendous difference to me — I was so much happier. I would definitely advise anyone to join Dateline. I enjoyed nearly all my dates and even at worst had a pleasant evening out each time. Dateline helped me get my confidence back and I enjoyed my membership.'

Even though Chris was a member for such a short time she met quite a few people before finding Tim. 'Even just getting correspondence and phone calls was nice,' she said. And what advice would she give people who join Dateline?

***'Give it time and you do meet the right people,' she said, smiling at Tim.***


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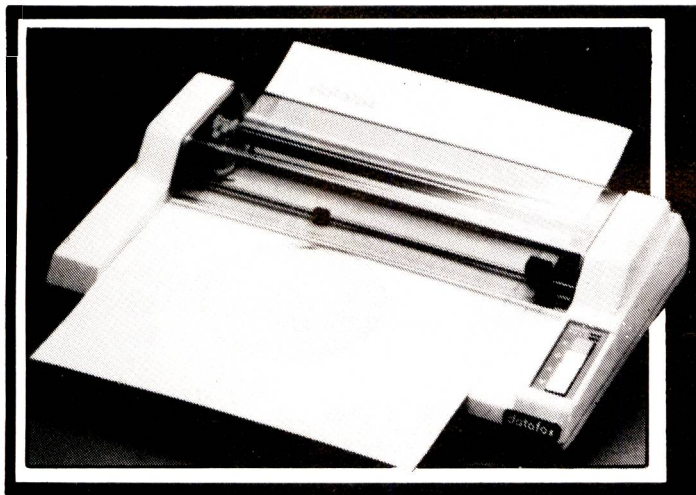

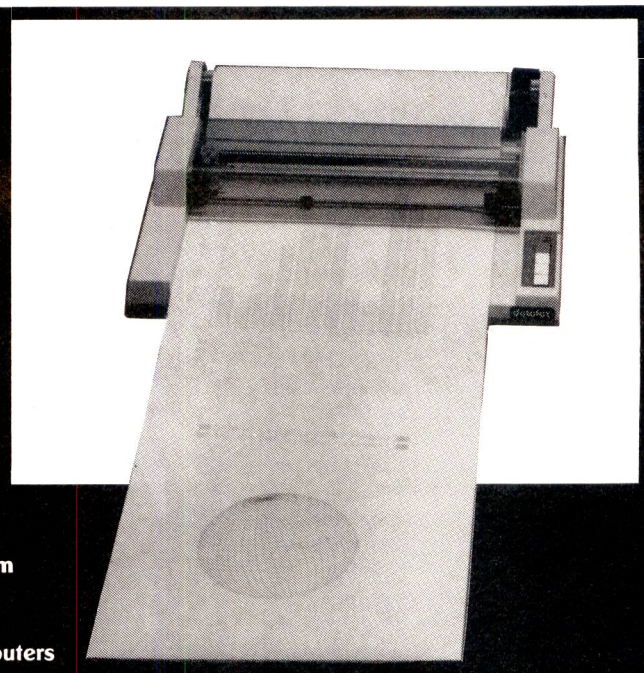

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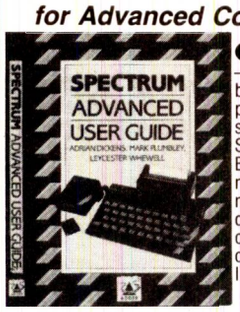


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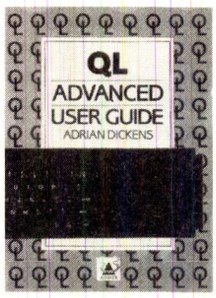


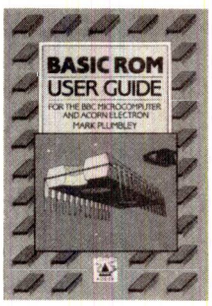


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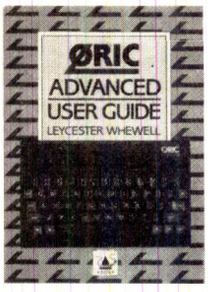


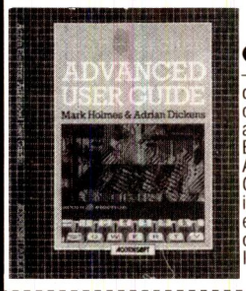


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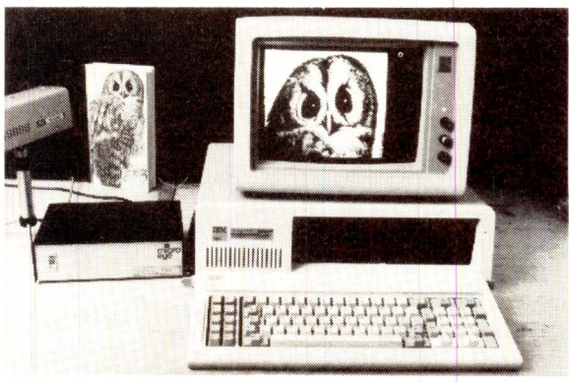

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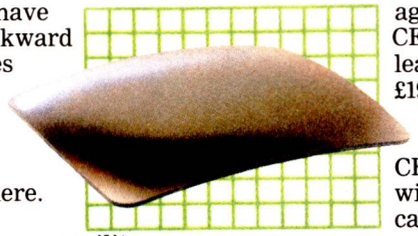

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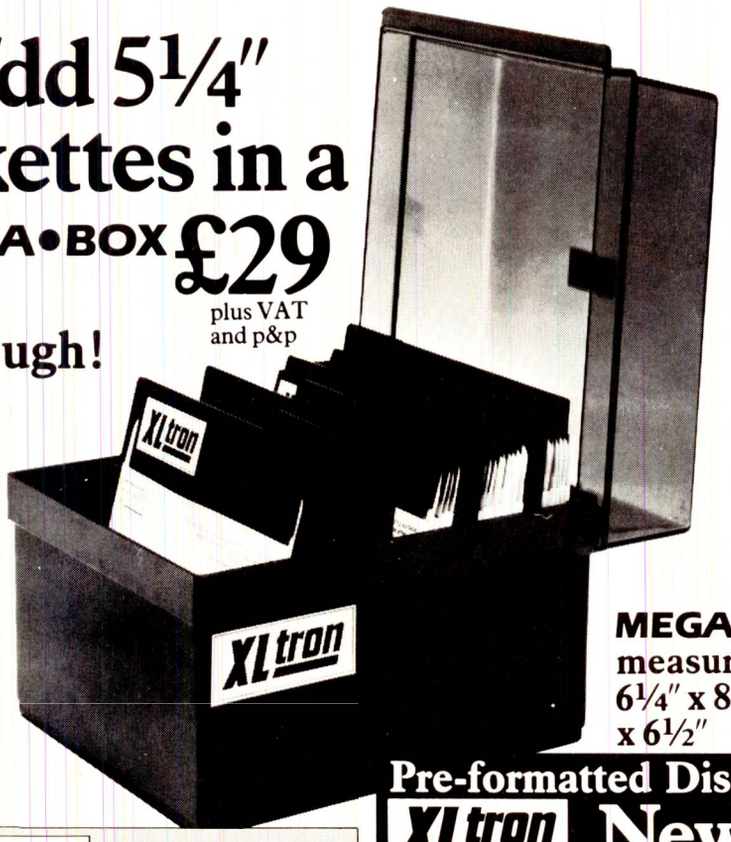


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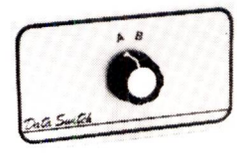


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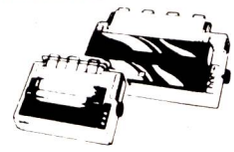

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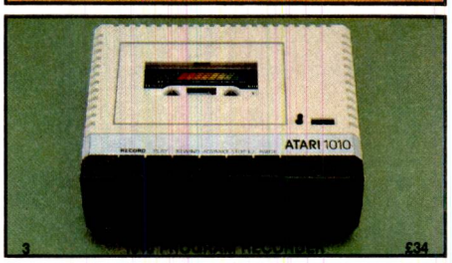

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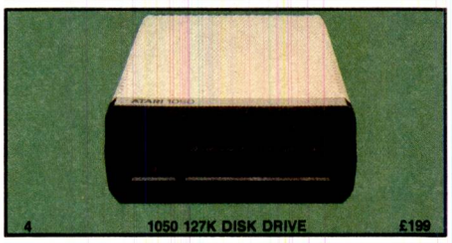
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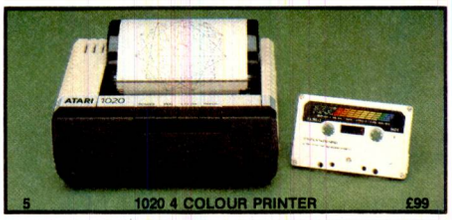

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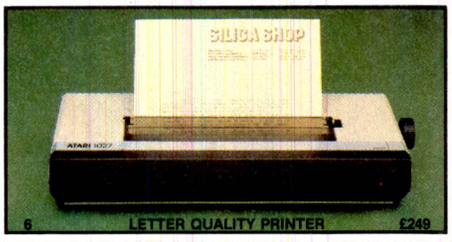

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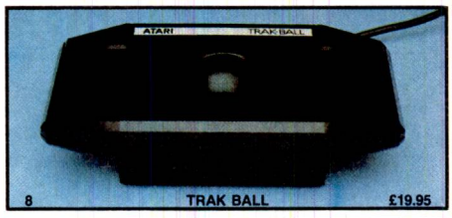

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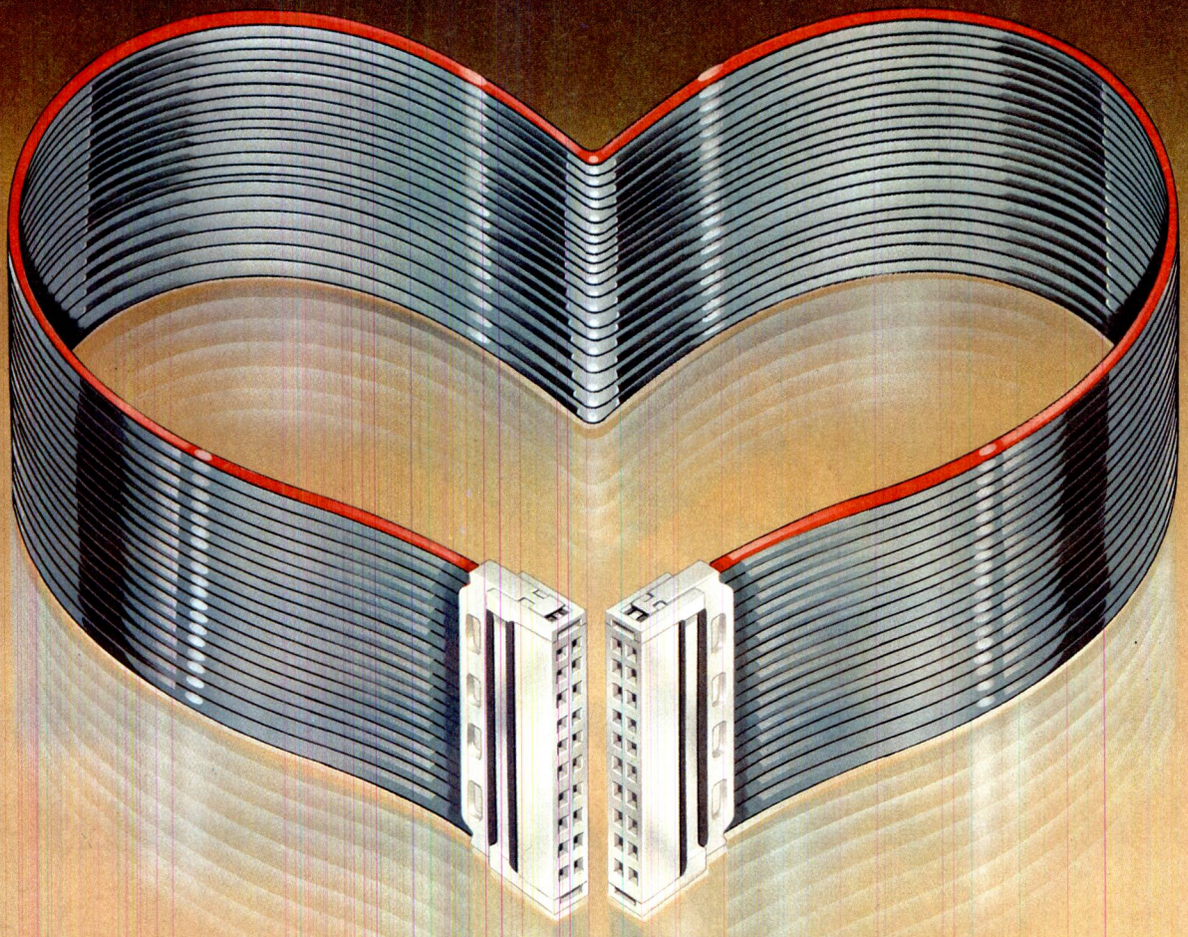

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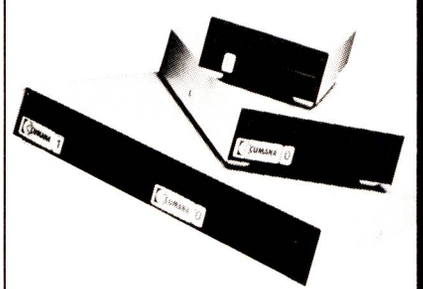

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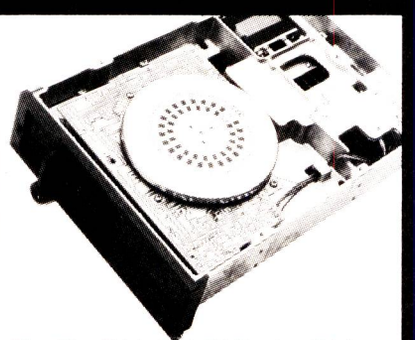

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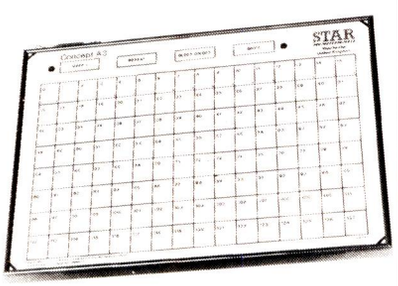


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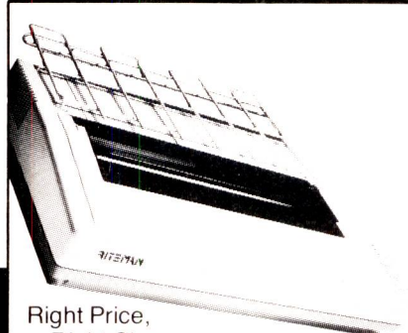

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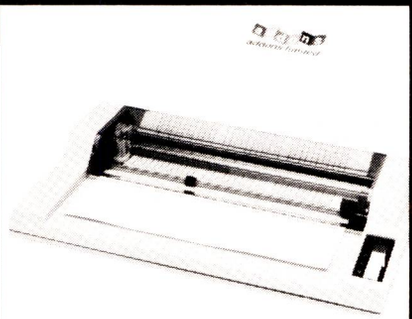

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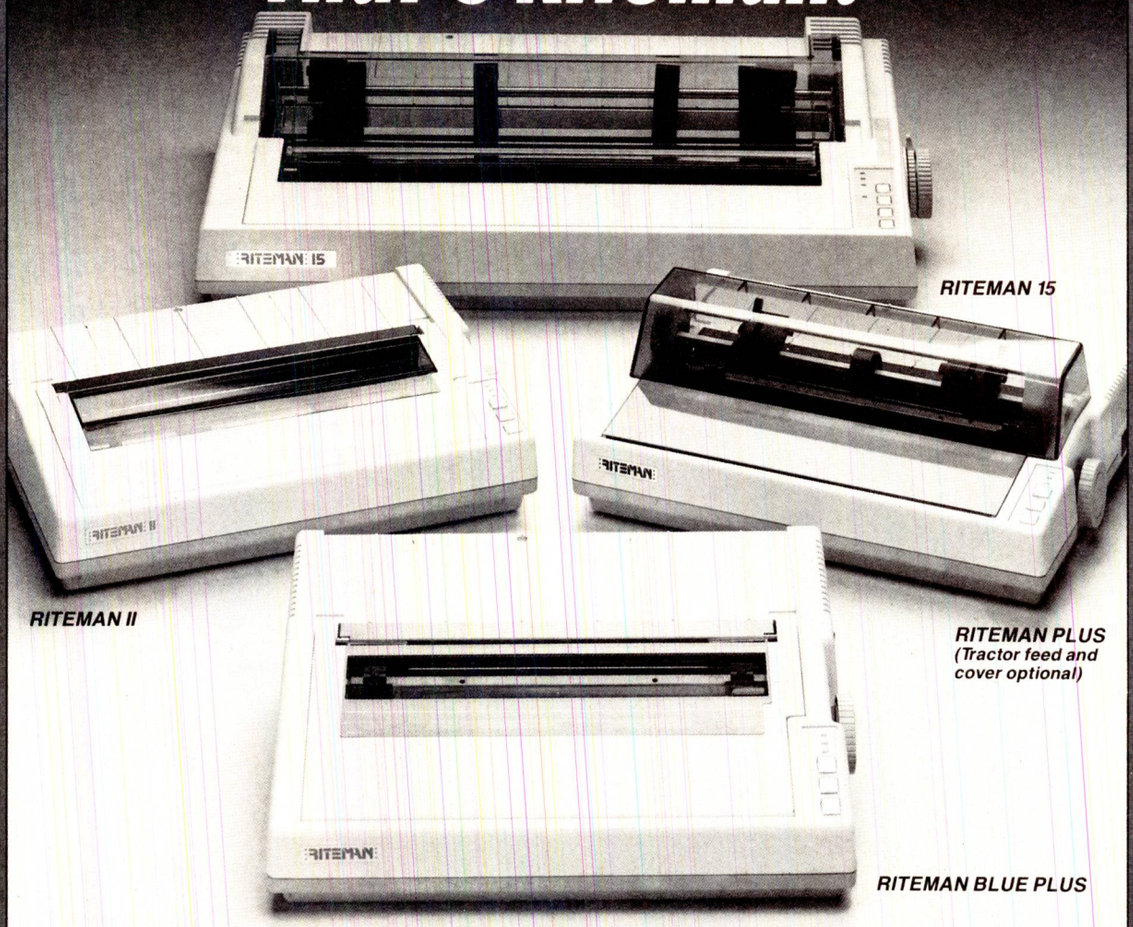


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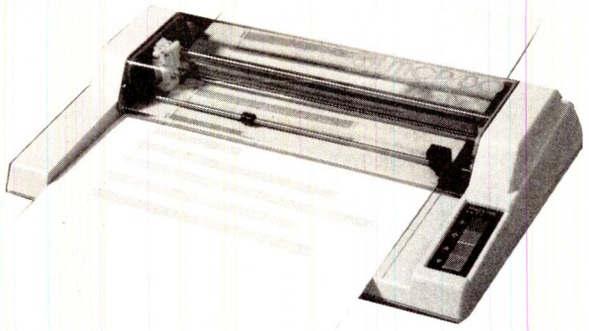

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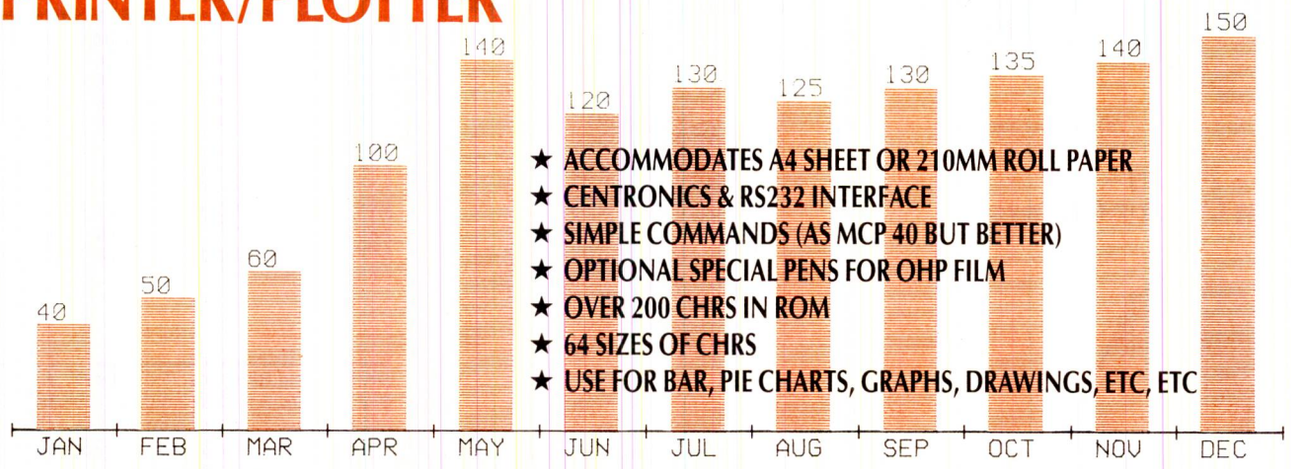


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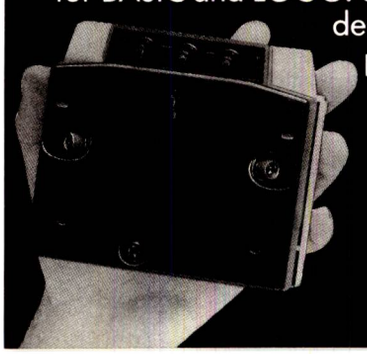

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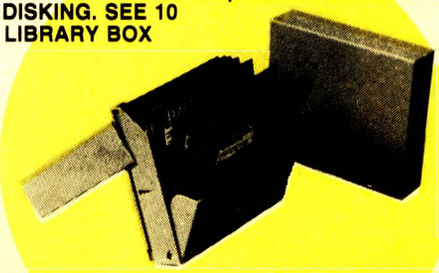

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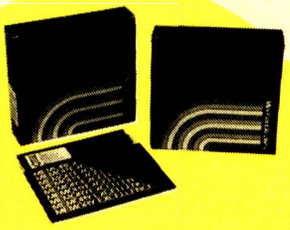
*Excluding diskettes purchased from bargain corner. All FREE offers are subject to availability.

**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.

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|---|---|---|---|---|---|---|
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| 3501 | D/S | 96 tpi | ... | 35.90 | 34.90 | 33.90 |

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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+ |
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0.5M Byte rating auto shutter

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

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10+ packs POST FREE
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ALL MEMOREX CLEANING KITS
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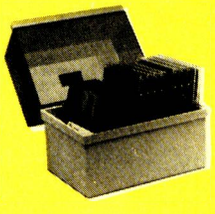
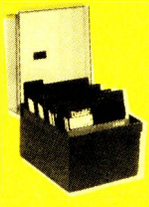
# DISKING *Means Business*



## 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.

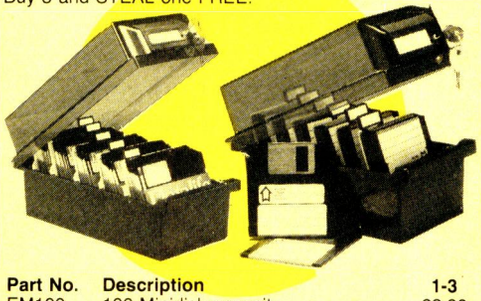
| Part No: | Description | Price EXC VAT |
|---|---|---|
| BM | 30 Microdisk capacity | 6.90 |
| B50 | 50 Minidisk capacity | 8.90 |

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.

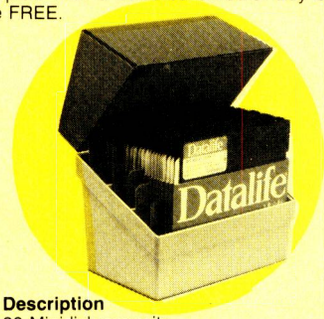


| Part No. | Description | 1-3 |
|---|---|---|
| JUMBO | 120 Minidisk capacity | 18.90 |

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.

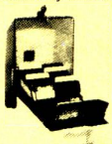



| Part No. | Description | 1-3 |
|---|---|---|
| B30 | 30 Minidisk capacity | 5.90 |

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 |

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## DYSAN — FOR THE DISCERNING

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| PRICES EXC VAT | | | | 10-40 | 50-90 | 100+ |
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| 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

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| 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

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

| PRICES EXC VAT | | | | 10-40 | 50-90 | 100+ |
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| 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+ |
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### 3 INCH DISKETTES

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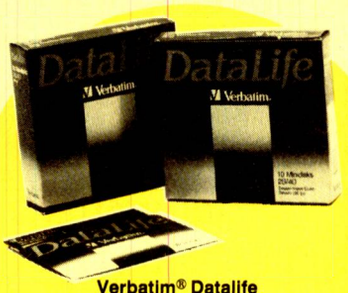
| CF2 Compact Floppy Disk | 39.90 | 38.90 | 37.90 |

# Verbatim




Verbatim® Datalife

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| MD550 | D/S | 48 tpi | ... | 29.90 | 28.90 | 27.90 |
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| 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+ |
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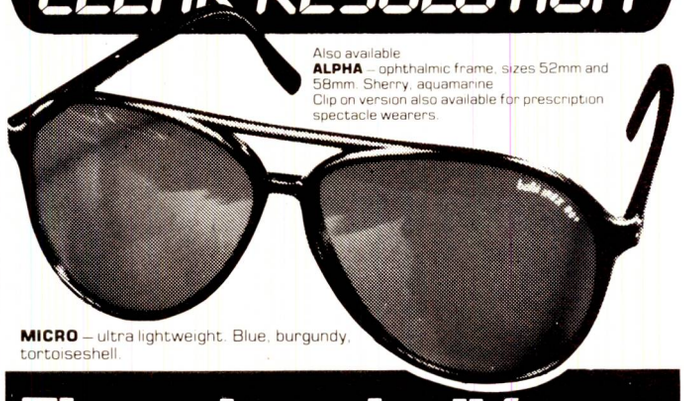

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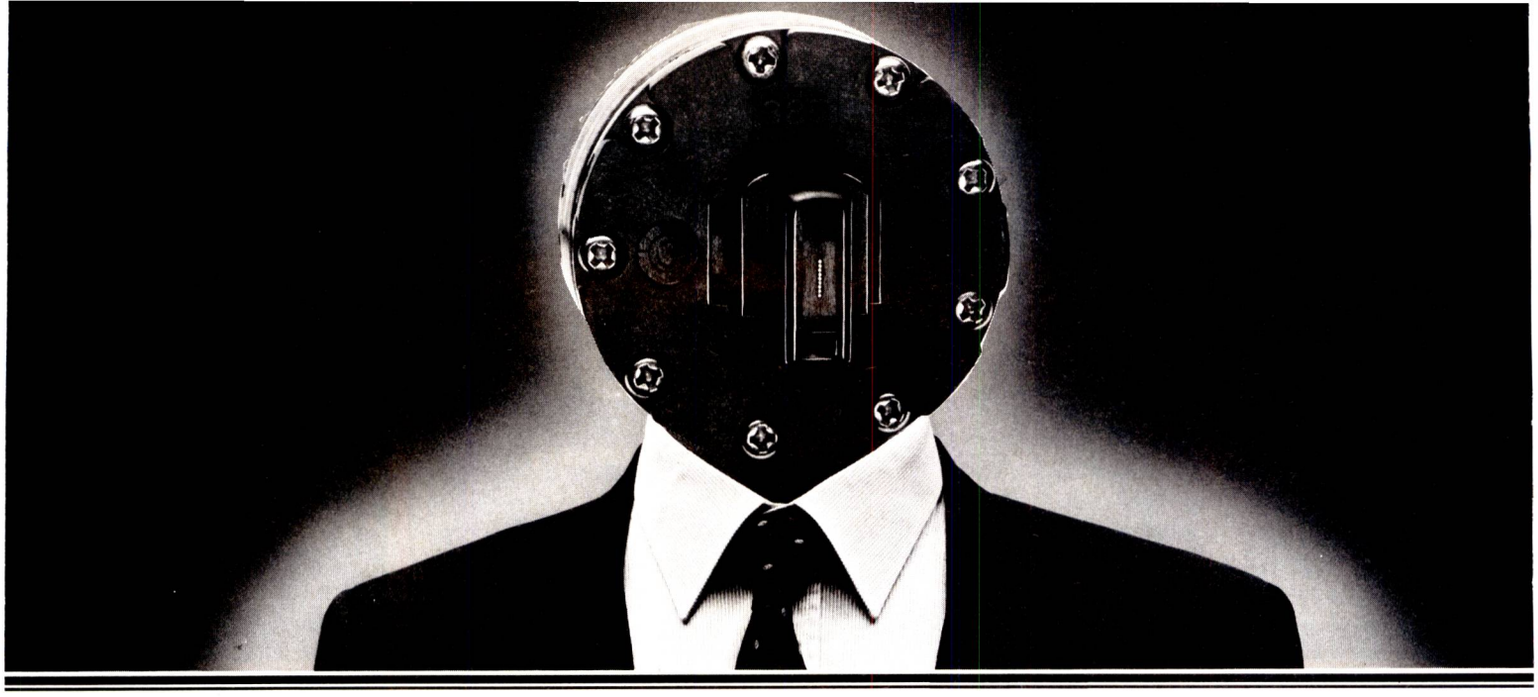

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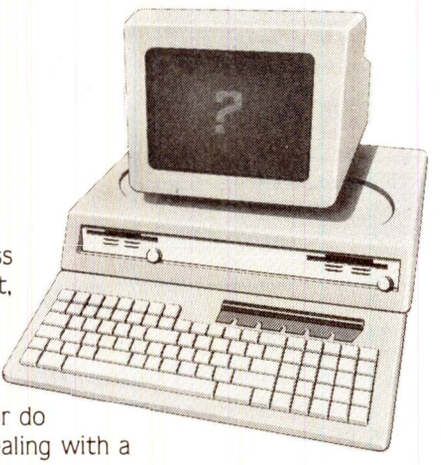

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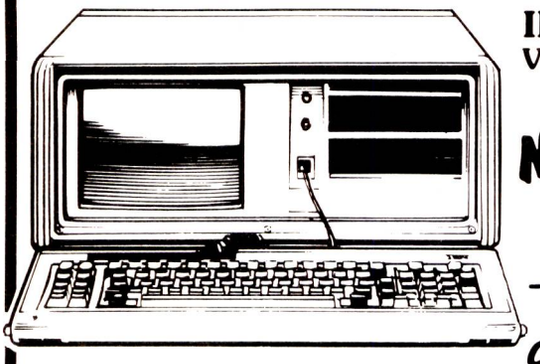

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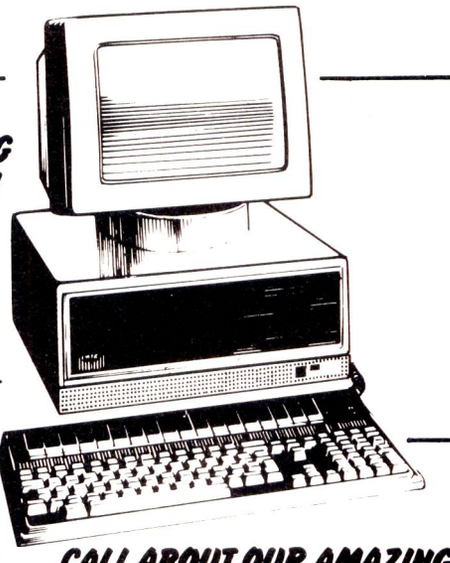

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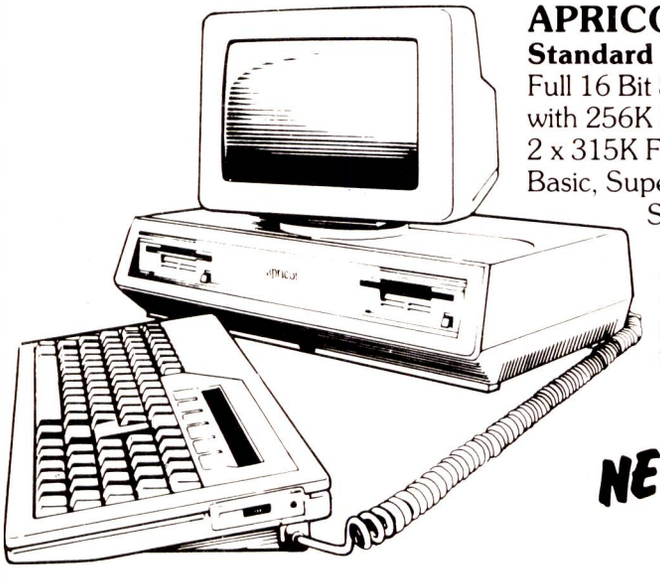

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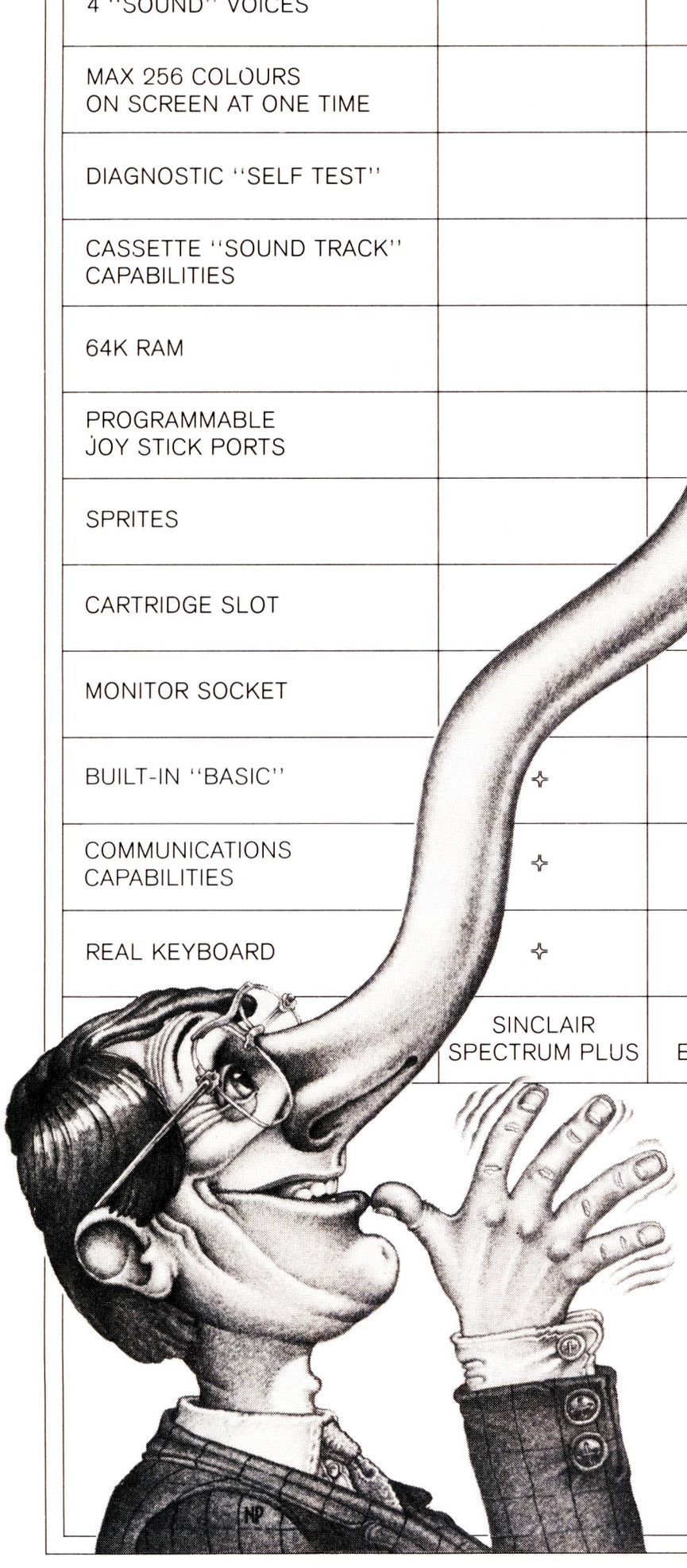

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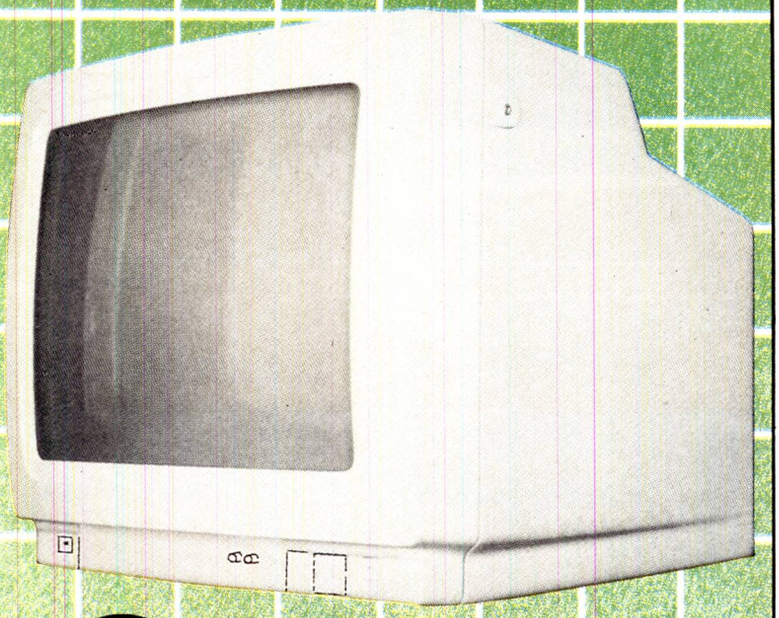

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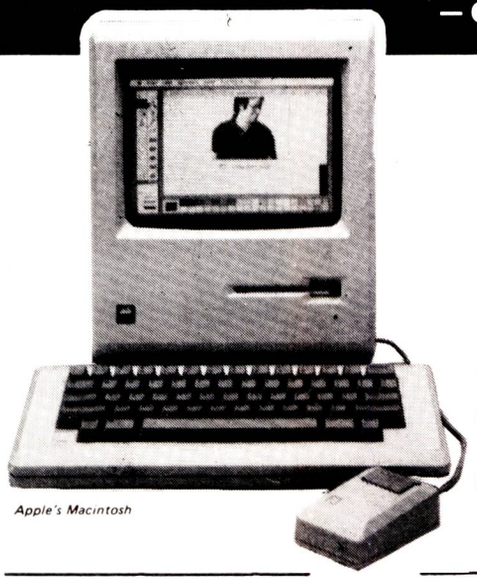

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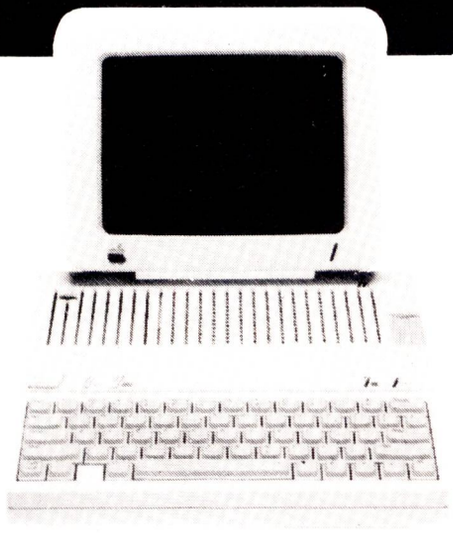

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# NEWSPRINT



*Guy Kewney's first-hand look at the news this month includes an exclusive look at Amstrad's disk software, the truth about which Expert went bust, and an on-the-spot review of Comdex Fall from Las Vegas.*

## Drive with care

Included in the price of the drives from Amstrad is a disk of software containing CP/M, DR LOGO, various Amstrad utilities and extra CP/M utilities. But before getting too excited about the possibility of a cheap CP/M system, it's worth examining exactly what is on offer. Although this is a complete CP/M implementation and does provide an 80-column display (unlike Commodore's CP/M), there's a problem with the Transient Program Area or TPA.

This is the area of memory available for application programs to run in. On the Amstrad this totals 39.5k which is less than many CP/M programs such as WordStar and dBasell need. Furthermore, suppliers of CP/M programs that do fit in 39.5k have to be persuaded to convert their programs to Amstrad 3in disk format. With the machine not being marketed in the US, it's likely that only British software houses will consider doing this.

That said, the Amstrad software is still impressive. DR LOGO, Digital Research's Logo, is a thorough implementation of the language and is well worth having, as are the Amstrad and CP/M utilities.

And to offset the problems with CP/M, Amsoft — the software arm of Amstrad — has commissioned some software houses to convert their programs to Amstrad format CP/M. Probably the most impressive package of this CP/M software is the word processor commissioned from Intelligence Ireland. For £49.95 you get a 'WordStar' quality word processor with a mini-spreadsheet calculator so that tables can easily be incorporated into text. The word processor can be integrated with the same company's Database and Spreadsheet, also available from Amsoft at £49.95 each.

A suite of accounting programs commissioned from Quest will be also be sold by Amsoft. Sales Ledger, Stock Control and Invoicing come bundled onto one package for £99.95 — these packages cost £250 each for other CP/M systems. For those that want it, both Purchase Ledger and Nominal Ledger can be added to this package for £33 each.

Not running under CP/M, but also available on disk for the Amstrad, are the more popular of Amsoft's games and the excellent 'Brainpower' series commissioned from Triptych.

The 3in disk drive unit itself was first seen at the 1984 *PCW* Show. At £199 it's certainly an impressive package.

Following Amstrad's 'Plug in and go' philosophy the package includes disk drive, disk drive controller, cable, the bundled software and documentation — all designed to be easy to get up and running. To set up the disk system, it's necessary to plug a cartridge containing the disk controller ROM into the 'Floppy Disk' socket on the back of the Amstrad, and then connect this via the cable to the long, slim disk drive unit. Both the cartridge and the disk drive match the main unit's dark grey colour scheme. Also'available is a second drive without controller cartridge which enables the system to be expanded to its maximum of two drives.

Each disk can store up to 180k of data per side; flipping the disk over gives a total of 360k per disk. With the cartridge installed, all the cassette commands, such as CAT, are redirected to the disk, making all previous software that accesses the tape compatible with the disk drive.

In addition extra disk-specific operations have been added to Basic; these are accessed by preceding the command with the bar symbol (Shift @). One of these extra commands, TAPE, reverts the system back to tape should you wish to use a cassette.

## Legal at last

By reducing its ambitions somewhat, B & L Software of Idaho ma:' have beaten Digital Research to the punch with Multi-Job, a multi-tasking product for the IBM.

DR's Concurrent DOS is designed to run on virtually any machine with an 8088 or 8086 family chip. Multi-Job, however, is written only for the IBM.

The claims for it (which Newsprint covered briefly when Pete and Pam got hold of it) are that it will run up to nine PC-DOS programs at the same time.

The new version, at last, will cope with programs using more advanced versions of IBM's operating system than version 1.0.

I have promised not to reveal which distributor it was that started its career with Multi-Job by buying £20,000 worth of illegal copies from Starware, in Washington — illegal copies, moreover, which wouldn't run, but came up with the message that it was an illegal copy, and crashed.

However, I can reveal the name of the distributor who is selling this new (authorised) version at £100 — it is Impex Software on (01) 900 0999 — which must be the longest number in the London phone book to dial.

The company is also distributing Electronic Disk at £69, and Printer Spooler at £25. Electronic Disk uses part of the internal memory as a very fast disk. Printer Spooler carries on printing while you get on with other work.

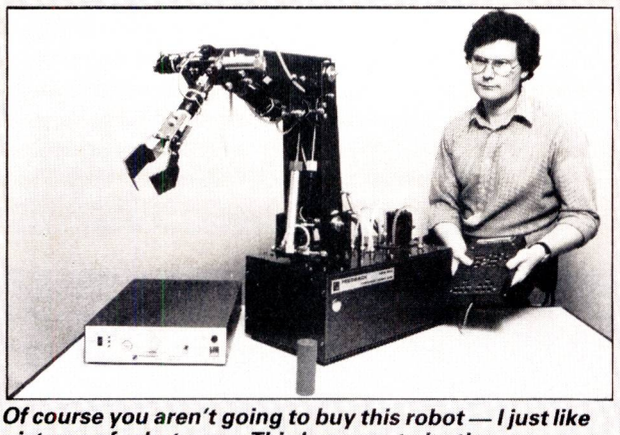
## Apple's party piece

The (unofficial) word from Apple's UK bosses comes in the form of knowing winks, nudges and subtle hints this month indicating that something really special is to be unveiled at the Annual General Meeting.

My sources in the US tell me that, candidly, Apple had better have a good rabbit to pull out of its hat because it's in need of a boost. It's short of cash.

Frankly, if Apple came to me with a request to borrow money and an offer to pay me interest on it next year, I'd lend whatever I had.

Certainly, I have never known Apple to have such a big, white smile as it is showing, with the 'Test Drive'



***Of course you aren't going to buy this robot — I just like pictures of robot arms. This happens to be the new, more robust and versatile HRA934 from Feedback, now that its designs have been modified by engineers from Powertran Cybernetics, the company it took over last year. The robot has its own inbuilt chip, or can be driven from an Apple or BBC Micro. Details on (08926) 3322.***

promotion for the Macintosh (take one home for the night) and buses hired to drive journalists around Hyde Park, showing them presentations, and other really aggressive signs of an intention to take the market and make it swallow as many Apples as it can bite.

Well, exactly what are we looking forward to on 25 January?

There will be a network, a file server, and a laser printer costing $7000 — but not the drastic price cut which the rest of us are hoping for.

Worse, there is no sign of the go-faster things that the Macintosh needs.

The machine is dreadfully slow. Even the new, 512k machine doesn't quite make up for its wonderful user interface by the relaxed way it uses its disks. You could make a cup of coffee between deciding to stop MacPaint and starting MacWrite.

At the time of writing my Macintosh test drive is being enhanced by a hard disk unit from Small Systems Engineering. There is £5000-worth of hardware strapped onto the Applebus port of my Mac, and it still took me 20 seconds to close one text file, find another, and open it.

There are reasons for this. The machine keeps an awful lot more data on file than most micros because of the pretty typefaces, and the detailed graphics, and so on. Also, each time it stores a permanent file copy onto the disk, it goes to a lot of trouble to make sure that it knows how far it has gone. If the power goes off, it can usually pick up the very complex threads left hanging and weave them back together into your document or database, or whatever.

Nice, but not good enough — something just has to be done to speed things up.

A really fast hard disk would be one way of doing it. Even better, would be a lump of semiconductor memory, plugged into the second disk socket, pretending to be a disk — but running at memory speeds (several hundred times faster than a floppy).

There are hints and nods that such things are on the way — *but*, I gather, not for some months.

The Small Systems hard disk, by the way, is rather better value than its enormous price makes it sound because it includes the beginnings of a working local network.

On my pre-production test sample it was possible to hook up two Macs (all I could get hold of!) and an Apricot simultaneously. Passing files from one machine to another, however, wasn't easy, and was only possible between the Apple models. I could have plugged in an Apple IIe, too.

But for the hard disk to work well requires the Macintosh software writers to wake up to the fact that people need bigger disks than the Mac gives. If you want to put your programs on the hard disk, you'll find that a great many users have copy-protected their stuff in a way that prevents this.

Officially, Apple's rules about copy protection are: you must have the original disk in the machine, but can run from a copy. PFS File and Report won't work like that (a new version is promised) and neither will Macintosh Pascal.

# Mistaken identity

Everybody knows that Expert Systems International, ESI, went bust last month, right?

Wrong! It was Expert *Software* International which crashed, and which bears no relation to Expert *Systems*.

Actually, the company doesn't seem as upset as you'd think at the living ESI, where (after an initial panic) it discovered that it was getting so much extra publicity that it was almost worth the bother.

It was a very opportune moment for the company to launch Prolog-2 — 'believed to be the world's most sophisticated version of the artificial intelligence language, Prolog.'

That's all the excitement you get for today: it runs on the IBM PC and Sirius, and Apricot and Rainbow machines will have versions by March or April — but the drawback is that it costs £2000.

'You've got to be a serious software developer to be interested,' confirmed Alex Goodall at Expert Systems.

Details on (0865) 242206.

# Sprinting home

A neat little tape recorder which loads Spectrum programs at four times normal speed was released some months ago by Challenge Research.

Called the Sprint, it costs around £65. For anybody who uses the Spectrum to write their own programs, it's wonderful.

The Sprint works by plugging directly into the



***There's an interesting computer battle, using country-wide networks, just starting. It could end up going into the City of London before 1985 is out.***

***It may not be a battle officially, but from the outside the race to supply every school in the country with electronic mail looks very like a tussle.***

***And with the Times Network for Schools launched, but with CAMPUS (Computers And Modems Project for Use in Schools) not due to be revealed for another two months, it's a shame that we can't really give readers a form guide for predicting the likely outcome.***

***So, what we do know is that The Times has decided to sell modems worth £400 and software worth — well, whatever communications software is worth, so, say £50 — to every school in the country — at a cost of £150, plus a user fee of £69 per term.***

***On the other hand, the Prestel-backed Prism group was planning to give away 8200 Prestel-style modems to schools. No, it isn't Micronet, it's a rival service.***

***Or is it?***

***The Times network uses electronic mail services provided through Telecom Gold, or BTG (as it hates to be called). Eventually, the plan is to buy The Times network's own Prime computers, and move the users, the information databases and the bulletin boards onto them, leaving Gold behind — but BTG doesn't seem to be altogether aware of this plan.***

***The Campus network, if it happens, will use Prestel. Unlike the TNS it will not allow users to connect their computers to each other, nor will it work at the very fast 1200/1200 bits per second speed of TNS intelligent (error correcting) modems.***

***And, from what is known so far, the TNS looks much more ambitious, offering big databases, opportunities for big companies like Memorex and National Computer Club to sponsor special information services, promotions, competitions through retailers, and so on.***

***To make the fight look more interesting, one of the contenders has nobbled itself.***

***Prism managing director Bob Denton, fighting for a 'time of stability' and holding only 35 per cent of the shares in the company he co-founded, told Richard Hease, the other founder (weighing in the 51 per cent of the shares) that if the company didn't want to do it his way, he would offer his resignation.***

***Richard Hease, wanting to use Denton's Wild West talents (as his enemies see it) to scour the world for new and exciting ideas, accepted his resignation.***

***A week later, they were still playing games, with Hease offering Denton a consultancy role to handle Campus, and Denton saying firmly that 'I can live without Prism, let's see if Prism can manage without me,' and refusing. You could make a living on bets as to whether there will be a reconciliation, and if, then when, but it's worth noting that Denton isn't selling his shares.***

***There's no denying the rivalry between the two groups of pioneers at the grass-roots level. But there is the irony of the fact that Richard Hooper, communications king of the Seventies, is in charge of both projects from within British Telecom Developments.***

***Unfortunately, we had to go to press before getting a chance to talk to Hooper — so watch for next month's fascinating episode.***

system via the back expansion slot, and feeding information from the tape directly into memory. It gets its power from the Spectrum too, and gets its speed increase by running the motors of the tape drive fast.

There are snags, however, some caused by copy-protection systems, others by considerate program writers.

The copy-protection problem is one we can despair of overcoming. A very nice program called Dark Star, for example, just wouldn't load. Well, it looked nice when I saw it demonstrated at the *PCW* Show but it may be a load of rubbish, because it's the longest ever Spectrum program and life is just too short. And the Challenge Sprint can't cope.

The considerate programmers can be managed. They are the people who have pity on you, and know you don't enjoy spending five minutes watching the TV screen go flicker and the Spectrum go chirrup. So, they load in sections with little animated graphics, and then load the next section. Too late! The Sprint has already gone half way into the next section.

Challenge says there's a way round it, by tapping any key to disable the 'pause' statement. It works, but it really is more trouble than I think it's worth.

Details on (0707) 44063.

# Big business

Exciting new machines for the business market from Commodore? Recently appointed software development manager, Gail Wellington, celebrated her arrival to head up a special project team aiming to take Commodore back into the business micro scene, by 'confirming' that the company does plan to chase IBM.

'The Commodore PC and Z8000-based machines, previewed earlier this year in Hanover, will play an important part in the new operation,' was the official statement. Wellington added: 'We will be bringing them to the UK early in 1985, together with a number of other machines which are going to have an extremely dramatic effect on the market. In fact, we believe that the industry is in for some big surprises from Commodore.'

Big surprises, eh? Certainly the appearance of *any* Commodore business machine *any* time in 1985 would be quite a surprise after all the false dawns from that company.

But the word from inside suggests that the PC will not be the portable Hyperion-based system, but a desk-top machine based on a subsequent evolution of Bytec's PC imitation 'which this time would be genuinely compatible' with the IBM.

And the main hopes of the top brass lie in the Amiga design, a Macintosh-buster which it hopes will go into business and home markets.

Business and home markets together is something Commodore had dreamed of for some time with the 64, and it remains just a dream for the immediate future. I think Commodore has a simple choice.

Either, it comes out with one business system, and one office system, in 1985 — or alternatively it comes out with a dual-purpose machine in 1987. That's when the market will converge on that level. And even then, there will always be a market for something costing £2000 to £4000 in business terms, but nobody is going to spend that on a home machine — period.

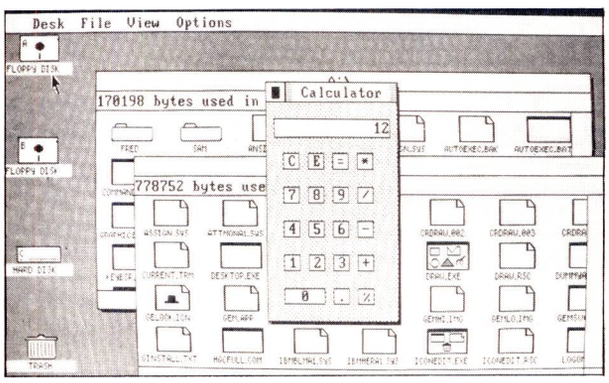
# Homing in on the truth

The reason that the home computer market 'is likely to fall off from a peak of 1.9 million per year to 1.2 million by 1998' is that 'the market will become mature.'

A report making this prediction has just been released by Market Assessment Publications — and it looks certain to walk into rage and flak from Commodore because of the way it analyses today's market.

The report says: 'In the long run, it is conceivable that home computers will become major items of household equipment. An expansion of computer use beyond games to include domestic management is quite feasible.'

And, it adds: 'As a home workstation, with a link to the place of employment, computers in the home have a strong future. This will expand and change the potential market considerably towards the end of the




***Fascinating, isn't it, how Microsoft, author of MS-DOS and PC-DOS, always manages to make some kind of announcement whenever Digital Research, author of Concurrent DOS, comes up with something new.***

***This time, just to prove they aren't rivals, Microsoft announced MS Net the same week as DR released details of GEM, its Graphics Environment Manager.***

***Anybody who went to the PCW Show last September knows what GEM is, because it was the package that made Acorn's new ABC range look like a Macintosh, as the picture above shows.***

***Paul Bailey, head of DR in the UK, apologised handsomely to me for having mislead readers of PCW over this product, which had been secret at the time Acorn decided to show it. Both Acorn and DR pretended it was something else, something Acorn had written. It wasn't.***

***I was happy to accept his apology equally handsomely, and to match it; since his colleagues had got quite annoyed with me for suggesting, last month, that Concurrent wasn't multi-user on the AM Stearns machine — and that happens to be one of the machines which does use the multi-user version of Concurrent. An error on my part.***

***Still to be proved is whether GEM slows things down for the user.***

***Normally, 'ease of use' features like this are applications programs. They occupy space in the machine, take time to load and time to re-load after the application is finished. In the case of machines like the Apricot and the Hewlett-Packard 150, these friendly interfaces can drive you crazy with frustration as data cranks slowly in and out of the system, on and off disks, like a fast bowler strolling right back to the pavilion before starting to bowl.***

***Microsoft, which (as Digital Research will remind you at any opportunity) is not primarily an operating system company, chose two days later as the date for announcing a system of linking MS-DOS machines.***

***The announcement was impressive, say those who managed to attend, because it was the first time Microsoft had announced something before IBM.***

***Those less impressed remembered last year's announcement of MS Windows, due out last March. It is now expected this April, and was clearly announced purely to steal the wind from DR's sails over the announcement of windowing on Concurrent. That, too, by the way, was not announced as an IBM product at the time.***

***Had Microsoft and myself managed to agree on which date Bill Gates would be available for me to interview, I would quite have enjoyed asking him just how soon MS Net would appear. As it was, I showed up at a hotel while he was sitting back in the first-class lounge of an aeroplane over the Atlantic, and I didn't get much sense out of him as a result.***

***Equally, I failed to check with ACT boss, Roger Foster, over when GEM would be available on the Apricot, on which I am still anxiously expecting to see appear a version of Concurrent which runs IBM PC-DOS programs.***

***In other words, on this launch, I really feel the old warning 'wait till you see it in the shops' applies as much as on any of the other unlikely sounding products mentioned in these pages with enthusiasm and pleasure.***

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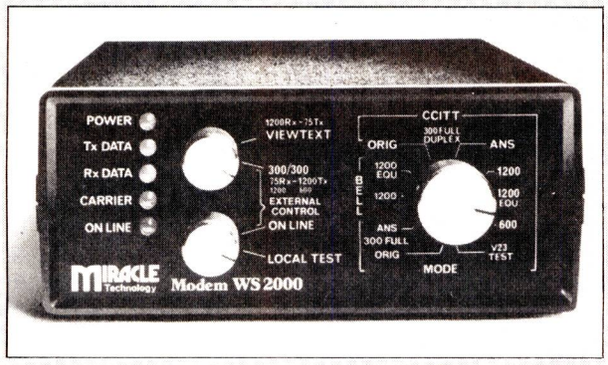



***Approval for the Minor Miracles modem, which works to just about every communications standard in the world, didn't come quickly, but at last you can buy one and use it legally. This will no doubt come as a great relief to the thousands of people who already have one plugged into their new-style BT sockets. Details from dealers, or from Miracle Technology in Ipswich, on (0473) 50304.***

***Irritatingly, the company doesn't quote a Telecom Gold id . . .***

forecast period.'

It's the bit where the analysis turns to the UK market today that will cause upset inside Commodore.

John Baxter, head of Commodore, has long been telling anyone who will listen that his company is matching Sinclair computer for computer, and is heavily outselling in terms of money. But what about market shares? Market Assessment says: 'Sinclair remains undisputed market leader with 43 per cent of the market share, followed by Commodore with 22 per cent, and Acorn with 10 per cent.'

Makers of other home micros shouldn't get too encouraged by the report's belief that the home market isn't really going to shrink, but just change into a 'domestic management' market.

It says that tragedy is inevitable. 'At present there are around 38 brands of computers, many of which are relatively small and lack the public awareness which established names have.'

And, it adds: 'How long these relatively small ones will survive is a matter of debate, but a reduction in the number of models available seems inevitable. The smaller machines look vulnerable, especially if MSX quickly gains popularity.'

Details of the report on (01) 278 9058.

# French invasion

French company SMT — maker of the Goupil micro (which means the 'fox'), is limbering up for an assault on — well, not on the British market, not exactly. It's more complex than that.

The company has taken offices down in East Putney, and is planning to get UK deals going — a special machine to run the MUMPS programming language has been demonstrated, for instance.

But Gregory Labru, the head of the UK office, says that this plan is to sell to 'the Anglo-Saxon market.'

This includes the UK, of course. But it also includes South Africa, America, and, most puzzling of all, French-speaking Canada!

The fox micro isn't likely to get a quick response from UK buyers. It's almost totally unlike anything else on the market, with the possible exception of the old Ohio Scientific range — it's a system based on the Motorola 6809, with the options of add-in 8088 and Z80 chips, too.

Labru seems to understand that he has his hands full — he says he's prepared to take two years selling without making an operating profit to get his company established.

In France, the machine profits handsomely from anti-American chauvinism — after the IBM and Apple, it's France's third bestseller, and gets the bulk of sales from Government, Defence and nationalised industries — including a big educational chunk.

Details should be sought from the company's publicity manager, Anthony Kenyon, since by press time, launch plans and phone installation plans had all been postponed 'due to unforeseen circumstances.' And Kenyon is contactable on (01) 378 6697.

# Address unknown

Full marks to Telecom Gold for getting the Times Network for Students (see page 107) going. If the company's so clever, why can't it keep track of its existing customers?

Just today, I received a BTG message from a subscriber. As is standard practice on BTG systems, you reply automatically, typing "R" and the thing sends the response back without your having to type in the address. Except it doesn't. You get a letter back from POSTMASTER" saying that the letter is 'undeliverable.'

Clever, isn't it?

And do you know, I bet the only response I get from BTG about this is a complaint that it is Telecom Gold, not British Telecom Gold, and would I stop using the BTG abbreviation.

# Stop here

Files on a QL can be compressed 'to about half their usual size,' according to Digitex Computers.

The company has announced an £18 program called STOP, or storage optimiser, and if it works well enough for you, it should pay for itself after you've saved the price of the next three microdrive cassettes.

A version for the Spectrum at £13 is expected sometime this month.

Details of this, and of ways to back up winchester disks on a QL (using floppies or microdrives) from the company at 4 Amwell House, Isleworth, Mddx TW7 6NX — no phone.

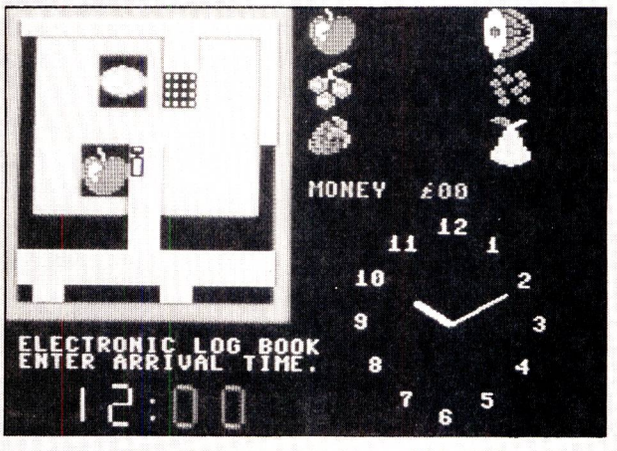
# Grapes of wrath

WH Smith didn't start off its Computer Shop at Waterloo station very auspiciously, unless you think the threat of legal action from IBM was a good omen.

The shop opened, selling computers including the Advance 86, an imitation IBM PC, just a week after IBM's lawyers wrote to WH Smith, and also to Ferranti (who build the Advance), and Advance and said: 'Stop it.'

The cause of the dispute is the chip with the read-only memory routines that handle basic input/output functions.

IBM says, as it did with Eagle, and with Corona, and with one Far Eastern imitator of the PC, that the ROM bears an uncanny resemblance to IBM's own ROM. And *that* is protected by copyright and patent.




***You would be quite wrong to suppose that anybody who can add and subtract can understand the 24-hour clock. So difficult is the problem that ASK software, educational specialists, has been able to launch a game called 'Time Trucker', which helps children aged 8-14 to understand the relationship between the 12-hour analogue and 24-hour digital clock.***

***Apparently the relationship 'between time and distance is reinforced while driving round country roads, collecting a full lorry load of farm produce . . . and returning to the depot within a specified time limit.'***

***It costs £8 for the Commodore 64.***

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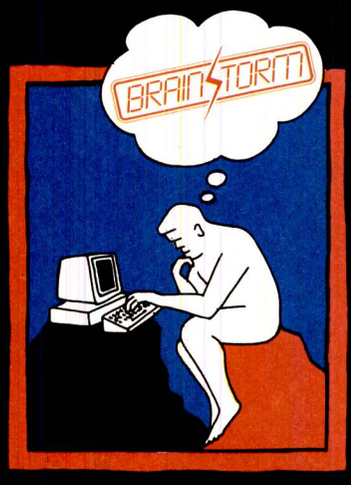


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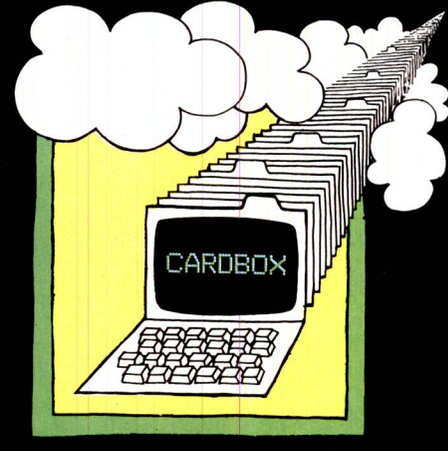


Cardbox – the electronic card index

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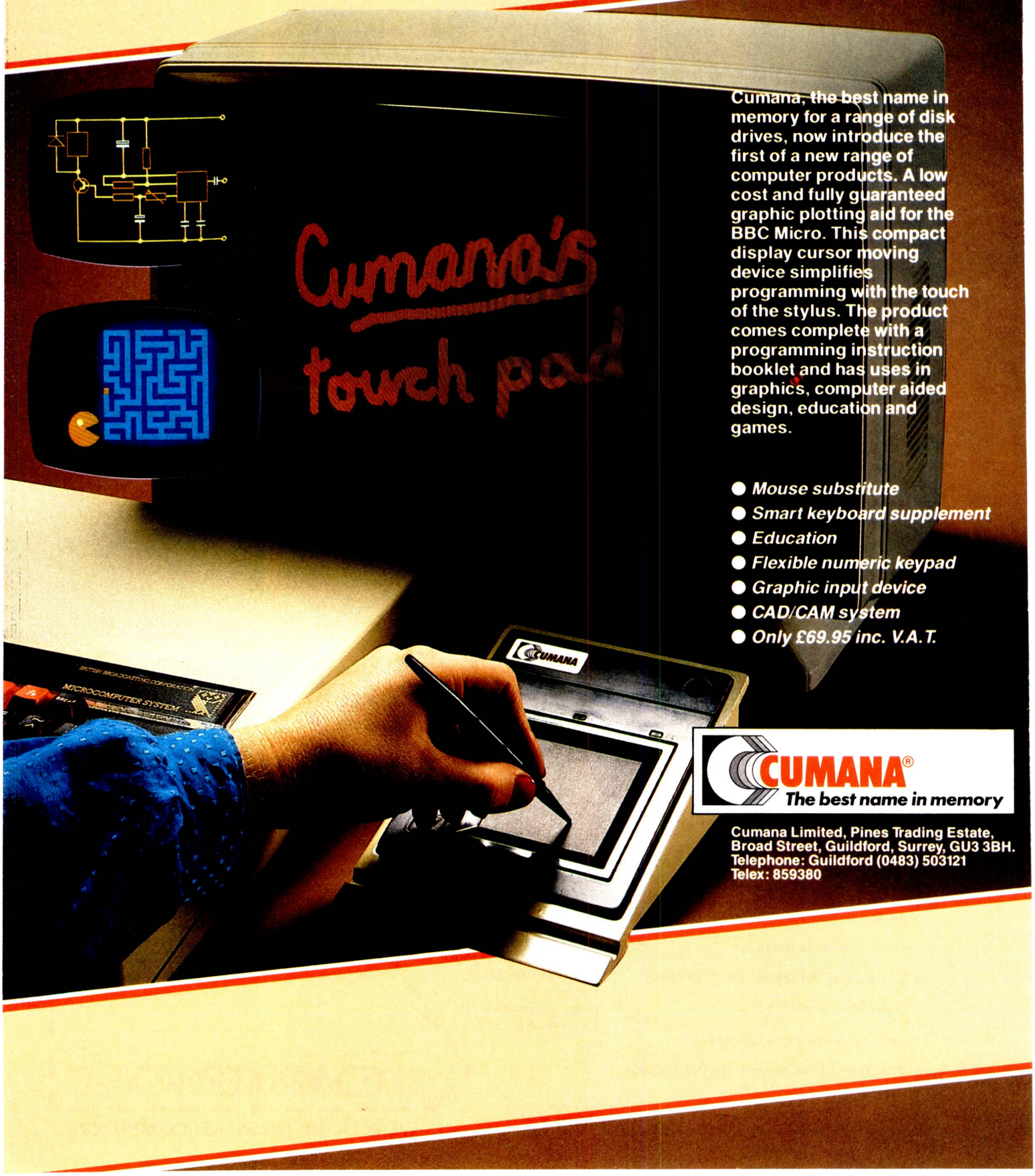


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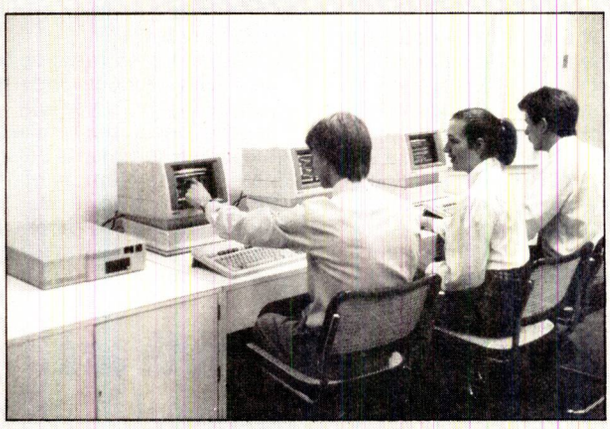


***One advantage that the Touch Screen HP150 has over the original IBM PC is not the touch screen, but the fact that HP put an HP interface bus into it.***

***This makes it possible for Protek to provide a local network — of sorts — good enough to have several 150 users working on the same file, held on a winchester disk. Prices start at £2000 for a five megabyte disk, rising to £5500 for a 45 megabyte drive with built-in floppy.***

***Details on (01) 245 6844.***

'We have rigorously examined the routines,' said an IBM official, 'and found that they are 90 per cent identical with our own. Furthermore, such changes as have been made appear mainly cosmetic in nature.

And, worst of all: 'Even the known errors in the BIOS software have been reproduced identically.'

At press time, the official 'no comment' screen from Smiths and Ferranti was broken only by suggestions that a new version of the software was available. Sceptics who felt that a new ROM, produced inside three weeks, was unlikely to work, may have a point.

However, sources inside the company say that it's true, and there really is a new ROM. 'We were working on new BIOS routines anyway,' said a programmer, 'because of compatibility problems.'

In other words, despite being a 90 per cent imitation, it still didn't do exactly the same things as the IBM micro? 'No.'

It didn't escape the attention of industry watchers that the IBM legal move came two weeks before Ferranti announced that it had taken over, not just manufacturing rights, but also distribution of the Advance 86.

The main point of taking over distribution is to get dealers. Dealers I have spoken to show a noticeable reluctance to get involved in placing orders for a computer which may be the subject of a legal action by IBM.

Also, WH Smith admits, sales of the Advance 86 have been 'disappointing.'

All three subjects of IBM's wrath will be hoping that, by the time IBM has checked out the new ROM, they will actually have it working, and that they will be able to do a deal to allow previously assembled machines to be shipped — a deal along the lines of the one which IBM struck with Corona last February.

On the other hand, a deal along the lines of one struck with Eagle must also be a worrying possibility — because that deal ended with the collapse of Eagle, and (sources say) its likely bankruptcy in the US courts this month.

## Making a quick profit

Since it costs £800 to turn a small Macintosh into a 512k one with Apple's own 256 Kbit chips, and since (if you use cheaper 64 Kbit chips) it costs only £180 to provide the memory, look for Pete and Pam to announce a £450 upgrade which will be very profitable for them in the next month or so.

Details on (0706) 217744.

## Sold to Tandy

A communications package for MS-DOS machines (and old CP/M ones) which can handle both Prestel graphic and normal ASCII files, has been sold to Tandy for its model 2000.

The program is called Comm, and is a greatly upgraded version of the original Lion House Comm.Com which appeared two years ago. Unlike many comms programs, this one includes a quite useful text editor.

Details from Lion Micro on (01) 580 4581.

## Fair exchange?

The number of people sending in copies of Lotus Symphony and asking for part-exchange on their old 1-2-3 disks is not (says Mitch Kapor) significant.

The original idea at Lotus was that the old (1-2-3) program could be upgraded to the new (Symphony) for only $200, for anyone who sent in a disk with 1-2-3 on it.

It appears to have worked pretty well, with Lotus turnover now bigger than MSA, which was previously accepted as the world's biggest software company. And MSA has shot itself in the foot with too-clever marketing by Peachtree, leaving Lotus home and dry on the top of the software heap.

But Kapor does acknowledge that a trivial, minuscule percentage of Symphony users have asked for their old 1-2-3 back.

Critics suggest that the problem is bigger than Kapor would like to believe. 'They have thousands of requests,' suggested one American industry observer, 'and they have a problem in that they don't have the old disks to give back. And we are literally seeing some people who say "never mind the $200 refund, just give me 1-2-3 because Symphony is too much."'

Lotus does have two answers to the problem.

For those who simply find Symphony too complex (a minority, surprisingly, of complainers), Kapor reckons time and practice will solve most snags.

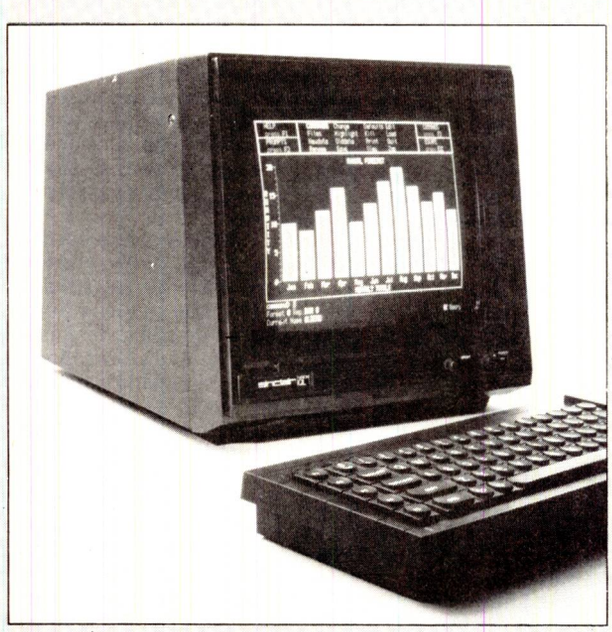
For the more significant number of people who find that Symphony won't accept their very biggest 1-2-3 spreadsheet templates, Kapor is launching a new software tool which will give Symphony users more memory inside the IBM PC.

And, coming soon, will be 'add-in applications'.

These will be new sections of the orchestra (to coin a phrase). 'It's as if we didn't provide a word processor with Symphony, and decided to offer one as an add-in application, part of the Symphony,' Kapor told me shortly before the launch.

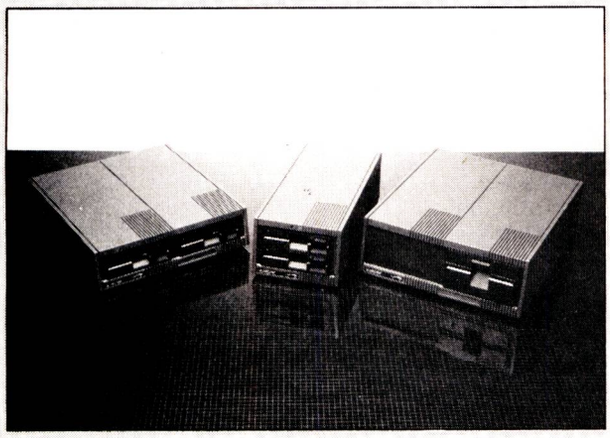
The biggest Lotus announcement of the next few months, however, will be the Macintosh version.

This isn't the same as Symphony, nor the same as 1-2-3.



***Recommended by Sinclair — the £300 colour monitor best suited for the QL is apparently Data Efficiency's Sinclair Vision model.***

***MBS Data Efficiency will also handle warranty and servicing for the box. Details on (0442) 60155.***



***As threatened by Quest three months ago, there are now disks for the QL.***

***Nicely packaged to match the QL styling, including CP/M-68k, they start at £250 for a 200k drive.***

***Possibly more fascinating in the long term, however, is the announcement that Quest is importing the first micro laser disk storage system — the Shugart Optimem.***

***The only disappointment is that Shugart was talking about a $5000 price when it showed prototypes a year ago, and Quest is talking £10,000 end-user costs for a system attachable to the Apricot or IBM micros.***

***Ah, well, details on (04215) 66321.***

Symphony on the IBM family of machines has only one database, with the various application bits and pieces interpreting it in different ways — the graphics section sees it as pictures, the text processor as words, the database as data, and so on. In the Macintosh, there will be separate data structures, more along the lines of 1-2-3.

But unlike 1-2-3, the basic structure of the Macintosh product is not a spreadsheet. Instead, it's a series of matched files, with automatic cut-and-paste always available from one to the other.

The plan is to make this very nice feature (simply not available with ordinary word processors) actually fast enough to be useful.

I was expecting to see convincing demo versions of the new product at Comdex on the Apple stand, but that doesn't mean you should get excited about it yet. It won't be appearing in dealers' stock lists until March/April, which is a much bigger gap between announcement and release than Kapor likes.

'It's just a question of not being able to keep the secret any longer,' he told me. 'I like a 90-day gap, ideally.'

I'm not altogether astonished the secret is out. Kapor was, after all, demonstrating it in public at the Softcon show in New Orleans as long ago as last March, and announced it even before the Macintosh was officially launched, as part of the Apple launch promotions.

It looked like such a good idea at the time, it's still hard to believe that Peachtree's strategy of selling to people like IBM rather than the end-user has failed miserably.

No doubt someone else will try the same idea sooner or later, so it's interesting to try to analyse why Peachtree made such a mess of the micro software market.

The idea was sweet and simple. 'If we sell direct to IBM, they will label all our software with the IBM label, and people will buy twice as much,' they argued. 'And if we do similar deals with other suppliers, business users of a wide range of micros will share the same software product.'

Software is very hard to judge objectively, and I really don't have any personal opinions about whether Peachtree software was any better or any worse than the average. Common sense tells me that *some* was probably pretty good, and *most* was probably average or below, since that seems to be the rule in the software market — there are a few, very good, and a lot, less than ordinary.

What I can report is that the bad was, in the opinion of some people who worked on it, very bad indeed.

Speaking to one professional programmer who was working on 'upgrading' the American accounting software to work in the UK, I was astounded at his opinions.

In a word he denounced one particular part of the accounting package — since improved — as 'something which could get you thrown into jail for fraud if you used it for your accounts. It doesn't comply with accounting laws in this country.'

Now, it isn't important whether his opinion was correct or mistaken. The point is that, the way Peachtree sold its software, the company was less likely than most to find out when users had grumbles.

Manufacturers like IBM and Digital Equipment were more concerned to be able to show a wide range of software in the catalogue than they were to actually sell the stuff. They made their profits on hardware, after all, and the purpose of a long catalogue was just to encourage people to buy the software.

As it happens, people didn't buy the software. John Hale, then boss of Peachtree in this country, took me to one side a year ago and wept on my shoulder about it. He didn't want to be quoted, he said, but really, his problem was that 'some manufacturers' (he meant DEC and Epson, in particular) 'just won't push the stuff to the dealers. And the dealers sell things like TABS.'

Feedback, in other words, was a problem.

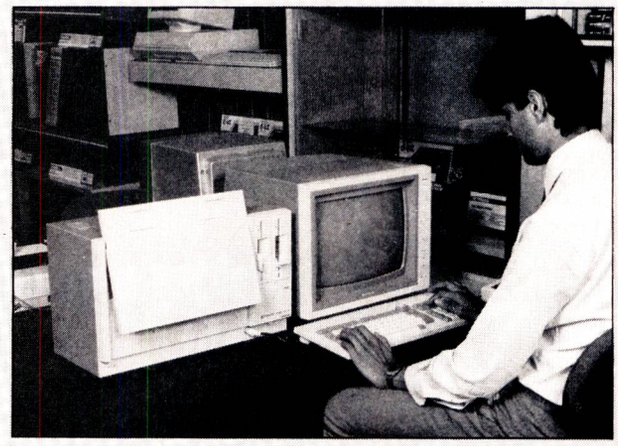
Today, Peachtree is up for sale. New products and new marketing strategies will shortly (one hopes) make all the above comments out of date. But the memory of the $1.8 million third quarter losses suffered by parent company MSA will take some time to fade.

## Rebirth and renewal

The original Personal Software company has finally managed to bury itself, and is now struggling to turn the tragedy into a sort of tree-planting exercise (page 110, December *PCW*).

It was called Visicorp after the success of its best-known product, VisiCalc, the rights to which it has now lost. And having failed so far to sell its next-generation product to the world under the name VisiOn, Visicorp has now decided to swallow itself up in the young, dynamic and thrusting Paladin software corporation of Santa Clara.

This is known as a 'reverse takeover' where the small company swallows its larger victim.



***It's exciting news that Dixons has cut the price of the Hitachi MBE 16002 by half, and stuffed in £900 worth of software (WordStar Professional, Nucleus Generator and Calcmaster).***

***What puzzles me a little, enough to draw it to your attention, is Dixon's claim that this is IBM-compatible. When I tried out a Hitachi MBE 16002, it wasn't compatible, it just used MS-DOS. That may be good enough for most purposes, especially using the software supplied, and at £1295 plus VAT, it's a useful colour system. But if there happens to be a particular IBM program you want to run, better take it along to the store to test.***

***Dixons also tells me the Hitachi deal is 'unbeatable' — something it says about everything it sells. It means that if you can get a cheaper version, it will refund the difference in price.***

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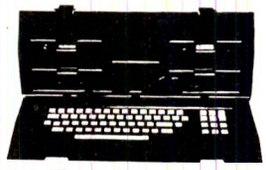
**MORSE NEWS**

Lotus 1-2-3 now available ex-stock on Apricot **£375.** On demo now, Apricot **Point 7** multi-user network.



## OSBORNE EVENT

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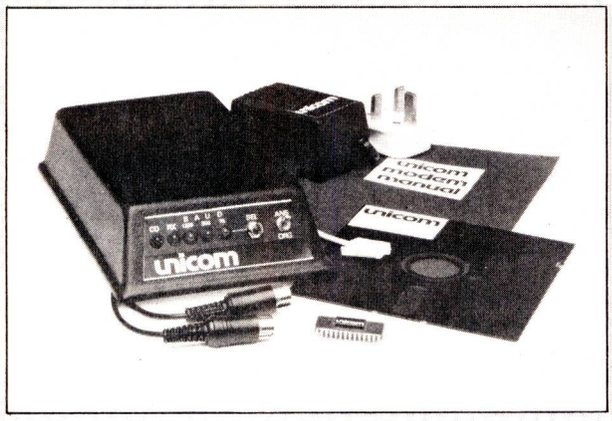



***Just under £50 (or just over if you add on the VAT) seems a small price to pay for a full facility RS232 modem. And the list of facilities on Unicom's modem is certainly long. There's automatic scanning to set the correct baud rate for receiving, and there's three rates, 300/3000, 1200/75, 75/1200. Then there's automatic dialling, redialling and answering, a remote facility, standards compatibility, error correcting, and more — as Unicom will doubtless be pleased to tell you on (01) 930 1612.***

The news to come is interesting.

What we can expect is that the money Visicorp raised (it got finance from investors, and also sold off the development rights to VisiOn to Control Data) will go into new products from both the Visi and Paladin stables.

In particular, there will be an IBM version of the Flashcalc product which sells quite well to Apple users, and applications to run under the VisiOn 'environment' — in particular, graphics.

A product called PC Paint is due for release very shortly, aiming to offer the sort of enjoyable drafting tools you get on a Macintosh with MacPaint, together with a 'frame grabber' for getting outside pictures into the machine.

Also, prices on VisiOn will come down sharply.

In the UK, the most interesting aspect is that Paladin/Visicorp (PVC?) is setting up a local office under John Wells. Queries to him should be routed through Richard Packer at Rapid Recall on (0494) 26271.

## Not so elite . . .

Sanity seems to have reared its ugly head — perhaps only temporarily — in the offices of Acornsoft, from whence comes the amazing BBC Micro game, Elite.

The game uses areas of memory in the BBC Micro which quite a lot of other people use for disk filing system software. The result is that Opus DDDOS won't boot the system, and Microwares DDFS will boot but not run it.

Opus reports that 'as a direct result of consultations with Acornsoft, we have produced a modified interface which is Acorn compatible, and will allow users to run Elite.'

Microwares says it worked it out by itself, and version 2.0 of the DDFS runs it, fine.

Earlier responses from Acornsoft to users who had bought the game, but were unable to run it because of having Watford or Microwares disk software, had been cold and unhelpful — very much, it must be said, in the Acorn tradition of doing nothing to make life easy for imitators.

There is, however, a gulf between not making things easy, and being unhelpful to the point of obstinacy; and it's good to see Acornsoft on the right side of the gap.

Elite, by the way, is a cult on the BBC Micro that may soon spread to other machines.

They didn't sound pleased, inside the Cambridge circle around Acorn, to hear that the authors of the program had decided to auction the rights to the game on other machines.

'We thought we had the rights,' said a distinctly peeved official on behalf of the company, 'but we now hope to work with the authors on other versions.'

My own rating (two weeks after buying the game) is *dangerous* and I'm on my sixth galaxy.

Mind you, I have a complaint for the manufacturers of the lasers.

I can quite understand that technology is limited. If my lasers are strong enough to destroy the thickness of a space-going trader ship hull, then I altogether accept that they get hot. And after a while, they stop working until they cool down. Fair enough.

But why, in the name of the Pan Galactic Gargle Buster, when the *front* laser gets overheated, does the *rear* weapon go too? And why does the mining laser never get hot at all?

## Important discovery

As expected when the Einstein was launched, Tatung has come up with a low-cost diskette option for the second drive — a kit.

The disk kit costs £149, and provides around 500k extra. The low cost is because the power supply, cables and controller circuits are already to be found inside the Einstein.

Details from publicity agents Peter Toland or Brendan Hanrahan on (021) 236 7532.

## Sting in the tail?

'Please remember, as you compile your publication,' says Scorpion Computing sternly to me, 'that Easyjunior is selling at a rate which places us in the top five for accounting system sales, with over 100 dealer outlets and thousands of users.'

Remember? I'd never even heard of the company but it says that it has launched version 2.2 of Easyjunior, that there are 2000 or more systems sold, and that the new version is 'fully integrated business software with accounts, stock and word processing all for £395.'

Details on (025126) 3706.

## The good and the bad

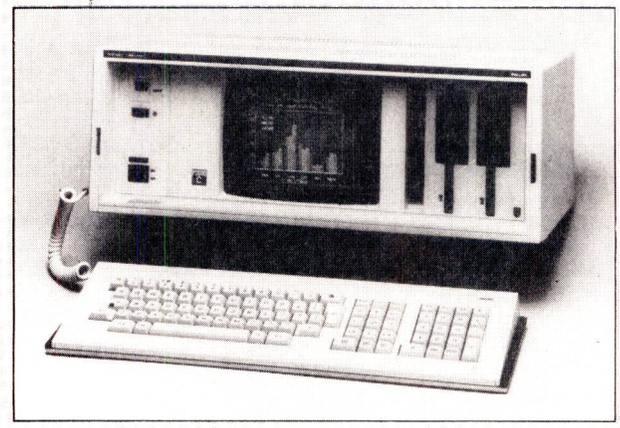
Things could change for users of the 6502 processor chip — that is, people on Commodore, Apple II, BBC Micro, Oric, and others — with Apple's announcement of an Apple IIX with a 16-bit chip in it.

The original designer of the 6502 was Chuck Peddle, whose chip company, MOS Technology, was taken over by Commodore before the PET came to Britain seven years ago.

But Peddle left Commodore to start up Sirius so nobody ever designed the equivalent of a 68000, and Commodore's founder, Jack Tramiel, fired the people who were trying to.

Now a company called Com Log, together with Western Digital Design, both in Phoenix, Arizona, has come up with a chip it calls the 65816. Like the original Intel 8088 inside the Sirius and IBM, this is a 16-bit chip with only an 8-bit data bus.

But what matters is the fact that the new chip can use



***The Philips portable, or to be more precise the P2000C, is now available with an 8088 board enabling the system to run MS-DOS 16-bit applications as well as 8-bit CP/M and p-System software. The entry level price is £995 complete with a bundle of software.***

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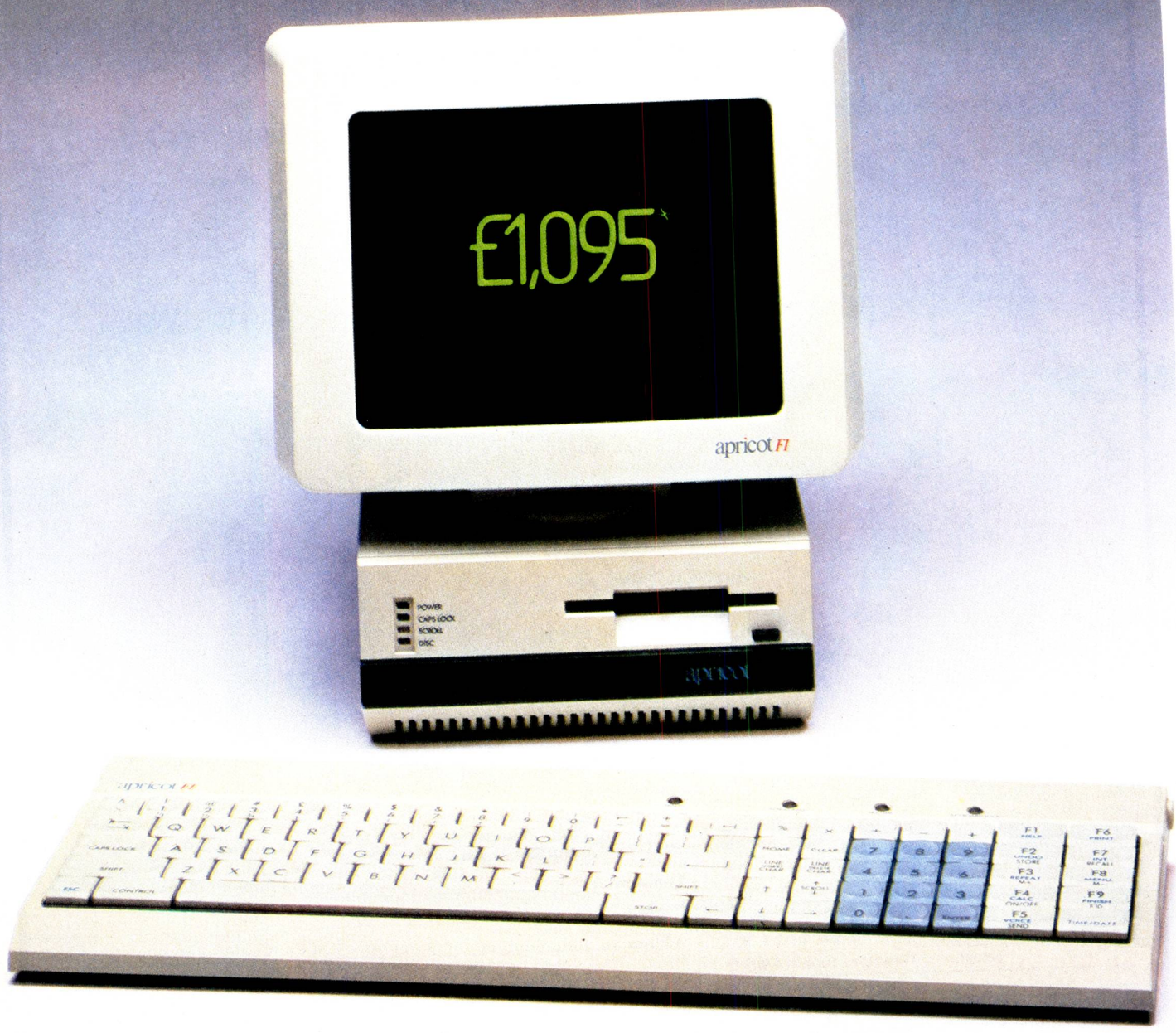
PC _____ Tel No. _____

# Has Apricot gone bananas?



That figure can't be right can it?

Surely its rivals are offering half the features for twice the price?

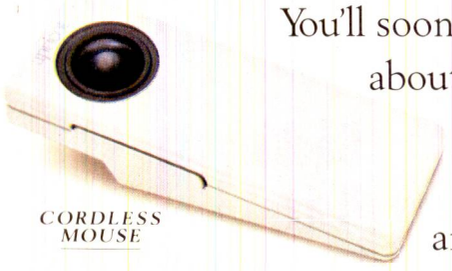
Yes and yes.

Which makes starting off with any other business computer a no-no.

## *HARDWARE MADE EASY.*

Sophisticated as the Apricot F1 is, it's tailor-made for a first-time user.

A tutorial is included in the free software to start you off at square one.



CORDLESS MOUSE

You'll soon be rattling on about the powerful 256k memory at your beck and call. (ie: lots more room for programs and info.)

How the expansion board can treble that figure. Plus the huge 720k disk capacity and Systems Expansion box to increase processing and storage.

Not to mention 92 keys (how does anyone scrape by with 58?) with numeric pad for speedy calculations.

## *PIXELS GALORE.*

Any idea what high-resolution sixteen colour graphics mean, resolved to 640 x 256 pixels?

Well you'll know it when you see it.

It means a brighter pin-sharp colour picture – much easier on the eye during a hard day at the office.

## *OF MICE AND MEN.*

Mice make any computer easier to use. Our mouse and the keyboard itself are both cordless.

Like the remote control of your TV set they are worked by infra-red.

Simply point the mouse at the screen and twiddle the ball with your thumb to zoom in on the appropriate piece of data.

## *PROGRAMS, PROGRAMS.*

Your free software includes a SuperWriter program (word processor, spelling checker and mailing facilities); SuperCalc – a spreadsheet package with financial projections; and SuperPlanner, your "mission control" complete with address list.

## *FROM LITTLE APRICOTS...*

Amazingly some of our competitors still have software which is incompatible with some of their hardware.

Rest assured, our F1 can be linked to each and every one of our Apricots. (Along with just about any monitor including your TV.)

It will also operate the most advanced software such as D-Base III and Lotus 1-2-3.

So as your business grows, your F1 can grow with it.

Please send me details of the Apricot F1. To: ACT (UK) Ltd., FREEPOST, Halesowen, West Midlands B63 1BR. Or Freefone Apricot via Operator.

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Position

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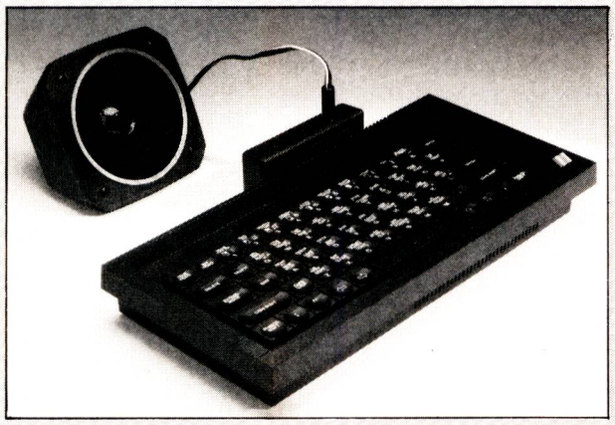


***Spectrum users who have struggled with complicated speech synthesis units may have an easier time with the latest peripheral from DK'Tronics. The company promises that 'everything you wish to be spoken is entered in normal English, without special codes or characters.' The price is £24.95 and more details are available on (0799) 26350.***

more than 16 bits in its addressing — where the 6502 could use 64k, the new one can handle 312k.

All this doesn't make the 6502 a rival to the Intel family, which starts with the 8088 and rises to the soon-available 80386. But it does mean that the Apple II family can be upgraded, giving it an extra couple of years of life when Apple releases a system based on the new chip.

So much for the good news. The bad news: the machine isn't likely to appear for another 18 months at least.

## Hard up QL

Still not much software for the QL: however, the hardware add-ons are starting to appear, and a universal interface based on the Hewlett-Packard interface bus is the latest.

This comes from Cambridge Systems Technology, which has already launched a centronics printer driver for the machine.

Details of what looks to be a very important announcement on (0223) 323302.

## Taking centre stage

Fresh from its triumphant burial of Visicorp, Software Arts (inventors of VisiCalc) has come up with a successor — called Spotlight.

It's the sort of program that I've been praying for, for some time now. It includes an appointment book, a disk file system manager, an onscreen calculator, phone book, index card file and a note pad.

If all that works, it takes it quite a few steps further down the friendliness road than Macintosh's utilities, because the one thing Mac doesn't let you do while running a program is look at the disks.

Spotlight runs in the background, or all by itself, 'with nearly every program available for the IBM PC, XT or Compaq computers,' says Software Arts, which means that any of its functions can be used at any moment.

It sounds a lot more convincing than TK!Solver (pronounced TKShriekSolver — or pling) which Software Arts raved about earlier, but which no-one I know could understand.

Until we have full dealer details, contact the company itself in New York on (212) 206 9090.

## Trojan trickery?

An odd little machine, the British Micro Mimi, was announced two years ago with a revolutionary program generator from a software company called Scifax.

This program writer, Trojan, has been developing quietly in the intervening months while Scifax has been taken over by BMG, and has now appeared on the IBM PC.

Howard Lock-Hooper, boss of Scifax, told me somewhat apologetically that the package has doubled in price to £500 in the process.

'We've added more applications written in Trojan,' he said, 'including sales ledger, bought ledger, word processing, stock control and video tape hire management.

'But the real reason for the price difference — it costs £250 on the Mimi — is that as part of the BMG, we feel we ought to give our partners a boost.'

Details on (0256) 469871.

## System evaluation

Engineers wanting to play with the bigger versions of the IBM PC's processor — 188, 186 and 286 — can get hold of evaluation kits from Intel. The smaller micros cost £117, the big one costs £208. With these kits plus a few hundred pounds of other components, including a hard disk, it would be possible to build quite a big system since they include dynamic memory controller, text co-processor, winchester disk controller, video interface controller and graphics controller as well as the basic processor chip.

Details from Rapid Recall on (0494) 26271.

## Battle of the bulge

Olivetti has 'won the battle hands down' against IBM. I am assured of this by no less a source than Olivetti's new press agency, which has been appointed to 'handle a campaign in which Olivetti's M24 and M21 micros will compete aggressively against the IBM PC.'

Won the battle? What battle?

'Olivetti has no option but to go for the throat,' said Tim Wickes, account director at the press agency. 'IBM's dominance of the PC market has little to do with technology, and lots to do with marketing. One look at the products and you can see that Olivetti has won any technical battle hands-down.'

Now, says the unstoppable Wickes: 'it's gloves-off in the marketing arena.'

I do hope nobody gets trampled in the panic inside IBM HQ.

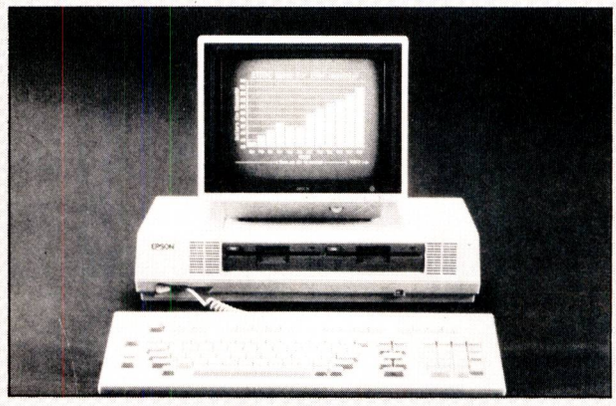
## Backing up Unix

Just one more exciting announcement of a plan 'to increase the amount of software available for Unix System V, the emerging system standard for multi-user computers,' this time from NCR.

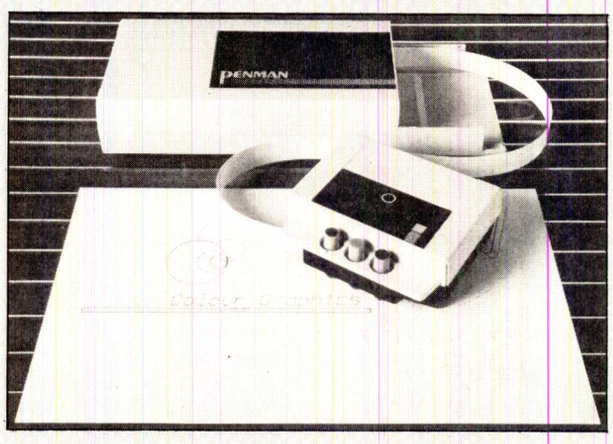
The company has teamed up with Unix Europe Ltd to 'encourage independent software vendors to develop high quality software packages.'

What do they get? A list of people with Unix System V Computers, printed on the back of a cigarette packet? Money?

No, they get a 40 per cent discount on the NCR Tower,



***This picture doesn't do full justice to one of the proclaimed features of this new machine from Epson, the QX-16. Its 'specially designed keyboard simplifies the use of different operating systems and applications programs.' For example: 'an upper row of function keys can be defined for either MS-DOS or CP/M applications simply by inserting an underlay.' Americans have the first chance to do the defining — price and specification for the European version won't be declared until early 1985.***




***If you've ever fancied a plotter, printer, turtle, robot or mouse, take a look at the Penman which combines all these functions to one degree or another.***

***The robot plotter costs £217 (as ever, add on the VAT) and can be connected to 'virtually any computer which has an RS232 interface.'***

***Penman can be commanded to move by programming in the appropriate instructions from your RS232 machine.***

***But to make life a little easier applications software is available for the Apple II and BBC — and for use with a range of standard business packages on IBM's PC.***

***Other machines in line for treatment include the Commodore 64, the QL, the Mac and ACT's Apricots.***

***Penman can be contacted on (0903) 209081.***

and 'a completely free copy of Unix System V.'

When I was a lad, no worthwhile software developer would touch a minority machine unless he got one free, but we'll see.

At least Tony Lazzerini, marketing manager at NCR for the Tower, has no doubts. His scheme will, he says, 'fuel the growth of Unix as a standard.'

And he adds: 'In exactly the same way that PC-DOS has become a standard because of the large quantity of software available, this program will create the same groundswell for Unix System V.

'Until recently', Lazzerini remarks, 'Unix has been criticised because of the lack of applications software.'

We can, certainly, agree with him there. Tower prices start at £10,000, and Lazzerini is on (01) 388 8171.

## Final offer

While stocks last: the original (but in the smart blue case) Osborne now costs £500, including WordStar, two Basics, and Supercalc. And with an 80-column board, the price is £660. VAT extra, says Mike Healy, boss of Osborne distributor, Future Management.

If you buy one, place an order *now* for a Drive C RAM disk. With the RAM disk, you find yourself the owner of the fastest WordStar machine in the world, complete with a big printer buffer, and it's just amazing. Mind you, it does cost close to £600 extra — but it's worth it.

Details on (0908) 615274.

## Shooting for the 16-bit market

The 16-bit bus built into the ITT 3030 is being put to use with a slot-in 80186 processor card.

This announcement — from the Arrow Computer Systems' subsidiary which started marketing the multi-user system in 1984 — gives me a chance to point out that the 8-bit model is based on the Z80, and not the 8085 I referred to last November.

Entry level price for the dual processor version is about £2530, compared to £1440 for the Z80-based CP/M version with one 800k floppy. For 8-bit users wanting to upgrade, the 80186 card with 128k of RAM costs £1147.

For details on the cost of setting up a multi-user system call Arrow on (03727) 42557.

## Small print

The IBM printer is not, quite, an Epson. The machinery is, but there is a different chip inside it, which doesn't print in exactly the same way as an ordinary Epson.

The price, however, is a little different, which has encouraged Quad Eight/Westrex to come out with its own ROM chip set which it plugs into Epson printers, so that the Epsons behave like IBM Epsons.

The cost is just an extra £20 to £25, says the company, and it has details on (01) 578 0957.

## Live from Comdex

A computer show with more than 1400 exhibitors spread over six sites is not the easiest place to find new products — especially when there are Las Vegas's other distractions to contend with. But Macintosh-related activity, another second processor for the BBC, and three new portables stood out.

Among the add-ons for the Mac was the Hyperdrive from General Computer — an internally mounted 10Mbyte hard disk unit which loads Macpaint in seven seconds as opposed to the usual 22. Macphone is a telephone management system from Inter-Matrix with an auto-dialling handset attached. The accompanying software includes a phone directory, a calendar, a memo pad and a time-billing facility.

Macphone will prove to be interesting competition for Warner's Desk Organiser, which was previewed for the Mac. They both offer similar features. However, the Organiser may have the edge as it can run concurrently with other packages.

Although Lotus was not exhibiting at the show, its Jazz integrated package was demonstrated on the Apple stand — combining word processing, spreadsheet analysis, database management, communications and business graphics.

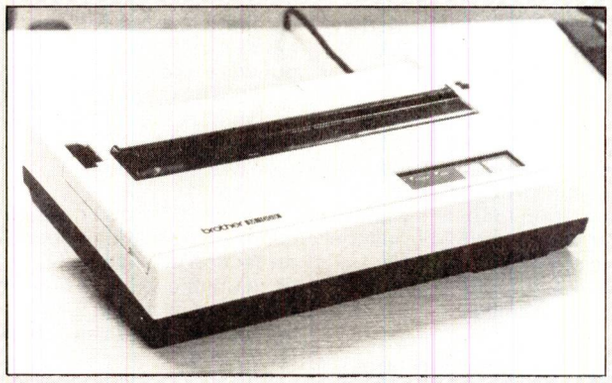
Acorn previewed the 82016 second processor which will be connected to the BBC Micro via the Tube. The 82016 is accompanied by C, Pascal, Lisp, Fortran 77 and up to one megabyte of memory.

Three new lapheld computers were launched or previewed, ranging from the $3000 Texas Instruments Prolite, through the Sord IS-11C to the $999 NEC PC8401A. The Prolite features a 16-bit 80C88 processor, 256k RAM, an 80 × 25 LCD display and a built-in 720k, 3½in drive. Via the expansion bus at the back of the computer the user can add a range of peripherals including a second drive, a modem and a portable thermal transfer printer. Files created on the Prolite can be transferred to an IBM PC or TI Professional via a PC interface.

The Sord IS-11C is also PC-data compatible but only via an additional cartridge. The basic Sord machine has a Z80A processor, 80k of RAM, an 80 × 25 LCD display and a built-in microcassette recorder. The Sord IS-11C also offers a bundled-in word processor and communications package.

Bundled software is the major feature of the new NEC portable, the PC84108, as it includes portable CP/M, WordStar-to-go, Calc-to-go, and Personal Filer. It has a PD 70008C processor (Z80-compatible), 64k RAM, and an 80 × 16 display.

Infocom announced its entry into the business computing market with the preview of its database applications program, Cornerstone. Cornerstone is aimed specifically at the non-technical user: it contains some helpful features such as field length, which can be changed at will, and a built-in calendar which understands input such as 'last Friday' and 'next month'. Cornerstone will cost $495 and will soon be available for the IBM PC. **END**



***Dot matrix printing for less than £200 is provided by the snappily titled Brother M-1009.***

***The 50-characters-a-second printer has a built-in centronics interface — RS232 is 'available as an option.' More details from STC Electronic Services on (0279) 26811.***

# YANKEE DOODLES



*Our US reporter, David Ahl has encouraging news for word processing users, and announces tough competition in the disk market.*

## Taking the stage

December 1984 saw the worldwide debut of WordStar 2000, a complete rewrite of the old WordStar. The new features look like a wish list from every word processing user in the world: a three-window screen, footnoting, multiple-line headers and footers, proportional spacing, a glossary key, sorting, spelling checking, an UNDO command, built-in calculator functions, and much more. Micropro claims that the package will be easy to use — something that WordStar has never been — and that first-time users will be up and running 'in a few hours'.

WordStar 2000 will sell for $495, or half that ($250) if you upgrade from the old WordStar. An advanced version, WordStar 2000 Plus with menu-driven telecommunications, mailing list database and an indexing feature, will sell for $595 ($350 with a trade-in). The initial version runs only on the IBM PC and 100 per cent compatibles, but there's no 8-bit machines: Micropro doesn't see that as a major future market.

This delights the people at Newstar Software (formed by former Micropro people). Newstar's improvement on WordStar, NewWord (functionally equivalent to WordStar 3.3 with MailMerge plus a few additional features) has been struggling for recognition for over a year. NewWord costs $249, half the price of WordStar, and is available for both 8- and 16-bit machines.

## The floppies are retaliating!

Three leaders in audio compact disk technology have invaded the computer field, but floppy disks are retaliating.

Denon, Philips and 3M have announced the development of a CD-based optical ROM system for computers. A single 4¾in CD ROM has a capacity of over 550Mbytes, about the equivalent of 500 double-density floppy disks. In addition to offering efficient storage, this enormous capacity also provides the opportunity to store high resolution graphics along with standard ASCII data.

Moreover, the ruggedness and reliability of the optical CD ROM disk and its drive mechanism is said to far exceed that of conventional magnetic media — floppy disk or hard disk.

Meanwhile, Compusonics of Denver has invented a digital machine that records music on ordinary magnetic floppy disks and hard disks. The professional model ($35,000) records up to one hour on a hard disk, but the company plans to launch a $1200 home unit that can record up to 45 minutes on a floppy disk. McIntosh Laboratories, a maker of high-end audio gear, also plans to make a floppy disk recorder using Compusonics' technology.

## Sinking or swimming?

Awash in a flood of red ink, Otrona Advanced Systems terminated all 175 remaining employees in late October 1984. About the Otrona 2001 transportable IBM PC compatible, president James Lindner said: 'We could sell it, but were unable to build it at a profit.' The managers planned to liquidate the company rather than file for reorganisation under Chapter 11.

Franklin Computer, which had been operating under the protection of Chapter 11, has been unable to find a buyer or merger partner and will liquidate its assets and cease operations.

Stearns Computer Systems in Minneapolis, maker of an 8086-based desktop system, announced a layoff of 14 employees last October. The firm had previously laid off 30 workers in the summer of 1984. On the bright side, the company announced it had become profitable as of September 1984.

Knoware Inc, founded by two MIT professors, marketed an interesting software package that purported to teach executives how to climb the corporate ladder by learning how to use their personal computers. Apparently it wasn't well received, and Knoware recently filed for liquidation.

At the 1984 Softcon show, Ovation was touting a new integrated software package. 'It will run rings around Symphony, Framework and Windows,' said the enthusiastic Ovation personnel. But the product was never completed. Today, after discharging most of its 40 employees, the firm is for sale. Ever optimistic, president Thomas Gregory hopes that someone will eventually market the product.

Handwriting on the wall? In June 1984, Rodney Zaks of Sybex Computer Books invited 20 notable computing pioneers to Pioneer Days in San Francisco. It was a gala media event. Then, three months later, each of the pioneers received a letter from the credit manager of the Hyatt Regency which said: 'Sybex has not paid for your account and your charges have been placed on your personal credit card.' Pretty shabby, Sybex.

For a games software maker the busiest season is before Christmas, but that was when Activision laid off 30 more workers. In just a year, the workforce has decreased from 400 to 150. President James Levy expressed hopes that the bottom has been reached and the market will rebound.

## Random bits

IBM is overwhelmed with orders for the AT. Dealers have been put on allocation and the lead time to get a system is now about three months . . . IBM has also bought a bunch of Japanese MSX computers, peripherals and software from Quest Publishing, a group of former SpectraVideo employees — I wonder why? . . . An apologetic letter from vice president Steve Ballmer of Microsoft discloses a further delay in the shipment of Microsoft Windows from November 1984 to June 1985. Apparently the designers are having problems with speed, graphics capabilities and reliability . . . Microsoft isn't alone. Gordon Mustain of Rising Star announced yet another delay in the release of Valdocs 2.0 for the Epson QX-10 to increase the speed of the word processing module and add additional features . . .

Film giant Eastman Kodak has entered the floppy disk business. Initially it plans to resell disks made by Dysan and several other domestic and foreign producers, prior to producing its own media in Guadalajara, Mexico . . . Hotels are becoming more responsive to the needs of modern business travellers. For example, the Hyatt Regency in Chicago rents an IBM PC (and software) for $6 per hour. In Minneapolis, the Omni Northstar rents an IBM PC and printer for $10 per hour; Lotus Symphony costs an additional $10 . . . Having lost $3 million in the first nine months of 1984, Management Science America (MSA) has put Peachtree Software up for sale. So far, no takers. Peachtree recently bought two educational software publishers, Edu-Ware and Design Ware but killed off the Edu-Ware label. Now, Design Ware plans to re-introduce the label . . . Deserting the ship? Ronald Mickwee, chairman of Eagle Computer, recently sold his entire stock holdings of 128,500 shares . . . Doubleday paid one of the biggest advances ever for a computer book, $1.3 million, to Stewart Brand for the Whole Earth Software Catalog. To make money on the deal, Stewart expects Doubleday will have to sell more than 500,000 copies. I'd be surprised if it touches 100,000 . . . Rumours: VisiCorp will merge with a new Sunnyvale-based company, Palladin, and founders Dan Fylstra and Peter Jennings will not have a role in the new company . . . Apple will discontinue the Lisa line in 1985 and concentrate on the larger Macs plus a new 16-bit Apple IIx. END



# THE RIGHT TOOLS FOR THE JOB?



If you've been looking around for business software, you'll probably know all about the latest gadget. It's called "integrated software". A little bit of everything, crammed into one do-it-all package.

But if you're really serious about running your business, you'll know how important it is to get the best possible tool for every job.

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# ORIENT EXPRESS



*Our Tokyo correspondent, Shinichiro Kakizawa, reports on what the best-dressed computer user is wearing this year and advises on matching accessories.*

## War of the standards

Sony's 3½in micro diskette is gaining acceptance as the *de facto* standard for the micro-size floppy disk. There has been a lot of confusion and competition on whose floppy would emerge victorious: among the competition were Sony's 3½in, the Hitachi and Matsushita group's 3in and Dysan's 3¼in. The reason for the standard is that the world's largest disk drive manufacturer, Y-E Data Company of Tokyo, has recently announced the result of its year-long evaluation on micro disks. The company's report concluded that the 3½in was the best for business applications, taking into consideration the manufacturing costs of the drives.

Y-E Data spent more than a year evaluating drive production technology, which included the drive performance and reliability aspects of both the 3in from the Hitachi/Matsushita group, and the 3½in from Sony.

With Y-E Data's announcement, the number of manufacturers adapting to the 3½in drive will probably increase dramatically.

The focus of Y-E Data's evaluation was placed on a drive's reliability in business use when mass produced at low cost. For business use, a disk drive must be compatible with 8in disks and have a storage capacity of 1.6Mbyte per disk. Y-E Data concluded that the mass production 1.6Mbyte 3in drive will be far more costly compared to the cost of producing a drive of the same capacity using 3½in technology.

Toshiba has received an OEM order of one million 3½in diskette drives from the US giant IBM. Toshiba was among the 20-plus contenders who fought for the big order. Toshiba has only recently joined the disk manufacturing business, and had originally been planning to produce 3in drives. However, because of IBM's decision and Y-E Data's evaluation, it quickly switched its production line to the 3½in drive. The company's production capacity is presently 200,000 units per month. It would now appear that buying a 3in series diskette drive, other than the 3½in Sony version, would be risky.

Y-E Data has not yet revealed its findings on the disk size for home hobby computers.

## Lighter printing

Liquid crystal printers claiming to be the next generation printers will be available soon. Epson and Casio have both announced their products for the spring. The liquid crystal (LC) printers print one full page at a time — and have a similar capability to laser printers. However, the cost of an LC printer is much cheaper than a laser printer due to its simple printing mechanism. It can also produce a very high quality printing result at high speed.

The heart of the LC printer is the part called the 'liquid crystal shatter'. Light is unable to pass through the liquid crystal board when a certain amount of electric voltage is applied. As soon as the voltage is removed, however, the light can freely pass through. So, by inserting a number of micro-size liquid crystal boards between the light source and the light-sensitive drum, the LC shatter controls the printing function.

Unlike a dot-matrix printer which forms characters by arranging the dots, the LC printer can achieve a high quality and high density printing result, and reverse printing is a very simple process.

## Watch this space

Casio has started shipping data bank wrist-watch computers. The new watch, called the 'Casio data bank read sensor', can recognise the handwritten alphabet and numeric characters. Characters you write on the glass surface of the watch with your finger become the input data to the watch and are consequently stored in its memory.

The watch can store a maximum of one kbyte of data — the equivalent of 50 names and telephone numbers. Each entry consists of eight alphabet characters and 12 numeric digits. The watch features an eight-digit calculator function which also uses the same handwritten character recognition.

The product costs $70, and is the result of Casio's integration of its two earlier products — the character recognition wrist-watch calculator and the data bank wrist-watch with touch-key input function.

## Dressed not to kill

A special cloth to protect the human body from potentially harmful electromagnetic radiation has been announced from Takase Co of Osaka. Government health authorities in Japan have not yet reached any specific conclusion as to the risk of radiation on the human body, but Takase has quickly taken advantage of the average VDU user's fear.

The idea is that by wearing a cloth made of a special material called 'metax', you are protected and safe from the effect of the harmful electromagnetic fields commonly found in any computing hardware environment. Metax is made of polyester and coated with a thin nickel film. It is claimed to help reduce the electrostatic charge in the human body.

## IBM moves to Japan

IBM Japan has announced a series of new 16-bit micros for the Japanese market. The machines are marketed as the lower end systems of the existing IBM 5550 16-bit business micro which has sold well in Japan for nearly two years. The new series consists of four models — JX1, JX2, JX3 and JX4 (the JX1 is the low end system and JX4 the highest). The series was designed by Fujisawa Lab of IBM Japan, and Matsushita will manufacture them — which is the same arrangement as its predecessor, the 5550, had.

All JXs use the Intel 8088 chip (the same as the IBM PC and XT) and run PC-DOS 2.1 (the JX version). This processor/OS combination makes the new machines program-compatible with the IBM PC. Data compatibility is also offered with a 5¼in diskette. With this data and program compatibility, the vast choice of PC software has finally reached Japanese shores.

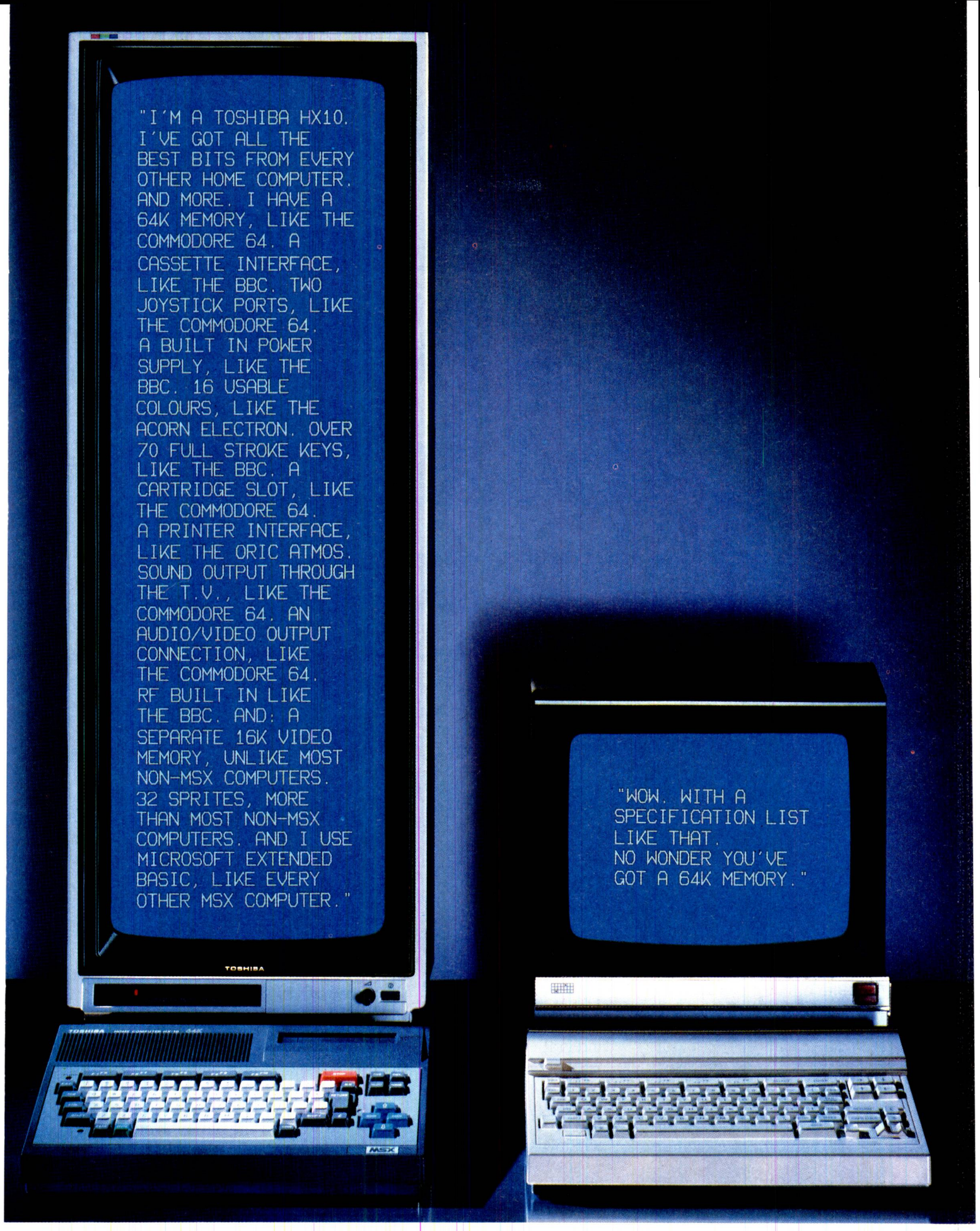
The low end model JX1 has 64k RAM but the JX4 can have a maximum of 512k. Although the JX1 has no disk unit, the JX4 can have up to three 3½in Sony standard drives. The series uses a TV set as the display unit and costs £550 for the JX1 with no diskette drive and £1240 for the JX4, which includes a twin 3½in diskette unit. The JX series covers the range from PC Jr to the higher end of the PC and there are three operating modes. Japanese is the main processing mode but the PC mode is also supported.

## Going into overdrive

Hitachi has developed a desktop mass floppy disk drive which has a capacity of five gigabytes per spindle. The machine stores 500 tightly-packed 8in floppy disks in a small, sealed case and rotates all 500 together by a powerful motor.

The most notable feature of the device is its low cost. While it offers a massive storage capacity comparable to higher end hard disk drives, the cost per bit of the new device is only one tenth of the hard disk because it uses low cost floppy disks. Each floppy disk is separated by a 'spacer' made of stainless steel.

The data transfer speed of the device is 0.7Mbytes. This is faster than an optical disk. An interesting development to watch. END




You'd expect one of the best-selling home computers in Japan to have a specification list as big as its memory.

But the Toshiba HX10 doesn't just limit itself to that.

It was developed along with other Japanese home computers to operate on one language: MSX. You can swap programs, games, cassettes, even peripherals like disk drives, printers, and joysticks: they're all compatible with every other MSX computer.

All of which makes MSX the system of the future.

So if you want a computer that won't be obsolete in a few years, buy an MSX. If you want one of the best-selling MSX computers in Japan, buy a Toshiba HX10.

TOSHIBA MSX

FOR MORE INFORMATION ON THE TOSHIBA HX10 CONTACT TOSHIBA (UK) LTD., TOSHIBA HOUSE, FRIMLEY ROAD, FRIMLEY, SURREY GU16 5JJ. TEL: (0276) 681691.

# After everything that's been said in praise of Amstrad's CPC464, is there anything to add?

Plenty.

The CPC464 is an enthusiast's dream come true.

Few applications are beyond its capabilities, with its sophisticated features, complete expansion bus connector for sideways ROMs, serial interfaces, disk drives and modems.

No wonder the press is in raptures over it.

## The CPC464 system.

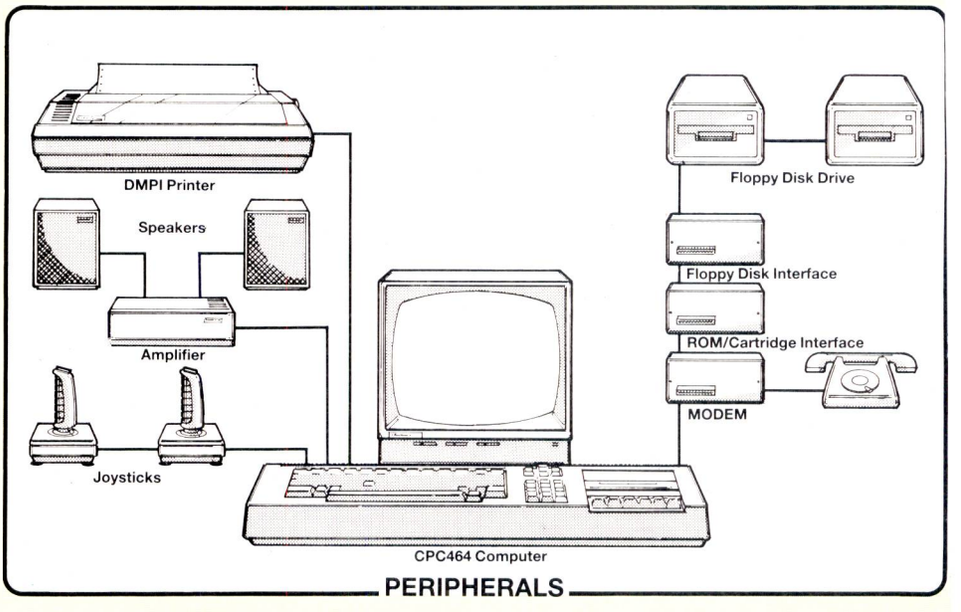
It comes complete and ready-to-go. Here's what you get for that incredibly low price.

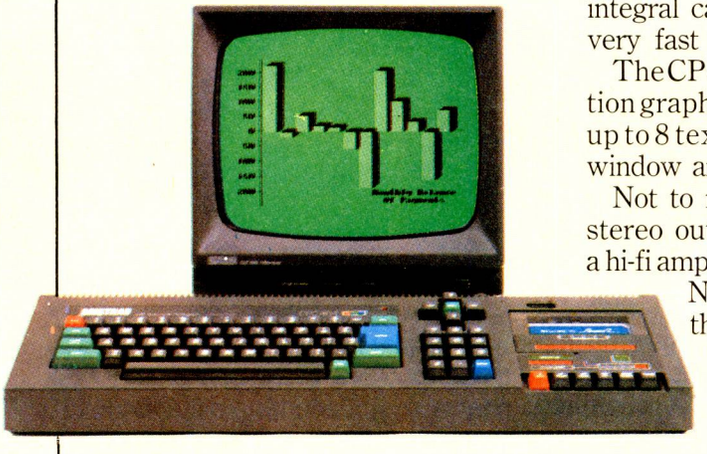
64K of RAM (42K available), 32K of ROM, colour monitor or green screen VDU, typewriter style keyboard, integral cassette data recorder and a very fast extended BASIC.

The CPC464 offers you high resolution graphics, 80 column text display, up to 8 text windows plus a graphics window and a palette of 27 colours.

Not to mention a 3-voice, 7-octave stereo output you can feed through a hi-fi amplifier and speakers.

Now we think you'll agree, that's some system.



CPC464 green screen VDU (GT64)

## Low cost disk drive.

An inexpensive floppy disk system is available which includes CP/M* (giving you the option to access 3000 proven programs) and LOGO with its famous educational applications.




Optional disk drive DDI-1 including interface CP/M* and LOGO £199.95

# £249
Computer complete with green screen VDU (GT64)

# £359
Computer complete with colour monitor (CTM640)

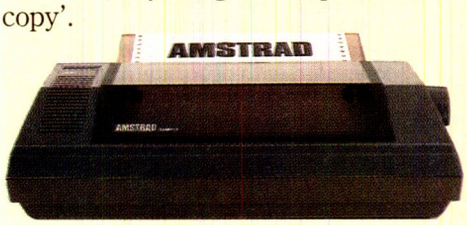
## CPC 464 complete with monitor and datacorder




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

### Printer port.

The CPC464 has a built-in standard parallel printer interface which offers you the facility to provide permanent reference of program listings, letters, invoices, anything that requires 'hard copy'.




Optional 80 column dot matrix printer DMP-1 operates at up to 50 characters per second. Combined with the CPC464, it offers a high performance text processing system for only £199.95.

### Joysticks. Power supply modulator.

You can bring those arcade games stunningly to life with the optional joystick controller which has a socket for a second stick.

The optional power supply and modulator enables the CPC464 to be connected to any home colour TV.

### Amsoft. Fast growing software.

The high quality software takes full advantage of the CPC464's high specification and speedloading capability. Which means even complex programs can be loaded quickly.

A range of software is already available. And it's growing rapidly.

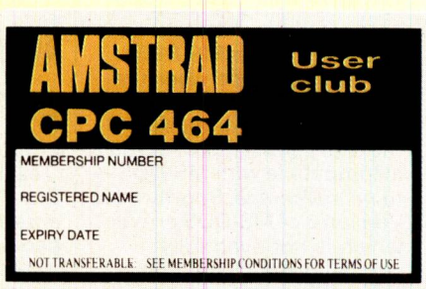
Educational programs, business applications and arcade games are all designed to utilise the CPC464's impressive graphics, sound and processing abilities.



### Amstrad Club Membership.

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

Members enjoy immediate benefits like the privilege card, Club binder, regular magazine, competitions for valuable prizes and contact with other Amstrad users.

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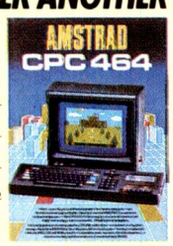
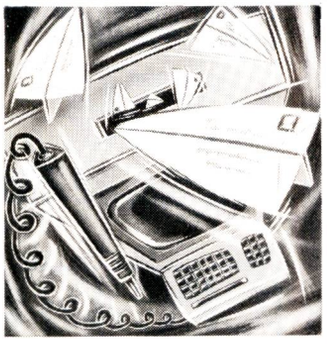


# LETTERS



*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.*

## Each to his own

With reference to your Benchtest of the Sharp MZ-5600 (November 1984), I would like to take issue with a comment made by the reviewer.

In the opening paragraphs of the article, the reviewer states that he is puzzled by 'the thinking behind the choice of outdated CP/M-86 and a non-IBM PC compatible implementation of MS-DOS'.

This reminds me of the early days of microcomputing when quite a few of the 'uninformed' were convinced that if it wasn't TRS-80 compatible, it was antiquated.

IBM-DOS has been through as many as three versions, none totally compatible with the other. After Digital Research stuck out so long for compatibility and achieved a *de facto* standard with CP/M-80, it became necessary to bring out an operating system for the 16-bit world. CP/M-86 was born, and the level of compatibility with the old CP/M-80 is *very* high. This has led to a large amount of software becoming available for CP/M-86 in a very short amount of time. Wonderful — then along came MS-DOS; the differences between the operating systems being quite trivial, yet enough to make programs for CP/M-86 incompatible with MS-DOS — *to no advantage.* Shortly after, Version 2 of MS-DOS arrived, which is not even fully compatible with the first.

The IBM name carries a lot of weight and many have copied the machine (as many copied the TRS-80), and if you want to rip off someone's software, then the compatibility between different machines makes that easy. But if you want a fast, efficient computer with decent graphics, then the IBM PC is very slow (like another so-called 16-bit machine, the ACT Sirius) and the graphics are *very average.* MS-DOS 1 permanently damages files with the greatest of ease, while its successor, MS-DOS II, is actually slower (in implementations I have seen) than the first version. I would argue that the rush for compatibility has slowed down progress in the 16-bit world by an intolerable amount.

Take a look at the Zenith Z100, an 8/16-bit machine, *totally* compatible with both CP/M-80 and CP/M-86 *simultaneously*, as well as (if you must) a 'kind' of MS-DOS. There are other examples of fast, efficient, cost-effective machines: the Sharp MZ-5600 looks to me like another potentially good example.

For my money (and I've used and dealt with professional machines for quite some time), forget IBM compatibility and take each machine on its merit. If it runs CP/M-86 or even CP/M-80, you won't find any shortage of software. When Digital Research finally gets Concurrent CP/M-86 right (how many perfect working installations have you seen?), then with any luck this will kill off MS-DOS altogether (Concurrent runs MS-DOS programs, MS-DOS does not run Concurrent CP/M-86 programs).

Until then there are thousands of packages available for CP/M-80 and CP/M-86.

**P Scargill, London**

## WordStar below par

In your September issue's 'Teach yourself Lisp' series, Dick Pountain makes the *amazing* assertion that 'Lisp people tend to be spartan, almost monastic souls, unspoiled by full-screen editors . . .'

*Boy, has he got it wrong!*

Poor souls who struggle with Lisp on personal machines may think WordStar is good, but those who use real Lisp systems like InterLisp, MacLisp, and so on would liken using WordStar to using a hand calculator.

Their editors are probably the most sophisticated in the world: they'll automatically indent functions for legibility as they are typed in, balance brackets for you, and move whole nested brackets expressions about as one piece. Add to that the fact that they'll let you work with several files at once, each in its own window.

They'll also automatically draw up calling trees (the Lisp equivalent of flow charts) of the routine you're using *and all those called by any it calls.* And if you ask them nicely, they'll even go away and find out where the function you are working with is called, and show you each call in turn. And all these functions are called up by a mouse . . .

I don't think WordStar is quite up to that lot, is it?

**Robert Inder, Edinburgh**

## Multi-lingual bent

Tony Hetherington's answer to Dr Alex Longhurst of Leeds University ('Viva España!', Computer Answers, November) engaged my attention, as I recently tackled the same problem with a vastly more humble machine than the IBM PC, namely my Commodore VIC-20 (with expanded memory and an 80-column cartridge), on which I run Word Manager for word processing.

I needed a character set which included the normal alphabet, plus the seven special characters used in the German language. These seven are included in the ROM of my printer (a Star Gemini 10X — which offers eight international control codes), but two special characters cannot be accessed because of the necessary ASCII codes when in Text mode.

The French language, which I shall also be requiring, poses an even greater problem. Once again (with the Gemini 10X) two of the special characters require the missing ASCII codes, and in addition the circumflex accent is a separate character which needs to be printed by backspacing — a function not included within Word Manager.

The answer has proved to be the writing and saving of a 'Download Character Set' program, with which I program my printer by loading and running it immediately before running the Word Manager program. Certain standard characters must, of course, be sacrificed. Before typing this letter I programmed my printer for my German character set, and I am therefore able to demonstrate how I have reallocated certain keys (which fortunately are not usually needed for normal narrative text):

| Key | Prints |
|---|---|
| Left arrow | Ä |
| Encircled 'a' | ß |
| Up arrow | ä |
| LH square bracket | Ö |
| RH square bracket | ö |
| Less than | Ü |
| Greater than | ü |

A French character set requires 10 rather than seven special characters, which does stretch the capacity of the VIC-20 keyboard to the limit. I have come to the conclusion that, in addition to the seven keys detailed above, as for German, it is probably the 'hash', the '&' and the '"' which will have to be reallocated.

I note that Dr Longhurst's budget figure for a word processing package is £4000. You may be interested to know that my own system, which has an 80-column display, a typewriter-style keyboard with programmable printer, and is disk-based, can be obtained for about £850, including VAT. Word Manager may not be as sophisticated as WordStar or Perfect Writer, but it does have 80 columns and full onscreen editing and formatting, plus plenty of other very useful functions, and it's probably the best word processor available for the VIC-20.

My hardware is as follows: Commodore VIC-20 (obsolete but still obtainable at some stores); Stack four-slot motherboard; 16k RAM cartridge; Display Manager 80-column cartridge (with which Word Manager is 'bundled'); Commodore 1541 disk drive; Star Gemini 10X printer; Star Universal/Commodore parallel interface; and a Philips V7001 'green screen' monitor.

As regards price, the above system is unlikely to be

beaten until a disk drive becomes available for the Amstrad CPC 464.

I very much enjoy reading your magazine.

**John W Dunster, Chigwell Essex**

## Advance problems resolved

I have recently purchased the Advance 86B personal computer, produced by Ferranti and marketed by WH Smith. There have been suggestions that the after-sales service and maintenance are inadequate. I had cause to utilise the service after a board came loose following a jolt during transport. The service was conducted by a company called NAS, and I'm pleased to say it was carried out in a friendly and efficient manner within 24 hours.

However, I have a Juki 6100 printer, also now marketed by WH Smith, and I had problems finding out how to configure Perfect Writer, supplied with the Advance 86B, to run this printer. After consulting the British division of Perfect Software Inc, it transpires that the Juki 6100 can use the same configuration as the Diablo printer which is already programmed into Perfect Writer. Thus, depending on the daisywheel used, the Juki 6100 can be run on the Diablo 10, 12, 15, or PS settings.

I hope this is of assistance to anyone purchasing the same combination.

**KA Christianson, Kingston, Surrey**

## In defence of C

I feel I must defend the C programming language against Dr Jowett's accusations ('Slow, slow, Quill Quill slow', Communications, November).

Dr Jowett refers to the fact that C's handling of strings is not part of the language; movement, comparison,and so on are all performed by calls to a run time library. While this may appear cumbersome in the source code, it's not necessarily a slow method; those routines should be written in assembler and would be very fast on a 68008, even when moving data one byte at a time. A string move can be written in five lines of assembler and moves 200,000 characters per second (from memory to memory).

Also, since C strings are delimited by a closing null (zero code), they need not be counted to be moved — the string move simply checks for a zero in its source string.

There is also the point that using strings is not the best way of handling text in buffers. Moving a paragraph might be better done using pointers to the start, finish and destination of the block, the length of the paragraph being found by simple subtraction.

The real cause for Quill's poor peformance (short of dreadful design) is likely to be the operating system interface which puts the characters back on the screen. I can't comment on this, since I don't own a QL.

**Mike Corlett, Ilford, Essex**

## The Nascom lives!

We were horrified to read in your article 'Accessible Amstrad' (November *PCW*) that the Nascom is no longer in production.

While we have discontinued the Nascom 1, which was the original machine, we are still manufacturing substantial quantities of Nascom 2 and Nascom 3 systems.

The Nascom 2 is available in both kit and ready-built form and together with the advanced video controller, floppy disk controller, 64k RAM, and many other accessories, still offers both the hobbyist and professional user one of the most flexible of systems. The Nascom 3 utilises the Nascom 2 together with a number of other boards to form a complete standalone machine running under either CP/M or NAS-DOS.

Should further details of products be required, then we would be only too happy to supply details on request.

**Peter Seddon, General Manager, Lucas Logic Ltd, Warwick**

## Setting new standards

I read with considerable interest the article by Mike Liardet on the newly released version of Logo by LCSI for the Spectrum (October *PCW*). I found the review topical because of the current educational interest in Logo and the significant scarcity of anything like full versions for the common educational microcomputers. One point, however, I feel is worthy of some further attention.

The use of Benchmarks is admirable, but if they are to be of use to readers in evaluating a version of Logo for their particular purposes, the Benchmarks must reflect both the language facilities and the type of use to which the language is to be put.

In the case of the Basic Benchmarks developed by *PCW*, they are useful because they use common Basic statements ignoring only graphics, filing and system commands. They use a good cross section of the statements which 'average' programmers will use on 80 per cent of the lines of their programs, and they separate the statement types.

Translating them into Logo is, I feel, not useful. The Benchmarks do not test the graphics which most users of Logo will feel important, nor do they test the effective memory size which will limit the depth of recursion and the number of procedures which can be used. The list processing properties have likewise been ignored.

The Hilbert Benchmark, while producing a pretty picture, includes rather too many types of statement to enable a user to disentangle their various time effects. A new set of Logo Benchmarks is needed, and it may be prudent to give this matter some thought considering the wide use of the *PCW* Basic Benchmarks.

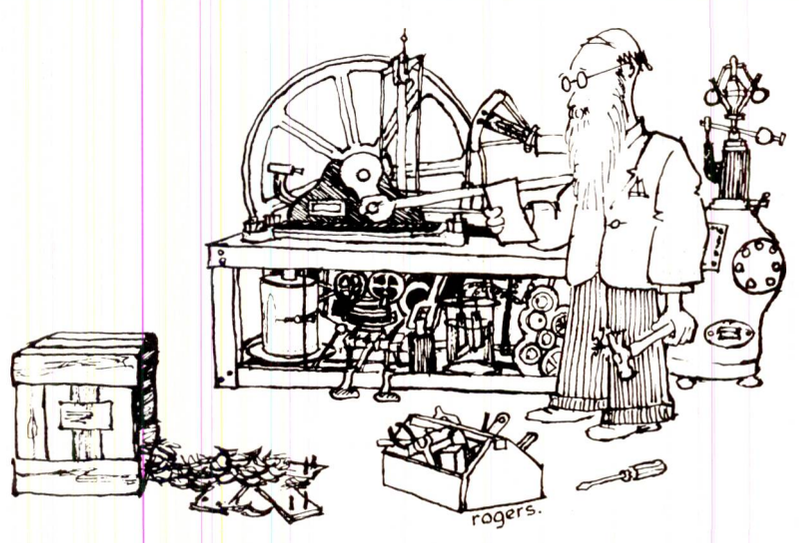
**SJ Waller, London SE2**

*(We'll be publishing some Benchmarks especially written for Logo in the February issue. Let us know what you think of them — Ed)*

## A matter of speed

In his review of the word processor Workwriter (November *PCW*), Peter Jones described as *fast* a save to disk of 80 lines in 9.5secs. I think this is very slow.

I have an Apricot (two × 320k) which I use a lot for word processing, and I found the SuperWriter package tiresome in its slow writing to screen and disk, and constant use of overlays. I am currently using a word processor called PRO-TEXT, priced at £125 plus VAT from MLH Technology, Comberbach, Cheshire, which does not depend on overlays and is fast enough, both to screen and disk, to avoid frustration.




*'Dear Timmy, we apologise for the somewhat late delivery of your patent micro computing machine . . .'*

For example, the average document, which is not restricted to 80 lines, once in the workspace, can be saved in about a second.

MLH is perhaps better known for its DeSmet C package, and it was when buying this that I found the company was developing a word processor. I have a special interest in PRO-TEXT, in that I served as a guinea pig in its later development; nevertheless it has met my needs, and it shows what can be done.
**AD Ryder, Bolton, Lancs**

## Inadequate accuracy

Now that Sinclair has settled down to supplying customers with the JM version of SuperBasic with the QL, may I offer an update on the published Benchmarks:

| | QL* FB | QL JM | BBC* |
|---|---|---|---|
| BM1 | 2.1 | 2.0 | 1.0 |
| BM2 | 6.4 | 5.6 | 3.1 |
| BM3 | 10.7 | 9.6 | 8.2 |
| BM4 | 10.3 | 9.3 | 8.7 |
| BM5 | 13.2 | 11.8 | 9.1 |
| BM6 | 26.1 | 24.4 | 13.9 |
| BM7 | 61.8 | 42.7 | 21.4 |
| BM8 | 25.8 | 20.9 | 51.0 |
| Ave | 19.6 | 15.8 | 14.6 |

**Taken from previous* PCW *reviews*

This shows the worthwhile increase in speed which the latest version of SuperBasic offers. The point that the QL offers a useful increase in speed over both the BBC and the Commodore 64 on more complex programs such as polynomial curve-fitting, has already been made by others.

However, I would like to question Sinclair's design philosophy which has given us a *serious* computer whose mathematical accuracy (7 sig fig) is worse than most £10 hand-held calculators.

While I don't suppose many businessmen dealing with figures bigger than £99,999.99 would buy a QL, this is clearly inadequate for many students. There seems to be a growing market among financially hard-pressed postgraduates for cheap, serious computers; I know of at least three in Oxford who have bought QLs for word processing. Having bought a QL myself, my money is now waiting for the first decent double-precision floating point compiler to be offered. In trying to create a new market sector Sinclair might have just missed the boat!
**Roger MacNichol, Oxford**

## Fighting off . . .

Having an interest in both classic motorcycles as well as computers, I observed the advent of the MSX machines with some trepidation.

It reminded me of the early Sixties when Japanese motorbikes came on the market. They were simple, reliable and cheap; just what the public wanted, even though the Gold Stars and Bonnevilles of the time were much more powerful.

The question I keep asking myself is: have the Japanese realised the public's needs with MSX? Are the BBCs and QLs not akin to the Gold Stars and Bonnevilles?

Beware that the British computer industry does not suffer the same fate as the British motorcycle industry.
**Huw Williams, Clwyd**

## . . . the Japs

Nobody can ignore the fact that the Japanese MSX micros have finally arrived. Although they are clearly overpriced, prices will no doubt fall in time. Their standard may at first appear a boon, but I believe that it's probably their downfall. When you strip a micro down, what is it? The processor, the Basic, sound, graphics and interfaces. If you standardise these things, what are you left with? The same machine in a different coloured box. There will be small variations: different keyboard layout, printer ports in different places, and so on.But the result could be that instead of choosing between, say, a Spectrum, an Electron, a Commodore, a Goldstar MSX, Hitachi MSX and Toshiba MSX, the choice would be between a Spectrum, an Electron, a Commodore and MSX. Once the choice for MSX is made, then the choice of *which* MSX is made.

So, instead of the market being divided into sixths it will be divided into quarters. This would mean that MSX companies will have to share a quarter between, say, 10 companies and the likes of Sinclair will get a full quarter.

While Toshiba and Hitachi can put up with a reduced share of the market they will not have the same punch as was expected. This may cause some of the smaller companies to pull out of the market or go under.
**A Kelly, Birkenhead, Merseyside**

## The early bug catches the man

I recently saw the film *Edison the Man* (1940) on television. In it, Edison is portrayed saying: 'Jumbo (the dynamo) developed some bugs at the last minute.'

1940 is a bit early for 'bugs', isn't it?
**David Ainsworth, London SW15**

## Beethoven's last laugh

I have been a professional computer user for many years during which period I have been a regular reader of *PCW*.

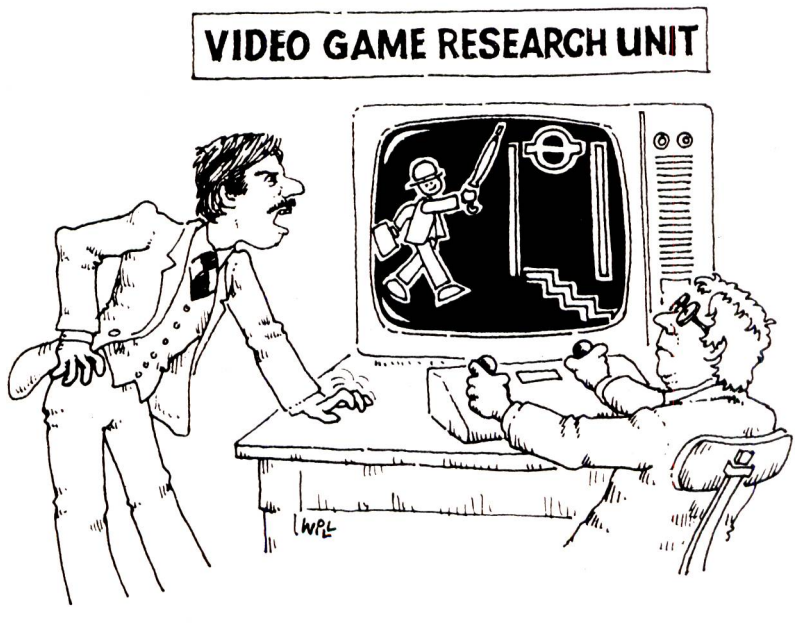
I thought that I was immune to the necessary but occasionally informative evil of advertising. However, the brainless twit(s) who designed the double-page advert entitled 'Roll-over Beethoven' for Island Logic on pages 300-301 of the November issue plumbed new depths of bad taste.

The very idea that these megalomaniac morons could believe that their music program would turn 'the average man in the street' into a towering genius like Beethoven I find truly incredible.

I'm sure that the only thing in this advert that would make the late Ludwig turn in his grave (at about 10MHz I should think) would be the smug little conclusion that 'Mr Beethoven, as you decompose, we compose'.

Ugh!
**Les Hatton, New Malden, Surrey**

*(Music packages may be fun but they're no competition to Beethoven. I hope the review of similar software in this month's issue puts things into better perspective — Ed)* END




*'Let's face it . . . "Chartered Accountants and Tubes" just doesn't have the same charismatic ring as "Dungeons and Dragons!"'*

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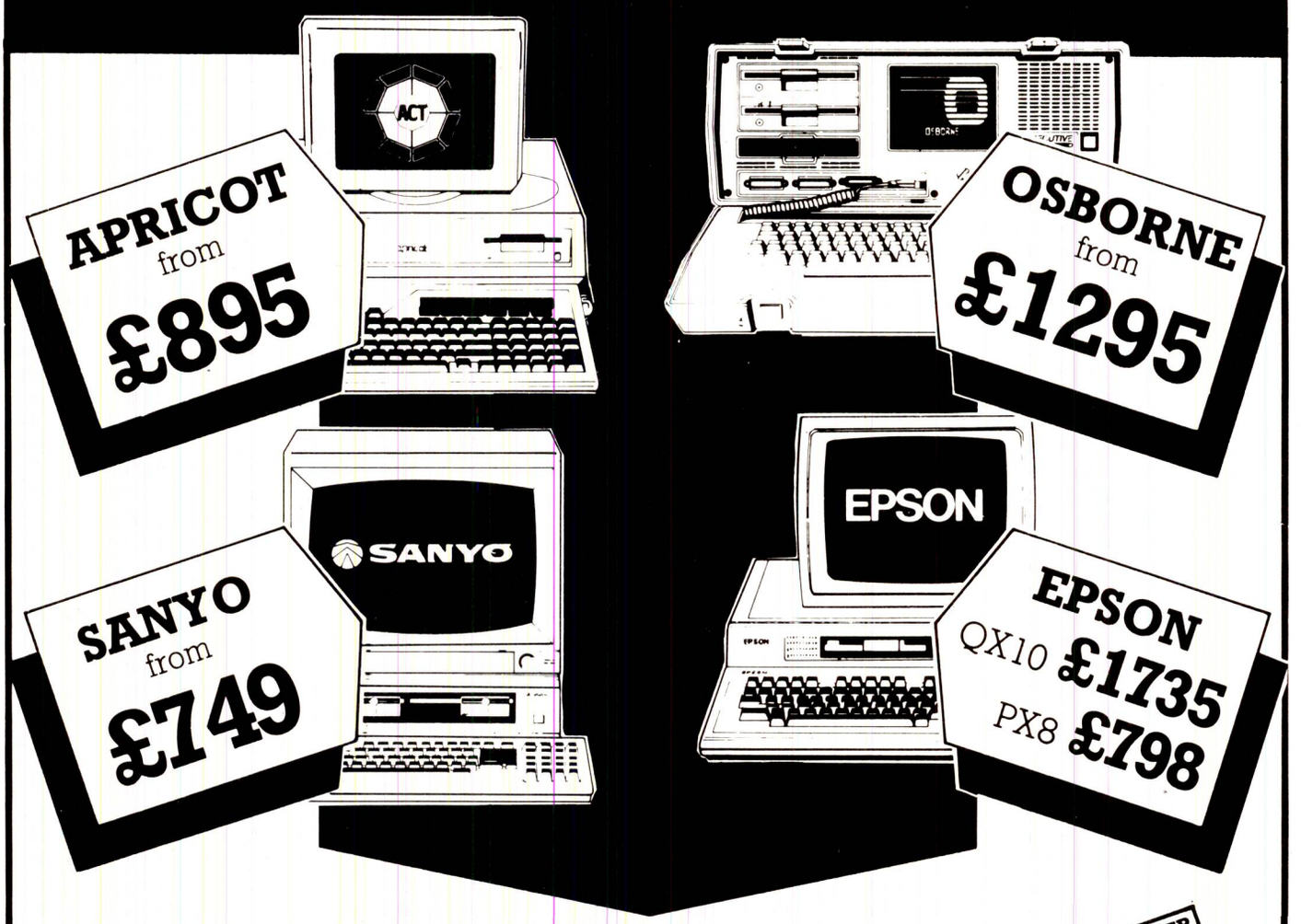


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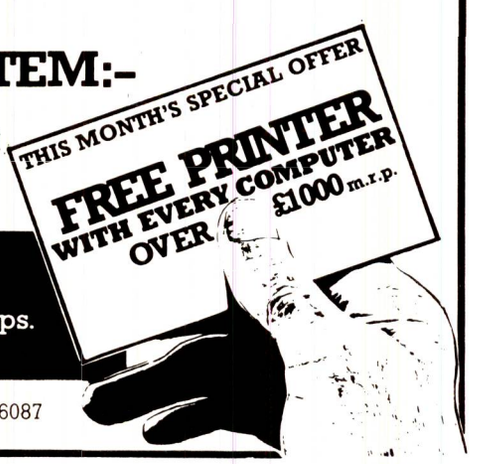


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PCW133



## BANKS' STATEMENT

# State of repair

*Martin Banks takes his toolkit to the tricky problem of micro maintenance and insurance.*

Once upon a time, a friend of mine got a job as a computer operator. When he was ensconced in his chair and had vaguely learned how to twiddle the knobs, he invited me over to visit him in his new abode.

When I arrived, I found him sitting at a large console surrounded by several very large metal cabinets. 'There it is,' he said, 'a Ferranti Atlas computer.' The Atlas was one of those classic 'computer-the-size-of-a-house' machines, full of thermionic valves and other gizmos. This one also had Gordon.

Gordon, my friend informed me, came with the Atlas from Ferranti. He was the resident engineer and spent his working day rummaging around in the bowels of the machine, clutching a soldering iron and a screwdriver. Making the Atlas work was no job creation scheme: Gordon worked long and hard to ensure that the beast carried out its (now relatively menial) duties. He was also a whizz at making the beast play Christmas carols on its loudspeaker a long, long time before the likes of Commodore and Sinclair came on the scene, but that's another story.

Computing has come a long way since then, to the front parlour, the pocket and beyond. The subject of Gordon, or, more specifically, the subject of maintenance and repair, hasn't come quite so far.

To the majority of professional computer users (that is, those who run mainframes and minis in the traditional way), the need for a fast, reliable maintenance and repair service is well appreciated. A computer system of that type represents a considerable investment, and the best way to make it pay is to keep it working efficiently. This understanding of the subject has been good enough to allow a whole industry of third party maintainers to grow up to complement the manufacturers' service departments. They have accurately costed out the economics of maintenance to the point where every user knows that he is signing for an extra charge of 10 per cent of the purchase price per year as the cost of maintenance. This is all well and good where the purchase price is £50,000 or more; however, 10 per cent of that still represents a sizeable chunk of money, and a fair amount of service can be provided for it.

Down at the micro end of things, the situation is rather different. Five thousand pounds represents the all-up price of a handy, small business system — something like an IBM PC, Apple, Macintosh or ACT Apricot, with software and a printer. The majority of computer units sold at the low-end are even smaller than this. A BBC Micro will realise some £40 for maintenance on this basis, while a Spectrum qualifies for a paltry £12.90-worth of service. It's figures like these that have kept many maintenance companies away from the micro-end of the scale, with the IBM PC and Apple products being the smallest machines they will consider handling.

Now, it's true to say that there's a strong school of thought which says that, given the price of some of these home computers, it's stupid to even contemplate maintenance or repair. If it goes wrong, chuck it and buy another (unless you can get it replaced under the warranty, of course).

Things are changing, though. Manufacturers are looking closely at a new class of 'professional' user. Many have launched, or are just about to launch, products into this area. These new machines have a superior specification to the standard home games micros, including the minimum provision of a disk interface (or equivalent) and access to business-oriented software. In many cases, this means running CP/M.

The potential of this new marketplace should not be underestimated. Psion, for example, would not have gone to the trouble and expense of creating its suite of QL-based business packages just on the off-chance that it might sell some. Computer users are developing fast and want to do more than play games. Many can make use of a suitable machine in their work, especially if they're self-employed or running a side-line business. They need the greater power and flexibility of 'professional' hardware and software. They also need the machines to work.

Once people start to depend on their computer for more than entertainment; once that nasty subject, earning money, becomes involved, they're unlikely to look benignly on the computer should it break down. If these new machines don't prove to be tolerably reliable, wailing and the gnashing of teeth will be heard all round.

In part at least, users have failed to appreciate that a computer is much more complicated than a portable radio, that it takes a skilled person to fix one, and they are liable to go wrong. When the system breaks down they'll be amazed at the price being asked to fix it, yet they'll have shunned the option of taking out a maintenance contract at the time of purchase; partly on the misunderstanding that they 'never go wrong' and partly at the horror of 'paying that much, every year!'

Even if such people *wanted* to take out a contract, the choice is currently limited. Most third party maintainers regard this end of the business as unprofitable — which it is if approached in standard maintenance company style. For them to consider the business in the first place means the user facing an annual contract charge of 50 per cent of the purchase price at least — and that's just the charge for ringing the door bell.

There's a living to be made in this market however, even at the lowest end, although the right way to achieve it is still unclear. I would have a chain of franchised repair shops around the country, combining the best of small business with the buying power of a large company to get the best price on spares. Others, such as the recently announced Micro-Repair Club, are attempting to combine the expertise of a maintenance company (in this case, Computeraid) with the backing and actuarial skills of an insurance company (Domestic and General Insurance). Computeraid is part of the Thorn-EMI group, another bit of which puts Spectrums together for Uncle Clive. This inside knowledge means they will happily fix Spectrums and (expectantly) make money out of the £25 annual fee (*née* insurance premium).

Whichever way the market is eventually tackled, someone will succeed. If these new machines are to sell to the types of users predicted, they're going to want such a service, and will be willing to pay for it. END

*Illustration by Chris McEwan*

SOFTWARE

# Hitch-hiker's Guide to the Galaxy

*Are you searching for the meaning of Life, the Universe and Everything? Forget it! Tony Hetherington has found it in Infocom's humorous and impressive adaptation of Douglas Adams'* Hitch-hiker's Guide to the Galaxy.

In 1978 a radio series was broadcast on Radio 4 called *The Hitch-hiker's Guide to the Galaxy.* There then followed a second series and a book of the same name. Then a second book was written which was followed by another. Meanwhile it had become a television series and also a stage play. Now it's a computer game.

It is, however, unlike any other computer game that I have played. Published by the American software house Infocom, The Hitch-hiker's Guide to the Galaxy has all the trademarks of the excellent interactive fiction series, but there is a slight difference.

The game disk is accompanied by the demolition orders for your home and planet, a 'Don't Panic' badge, a piece of fluff, a small polythene bag (with which to attack microscopic space fleets) and the exceedingly useful peril-sensitive sunglasses — which you naturally cannot see through.

Adams is said to have enjoyed a number of Infocom's adventures and thought it would be a good idea to do one based on Hitch-hiker's. He initially contacted the company via a bulletin board and further discussions followed in a series of English pubs (which was cheaper, although response time may have been slower) before Steve Meretsky was given the job of programming (Steve had previously written the Infocom adventures Planetfall and Sorcerer).

The resulting game is a curious mix of the humour and imagination of Douglas Adams and the depth and quality of an Infocom adventure. It is also a difficult adventure to solve.

## Strategy

As with the other Infocom adventures Hitch-hiker's Guide consists of a series of logical problems which form the plot of a story in which you are the leading character. Your degree of success in tackling these problems determines the consequent route of the story.

You play the part of Arthur Dent and awaken one morning in a darkened room to discover that you have a dreadful hangover. On clambering out of bed and taking an aspirin you begin to feel slightly better: the irony of your situation is that this day will turn out to be the worst day of your life. In the next half hour your house is due to be demolished by a bulldozer (because it's simply in the way) and the Earth is scheduled to be destroyed by a Vogon constructor fleet to make way for a hyperspace bypass.

Just in time you and your friend, Ford Prefect, whom you always thought was from Guildford but is actually from a small planet near Betelgeuse, hitch a lift on the Vogon spaceship and the adventure continues.

If you've seen any of the previous versions of Hitch-hiker's and are now assuming that the game has the same plot and solution, don't. You're in for quite a surprise.

Although the characters are the same, and you'll come across similar creatures, places and situations, the difference is that you have to take a leading role rather than be lead through the action. A good comparison is *The Hobbit* by Melbourne House, wherein you play the part of Bilbo who is helped and lead through the story but takes the leading role in the game.

Therefore, it's up to you to find the answers to the obstacles which are placed in your way: you do, however, have some help in the dubious form of the *Hitch-hiker's Guide to the Galaxy.* This is an electronic book that you can consult about many things — but don't be too surprised if the editor for the section you require was out at lunch when the guide was compiled. As already stated the problems which you have to solve are logical and have logical solutions — but only if you apply the rather strange logic that exists in Hitch-hiker's.

To illustrate: the problem of getting a babel fish out of the babel fish dispenser. In the book and radio series Ford merely pops one into your ear but in the game you're not so lucky. After consulting the guide you realise that putting a babel fish in your ear is an excellent idea as it will allow you to understand and be understood by anyone or anything in the galaxy.

Consequently you are determined to get one so you press the button on the dispenser, but the fish shoots out the slot across the room and through a hole in the wall. You notice that there's a hook above the hole, so you hang your dressing gown on the hook in order to block the hole, and try again. But this time the fish hits the gown and falls down a drain. Not to be defeated in your objective you cover it with a towel. However, when the next fish lands on the towel, before you've had time to do anything, a cleaning robot charges in, picks up the fish and disappears through a robot panel near the floor. After some frantic hair-pulling you borrow Ford's satchel and place it in front of the panel and confidently depress the button.

Unfortunately, your lap of honour is interrupted by the following message: a single babel fish shoots out the slot. It sails across the room and hits the dressing gown. The fish slides down the sleeve of the gown and falls to the floor, landing on the towel. A split-

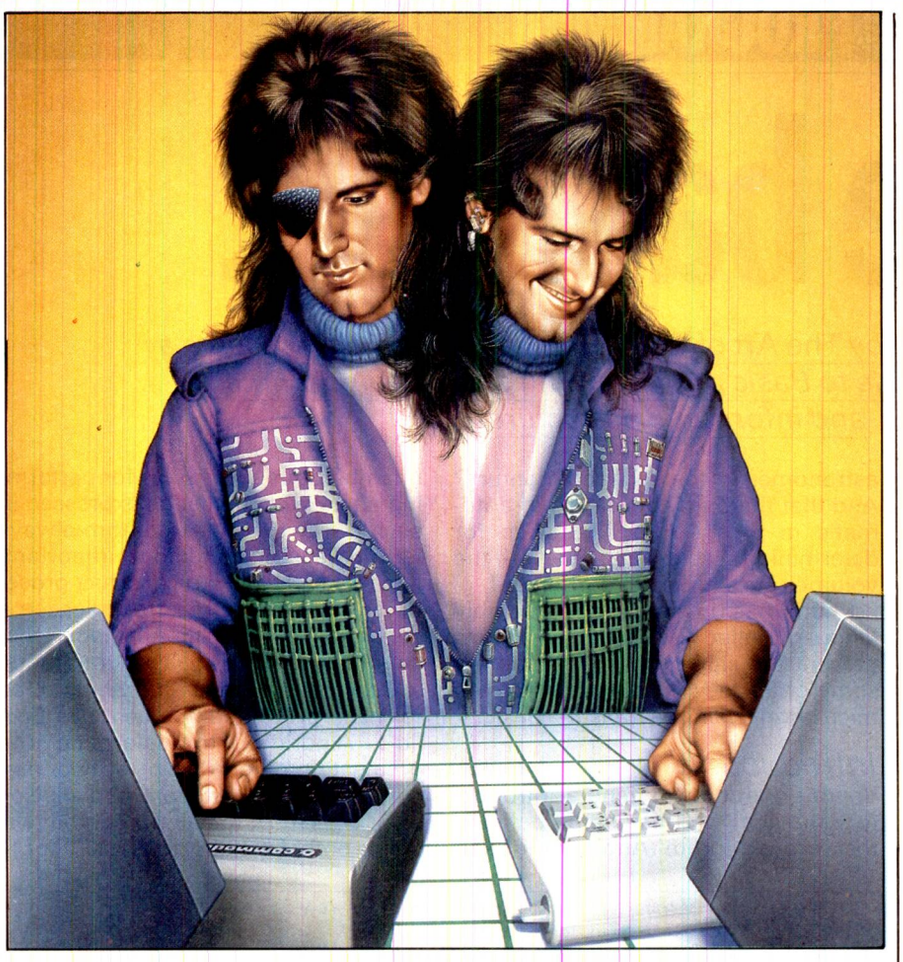

Illustration by Andrew Farley

second later, a tiny cleaning robot whizzes across the floor, grabs the fish, and continues its breakneck pace towards a tiny robot panel at the base of the wall. The robot ploughs into the satchel, sending the babel fish flying through the air in a graceful arc. A small upper-half-of-the-room cleaning robot catches the babel fish and exits.

Don't be surprised if your computer acts strangely. At one stage I was informed that there was an exit to port but when I tried it, I was told that I couldn't go that way. In frustration I typed 'starboard' but was told that I could and had gone port and that it had lied before!

And don't be too easily deterred: your progress through the game will undoubtedly improve as you tune into the game's 'brand of logic', a state which I only achieved half-way through the third sleepness night spent hitch-hiking.

To help you get there, here's a brief description of some of the characters and creatures in Hitch-hiker's.

Ford Prefect is a researcher for the guide but unfortunately stayed on earth slightly longer than intended (six years) during which time he updated the guide's entry about earth from 'harmless' to 'mostly harmless'. For some reason beyond his apprehension he saved you, Arthur Dent, from the earth's extinction but then recovered his senses.

Together you are thrown into space by the Vogons where, just before you expire, you are picked up by the Improbability drive propelled spaceship, the 'Heart of Gold'. The new owner of this ship is Zaphod Breeblebox whom you once saw looking normal at a party, but now he has two heads. He is also the president of the galaxy for which he got himself elected with the sole object of stealing the new Heart of Gold.

On board ship you meet Trillian, whom you previously knew as Tricia MacMillian and first met at the same party. This is an incredibly improbable situation but, after all, the Heart of Gold is driven by the Improbability Drive.

The ship is also populated by products of the Sirius Cybernetics Corporation whose attempts to install Genuine People Personalities into machinery has unhappily resulted in Marvin the paranoid robot and an overprotective computer called 'Eddie'.

During your adventures you will also meet the Vogon captain who is green and blubbery and recites poetry (aaagh!), a warlike alien wearing black-jewelled battle shorts, and the incredibly stupid but equally dangerous and ravenous bugblatter beast of Traal. This incredibly stupid monster thinks that if you can't see it, it can't see you!

If you try something a little silly (which *could* be the answer, so it's always worth a try), it doesn't respond with the all-too-usual 'You can't do that.' Instead it either gives you a helpful error message or passes a comment which can range from 'You're letting things get to you too much, try and relax' through to 'Are you sure you're allowed to be playing with this computer?'

Well, how *do* you solve the problems in Hitch-hikers? Here are a few tips that I've gleaned from the game.

Once you have tuned into the game's *peculiar* logic, you should ensure that you read everything carefully (including this review). Every word and object in Hitch-hiker's are there for a reason — even if the reason is only to confuse you. Also you should consult the guide about anything and everything as it contains some important hints. Be prepared to try anything no matter how dangerous or silly it may at first seem; but before you do, use the game's save facility so that you can restore it if things don't turn out too well.

Finally, don't assume for one moment that the game is the same as the book or radio series; even your main objective is different.

## Prices and availability

The Hitch-hiker's Guide to the Galaxy is available on disk for numerous machines including the IBM PC (this was the version used for the review copy), Apple II, Macintosh, DEC Rainbow, HP150 and 110, Commodore 64 and Atari. Most versions cost £34.50 with the last two being slightly cheaper at £30.20.

## Documentation

The guide is in a class of its own and even contains footnotes to its entries. These, of course, can be read and usually contradict what the guide has just told you. Just for fun I decided to read through the footnotes. When I came to footnote 10 the computer responded with: 'Isn't it fun reading through the footnotes?'

## Conclusion

The Hitch-hiker's Guide to the Galaxy is the first Infocom adventure to have a strong outside influence in the shape of Douglas Adams. This has undoubtedly improved an already impressive format and produced a genuinely funny and challenging game. Infocom classes Hitch-hiker's as a Standard Level game but it's hard Standard and more difficult to solve than some of the company's Advanced material.

There will be two groups of people who will particularly relish this game: the 'Hitch-hikers' for whom this will be their first Infocom adventure; and the Infocom adventurers who will be introduced to the humour of Adams. Those lucky people who already know both won't be disappointed.

Last but not least, the *Washington Post* once said: 'If it's 2am it must be Infocom.' On the experience of the last few days I'd like to add: 'If it's 4am it must be Hitch-hiker's.

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*UK distributors include Softsel on (01) 844 2040.* END

# The basic art

*Mike Liardet, aided by* The Art of Computer Programming, *presents a beginner's guide to Basic programming through algorithms and information structures.*

Computer programming is a craft. Given the raw ingredients of a programming language, a skilled programmer can blend them together into a fine working system by using his problem solving skill in conjunction with programming techniques that he has developed over a period of time. In an analogous fashion a traditional craftsman (a carpenter, for example) can transform a few pieces of wood into an exquisite piece of furniture by using different types of joints and various skills acquired over the years.

As with any craft the acquisition of skill comes partly with experience, but it can be more readily acquired by sound teaching and well-written text books. A valuable source of reference for anyone wanting to learn programming lies in a three-volume set of books by an American academic, Donald Knuth. These books are collectively entitled *The Art of Computer Programming**.

Knuth has planned seven volumes in the series, and has completed three volumes to date. Volume one introduces the basic concepts and defines what an 'algorithm' is, giving numerous examples; it also deals with 'information structures'. Volume two covers random numbers and arithmetic, and volume three deals with sorting and searching.

The books present the material as a pleasing blend of descriptions, formal presentation and set problems (and answers), and there are also interesting background histories and bibliographies. They have long been the computer science student's bible, but here they are presented for a new generation of apprentice programmers learning their craft outside the confines of academe. These books will be invaluable to anyone interested in what goes on 'under the bonnet' of computer systems.

Apart from the genuinely useful material, the books are also rich in a huge variety of algorithms that you always knew existed but were unable to find. One of my favourites is the algorithm to calculate when Easter falls (Fig 1). Easter is the first Sunday following the first full moon on or after 21 March. Did you know that this algorithm was devised by a Neapolitan astronomer in the sixteenth century? And that the only application of arithmetic in the Middle Ages was for determining Easter? Oh, yes — the volumes are a mine of information!

Knuth has invented an assembly language called MIX, which he uses to present the algorithms. We'll convert some of these MIX programs into the micro world's *lingua franca* — Basic.

## Introduction

Volume one contains general introductory material, and begins by defining the word 'algorithm'. An algorithm is an unambiguous set of rules for performing a task which must be expressed in such a way that the algorithm always terminates. This condition is important. It is relatively easy to construct procedures that never terminate under some conditions — the 'infinite loop' that should be familiar to all programmers.

One of the earliest algorithms to be formally presented as such was Euclid's Algorithm to determine the greatest common divisor of two integers. (The greatest common divisor, or GCD, is the largest number that will divide both: for example, the GCD of 12

```
2000 REM CALCULATE DATE OF EASTER FOR THE YEAR Y A.D.
2010 REM RETURNS N FOR DAY AND M FOR MONTH
2020 REM GET "GOLDEN NUMBER" (1 TO 19)...
2025 DEF FNREMN(A,B)=A-INT(A/B)*B:REM DEFINE REMAINDER FUNCTION
2030 G=FNREMN(Y,19)+1
2040 REM GET CENTURY C...
2050 C=INT(Y/100)+1
2060 REM LEAP YEAR AND LUNAR ORBIT CORRECTIONS...
2070 X =INT(3*C/4)-12:Z=INT((8*C+5)/25)-5
2080 REM FIND SUNDAY...
2090 D=INT(5*Y/4)-X-10
2100 REM CALC EPACT...
2110 E= FNREMN(11*G+20+Z-X,30):IF (E=25 AND G>11)OR E=24 THEN E=E+1
2120 REM CALC FULL MOON...
2130 N=44-E:IF N<21 THEN N=N+30
2140 REM ADVANCE N TO A SUNDAY...
2150 N=N+7-FNREMN(D+N,7)
2160 REM MARCH OR APRIL?
2170 M=3:IF N>31 THEN M=4:N=N-31
2180 RETURN
```

*Fig 1 Easter algorithm*

```
1000 REM EUCLID'S ALGORITHM
1010 REM RETURNS GREATEST COMMON DIVISOR OF M AND N
1020 REM ANSWER RETURNED IN N
1025 DEF FNREMN(A,B)=A-INT(A/B)*B:REM DEFINE REMAINDER FUNCTION
1030 R=FNREMN(M,N):REM CALC REMAINDER R FROM M/N
1040 IF R=0 THEN RETURN:REM N IS THE ANSWER IF ZERO REMAINDER
1050 M=N:N=R:GOTO 1030:REM OTHERWISE INTERCHANGE AND ROUND AGAIN
```

*Fig 2 Euclid's algorithm*

```
10000 REM INITIALIZE A DEQUE
10010 DIM X(100):DEQLEN=100:FRONT=1:BACK=1:RETURN
11000 REM ADD ITEM TO FRONT
11010 FRONT=FRONT-1:IF FRONT<1 THEN FRONT=DEQLEN
11020 IF FRONT=BACK THEN PRINT"OVERFLOW":STOP
11030 X(FRONT)=ITEM:RETURN
12000 REM ADD ITEM TO BACK
12010 X(BACK)=ITEM:BACK=BACK+1:IF BACK>DEQLEN THEN BACK=1
12020 IF FRONT=BACK THEN PRINT"OVERFLOW":STOP
12030 RETURN
13000 REM GET ITEM FROM FRONT
13010 IF FRONT=BACK THEN PRINT "UNDERFLOW":STOP
13020 ITEM=X(FRONT):FRONT=FRONT+1:IF FRONT>DEQLEN THEN FRONT=1
13030 RETURN
14000 REM GET ITEM FROM BACK
14010 IF FRONT=BACK THEN PRINT "UNDERFLOW":STOP
14020 BACK=BACK-1:IF BACK<1 THEN BACK=DEQLEN
14030 ITEM=X(BACK):RETURN
```

*Fig 3 Deque processing*

and 30 is 6.) The Basic variant is presented in Fig 2. The algorithm requires a 'remainder' or 'modulus' function; most versions of Basic don't have one, but the DEF FN facility can be used to create one:

DEF FNREMN (A,B) = A – INT (A/B) * B

Following the introduction to algorithms, Knuth outlines the basic mathematics needed to study some of the subsequent material. Unless you're mathematically inclined this is rather daunting, but fortunately isn't mandatory: the mathematics is needed for the theoretical study of the algorithms. The theory arises because it isn't sufficient to know that an algorithm will work; it's also important to know that it will work reasonably quickly. Determining information of this type can be very complex, and some of the material is devoted to it. However, if you're non-mathematical, or in a hurry, or both, you can safely skip this analysis and read the conclusions, not the proofs.

*'Given the raw ingredients of a programming language, a skilled programmer can blend them together into a fine working system by using his problem solving skill . . .'*

The next section describes the MIX assembly language, devised by Knuth and used in the description of some of the algorithms. (Descriptions are also given in a more familiar English-cum-programming language.) MIX is roughly equivalent to a typical 8-bit or 16-bit assembler available for most micros, but being a Knuth invention it doesn't commit the book to any one computer. Among other things the code for a MIX simulator is given, so if you're really keen you can get MIX up and running on your own machine and use it to work through some of the exercises. This is a good way to learn assembler programming.

## Information structures

Following the introductions, volume one gets down to business with a comprehensive guide to information structuring. Most interesting programming tasks, especially non-numerical work, demand some skill at structuring data. In fact, some programming languages implement many of the facilities described by Knuth. Artificial Intelligence languages, such as Lisp, Prolog and Logo, are particularly rich in these features, but if you're working with other languages, Basic for example, then Knuth provides a thorough grounding for building up these facilities from scratch.

The most elementary structure is the sequentially allocated list, simply represented in Basic as a one-dimensional array: for example, DIM X(1000). This structure is quite adequate for tasks where the data to be stored is fixed during initialisation and left alone thereafter, but it can be cumbersome for dynamic structures, where elements may be added and deleted 'at random' throughout program execution. In order to insert an element at some point, all the elements after it must be shuffled along to make room, which can be very inefficient if the list has more than a few elements. Likewise, a deletion necessitates a shuffle in the other direction.

There's a special case where this arrangement *can* work efficiently, and this is when all insertions and deletions take place only at the ends of the list; this is known as a 'deque'. The deque concept includes two further, even more special, cases — the 'stack' and the 'queue'. Stacks add or delete data from one end, and queues add data at one end and remove it from the other. Both are very widely used — queues for buffering characters prior to processing, and stacks for managing computations on recursive structures.

The code for the four basic deque operations, plus initialisation, is given in Fig 3. Two variables (FRONT) and BACK) are used to mark the position of the ends of the deque. This should be obvious but some care is needed to check for 'overflow', when no further storage is available to accommodate an insertion, and 'underflow', when no data is there to be deleted.

It's also convenient to use the elements in the array as if they were arranged in a circle, so that the third follows the second which follows the first, but the first also follows the last. Queuing operations propel the deque through memory and without this trick would quickly fail, even if the deque were comparatively empty. Note that the BACK pointer marks the next position for an addition to the back of the deque, not the position of the last element. This wastes one location in the array, in the sense that an overflow will occur when one location is still free, but without doing this it is much more difficult to differentiate between an empty deque and an overflowed one.

Knuth devotes a lot of attention to the issue of storage management, as good storage management minimises problems with storage overflow. For example, if there are several stacks, queues or deques used by a program which are all initialised with fixed capacity, the program fails as soon as one overflows even though many of the others are almost empty. This unsatisfactory state of affairs can be improved by arranging for all the available storage to be pooled, then allocated in small chunks as it's needed. If a deque overflows, a larger storage area can be requested from the pool, the data copied across, and the old storage area returned to the pool of free storage. Storage manage-

*'. . . if you're really keen you can get MIX up and running on your own machine and use it to work through some of the exercises. This is a good way to learn assembler programming.'*

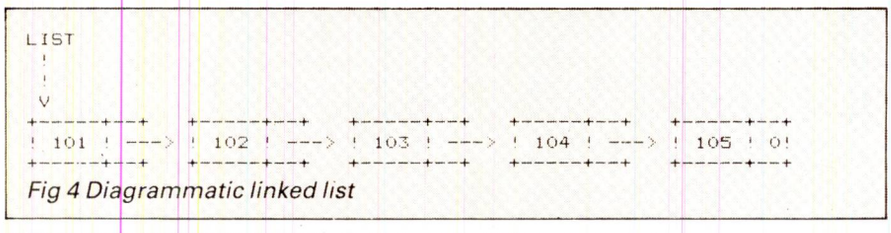


*Fig 4 Diagrammatic linked list*

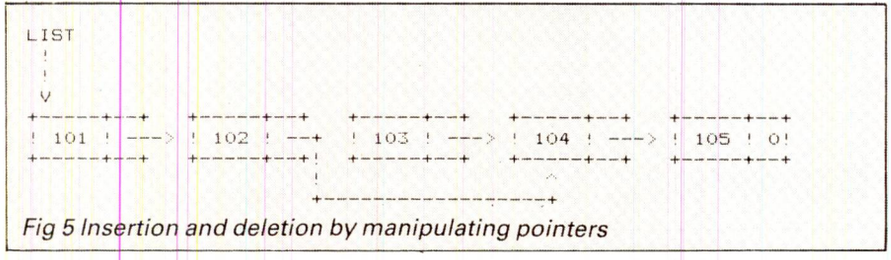


*Fig 5 Insertion and deletion by manipulating pointers*

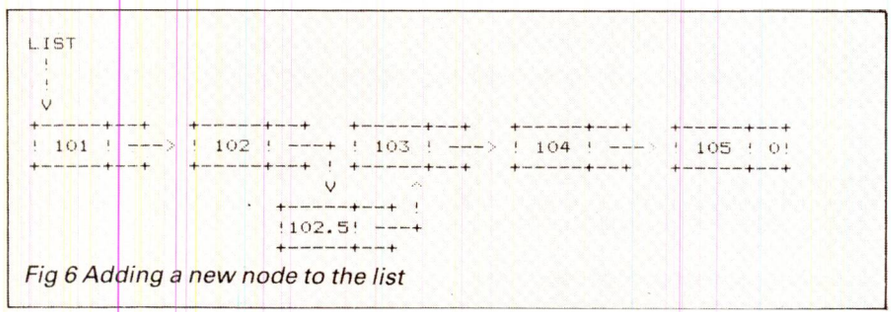


*Fig 6 Adding a new node to the list*

ment is also useful for handling any other information structures, such as linked lists. The linked list solves the insertion-deletion problem of the sequentially allocated list. Each item in the list is stored along with a pointer to the next, which therefore need not be adjacent in memory. For example, a list of the numbers 101 to 105 can be represented in memory as follows:

| Location | Contents | |
|---|---|---|
| | Data and Pointer | |
| 1 & 2 | 101 | 7 |
| 3 & 4 | not used | |
| 5 & 6 | 103 | 11 |
| 7 & 8 | 102 | 5 |
| 9 & 10 | 105 | 0 |
| 11 & 12 | 104 | 9 |
| 13 onwards | not used | |

In this example, both data and pointer each require one storage location, but it's possible to have lists where this is not the case and even where the amount of data varies between the different 'nodes'. The pointer following 105 is 0. As 0 is an impossible location (in this example), this indicates the end of the list. A linked list can be drawn diagrammatically as in Fig 4.

Insertion and deletion in a linked list is handled by manipulating the pointers: for example, deleting the node with 103 is achieved by changing 102's pointer (Fig 5).

Ideally, the node at 103 should be handed back to the pool of free storage so that its storage area can be re-used later: for example, if you wanted to add a new node to the list (Fig 6).

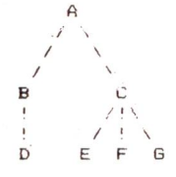
Apart from their use in representing live data, linked lists also form the basis of many storage management algorithms. At any given moment in the program's execution, the free storage will be in several isolated fragments. A single variable indicates the location of one — any one will do. This contains a pointer to another, and so on. Unless all allocations and deallocations are for a fixed size, the size of each will need to be recorded. As long as the node is large enough this can be stored with the pointer, thus each free node may start with a size value, then a pointer, and then the remaining free space. Assuming the pointer and size value each consume one location, a typical free list is shown in Fig 7.

The code to manage such a storage list is given in Fig 8, and demonstrates that there's nothing difficult about storage management. The free storage area is the array X(), which is initialised as just two free blocks; the first of length 2, with the second immediately following it and occupying the rest of the array. The first block is never allocated, but is kept solely for its pointer to the next free block. If this pointer were held in a variable, FREELIST, for example, then changes to the first block would need to be coded as a special case since they would alter the value of FREELIST and not a pointer in X(). In this example, all storage requests must be for an even number of locations as this will guarantee that no free blocks of length 1 are created. (A block of length 1 cannot contain a pointer *and* a length value.) The deallocation routine can be made a lot more effective by arranging for adjacent free blocks to be merged together. As it stands, storage will become more and more fragmented until the free storage is just a long chain of tiny blocks.

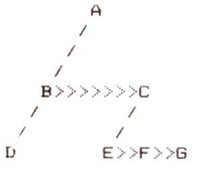
*'. . . programming tasks, especially non-numerical work, demand some skill at structuring data. In fact, some programming languages implement many of the facilities described by Knuth.'*

Knuth has much more to say on storage management including garbage collection, where it's unnecessary to explicitly free a block when it's no longer needed — the system can work this out for itself. There are also many alternative algorithms for maintaining freelists, each with pros and cons which are discussed at length.

Another major type of information structure is the 'tree'. A tree is more complex than a linked list in that each node contains several pointers, not just one. The pointers are to the 'children' of the node (the jargon for computer trees borrows heavily from that of family trees); these children in turn may point to grandchildren, and so on. It isn't usually desirable for each node to have a different number of pointers, depending on the number of children, so frequently just two pointers are used: one to the first child; and another to the next sibling of the node. For example, the tree structure:




is represented with two pointer nodes as:




(where '>> . .' denotes sibling pointers). With this structure it is only slightly more difficult to access, say, the

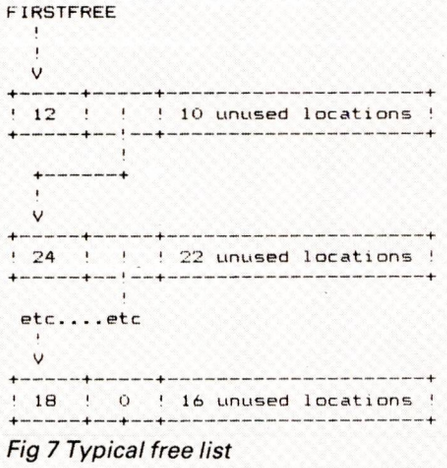



*Fig 7 Typical free list*

```
20000 REM INITIALIZE FREE STORAGE AREA
20010 DIM X(1000)
20020 X(1)=2:X(2)=3:X(3)=9998:X(4)=0
20030 RETURN
21000 REM RESERVE N UNITS OF STORAGE, ADDRESS OF BLOCK IN LOCN
21010 Q=1
21020 P=X(Q+1):IF P=0 THEN PRINT"STORAGE OVERFLOW":STOP
21030 IF X(P)<N THEN Q=P:GOTO 21020
21040 K=X(P)-N:IF K=0 THEN X(Q+1)=X(P+1):GOTO 21060
21050 X(P)=K
21060 LOCN=P+K:RETURN
22000 REM RETURN N UNITS OF STORAGE AT LOCN
22010 X(LOCN)=N:X(LOCN+1)=X(2):X(2)=LOCN:RETURN
```

*Fig 8 Storage management routines*

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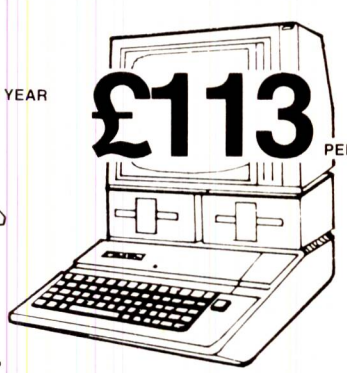

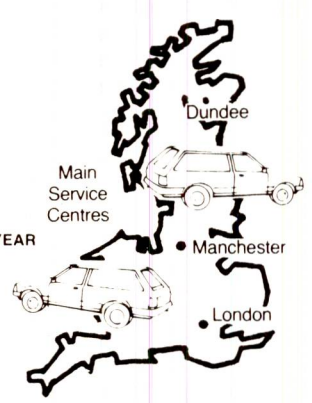


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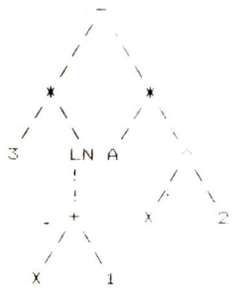
Nth child of a node, than it would be with multiple pointers. Note that A, C, D and G have no 'younger' siblings, so their pointers are simply null. Likewise D, E, F and G have no offspring.

Tree structures can be very useful for working with mathematical expressions, where the tree structure exactly represents the order of evaluation: for example, 3 * LN(X + 1) – A * X^2 is represented as a tree:




Knuth develops all the algorithms necessary for symbolically differentiating such a tree. The answer is generated as another tree structure, and issues such as copying tree structures, and ordering the nodes for evaluation, are all dealt with along the way.

With the above representation, it's not readily possible to determine the parent of a node as there are no pointers back to it. In tree processing, it's usual to maintain a stack of the parents *en route* to the current node — the earlier work on stacks and queues is of value here. It's also possible to use the null pointers of childless or youngest-sibling nodes to point back; this is called a threaded tree. It has the advantage that no stack is needed, so it's impossible for it to overflow. To determine whether your Basic interpreter uses threaded or unthreaded trees for evaluation of expressions, type:

PRINT ((((..(((3 + 4)))..))))

for ever more pairs of brackets. If it eventually gives a memory error, this is a strong indication that it's using a stack for handling the evaluation. Microsoft's Basic finally runs out of space with 72 pairs of brackets — not a serious limitation!

The last major topic to be covered under Information Structures is the 'array', which is represented in Basic by the multiply dimensioned use of DIM. For example, DIM A(3,3,3) defines a 3D array with 27 elements (or 64 if the lower bounds are 0 and not 1).

Representing arrays in this fashion can be highly inefficient if the contents of the array are sparse. Some arrays are triangular, with all zeroes above the diagonal, or diagonal with all zeroes except the diagonal, and so on. Knuth suggests a linked allocation method for these circumstances. Each non-zero element in the array is represented by a node containing the value, its row and column numbers, and pointers to the next (non-zero) node above it and to the left of it. Zero elements are not there, so consume no extra storage. In addition, each row and column starts with a dummy node, not an array element, but eases the processing of empty rows and columns.

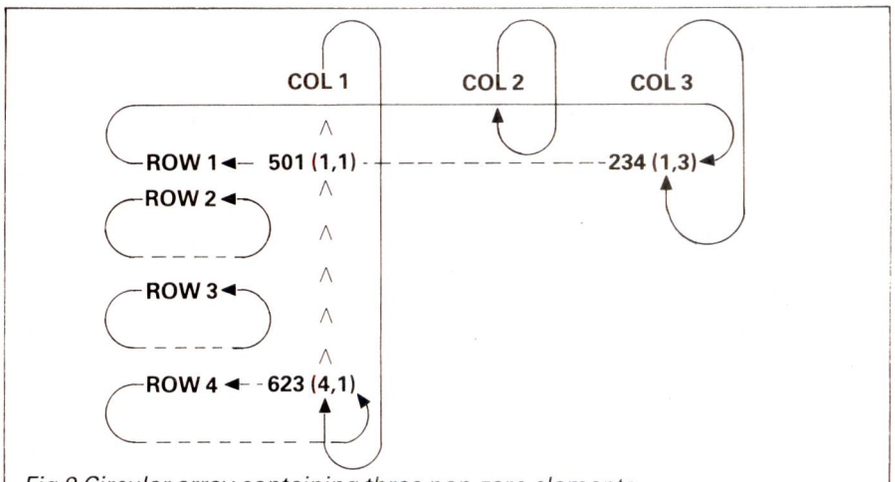



*Fig 9 Circular array containing three non-zero elements*

A further refinement is for the linkages to be 'circular'. This means that the pointer in the last node of a sequence is not null, but points to the first node. With this scheme of pointing, the notion of first and last disappears. Such an array, containing only three non-zero elements, is shown in Fig 9.

With this type of structure, great storage savings can be made with large sparse arrays, and the access time for any given element need not be excessive.

As the array is sparse there should be only a few elements on each list. This means that it should be comparatively fast to find any element.

It's even faster if the array is being scanned in some systematic fashion, as is the case with most numerical algorithms. It's also worth noting that this type of representation allows for new rows and columns to be inserted with minimal changes to the structure, or data moving.

## Conclusion

We have taken a look at the first of Knuth's *Art of Computer Programming* volumes, and introduced most of the major topics dealt with in the book. I hope the reader's appetite for improving his programming techniques is sufficiently whetted, and strongly recommend this book as an instructor and reference manual.



*'We try to ease the older members of staff into the new technology!'*

*References*

The Art of Computer Programming *by Donald E Knuth; Addison-Wesley Publishing Company.*
*Volume 1 Fundamental Algorithms.*
*Volume 2 Seminumerical Algorithms.*
*Volume 3 Sorting and Searching.* END

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# To see or not to see

*Your home movies may not win you any Oscars but editing them with your micro may bring you one step closer. Robin Luxford directs the action.*




Illustration by Paul Tupling

Now that 14 per cent of households have a video recorder and a video camera can be bought for about the same cost as a medium size computer, the production of electronic home movies is an attractive proposition. The extremely low cost of tape compared to processed film, the fact that tape can be reused almost indefinitely and the instant replay facility are just a few of its many advantages over film. The main disadvantage,and the factor that retarded the transition from film to tape for some years in the professional world, was the difficulty of editing. The first professional videotape edits were done by coating the edge of the tape with microscopic iron particles to make the magnetic tracks visible, making an accurate cut between frames with a razor blade and joining the pieces in the required order with sticky tape. This was a time-consuming method and one which could not be used with home video formats, or indeed with modern professional formats,because of the narrow angle of the tracks along the tape and the risk of damage to the video heads by the splice.

Gradually the razor blade method was replaced by electronic editing: this simply means that selected sections of the original tape are copied in whatever order required to a second tape, a method known as assemble-editing. This leaves the original tape uncut, the same shots can be copied again to the edited tape which can be erased and reused. The snag (there's always one) is that there has to be some loss of picture and sound quality in the copying process. Although this is discernible with home formats, it's still quite acceptable.

## Assemble-editing

To assemble-edit all you have to do is connect the video and audio outputs from the play-in machine to the inputs of another, the record machine, and push the appropriate buttons. Starting with a blank tape in the record machine run the play-in machine first, and just before the beginning of the first shot press the record button in the recording machine, going to pause on that machine at the end of the shot and keeping the record tape in position while you spool through the original tape to a point just before the start of the next shot to be played in. Unfortunately, the reaction time must be measured in microseconds and you need to be familiar enough with the original material to know, say, a second before a car comes round the corner into shot.

What is needed is some way of uniquely identifying each frame of the original tape, not only so that the numbers can be written down and accurate shot lists compiled, but so that equipment can be developed to recognise the exact moment that a particular frame is being played and start the recording machine. Similarly, it could recognise the 'out' frame and hold the recorder in pause. The professionals invented 'Timecode', a digital signal recorded on a second audio track which carries information relating to hours, minutes, seconds and frames. Microprocessors in their machines were programmed not only to generate the timecode for recording, but to read it in the playback mode and control the machines to position tapes accurately, start and stop recording; in fact, all the functions of their machines.

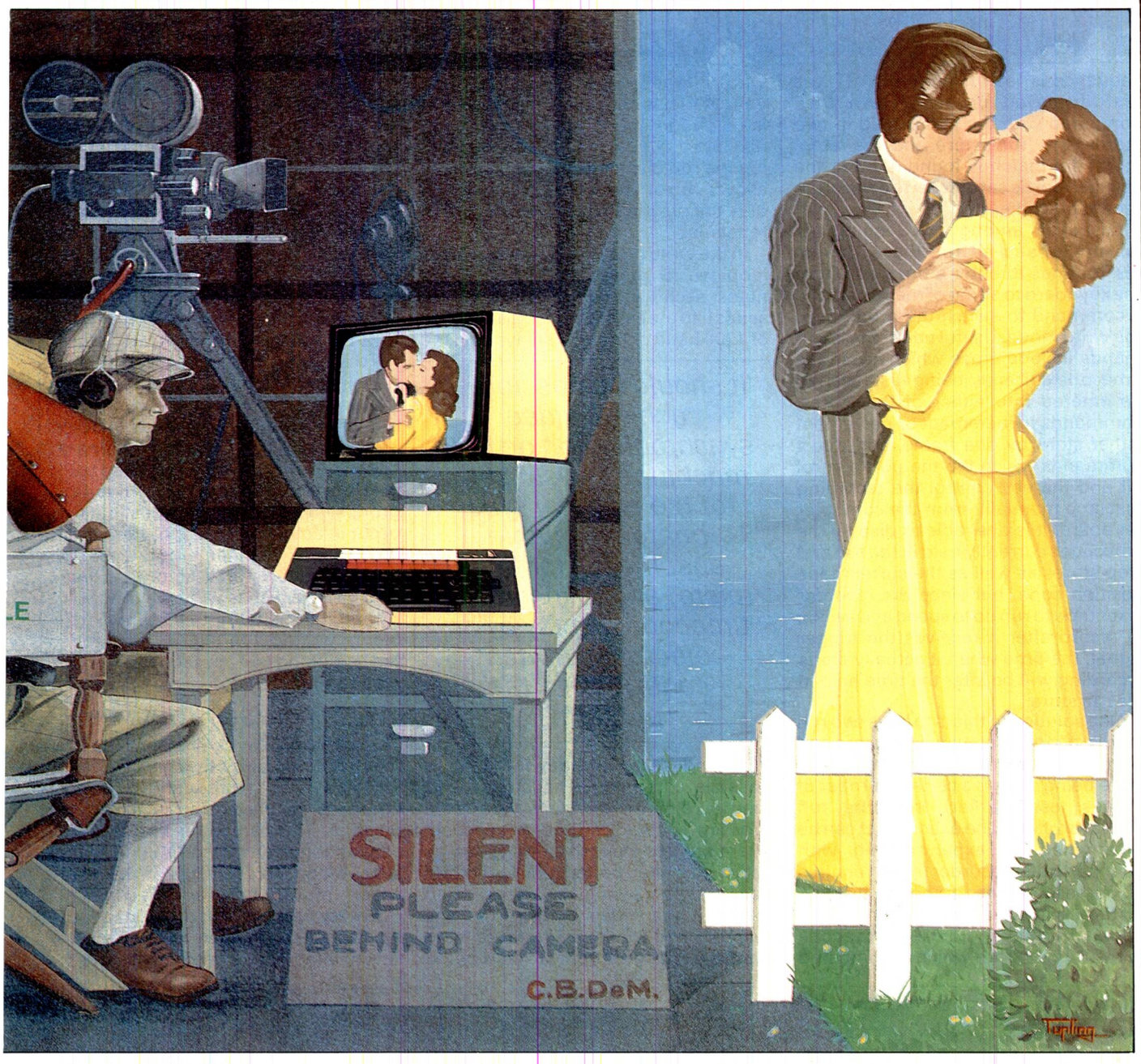
## Application

Now, let's see what we need to make our home computer write and read our own version of timecode and control the machinery. We will confine ourselves to controlling the record/record-pause function of the record machine because we can do this with the minimum of hardware and without delving into the works at all. Most recorders have a camera socket, and included in this will be video and audio inputs and a tape run/stop circuit from the camera trigger which controls the record/record-pause function we need. On VHS recorders,which mainly use a 10-pin camera connecter, the relevant connections are as follows:

Pin 1—video input
Pin 2—video ground (screen)
Pin 6—tape run/stop
Pin 7—audio input (−20db)
Pin 8—audio ground

When pin 6 is open circuit or below a volt or so, the tape will run. When it is pulled up to around +4 or 5 volts, the tape will stop. Since these are TTL levels, they are just what we get out of one of the pins of a parallel port. If your recorder does not have a 10-pin plug, you'll have to do a little research on your particular model.

The tape run/stop function on Betamax machines is flipped each time the camera trigger is pressed, so the port output will have to send a short pulse at each run/stop transition rather




than remain high or low.

We already have the hardware to send and receive the audio tones carrying the timecode in the form of the cassette interface, so apart from a bit of experimenting with levels, the hardware side of things is under control. In order to record the timecode and still retain the original sound track, a stereo machine is necessary. If you don't have access to a stereo machine and the audio track is needed, it can be copied to sound cassette or tape, edited and copied back to the edited video tape using 'audio dub', after the picture editing is completed. On most stereo machines the audio dub mode records on *one* of the audio tracks only, and it's to the input of this track that we connect the cassette output from the computer. The other machine, the one used to record, does not need to be stereo.

If you have a stereo machine the technique is as follows:

(1) Rewind the original tape to the beginning, run the timecode program in the write mode, press audio dub and leave it to run through to the end of the tape.

(2) Connect the output from the track holding the timecode to the cassette input of the computer and run the timecode program in read mode. Now you can play the tape a number of times to decide on the shots you want to use and to make a list of 'in' and 'out' points. Whenever the tape is playing your VDU will be showing a 'time' in hours, minutes, seconds and frames which exactly identifies each frame.

(3) When you're ready to start copying, connect the two machines with video and audio (not the track with timecode, of course) and the record/record-pause control wire to the computer port. Enter the 'in' and 'out' times for the first shot, press RECORD-PAUSE on the record machine and PLAY on the play-in machine.

If you've got the software right everything should happen without a hitch.

## *Writing the timecode program*

My own timecode program runs under CP/M on a Nascom 2/Gemini computer, but in order to have the RE output from the modulator on the Nascom, the VDU output is sent to the 48-column Nascom display instead of the Gemini IVC. The Nascom cassette I/O routines are also used but keyboard input is via CP/M; altogether a rather non-standard arrangement. Rather than go into details of this version I'll outline the basic facilities that are needed, together with some possible 'whistles and bells', and ways of providing them.

The program has two modes: 'write' and 'read'. Since it is mainly used in the latter mode this is what is run on initialisation. In this mode the cassette input port is continually scanned and in periods when the flag from the UART indicates that there is no data ready, the keyboard is scanned for a possible command. When a complete code

sequence is read from the UART it is first displayed on the screen then compared with the codes held in two stores, the 'run' store and the 'stop' store. If a match is found, a bit of the selected port is set or reset to control the record machine.

Essential among the commands which can be called from the read mode are routines to enter a timecode from the keyboard to either of the stores, and a command to switch the program to the write mode. Useful additional commands include those which cause the timecode currently being displayed to be entered into either of the stores, commands to increment or decrement either store by one frame, and direct commands which flip the port control bit and thereby control the recording machine manually from the computer keyboard. It is desirable to display the timecodes currently held in the run and stop stores as well as the current tape position code, but since the recorder takes time to run up to speed and switch to record after it receives the trigger signal, the time when it actually starts recording will be after the time held in the run store.

One solution to this is to have two run stores, a 'run displayed time' store and a 'run trigger time' store, the trigger store being always a certain number of frames less (earlier) than the run displayed store. The exact offset can be determined by experimenting with your particular recorder (mine requires 28 frames). Whenever the run displayed time is changed the trigger store is updated by the program — it is the code in the trigger store which is compared with the tape position code, of course. If your VDU has an audible 'bell' signal, it is helpful to sound this when the run displayed time is reached by comparing the run display store contents; this allows you to check the edit point with only the play-in machine running, as a rehearsal.

In the write mode the program runs a loop which generates in hours, minutes, seconds and frames sequence, sends it to the cassette interface at a rate of 1200 baud or more, displays it on the VDU and scans the keyboard for a possible command. The timecode is then incremented by one frame and the process repeated 25 times per second. There are two ways this timing can be achieved; the perfectionist method uses a simple sync-pulse separator to examine the video signal from the recorder and supply a TTL pulse to an input port corresponding to field syncs,

*'It should be possible to achieve video synchronisation on BBC machines by using one of the external sync boards available specifically for this micro, and to insert the timecode display by an electronic switch controlled by the program.'*

a loop in the program testing for this before continuing. The other way, which does not require any additional hardware, simply includes a delay loop which is adjusted by trial and error; accuracy of about one second in five minutes can be attained by this method.

The only essential command to be entered from the write mode is one to switch to read, but commands to write from zero, to write from a pre-set starting time or to continue from the last time held in the main store, are useful.

To make for compact code and fast handling, timecode values are stored as four-byte ECD codes, each byte corresponding to frames, seconds, minutes and hours, in that order. Since binary-coded decimal handles values up to 99 in one byte by considering it as two 4-bit groups, and the largest values that can occur in timecode are 24 for frames, 59 for seconds and minutes, and 23 for hours, it follows that the most significant bit in each byte will always be zero. By setting this bit of the 'frames' byte before writing it to tape, we can mark the beginning of each sequence for the read routine.

## Writing the sub-routines

The screen display can consist of a short menu of commands, the contents of the 'go' and 'stop' stores, and the main timecode display; the current tape position. This can be displayed in the conventional form 01 : 59 : 59 : 24 using spaces and colons between figures, which makes for good readability. However, as the timecode will normally be displayed on a VDU alongside a TV set showing your videotape, it helps to

*Timecode routines in Z80 assembly language*

```
; Increment contents of store by one frame. Enter with
; DE pointing to 1st byte of 4 byte store to increment.

INCSTR: LD A,(DE)       ; Get FRM
        AND 7FH         ; Reset b7
        INC A
        DAA
        CP 25H
        JR NZ,STFR
        XOR A
STFR:   SET 7,A
        LD (DE),A       ; Load FRM
        CP 80H
        RET NZ
        INC DE
        LD A,(DE)       ; Get SEC
        INC A
        DAA
        CP 60H
        JR NZ,STSC
        XOR A
STSC:   LD (DE),A       ; Load SEC
        RET NZ
        INC DE
        LD A,(DE)       ; Get MIN
        INC A
        DAA
        CP 60H
        JR NZ,STMN
        XOR A
STMN:   LD (DE),A       ; Load MIN
        RET NZ
        INC DE
        LD A,(DE)       ; Get HRS
        INC A
        DAA
        CP 24H
        JR NZ,STHR
        XOR A
STHR:   LD (DE),A       ; Load HRS
        RET
```

```
; Decrement contents of store by one frame. Enter with
; DE pointing to 1st byte of 4 byte store to decrement.

DECSTR: LD A,(DE)       ; Get FRM
        AND 7FH         ; Reset b7
        DEC A
        DAA
        CP 99H
        JR NZ,STFRF
        LD A,24H
STFRF:  SET 7,A
        LD (DE),A       ; Load FRM
        CP 0A4H
        RET NZ
        INC DE
        LD A,(DE)       ; Get SEC
        DEC A
        DAA
        CP 99H
        JR NZ,STSCF
        LD A,59H
STSCF:  LD (DE),A       ; Load SEC
        RET NZ
        INC DE
        LD A,(DE)       ; Get MIN
        DEC A
        DAA
        CP 99H
        JR NZ,STMNF
        LD A,59H
STMNF:  LD (DE),A       ; Load MIN
        RET NZ
        INC DE
        LD A,(DE)       ; Get HRS
        DEC A
        DAA
        CP 99H
        JR NZ,STHRF
        LD A,23H
STHRF:  LD (DE),A       ; Load HRS
        RET
```

```
; Routine to accept and check a timecode entry from keyboard.
; Enter with DE pointing to 1st byte of 4 byte store to be
; loaded.  For use with a memory-mapped screen.
; ENTPOS points to location of ascii numerals on screen
; after entry.  GETKB, CRT and BLEEP are routines particular
; to your computer.

KEYIN:  LD B,9          ; Get HRS, MINS, SECS, FRMS & CR
KIN1:   CALL GETKB      ; Get a character from keyboard
        PUSH BC
        CALL VALID
        POP BC
        JR NC,KIN1      ; NC =invalid
        CP 08
        JR Z,KIN2
KIN1B:  CALL CRT        ; Output a character to screen...
        DJNZ KIN1       ; ...at current cursor position.
        JR KIN3

; Handle BS
KIN2:   LD A,9
        CP B            ;
        JR Z,KIN1A      ; start again
        INC B
        INC B
        LD A,8          ; reload BS
        JR KIN1B

; Now convert screen entry to BCD store
KIN3:   LD HL,ENTPOS    ; points to units frames on screen
KIN4:   LD A,(HL)
        CALL CONAB      ;  Convert Ascii to BCD
        SET 7,A
        LD (DE),A       ;  Load into store
        LD B,3
KIN5:   INC DE          ; Do MINS, SECS, HRS
        DEC HL
        LD A,(HL)
        CALL CONAB
        LD (DE),A
        DJNZ KIN5
        XOR A
        RET             ; end of main routine

VALID:  CP 08           ; Backspace
        SCF
        RET Z
        LD C,A
        LD A,1
        CP B
        JR NZ,BNOT1
        XOR A           ; If not BS & B=1, return null
        SCF
        RET
```

```
Continuation of KEYIN subroutines

BNOT1:  LD A,C
        CP "0"
        CCF
        JR NC,NOTVAL
        CP 3AH
        JR NC,NOTVAL
        LD A,7
        CP B
        JR Z,BE75
        LD A,5
        CP B
        JR Z,BE75
        LD A,3
        CP B
        JR Z,BE3
        DEC A
        CP B
        JR Z,BE2
        LD A,C
        RET             ; Key entry valid

BE75:   LD A,C          ; Tens minutes or secs
        CP "6"          ; NV if >5
        JR NC,NOTVAL
        RET

BE3:    LD A,C
        CP "3"          ; Tens frames
        JR NC,NOTVAL
        RET

BE2:    LD A,C
        CP "5"          ; Unit frames
        JR NC,NOTVAL
        RET

NOTVAL: PUSH AF         ; Entry not valid
        CALL BLEEP      ; ...audible signal at VDU for error
        POP AF
        RET

CONAB:  SUB 30H         ; convert ascii to BCD
        LD C,A          ; store units
        DEC HL
        LD A,(HL)       ; get tens
        SUB 30H
        SLA A
        SLA A
        SLA A
        SLA A           ; move to tens position
        ADD A,C
        RET
```

make the timecode display much larger than the ordinary character height used for the menu, and so on. This can be achieved with most computers by using screen-graphics routines.

The routines to compare the current tape position with the contents of the various stores are simply two successive 16-bit subtractions, returning a zero flag if a complete match of all four bytes is found. The routine to enable a timecode to be entered from the keyboard to the run-display, the stop or the current store, needs to convert each pair of ASCII values (tens and units) to one BCD value, set bit 7 if it's the frame byte and store it. Ideally, some form of error checking should be included to prevent non-numerals or values larger than the maximum being entered.

The 'increment by one frame' routine, used both as a command and by the write routine, utilises an increment instruction followed by a decimal accumulator adjust instruction to convert from binary to BCD on the contents of the frame store.

This is followed by a check to see if the value of 25 has been reached; if so, the figure is set to zero and the contents of the seconds store incremented and compared with 60, the process continuing for up to 24 hours. The decrement routine is similar except that after decrementing and decimal adjusting each value it is compared with 99.

The routine to write timecode to and read it from tape can be adapted from the cassette routines in the operating system. When the UART is busy, the keyboard should be scanned for a possible command.

## Potential

If you can devise a way of synchronising the video output of the computer with the videotape playback, it's possible to make a straight,unedited copy of the original material with the original sound and the timecode display inserted in the picture. This is known as a viewing copy,and enables you to use slow-motion playback to examine the action very carefully and select the exact frame number. Once this viewing copy is made, the original tape is not used again until the final editing session, saving it from the risk of accidental erasure when running the tape to and from compiling the shot list.

It should be possible to achieve video synchronisation on BBC machines by using one of the external sync boards available specifically for this micro, and to insert the timecode display by an electronic switch controlled by the program. However, the method I use is to have a black and white camera, driven by sync-pulses derived from the playback machine, looking at the timecode display on the VDU. The camera output is then inserted into the picture by a 'video camera selector', an inexpensive device made by Sony for inserting captions into home videos. Although this may sound cumbersome, it works well, and by moving the camera the timecode may be positioned anywhere in the picture. In professional use, it is usually placed about a fifth of the way up from the bottom of the frame.

It's easy to overlook the sound aspect by concentrating on achieving immaculate picture edits. In some cases, such as a video made to a piece of music, the sound recorded with the picture is discarded, but when it is copied with the picture it helps to use a simple audio mixer between the play-in and record machines to control levels. In any case, because the output from the play-in machine is around −6db and the input level of the record machine is around −20db, it is desirable to attenuate the feed by about 14db to prevent the automatic gain control circuit in the record machine from spoiling your artistic efforts. Any really elaborate treatment of the sound is probably best done after the picture editing, using the audio dub facility.

*Thanks to my colleague, Geoff Higgs, a former videotape editor and fellow Z80 machine code enthusiast.*

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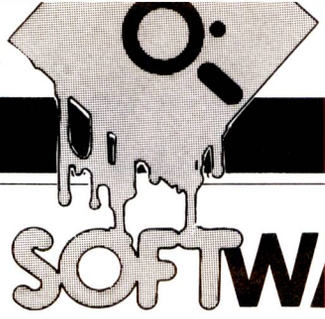


# Acornsoft's Viewsheet

*Serious applications for home micros are still few and far between. Viewsheet from Acornsoft is a straightforward but powerful spreadsheet which transforms the BBC Micro into a simple business machine. Mike Liardet figures it out.*

The difference between home and business computers is ever decreasing, as the prices of business systems fall and home computers become more sophisticated. Similarly the gap between home and business computer software is closing and there is now a trickle of very sophisticated home computer software products. One such product is Acornsoft's recent release: Viewsheet.

Viewsheet is a spreadsheet system for the BBC Micro. Although of prime interest to serious home users, it is also worthy of any business application. It has a blindingly fast calculation speed, an advanced multiple windows facility, and the ability to link multiple models. It is one of a range of products from Acornsoft, including database and word processing, designed to intercommunicate.

Published by Acornsoft, the software publishing arm of Acorn, Viewsheet was released in October 1984, following two years of intensive development effort. The software was not actually written by Acorn, but by another Cambridge company called Protechnic Computers Ltd — also the author of the BBC word processor, View.

## Installation

Viewsheet is sold in a compact little box containing a manual, reference card and a keynote template. The software itself lies in a 16k ROM chip, protected by an electrostatic-proof sponge mat. This ROM chip must be housed in one of the BBC's 'sideways ROM' sockets — of which the BBC Micro has five specifically for optical software such as Viewsheet. Once installed, the chip can stay there indefinitely (unless you plan to run more than five ROM products), which is just as well, as it is not designed for repeated insertions and extractions.

The benefit of software in ROM is that it is available as soon as the computer is switched on, and none of the internal RAM is taken up with software. On the other hand ROM chips cost more than cassette tapes, which unfortunately pushes up the price of the product. There is also the problem of installing the chip: this is dealt with by an accompanying leaflet containing full instructions.

If you are not technically minded the idea of inserting chips into the guts of your precious computer may seem a little intimidating. But the instructions are quite explicit, and a screwdriver is the only tool necessary. There's no soldering — the chip is simply pressed into a waiting socket (a process which takes no more than five minutes, including the time spent reading the instructions).

My only difficulty with installation was caused by the identifying label on the top of the chip. It is vital that the chip is placed the right way round, and the leaflet explains that a notch on top of the chip indicates its correct position. In my case the label obscured the notch, but peeling it back revealed all, and one careful push had it in place.

## Getting started

When the BBC is switched on, whichever chip is in the rightmost of the five sideways ROM sockets is given control. If it's Viewsheet, then Viewsheet is automatically started; but whichever chip is activated, it will be in a state known as 'command mode'. This is where a variety of commands can be typed in at the keyboard, and the application itself is not on display.

Most ROM-based packages for the BBC support a common core of comands, relevant to all applications; for example, NEW clears out memory, erasing an existing spreadsheet for Viewsheet, or word processor text for View. There are special disk commands (if you have disks), and commands like LOAD, SAVE and PRINT have predictable effects, depending on the host application. It is possible to switch applications in command mode by typing '*' followed by the application name: if Viewsheet is not in the rightmost socket, it can be activated following switch-on, by typing '*SHEET'.

As soon as Viewsheet has been activated, spreadsheeting can begin by pressing the ESCAPE key. This key toggles between command mode and application mode, and in the case of Viewsheet the application mode results in a fairly orthodox display of the first 19 rows and first few columns of an empty spreadsheet. The number of columns visible depends on the currently selected 'display mode'.

The BBC Micro offers eight different display modes, numbered 0 to 7. The possibilities include high-resolution graphics, or colour, or 80 or 40 characters per line. Viewsheet can operate with any of these, or even cope with changes in mid-session, but the best display is obtained with number 3

which has 80-characters per line and optional inverse characters. Unfortunately, this also consumes a lot of free memory, which could be better used by the spreadsheet model. Nevertheless, it is best to start with this, and opt for a poorer display mode later if memory gets tight. In command mode, the type of display can be changed using the MODE command — thus MODE 3 switches the display image to smaller characters so that 80 can fit on a line. Following this, the ESCAPE key switches the display back to the spreadsheet.

## Basic facilities

When spreadsheeting, the first four rows of the screen contain status information or echo text typed in at the keyboard; the rest of the screen displays the spreadsheet itself. Initially most of the area is blank until something is entered into the spreadsheet. The left-hand side is earmarked for row numbers, and the top of it for column identifiers: A, B, C and so on. In display mode 3, nine 8-character columns can be accommodated.

For basic spreadsheeting, Acornsoft has introduced few innovations in Viewsheet. The familiar cursor hovers over one of the cells, and can be moved up, down, left or right by pushing one of the arrow keys at the right of the keyboard. The screen window can be shifted to a new portion of the spreadsheet by directing the cursor there. The spreadsheet extends to 255 rows and 255 columns in all. As on most 8-bit computers there is insufficient memory to use all 65,000 cells available (see Benchmarks box).

Text numbers and formulae can be entered into the spreadsheet by moving the cursor to the required cell, and then typing in whatever is required. Viewsheet sorts this out, and automatically recalculates following any modifications.

Formulae are built up using the normal spreadsheet conventions, with '*' = 'times', '/' = divide and cell references like A1 or BK23 being permitted. Viewsheet also employs 'operator precedences', which reduce the need for parentheses. For example:
A1 * B2 – C3 * D4
is calculated as:
(A1 * B2 – (C3 * C4)
since '*' has a higher precedence than '–'.

A variety of built-in functions are provided, including trigonometry, logic and exponentiation. There are also a number of spreadsheet 'specials': for example, AVERAGE can be given a list of values or cell references and will calculate the average of them:
AVERAGE (23, A1-1, B2D3)
will calculate the average of 23, the contents of cell A1 less 1, and the six cells in the rectangle from B2 to D3. Another special function is CHOOSE:
CHOOSE (D1, 31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31) would evaluate to the number of days in the month number stored in D1. An interesting omission is the SUM function, for summing a row, column or area. Viewsheet has a special notation for summing:
A1A12
sums the 12 values from A1 to A12, using neat and concise notation.

Viewsheet provides a good range of spreadsheet editing facitities, such as row or column insertion and deletion, and replication, and so on. It is also possible to edit a cell contents, saving the need to retype from scratch following an erroneous entry. All these facilities are activated by pressing one of the function keys.

The BBC is equipped with 10 function keys at the top of the keyboard which are coloured in a contrasting red. The use of these keys is explained in the manual but, as a source of quick reference for the expert, Viewsheet is supplied with a keyboard template which can be fitted just above the keys. This merely summarises the function of each. The function keys can also be pressed in conjunction with the control or shift keys, allowing for up to 30 functions in total. The template is arranged in three rows, to cover all thirty possibilities. Only seven entries are blank, so 23 of the 30 possibilities are used by Viewsheet.

*'Viewsheet offers some advanced features . . . multiple windows are useful when it is necessary to view distant parts of the spreadsheet simultaneously.'*

## Windows

In addition to conventional basic spreadsheet editing facilities, Viewsheet offers some advanced features. In particular, it is possible to define multiple windows. Multiple windows are useful when it is necessary to view distant parts of the spreadsheet simultaneously. The best example of this is in budgetting, when the profit line at the bottom of the spreadsheet is always of interest, even when entries right at the top are being changed. But there are many other situations when windows are useful.

Viewsheet provides for up to 10 windows onto the spreadsheet, nine of which are inactive, while one is defined to occupy the entire screen. This is, of course, a rather limited use of Viewsheet's windowing capability, but appears to the user as a perfecly normal spreadsheet, as described above. In fact, there is no need to know about windowing in the initial stages of using Viewsheet.

The 10 windows are numbered 0 to 9, and to initiate a non-trivial usage it is first necesary to shrink the one active window, otherwise there is no room for anything else. The sole active window, number 0, can be changed by pressing the 'edit window' function key, and specifying that window 0 is to be altered. Each window has a number of attributes which 'edit window' can change: to reduce it in size, alter the style of display, or the way it works.

Two of the attributes specify the top left and bottom right cells to be displayed. For window 0 these are set to A1 and 119 by default. The specification of A1 and 119 determines the initial window display, a rectangle of cells with A1 at the top left and 119 at the bottom right, but these values do not prevent the window from displaying other parts of the spreadsheet. Normal cursor moves have the usual scrolling effect within the window; thus the two cell references are more significant for the size of window implied, that is, 19 rows by nine columns. Changing 119 to B5, say, shrinks window 0 to just 10 cells, leaving plenty of room for other windows below it and to the right.

A new window can be activated by using 'edit window', but for a different window number, and as before the top left and bottom right can be specified. It is possible for the window to focus just on a single cell, when top left and bottom right are the same. Another attribute is the display position of the window, which must be either beneath or to the right of a previously defined window. In addition, windows can have different column widths as well as different numeric display format, numbers of decimal places and left or right justification.

Each window has an 'Options' attribute and initially, for all bar window 0, the window-off option is in force. Thus to activate a window this must be turned on. But it can be turned on in various ways: row and column identifiers can be visible or not, and there is a primitive graph option (which displays numbers as asterisks in order to produce horizontal bar graphs), or the window can be synchronised to other windows.

Synchronisation can be useful if, say, two single column windows are aligned vertically on the screen, showing different parts of a month's data. With synchronisation a cursor move to a new month in one window will automatically change the other window to the same month.

When several windows are on screen simultaneously, only one cursor is present, in one window. Although the window is smaller than the single original window, it operates in an identical fashion, except that other windows may be synchronised to it. To move the cursor to a new window requires the 'next window' keystroke. One of the function keys is used for this.

Although sophisticated displays can be arranged, they may require some thought and planning. Fortunately, Viewsheet allows window definitions to be loaded and saved independently;




this means that a complex window arrangement can be reused with several spreadsheet models.

Finally, should the window definitions be in error, and require more screen display than is actually available, then the excess is automatically clipped from the display. This situation can also arise if the display mode is changed to fewer characters per line. Unfortunately, it is not a rarity for an inferior display mode to be needed. The BBC model B has 32k of RAM, but the spreadsheet data must share this with the data for the display itself. The best display mode (MODE 3) leaves only 9k for the spreadsheet data. The least attractive display mode (MODE 7), with only 40 characters to a line, leaves all of 24k for the spreadsheet data. (The Benchmark performance tests were done with both modes.)

(The memory difficulty is due to a flaw in the BBC Micro, rather than Viewsheet, and is likely to be a source of trouble with other software as well. Thus the best solution is to improve the hardware: for example, by buying an Aries RAM board. This contains all the necessary display memory, and thus the full quota of RAM would be available to Viewsheet, even with MODE 3.)

## Advanced facilities

There are a number of advanced spreadsheeting features in Viewsheet, which I shall touch upon lightly.

Initially the rows of the spreadsheet are numbered, and the columns are identified by letters, but Viewsheet allows these to be changed selectively. Thus more meaningful row headings can be used: for example, row 10 might be renamed as 'SALES', and columns A to L as 'JAN' to 'DEC'. These new headings can be used in cell references — 'JAN' 29 instead of A29 or 'FEB SALES' instead of B10.

It is possible to protect individual rows or columns, but not single cells, against accidental deletion or changes. This is useful for setting up turnkey applications, where an unskilled user can be prevented from inadvertently destroying part of the model.

Printouts from Viewsheet are, like the display, handled by a window facility. In addition to the 10 display windows there are 10 printer windows, which are specified in the same fashion as above. On specifying the PRINT command, all the active windows are printed with the required formats. A printout can be made to mirror the screen display, although normally it is more useful to take advantage of the larger dimensions of printer stationery to print out the full width and length of a model. But there is a great deal of flexibility, and different style printouts can be quickly obtained by switching the various printer windows on and off before issuing the PRINT command.

It is also possible to print to disk or cassette, so that the spreadsheet can be subsequently read as a text file into Acornsoft's word processor. View. Like printing to paper, this facility makes full use of the printer windows.

If you have disk drives, then Viewsheet's workspace is not just limited to the non-display RAM in the BBC, but it's possible to use up to five auxiliary arrays of numbers, on disk. Each array can have up to 255 rows and columns, with a maximum of 10,710 elements in all. For five arrays, this means spreadsheet models can contain over 50,000 numbers in total. Any element in any array can be read or written automatically during spreadsheet recalculation. Apart from greatly expanding the capacity of the system, this feature also enables consolidation operations to be performed. Each array could contain the figures for different departments in an organisation and a simple read then sum loop can consolidate all the data into a spreadsheet. Of course, disk access can slow down calculations, but the manual contains hints for optimising this, and the facility enables tasks to be performed that would not normally be feasible on an 8-bit micro.

## Documentation

Viewsheet is supplied with a paperback-size, spiral-bound manual of about 140 pages which comes in two parts, starting with a tutorial, and then a reference section. Both parts are well cross-referenced by an index.

The tutorial section is very clear, and contains a number of screen illustrations. It assumes no prior knowledge of the BBC Micro. Not unreasonably, it does not describe how to set up the BBC hardware, but apart from that it is completely self-contained. From the operational point of view there is no need to refer to any of the BBC manuals in order to use it.

The reference section gives a brief run-down for every aspect of Viewsheet, including details of all the available commands (in command mode), function keystrokes, and so on.

The remaining documentation comprises a reference card, the chip installation instructions and the keyboard template. Both the keyboard template and the reference card are invaluable as a quick guide when you become familiar with the system. If you are continually switching between several packages, each with its own template, it is a little inconvenient to change them: the template is held in place under a transparent plastic strip which must be sprung open to replace a template making it difficult to get the new one correctly aligned with the function keys.

## Conclusion

The BBC Micro can be used either as a home or as a simple business machine, and Viewsheet complements it nicely: it is very simple to use but it is also very fast and powerful.

Having the software in ROM circumvents the usual home computer problems of slow tape loading. The software is also compatible with the BBC disk drives.

My only major reservation about Viewsheet is the limited RAM storage capacity of the BBC Micro, which restricts the size of spreadsheet models. Viewsheet mitigates this by permitting auxiliary data storage on the disks, but the use of an auxiliary RAM board would also be of help.

*Viewsheet costs £59.80 (inc VAT). For more information contact: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2PL on (0933) 79300.* END

## Benchmarks

For more information on the Benchmark tests, see PCW, December '83. These tests were performed on a BBC Model B computer with 32k of RAM. The spreadsheet capacity is greatly affected by the display mode used, so the tests were performed for the two most common modes: 3 and 7. In mode 3 9,486 bytes are available for spreadsheet storage, and in mode 7 24,846 bytes are available. Where different, the mode 3 figures are given in parentheses.

Maximum number of columns: 256
Maximum number of rows: 256 (plus up to another 53,550 cells on disk)
Numeric precision: 10 digits
Maximum column width: 31 (71) characters
1 (a) Maximum rows accommodated: 72 (27)
(b) Recalculation time: 10 (4) seconds — that is, 7.2 rows per second
(c) Horizontal scrolling: 1.6 columns per second
(d) Vertical scrolling: 1.8 rows per second
(e) Time taken to load/save 72 row model on cassette: 45 seconds — that is, 1.6 rows per second
2 Number of rows of text accommodated: 170 (65)
3 Number of rows of numbers accommodated: 104 (39)




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PCW 1/85

# Sanyo 550-2

*The enhanced model of the Sanyo 550 series, the 550-2, sets out to answer the criticisms of its predecessor. But it's still not IBM compatible, although it does offer more memory and an upgraded operating system. Bob Piper assesses the machine's value for money.*



The price of the original Sanyo 550/555 series raised a few eyebrows back in early '84. Comparing the Sanyo's value for money with its competition was very much a no contest situation. With Micropro software, valued at more than the retail price of the system, bundled in, it just had to win hands down. But feedback from dealers indicates that despite this apparent giveaway price the machine took a little while to take off. This may well have been due to natural suspicion on behalf of the buying public and the belief in the old adage: 'You get what you pay for.'

It has subsequently become apparent, however, that the Micropro software may be a little too ambitious for the machine, as the 160k disk drives tend to fill up very quickly. Furthermore, it was launched at a time when IBM compatibility was more of an optional extra rather than the necessity it tends to be these days. It now seems rather a pity that an 8088-based MS-DOS machine should not run off-the-shelf IBM software and sales have undoubtedly suffered as a result.

Sanyo, however, had always planned an enhanced model which would go some way towards answering those criticisms, but it has taken longer than expected to reach the market.

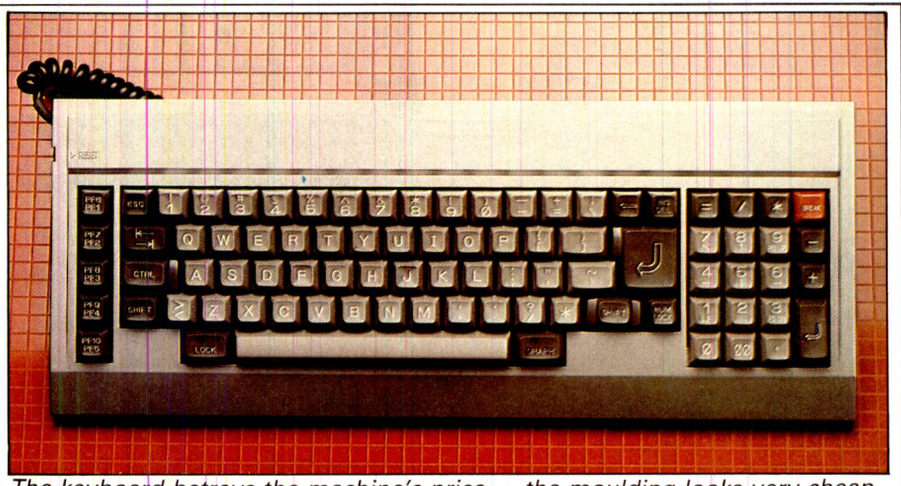
The 550-2 and 555-2 are upgraded versions of the original model which distinguish themselves by having 360k disk drives and running the updated MS-DOS version 2.11. The disk drives are over double the capacity of the original model, and both that and the implementation of MS-DOS version 2.11 should improve the machine's compatibility with IBM software.

At £1390 for the 555-2 and £999 for the 550-2, both prices excluding monitors, but including the same software as before, they are around £391 and £250 more expensive respectively. Whether the improved compatibility and enlarged disk drive capacity justify the price increases is one of the questions I hope to answer in this Benchtest.

## Hardware

The 'three-box' configuration takes on a whole new meaning with the Sanyo as it is probably one of the most angular designs currently available. The colour monitor shares the same modest footprint as the processor and is almost cube-shaped. With the monitor sitting on top of the processor the overall impression is one of a well-integrated, if somewhat lofty, design. The finish, in common with many Japanese computers, is more akin to a hi-fi system than a business micro, and, although initially attractive, its sheet steel construction may not stand up to the rigours of an office environment.

The low profile processor stands on a shallow plinth and has a compact footprint of 15in × 14in × 4.5in. The front of the unit houses the two TEAC drives superficially identical to those fitted on the earlier Sanyo. The difference is that these are double-sided, and working with the updated version of MS-DOS, offer a useful formatted capacity of 360k each, exactly the same as the IBM PC. The disk drives feel very robust and the 90 degree rotation locking lever is pleasant to use. Although not inaudible, they are reasonably quiet. Their one peculiarity concerns the read/write light which, as with the earlier model, is most unhelpful, being illuminated all the time a disk is present in the drive, irrespective of whether it's being accessed or not.



*The keyboard betrays the machine's price — the moulding looks very cheap*




*The two 360k disk drives are double-sided and the locking lever is easy to use*

To the right of the disk drives is the on/off button. This is not only vulnerable from the user point of view but is prone to damage while the machine is in transit. Obviously it would be better if the button were recessed to prevent inadvertent operation while the machine is in use, and to give greater protection from transit bumps. It would also be a worthwhile improvement to add an on/off indicator LED.

The rear of the 550/555-2 is unchanged from the earlier model. On the far left is an amazingly short mains lead, less than five feet in length. The problem is compounded by the fact that cable is fixed at the computer end, encouraging users who require a longer lead to splice extra pieces on to it; a very undesirable practice. This type of penny pinching may be understandable on a toaster costing £15, but is inexcusable on a professional machine which costs in excess of £1000.

Located adjacent to the mains lead are a hi-fi style external earth screw and a 1630mA mains fuse.

In order to keep the selling price down, there are only a limited number of interfaces supplied as standard. The first is a centronics-style parallel printer port. This will enable users to plug in most types of dot-matrix without encountering any configuration or compatibility problems. Users whose printer has a serial interface will have to purchase the optional RS232C board.

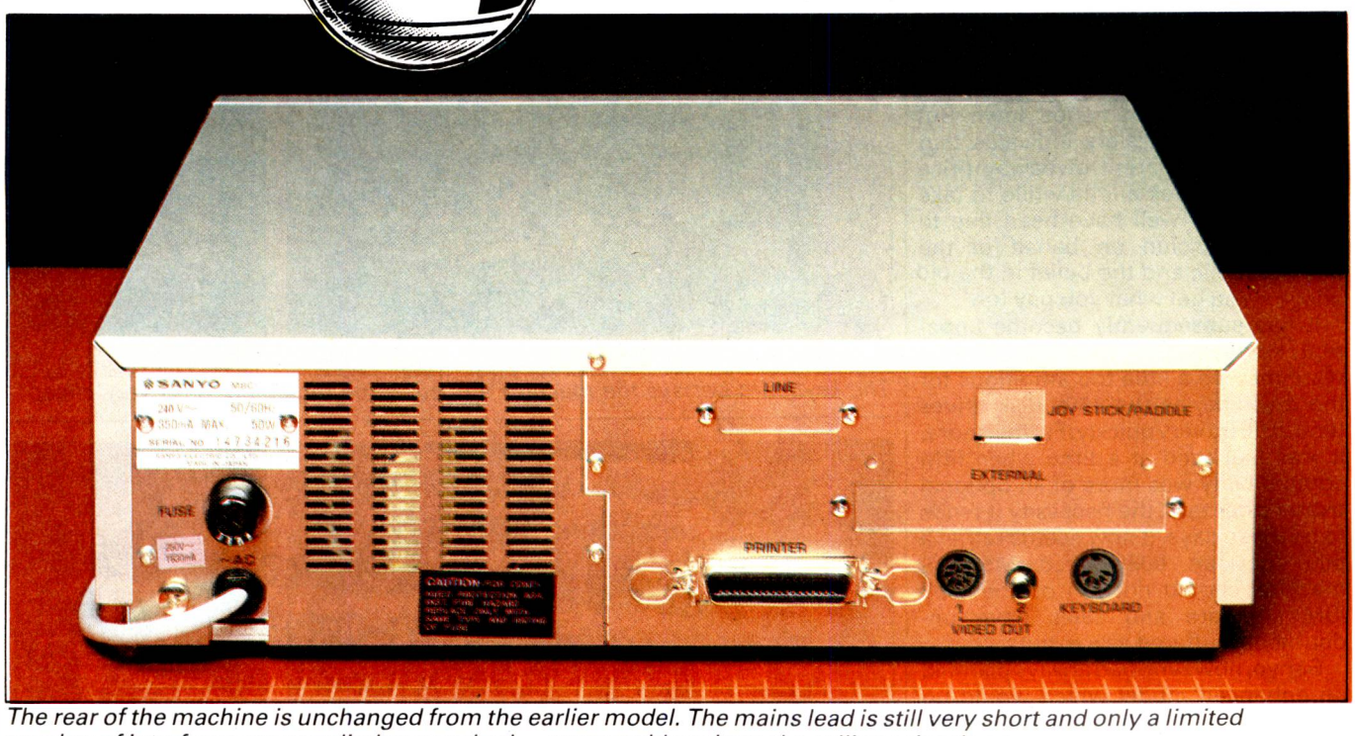
Further along to the right are the two video outputs. The standard 550/555-2 can support RGB and composite video monitors via DIN and phono sockets respectively. On the far right is a DIN-style keyboard socket.

Above these ports are two blanked-off panels which allow the optional RS232C interface and Apple compatible joystick to be fitted at a later date.

Once again the latter is not of much use to the average businessman and in any case will not have any ready made software available to exploit it. However, it may prove of interest to users who intend to write their own programs in Sanyo Basic.

In order to look inside the 550/555-2 five cross head screws need to be removed — two on each side and one at the rear — before sliding the thin sheet steel cover off. Although by no means the best I've seen, the standard of construction is still quite respectable. Once again, however, signs of cost-cutting are evident.

The power supply, for example, which occupies the lower right-hand side of the machine, is only partially




*The rear of the machine is unchanged from the earlier model. The mains lead is still very short and only a limited number of interfaces are supplied as standard — presumably to keep the selling price down*

screened and tends to be spread out over a larger area than appears necessary. The fan, which although noisy in operation is not irritatingly so, actually draws air through the machine's upper casing and exhausts it out through the base plane underneath the plinth.

The very compact motherboard occupies the remaining two thirds of the base plane and is partially obscured by the disk drive sub-chassis located above it. This can be removed by unplugging four connecters, extracting five screws and withdrawing both drives together.

The motherboard has no bus expansion facilities and, therefore, contains most of the necessary electronics. The CPU is an Intel 8088 running at a remarkably slow 3.6MHz. The IBM, which uses the same processor, is now regarded as something of a sluggard but its operating speed is 4.77MHz. The latest IBM compatibles, using the full 16-bit 8086 chip running at 8MHz, make the Sanyo seem very slow. But such relative comparisons are not very meaningful, especially bearing in mind the cost difference: the Sanyo should still be fast enough for its intended environment in small businesses.

As standard both the 550-2 and 555-2 come with 128k of non-parity checking memory, which can only be expanded to a maximum of 256k using Sanyo supplied hardware. The upgrade kit is supplied in the form of loose chips which plug into sockets adjacent to the existing RAM. Upgrade kits are available in two 64k steps: the first to 192k and the second to 256k.

Under certain circumstances the Sanyo allocates 16k of ordinary RAM to video RAM to boost the complement to 48k. An 8259A interrupt controller supports up to eight levels of interrupt, and sound generation is controlled by a 8405 chip limited to producing a variety of beeps and burps. The loudspeaker is located well to the rear of the machine and mounted on an internal bulkhead.

Adjacent to the 8088 is a spare socket intended for the almost mythical 8087 arithmetic co-processor. There is still only a limited amount of IBM software which can exploit this magic chip, so for the moment its inclusion on the Sanyo seems even less useful.

The RS232C option comprises a small board which bolts onto the backplane amd plugs into a 20-pin connecter on the motherboard. Although it defaults to a 1200bps baud rate, this can be changed by running a simple assembly language or Basic program detailed in the manual. It cannot, however, be changed permanently, so the program has to be run each time the machine is booted up. Furthermore, it has other parameters that cannot be changed, and may not, therefore, suit some of the devices that are hooked onto it. The RS232C port is initialised by a USART 8251 and provides one start bit, eight data bits, no parity, and one stop bit.

Although the 550/555-2 will work with a wide variety of monitors, not surprisingly Sanyo recommends two of its own as the most suitable. The CRT 70, as supplied with the review machine, is a 14in colour monitor and the CRT 36 is a budget monochrome monitor.

The CRT 70 is a large unit with a 13.5in screen diagonal but its design and finish complement the processor very well. Its size and the lack of a tilt swivel base, however, do not lead to a very ergonomic hardware configuration. If the monitor is located on top of the processor it is only possible to swivel it by 15 degrees before the feet fall off the edge of the processor.

Visible beneath the highly reflective screen are the on/off switch and pilot LED. Cleverly camouflaged behind a hinged front panel are further controls for 50/60Hz operation, horizontal centring, brightness and colour intensity. The rear of the unit has a fixed mains cable — this time a good deal longer — and the vertical hold control. The RGB cable has locking clips on the monitor connecter but proved to be rather difficult to insert correctly at the processor end.

The 550/555-2 has a graphics resolution of 640 × 200 pixels and produces its text characters from a 6×7 matrix in an 8×8 cell. The normal display mode is 80 characters by 25 lines.

In use the monitor works very well. Although the character set is very similar to the IBM unit, even down to its coarseness, the display is clear and stable at all times. Colour displays are pleasant without being garish.

Screen-handling when running MS-DOS applications software does seem frustratingly slow. It takes around 15 seconds to load WordStar, about twice as long as modern IBM compatibles, and much of the delay appears to be attributable to sluggish screen-handling.

The keyboard is probably the part of the 550/555-2 that most betrays its shoestring price. The upper plastic moulding looks cheap and is attached

to a very crude steel base plate which includes two dual position (up or down) rear edge tilt stands.

The computer reset button, however, is a gem, ideally located and well-recessed on the left-hand side of the keyboard adjacent to the point where the tightly coiled cable exits.

The 84 keys are split into three main groups. On the far left are five function keys which can also be used in the shift mode to simulate the IBM PC's 10.

The qwerty keypad has a fairly conventional core with a useful LED status indicator on the CAPS lock key and a not so useful one on the GRAPH lock key. This key must be regarded as a hangover from Sanyo's involvement in home computers and places the qwerty keypad in a mode that produces predefined simple graphics characters very similar to those found on the now defunct Sharp MZ-80K. These characters are not usable at system or application software level but can be accessed from Sanyo Basic. In any event it is highly unlikely that business software houses are falling over themselves to write packages which exploit this facility.

The qwerty keypad features a usefully large RETURN key and BACKSPACE/RUBOUT key. The INSERT/DELETE key is used by WordStar to toggle the insert mode on and off. Although there is no separate ALT key, the SHIFT and CONTROL keys produce the same effect when pressed simultaneously.

The far right keypad has a dual function similar to the IBM of numeric entry and cursor control. The function is toggled by the NUM Lock key on the qwerty keypad, but, unfortunately there is no LED status indicator, so it is impossible for the user to know what mode the keypad is in at any time. In my opinion, this is a very irritating omission.

The numeric keypad has further similarities with the IBM unit. It has PGUP, PGDN functions but rather strangely the down cursor arrow is illogically placed on the 5 and not the 2 key.

The red BREAK key operates conventionally in Basic and produces a useful Control-C at system level. It is worth noting that all alphanumeric keys have an autorepeat facility.

Unfortunately there is no key to dump the contents of the screen onto a printer.

In use it quickly becomes apparent that the keys are ideally placed and angled. Key action is a little on the light side and the endstops are reached earlier and at greater velocity than anticipated — an experience that rapidly leads to tender fingertips. Sanyo could improve the situation by fitting stiffer or dual rate return springs.

One final point regarding the keyboard is that the type ahead buffer can store a mere seven characters; a limitation that may prove irritating to experienced typists.

## System software

The revamped Sanyo is supplied with MS-DOS version 2.11. The main difference is that it formats disks with nine sectors, instead of the old eight, giving 180k of formatted storage on each side of the disk. The series 2 Sanyo also uses double-sided drives giving a total capacity of 360k per drive.

The system utilities provided have been kept to a bare minimum. There are FORMAT and DISKCOPY commands but strangely the Sanyo cannot format and copy disks simultaneously. The notoriously unfriendly line editor EDLIN is included and the PRINT command will enable files to be printed from system level.

There are some omissions, however: for example, the MODE command which is normally used to program the RS232C ports and set up the video defaults. This kind of utility is very useful as it can be incorporated into an AUTOEXEC file which will customise the computer to specific user requirements each time it is booted up. Of course the reason it is not included is that the Sanyo does not have a serial port as standard and even when one is added most of its parameters are fixed. It is, therefore, unlikely that the Sanyo will prove to be a good machine for communications unless a more sophisticated RS232C interface is made available.

The good news for owners of the 550/555-1 series is that they will shortly be able to buy MS-DOS version 2.11 for around £50.

A demo program written in Basic is included on the system disk which runs well in colour but is more useful for shop window displays than impressing friends.

Sanyo Basic itself is rather confusing. At first sight it appears to be a cut down Microsoft Basic, but Sanyo assured me that it is entirely its own work. Programs written in it can be compiled by a Microsoft compiler providing no graphics commands are included. Forgetting for the moment any connections with the Microsoft interpreter, it is quite a comprehensive Basic and should not leave users disappointed.

Another peculiar aspect is the amount of memory which is left after the interpreter is loaded. The review machine displayed a mere 27896 bytes whereas Sanyo insisted that it should be in excess of 41000 bytes.

## Benchmarks

| | |
|---|---|
| BM1 | 1.8 |
| BM2 | 7.5 |
| BM3 | 15.9 |
| BM4 | 15.9 |
| BM5 | 17.2 |
| BM6 | 29.8 |
| BM7 | 55.8 |
| BM8 | 96.9 |

***All timings in seconds. For a full listing of the Benchmark programs, see p 185.***

Sanyo could not work out why the review machine displayed this idiosyncrasy but did explain that around 16k of RAM would be allocated to video RAM while in Basic.

Loading Compaq Basic, a version of Microsoft BASICA, left only 15913 bytes for user program.

Sanyo Basic does boast a very easy to use line editor which utilises the cursor control and INSERT/DELETE key to great effect.

For users who require full transportability of programs, Microsoft's GWBASIC is available for the Sanyo as an optional extra.

## Applications software

Of course the real good news about the Sanyo is both the standard and quality of the Micropro software bundled in with the package.

For some reason the review 555-2 was supplied with software intended for a 550-2, so it was lacking several packages. But as the packages are so well known it's not necessary to look at each of them in great detail.

Despite an intimidating list of Micropro names the software can be split into three groups: word processing, spreadsheet, and database.

The first group is catered for by WordStar, Mailmerge and Spellstar. Wordstar, although shortly to be superseded by WordStar 2000, is the most widely used word processor for micros and this version includes a colour set up program enabling users to select their own screen colours and a utility that allows the action of the Sanyo's function keys to be changed. Mailmerge and Spellstar, as their names imply, are an automatic mailer and a spelling checker respectively.

Calcstar is MicroPro's spreadsheet package. Although it lacks graphics capability, it is a reasonably powerful example of its kind. Implementation on the Sanyo suffers from the combined cursor control/numeric keypad. As spreadsheets involve entering vast amounts of data, cursor control has had to be banished to the dual key CTRL+"?" mode which makes moving round the matrix very tedious.

Infostar, Reportstar, Datastar, and Filesort are the components of a database. The package is best summed up as a relatively simple card index type system coupled to a powerful reporting facility. Data is entered via Datastar and the reports generated using Reportstar. High speed sorting is covered by Filesort and Infostar links the database into WordStar/Mailmerge and Calcstar to form a very rudimentary integrated system enabling data to be transferred between them.

Some users, however, may not find that the comprehensive Micropro package meets all their needs. There are a wide variety of vertical market packages available but memory and graphics limitations have prevented integrated packages like Symphony



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and Framework being ported over. Sanyo says that IBM versions of dBasell and Easywriter will run normally on the 555 but what other IBM software will the 555 run?

There are two major stumbling blocks. The first is the shortage of memory and the second concerns the keyboard. The Sanyo would run programs like demos only requiring 128k and not using the keyboard without any difficulty. The trouble is that most of the interesting DOS 2.0 software requires at least 256k RAM, so I was unable to try it out.

The keyboard problem arises from the different layout to the IBM and consequently some keys do not perform as expected. Sanyo provides a conversion chart in the manual giving the equivalent 555 key for each IBM key, but trying to learn a package and refer to this chart may prove an impossible feat.

It must be said that even in its new guise the Sanyo 550 series cannot be described as IBM compatible and mentioned in the same breath as machines like the Compaq and ITT Xtra. However, the updated operating system and enlarged disk drives should make it far easier to convert IBM software and I would expect to see a much wider choice of mainstream packages available shortly as a result.

## Documentation

The Sanyo 555 is supplied with three A5 reference manuals and an audio tutorial comprising two cassettes, instruction booklet and demonstration disk.

The hardware documentation is contained in one of the A5 manuals and comprises six sections. The best section covers getting started and tells the user all he needs to know about setting up the hardware and getting as far as making backup copies of all his master disks.

Further sections covering Sanyo Basic and MS-DOS are well presented but not very comprehensive. There are also sections covering the technical specifications, how to connect peripherals and add interface boards.

Although Sanyo did not supply the full suite of Micropro software, I am told that the remaining two A5 volumes will include the necessary manuals to cover all the packages. The first section of volume 1 which was supplied contains a large section written by Sanyo. This covers the specific implementation of each Micropro package on the 550/555-2 series and is extremely useful as it details the action of the function keys as well as provides handy command reference charts for each package.

Also included with every Sanyo is an audio training guide prepared by Headline communications famous for its *How to use...* series of software tutorials. The two audio cassettes, disk and booklet take a raw beginner right from square one on learning how to use MS-DOS, through to programming in Basic and using the Micropro software. Providing the user has a handy cassette deck, audio guides can prove a novel and strangely addictive way of learning the basics of computing.

## Prices

The Sanyo's pricing structure is impressive both for its simplicity and its value for money.

There are just two models in the new range. The Sanyo MBC 550-2 with a single 360k disk drive costs £999 excluding monitor but including Micropro's WordStar and Calcstar.

The Sanyo MBC 555-2 with dual 360k disk drives costs £1390 excluding monitor but including Micropro WordStar, Mailmerge, Spellstar, Calcstar, Infostar, Datastar, Reportstar, and Filesort.

Recommended monitors are the colour CRT70 at £499 and the monochrome CRT36 at £127.

The additional 128k RAM costs £181 and the RS232C interface board £50.

## Conclusion

The 550/555-2 is most likely to appeal to small businesses and Sanyo, obviously aware of this fact, has packaged the machine in a thoughtful manner. Included is a full suite of professional software on the dual disk drive model, which should meet the needs of its targetted users for quite a while.

Furthermore, Sanyo, aware that the Micropro software included are not state of the art packages as far as user-friendliness is concerned, has thrown in an interesting audio cassette-based tutorial.

It is something of a disappointment that the new models are not IBM-compatible bearing in mind the similarities in processor operating system and disk drives, but at least Sanyo is honest about the fact, even if some dealers may have been less so in their advertising campaigns for its predecessor.

However, the fact that the 550/555-2 is much closer to the design of IBM than before should ensure users will have a far greater selection of applications software from which to choose.

Sanyo assures me that its series 2 machines should be available by the time you read this Benchtest. The 550/555-2 comes with a 12 month guarantee on all parts bar the disk drives, which are only covered for three months. After this period various levels of maintenance are available through Systems Reliability Ltd or dealer appointed service facilities.

To achieve such a low selling price Sanyo, as before, has only supplied the bare essentials in the hardware department. The lack of a flexible serial interface, the marginal processing speed, and the non-parity checking memory all point to this fact. But to be honest the users at which the Sanyo is aimed are unlikely to be troubled by such deficiencies.

For them the 550/555-2 may not be state of the art technology bristling with features that will never be used, but simply a technically competent and remarkably complete machine at a very attractive price. END

## Technical specifications

| | |
|---|---|
| Processor: | Intel 8088 clocked at 3.6MHz |
| RAM: | 128k expandable to 256k |
| ROM: | 8k |
| Mass Storage: | Two 5.25in TEAC floppy disks (360k each) |
| Keyboard: | 84 keys, three keypads including five function keys |
| Size: | Processor 15in × 14in × 4.5in |
| Weight: | 21lb |
| I/O: | centronics parallel printer only |
| DOS: | MS-DOS version 2.11 |
| Bundled Software: | 550-2 WordStar, Calcstar |
| | 555-2 — as above plus Spellstar, Mailmerge, Infostar, Reportstar, Datastar, Filesort |
| Peripherals: | None |
| Options: | Extra 128k memory, RS232C board, extra disk for 550 |

## In perspective

Despite the large price increase the improved Sanyo range still finds itself in a very healthy position when compared to the competition. It is obviously cheap compared to any mainstream IBM compatible bar the Advance 86 — which machine is alsó bundled with a full suite of software and runs faster than the Sanyo, thanks to its 8086 processor. But the ugly duckling Advance is not everyone's cup of tea. Its massive footprint and suspect construction tend to rule it out for serious applications.

The fiercest competition the Sanyo can expect is from the new ACT Apricot F1, which is faster, has more memory and runs standard Apricot software. At £1490 for a single disk drive colour F1, including monitor and a generous amount of software, the Sanyo is unlikely to have it all its own way this time round.




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# TDI Pinnacle

*TDI's proud boast about the Pinnacle is that it's 'blindingly fast'. Peter Bright takes a look at this elegant but powerful multi-user micro, aimed at the education and software development markets, to see if he can keep up.*



Get rich quick plan A — import a potentially successful product from the US. This scheme is well used by many British firms; ACT is perhaps the best example with the Sirius. Many other firms in the UK have trodden the same path with varying degrees of success.

One such company is Bristol-based TDI. It started out importing the Sage range of supermicros and distributing the UCSD p-System in this country. TDI's latest venture is a cooperative deal with the US firm Pinnacle Technology of Texas to produce a TDI-badged machine that it can sell in Britain alongside the Sage range.

The result is the TDI Pinnacle, an allegedly blindingly fast Motorola 68000-based multi-user micro. I took a closer look.

## Hardware

The first thing I noticed about the Pinnacle was how small it is. Its grey sheet metal casing measures only 17ins wide by 1.5ins deep by 4ins high. When you consider that it's supposed to be one of the most powerful micros you can buy it seems small indeed, especially when you compare it with the vastly oversized proportions of something like the IBM PC.

The casing construction is pleasingly simple and cheap to produce. It consists of just two pieces of sheet metal; the bottom piece has its front and back bent up to form the front and back panels, and the top uses a similar trick to form the sides.

Apart from being elegant and simple, it's also very cheap. Grown men have turned white at the cost of tooling up for injection-moulded casings on micros. This is fine if you're building Apricots and the like, but when you're talking about comparatively low volumes, then the economics don't look too good. Sheet metal is a much better material.

The front of the machine is very plain — the review machine had a sticky plastic strip which displayed the Pinnacle name and the TDI logo. Below this was a single, half-height floppy disk and a half-height hard disk. Nothing else.

Unfortunately, the rear panel isn't much more interesting. To the left is the cooling fan and working to the right we have on/off switch, power input, seven RS232 ports, a small reset switch and a decidedly unstandard centronics parallel printer port.

The only odd-looking feature of the rear panel is two banks of DIP switches, a hangover from TDI's popular imported Sage micros. These switches are used for broadly the same functions as on the Sage: you can play with communications line settings, set which hard disk partition the system boots from, and so on. Having the switches on the outside is much better than burying them within the machine's casing.

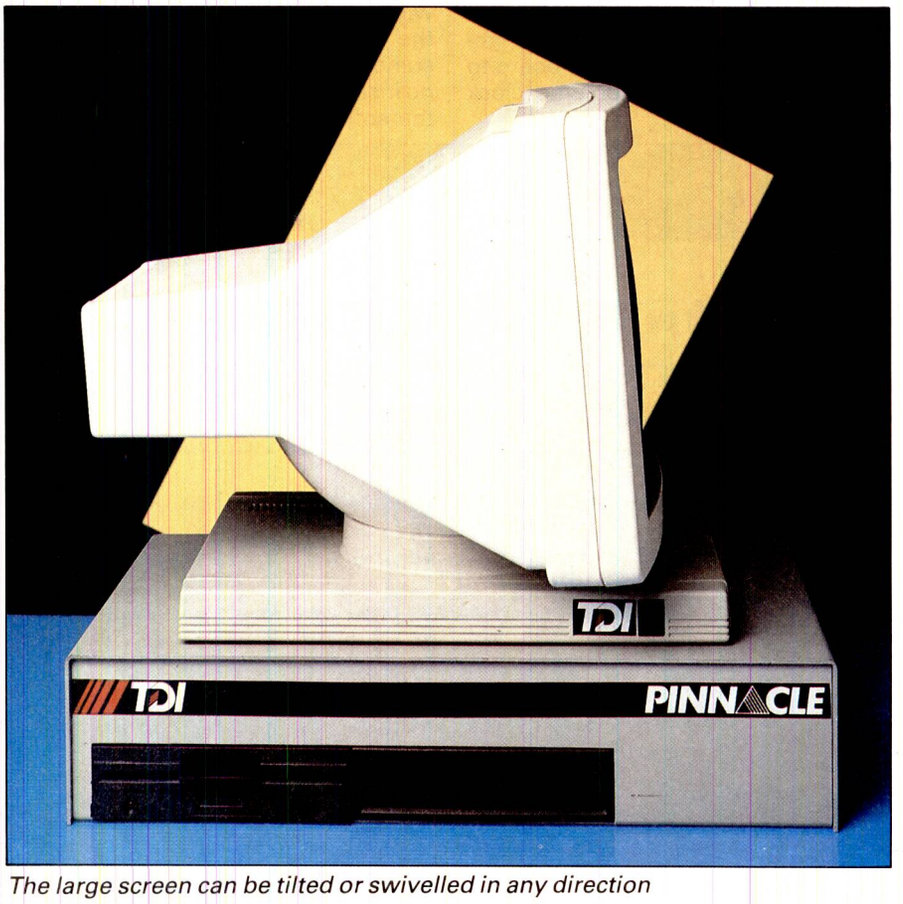
Getting inside the machine is easy — remove four screws and slide off the lid. Once inside, the main circuit board is revealed. Below this are the power supply unit, and the floppy and hard disk units.




*DIP switches on the rear panel are a hangover from the Sage*

The main board is very well made and laid out. Pinnacle Systems in the States makes many circuit boards for the US defence department, so standards should be high (sic).

The main PCB on the review system was dominated by the main processor chip and the RAM chips. The main processor is the well-used Motorola MC68000; the most widespread use by far of this chip is in Apple's Macintosh,




*The large screen can be tilted or swivelled in any direction*

but many multi-user business micros also use it.

The Pinnacle differs from other micros using this chip in that it runs the 68000 flat out at a staggering 12MHz with no wait states. If you take a quick look at the Benchmark figures, you'll see that the Pinnacle is indeed very fast: it's easily the fastest micro *PCW* has ever Benchtested. Interestingly the previous champion was the Sage machine which is also imported by TDI.

The entry level machine is supplied with 256k of RAM, which is currently expandable to 1.5Mbytes. The review machine was supplied with 1Mbyte of RAM. The main board can only take 512k, the other 512k was accommodated on an expansion board piggybacked under the RAM area on the main board. There wasn't much space for air to circulate over the piggybacked board, but I didn't suffer any overheating problems.

All the RAM on the review machine was made up of 64k × 1 chips. The review machine had no less than 144 of these little beasts arranged in 128k rows of 18 chips, giving parity on every byte — quite an impressive sight. When 256k RAM chips are more freely available, then the Pinnacle will use them. This will take the maximum RAM of the machine to 6Mbytes. The system also has 8k of ROM containing the bootstrap and various diagnostic routines.

The rest of the main PCB consists of the usual logic chips, disk controllers and I/O controllers. A large rechargeable battery is included in the board to supply power to the real time clock calendar chip.

A large ribbon cable runs from the main PCB to the RS232 board. Next to the ribbon connecter on the main board are four Zilog Z80 DART asynchronous communication controller chips; it's these that drive the RS232 ports. The baud rate can be controlled either by software or by the first three of the bank A DIP switches. The system defaults to 19200 baud.

Unusually for a modern micro, many of the chips on the board are socketed. These include the 68000 chip, all the RAM, the ROM, the Z80 DART chips and some of the TTL chips. The review system also had some empty sockets; presumably these are for the various add-on boards.

The Pinnacle can be supplied with a combination of 800k floppy disk and 10-, 20- or 32Mbyte hard disk. The review machine was supplied with one floppy disk drive and a 21Mbyte hard disk. In use the hard disk worked well, but it was very noisy.

The floppy disk drive is worthy of mention. It echoes the Sage drive in that it has very fast access times. This is because unlike most other floppy drives, it doesn't use any interleave or skew factors when data is stored on the disk. Instead the system lays consecutive blocks end to end over the surface of the disk. This saves the time which is usually lost while the head is waiting for the next block to come round.

The Pinnacle can be made to work with virtually any remote terminal. On the hardware side, it's supplied with standard RS232 serial ports so there are no insurmountable problems there. On the software side, the system is supplied from the factory with a 'Plain Vanilla' terminal driver which is so basic, it should work with most terminals.

TDI recommends that you do something about the 'Vanilla' terminal driver as soon as you can, because although it will work, it will also be very slow. You can either install your own driver into the system, or you can use one of TDI's pre-written drivers (if it has one for your terminal).

The review system was supplied with two thinly disguised American Wyse 50 terminals. These are TDI's choice as the standard Pinnacle terminals, and are even supplied with stick-on TDI badges and a Pinnacle logo on the keyboard. It's likely that many Pinnacle systems will be shipped with these terminals, so it's worth looking at them in more depth.

I must admit that on the few occasions I've come across them, I've come to like these Wyse terminals. They are constructed on modern low profile lines, quite unlike the bulky, ugly DEC VT100 style which is more commonly associated with computer terminals.

The screen is large and can be tilted or swivelled in any direction on its base. Brightness can be controlled by a thumbwheel on the right-hand side of the display casing. The base unit houses two RS232 ports; one connects to the remote computer and the other is for a local printer.

The keyboard has no less than 101 keys of various shapes, sizes and colours. All the keys are well pitched, but if that isn't enough for your tastes, you can flip down a bar which increases the typing angle.




*There are 101 keys of various shapes, sizes and colours; the typing angle can be increased with a flip-down bar*

The main qwerty typing area takes up most of the space. To its right is the numeric keypad which also plays host to four specialist editing keys. Sixteen function keys run along the top of the keyboard.

The four cursor control keys are located in the qwerty area, but are distinguished by their bright yellow colour which adds a touch of decoration to an otherwise bland, grey keyboard.

The only unusual key on the keyboard is marked 'Setup'. This allows you to play around with the terminal settings, baud rate, parity, and so on.

I found the keyboard easy to use. The action is fairly springy, but the feel is good. I like the way that the 'F' and 'J' keys on the qwerty section, and the '5' key in the numeric keypad, have small lumps moulded onto the keytops to make them easier to find when you're touch typing.

Overall I like the Wyse terminal a great deal. My only criticism is that the RETURN key on the keyboard is rather small and can be hard to find.

## System software

Like the Sage, the Pinnacle can be supplied with a wide range of system software. The standard operating system is the UCSD p-System; however, other operating systems are available, such as CP/M-68K and MBOS.

The review system was supplied with the UCSD p-System and MBOS happily living together on the same hard disk. With the DIP switches in their normal positions, the system booted into the UCSD p-System. However, by altering the switch settings, it could be made to boot from the BOS section of the hard disk. In practice it's unlikely that many users will want to run multiple operating systems in this way, but it was useful for the Benchtest purposes.

In the normal run of things I would think that business users will take the system with BOS, because there's a comparatively good range of multi-user business software now available under this system. I would expect educational establishments, software developers and the like to take the basic system as offered with the USCD p-System. The problem for business users is that while there's a good deal of single-user p-System software around, I haven't come across that much multi-user p-System software yet.

There are some interesting features of the UCSD p-System on the Pinnacle. When you boot up the system it does a little hardware check, then the hard disk starts hammering and the system boots into the p-System. One of its first acts is to copy system files into the different users' RAM disks — each user can have his own RAM disk to speed up the system. Obviously you need a fair amount of RAM to be able to give each user a useful RAM disk, but it does make a fast system even faster.

After it has copied the files to the RAM disk, the hard disk does some more hammering and asks you to confirm that the date is right. The review system then went into a 'user-friendly' menu system: utilities are provided that allow you to edit and generally play around with menus, so with some practice it should be possible to create a menu for any occasion.

If you leave the nice, friendly world on the menus and descend into the dark, dingy world of the UCSD p-System, you find that things aren't that bad. I must admit that this was the first time I've used the UCSD p-System. I'm a confirmed CP/M-DOS user and have always thought that p-System was fine for education buffs, but not much use in the real world.

Imagine my surprise at finding that all the available commands are listed at the top of the screen and executed by hitting a single key! No more fumbling around wondering what the keyword to get the directory is — just look at the screen.

However, things aren't *quite* as easy as I've been making out (the directory function isn't available directly but as a sub-function from within the FILE command, for example), but I was happily wandering around the system within ten minutes.

A total of 12 commands are available from the top level UCSD p-System command line: E(DIT, R)UN, F)ILE, C)OMPILE, L)INK, A)SSEMBLE, D)EBUG, H)ALT, I)NITIALISE, U)SER, RESTART and M)ONITOR. These are all self-descriptive, and the editor is of the full-screen variety.

The only function worth examining is the F)ILER. This provides some very sophisticated file manipulation and maintenance functions which are certainly not found on lesser CP/M-DOS-type systems.

The menu for F)ILER has a total of 20 menu options, most of which are self-explanatory but some of which are odd. The options are: G)et, S)ave, W)hat, N)ew, L)dir, R)em, C)hng, T)rans, D)ate, Q)uit, B)ad-blks, E)xt-dir, K)rnch, M)ake, P)refix, V)ols, X)amine, Z)ero, O)n/off-line and F)lip-swap/lock.

I don't know why you have to hit 'L' to get a directory — you can get an extended directory by hitting 'E'. Because the UCSD p-System uses a system of logical and physical 'volumes' to describe different data and devices, some of the F)ILER options relate to them. V)ols, for example, lists all the volumes currently online while O)n/off-line allows you to mount and dismount subsidiary volumes.

A multi-user micro tends to be a much more complicated beast in system terms than an equivalent single-user machine. Consequently there's a range of utilities supplied with the Pinnacle which is worth taking a look at.

At the lowest level there are utilities for backing up the winchester and parking its heads. As this is a multi-user machine it's unlikely that it would be switched off that often, but when it is, TDI recommends that you park the heads out of harm's way. This is easily done using the utility provided. Likewise, backing up the winchester has been provided for with backup and restore utilities.

The more interesting utilities are provided under the heading of 'Pinnacle Utilities'.

At the top level the options are: C)onfigure, F)ormat floppy, B)oot transfer, H)ard disk [backup, Restore, Format, Ship, Partitions, Transfer boot] and Q)uit. These are all self-explanatory; the only vaguely interesting option is C)onfigure. This allows you to play with the floppy disks, serial ports, users, the real time clock, buffers, partitions, and so on; in fact all the things that make the system tick. You can either write your changes to disk if you're confident that what you've done is right, or temporarily write them to RAM if you just want to experiment.

The only problem with most of the screens in the C)onfigure option is that knowledge of hex is required. The exception to this is the special E)asy setup system where all numbers are expressed in decimal. Most users will find that the E)asy menu system allows them to do everything they want, and that there's no need for them to use the other utilities.

The first thing that the E)asy setup system allows you to do is to allocate a buffer length to each of the seven serial ports and to the printer port (you could, of course, use any of the serial ports as a printer port). You can allocate any size of buffer you like, up to the limit of RAM which is displayed at the bottom of the screen.

In normal circumstances display terminals wouldn't need large buffers, but it would be useful to allocate a big buffer to the printer so that it doesn't tie up the processor unnecessarily. The only potential drawback of doing this is that under certain circumstances the buffers could be accidentally erased if a user started poking around the system. This wouldn't endear him to anyone with his life's work in the output buffer!

The next screen in the E)asy setup menu allows you to allocate system resources to different users. Using this screen you can set the size of the user's RAM disk, which volume RAM disk files

### Benchmarks

| | |
|---|---|
| BM1 | 0.35 |
| BM2 | 0.45 |
| BM3 | 0.90 |
| BM4 | 1.30 |
| BM5 | 1.34 |
| BM6 | 3.36 |
| BM7 | 4.24 |
| BM8 | 4.25 |
| Average | 2.02 |

***All timings in seconds. For a full listing of the Benchmark programs, see p185.***

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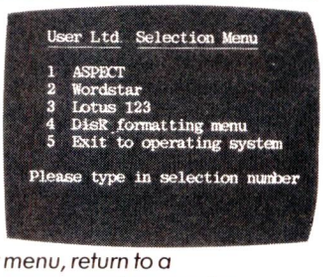


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are copied from, boot volume, which serial port he can access, and so on. This provides the system with all the information it needs to install a new user or to modify an existing user.

The rest of the E)asy setup allows you to play around with hard disk partitions and system volumes.

Back at the 'non-easy' setup utilities, there are a number of interesting options you can use if you know hex.

The first is marked F)loppy. This allows you to play around with all kinds of useful floppy disk settings, such as the read head and write head settle rates, and the format you want the drive to read (it can read IBM and Sage disks among others). By experimenting with some of the settings you can tune the drive for the best speed.

The S)erial port option allows you to set the baud rate, data bits, stop bits, parity, and so on on each of the serial lines. This can override the settings made by the DIP switches on the back of the machine.

The multi-user p-System allocates the processor's time to each user by 'time slicing': each user gets a fraction of a second of processor time in rotation. Obviously the more people who are on the system, the slower it will be (but then the system is so fast it will still look good by comparison with other micros).

You can test the time slices to some extent by using the 'M)ulti misc' configuration option: this allows you to set the time slice for each user. You can either set it short for smooth system response, or give one user more time if he has a special job.

The p-System is primarily famous for its Pascal; however, the review machine was also supplied with Basic so that I could run the *PCW* Basic Benchmarks. Unfortunately I didn't have time to run the Pascal Benchmarks, but if you look at the Basic set here you'll see that the system is our new speed champion, being over twice as fast as the Sage II. (A system with a floating point unit installed was running the Benchmarks even faster at Compec in November.)

*'The Pinnacle ran the Benchmarks with astonishing speed . . . it's faster than an IBM PC . . .'*

The Basic run on the Pinnacle was compiled with two-word reals, which is marginally faster than using four-word reals.

It's interesting to note that if you assume that the system does a straight time slice (which it does on processor bound jobs), then you could have all seven users running the Benchmarks at the same time and the system would still be faster than the IBM PC with one user! This doesn't prove much, but it's a nice thought.

## Applications software

It was good to see that a great wad of applications software was supplied with the machine. Under BOS various business applications comprising ledger programs, word processors, and so on were supplied, and under UCSD p-System various games were provided in addition to the Word7 word processor, ProCalc spreadsheet and Aladin database.

Under the games section, TDI provided a program to solve the Towers of Hanoi (this is a puzzle loved by TDI—the company always sells machines that are so fast they can solve the problem ridiculously quickly). For Towers freaks I timed the Pinnacle at 39 seconds.

## Documentation

A veritable mountain of documentation was supplied with the Pinnacle. This ranged from third party manuals for the applications packages, TDI manuals for the system and even a copy of Mark Overgaard and Stan Stringfellows' *Personal Computing with the UCSD p-System* to make sure that even a newcomer to p-System like myself could use the system.

The most interesting manuals were the ones supplied by TDI. These are very professionally presented, and are bound and presented in exactly the same way as a paperback book.

The quality of the manuals varied. The two manuals I made the most use of — the *Pinnacle User Manual* and the *Operating System Reference Manual*— were different in style. The operating system book was large and easy to understand, but the user manual was more technical and had forward and backward references which were distracting and confusing.

## Prices

An entry-level system with 256k of RAM and a 10Mbyte hard disk will set you back £4995. The price increases by £1000 for the 21Mbyte hard disk and another £1000 for the 32Mbyte hard disk. The terminals cost £695 each.

## Conclusion

I like this machine. It has a commendable lack of bulk but is the most powerful micro I have ever Benchtested. In a great many ways the Pinnacle reminds me of the Sage which, of course, is imported by TDI.

The Pinnacle ran the Benchmarks with astonishing speed — 'blindingly fast' is right — and it's interesting to note that it's still faster than an IBM PC, even when all seven users are running the Benchmarks at the same time.

Of course not everyone wants sheer speed, and I don't see this as a mass market machine — it isn't competing with the IBMs and Apricots of this world. Instead TDI has chosen to market the machine where the competition isn't quite as strong and where the returns are higher.

This is a very nice, fast multi-user machine. As such the only competition I can think of is the Sage, and TDI has that machine too. END

## Technical specifications

| | |
|---|---|
| Processor: | 12MHz Motorola MC68000 |
| ROM: | 8k |
| RAM: | 256k to 1.5Mbytes (6Mbytes soon) |
| Mass storage: | 800k floppy, 10-, 21- or 32-Mbyte hard disk |
| Keyboard: | Varies according to terminal — Wyse terminal 101 keys |
| Size: | 4ins × 17ins × 11.5ins |
| I/O: | Seven × RS232 serial ports, one parallel printer port |
| DOS: | UCSD p-System, BOS, CP/M-68k |

## In perspective

The Pinnacle may be fast, but it will only appeal to a small group of people. As a business machine the limit of seven users means that each user should have more than adequate response under most conditions. The fact that the Pinnacle is available with the BOS business operating system is an advantage due to the access it gives users to a library of high-quality, multi-user business software.

Other areas where the Pinnacle is likely to sell well are further education and software development. In education the machine's speed will make it ideal for data logging and psychological work as well as straight data processing. Software developers will like the machine because its sheer speed means that it can compile code very quickly and thus reduce software development time.

# Pointing the way

*Maurice Hawes presents some simple programs which reveal how different versions of Basic help a selection of micros to code floating point inputs.*

Floating point notation is a way of representing numbers that enables them to be conveniently manipulated regardless of how big or small they are. As examples, 111.23 and 1112.3 would be stored as $1.1123 \times 10^2$ and $1.1123 \times 10^3$.

But life is never that simple in the micro world — many different coding patterns are used, and in many handbooks the magnitude limits are not clearly stated and the precision available is not explained in detail. This article tries to fill the gaps in the literature, provide concrete information on a few popular machines as examples, and indicate the methods by which this information may be obtained for other machines.

## Floating point codes

Any floating point number N may be expressed in terms of a base number B, an exponent A, and a fraction F, according to the following model:

$N = \pm(B^A)*(B*F)$

where A is a positive or negative integer, and F is a fraction which must lie in the range $(1/B =< F < 1.0)$ if the values of A and F are to be unique.

Combining the factors of B, this may be rewritten:

$N = \pm(B^E)*F$ (where $E = A+1$)

Once B has been chosen, the two values E and F as defined above uniquely govern the magnitude of N, and normally it's these two values which are stored in the computer, in some form, to define the magnitude of N. They are often referred to as the Characteristic of N and the Mantissa of N respectively; this is a little unfortunate, as the system is *not* a logarithmic one. The value of E is one higher than the logarithmic characteristic of N (which is A), and F is a fractional multiplier rather than a fractional increment to the characteristic. In the following, E will be referred to as the Exponent part of N, and F as the Fraction part of N.

This concept of F as a fractional multiplier is essential if the system is to be used for addition and subtraction. The addition or subtraction of two numbers begins by shifting factors of B in the smaller number from its fraction part to its exponent part until the exponent parts of the two numbers are equal: this process is called 'scaling'. Once the exponent parts are equal, the two fraction parts may be legitimately added or subtracted to give the result. The process ends by rescaling this result as necessary until its fraction part comes within the prescribed limits.

The process of multiplying or dividing two numbers is easier: the two exponent parts are added or subtracted, and the two fraction parts are multiplied or divided. The result is then scaled as necessary. Scaling is an essential procedure in this system of number handling, and has no counterpart in a purely logarithmic system which cannot be used for addition or subtraction.

All these processes require that the computer be able to recognise and handle E as a signed exponent, and N as a signed number. The computer cannot store negative values as such, so the actual stored value of E must be modified in some way to indicate whether the exponent is positive or negative. In addition, the complete code must contain an indication of the overall sign of N.

The exponent part E is normally allocated one hexadecimal byte, then the standard method of coping with negative vaues of E is to offset E by +80H. This means that if E=1 it will be stored as 81H, and if E=−1 it will be stored as 7FH. In such a case, the range of values of E that can be handled by a machine is from +127 (stored as FFH) down to −128 (stored as 00H).

If the exponent base is chosen as 2 or a power of 2, F will be stored as a binary fraction. If the exponent base is in fact 2, the limits on the value of F become $(0.5 =< F < 1.0)$ and F must then always be computed as a binary fraction with its top bit set. For example:

F=0.75D=.1100 0000B (for a 1-byte fraction)=.C0H

The standard method of indicating the overall sign of a number is to put a sign bit somewhere in the code. It's usual to set this bit to 0 for positive numbers, and to 1 for negative numbers, although sometimes the opposite convention is used. In a base two system, the top bit of F is a very convenient location to choose for the sign flag, as it may always be assumed 1 in the actual computation of the size of the number whatever the setting of the sign flag. This trick is very common and saves having a specially reserved bit for the sign flag.

Whichever conventions are adopted to deal with negative exponents and negative numbers, it's always necessary to deal with the number 0 as a special case because 0 cannot be constructed from permissible values of E or F in the above model. The standard method of flagging 0 is to set the exponent byte of the code to 00. The range of E that can be handled normally is then reduced by one and, with an offset of 80H, is from +127 (stored as FFH) to −127 (stored as 01H). (In many floating point — FP — packages which adopt this convention, those very small numbers which should be coded with an exponent byte of 00H are in fact coded as might be expected, but are subsequently treated as 0 by the machine.)

The precision with which the number N can be coded is governed entirely by the number of significant bits in F. In a base two system all the bits in F are always significant; for example, a three-byte fraction offers a precision of one part in 2^24, and a seven-byte fraction offers a precision of one part in 2^56. These two examples were chosen deliberately because the majority of small computers use an exponent base of 2 and one or both of these fraction lengths. Expressed in decimal notation, three bytes give an internal precision of seven significant figures (sf), and seven bytes give an internal precision of 17sf. These are the norms for 'single-precision' and 'double-precision' packages respectively. Other fraction lengths and bases are sometimes used and give different precisions, as will be seen below.

The input routine which accepts numbers from the keyboard, or from a program in decimal form, and converts them to FP code form, should be able to handle the maximum number of significant decimal digits that can be coded internally. The output routine, which takes stored numbers in FP code form and converts them to decimal form, will normally round off to at least one significant decimal digit less than is handled internally to allow for the small errors which occur during binary-

| | | | EE | F1 | F2 | F3 | |
|---|---|---|---|---|---|---|---|
| N = +L! | = + (2^127)*(1−256^−3) | codes as | FF | 7F | FF | FF | sign bit set to 0 |
| N = +6 | = + (2^3)*(0.75) | codes as | 83 | 40 | 00 | 00 | |
| N = +4 | = + (2^3)*(0.5) | codes as | 83 | 00 | 00 | 00 | |
| N = +pi | = + 3.141593 | codes as | 82 | 49 | 0F | DB | |
| N = +1 | = + (2^1)*(0.5) | codes as | 81 | 00 | 00 | 00 | |
| N = +0.25 | = + (2^−1)*(0.5) | codes as | 7F | 00 | 00 | 00 | |
| N = +S | = + (2^−127)*(0.5) | codes as | 01 | 00 | 00 | 00 | |

*Fig 1 Establishing the overall code pattern for positive numbers*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N = −L! | = −(2^127)*(1−256^−3) | codes as | FF | FF | FF | FF | sign bit set to 1 |
| N = −6 | = −(2^3)*(0.75) | codes as | 83 | C0 | 00 | 00 | |
| N = −4 | = −(2^3)*(0.5) | codes as | 83 | 80 | 00 | 00 | |
| N = −pi | = − 3.141593 | codes as | 82 | C9 | 0F | DB | |
| N = −1 | = −(2^1)*(0.5) | codes as | 81 | 80 | 00 | 00 | |
| N = −0.25 | = −(2^−1)*(0.5) | codes as | 7F | 80 | 00 | 00 | |
| N = −S | = −(2^−127)*(0.5) | codes as | 01 | 80 | 00 | 00 | |
| The number 0 (special case) | | codes as | 00 | XX | XX | XX | |

*Fig 2 Establishing the overall code pattern for negative numbers*

| | | F7 | F6 | F5 | F4 | F3 | F2 | F1 | EE |
|---|---|---|---|---|---|---|---|---|---|
| N! = −1 (single-precision) | codes as | | | | | 00 | 00 | 80 | 81 |
| N# = −1 (double-precision) | codes as | 00 | 00 | 00 | 00 | 00 | 00 | 80 | 81 |
| N# = +3.141592653589793 | codes as | BE | 68 | 21 | A2 | DA | 0F | 49 | 82 |
| L! = +1.701411733E+38 | codes as | | | | | FF | FF | 7F | FF |
| L# = +1.701411834604692E+38 | codes as | F4 | FF | FF | FF | FF | FF | 7F | FF |
| S# = +2.938735877055719E−39 | codes as | 06 | 00 | 00 | 00 | 00 | 00 | 00 | 01 |

*Fig 3 Typical code patterns*

decimal conversion processes.

A coding system for floating point numbers, when constructed on the basis outlined above, will use one exponent byte and sufficient fraction bytes to achieve the decimal precision required. These bytes must be stored in a particular order on any one machine, but there is no settled convention between machines on this point and many patterns are found. As a starting point, we'll construct a hypothetical four-byte FP coding system to illustrate the principles outlined above in the simplest possible way. Various systems from a representative range of microcomputers, which all differ in some way from the simple model, will then be described one by one.

## Code patterns

Here is a simple, hypothetical four-byte coding system. The exponent base is 2, and the code consists of one exponent byte, EE, and three fraction bytes — F1, F2 and F3 (F1 being the most significant of the three). They are stored in memory in that order (that is, EE F1 F2 F3) with EE at the lowest location. EE=(E+80)H, and the top bit of F1 is computed as 1 and also used as the sign flag (1=negative).

The largest negative number that can be handled is represented by the code set FF FF FF FF, and its positive equivalent by the set FF 7F FF FF. The magnitude of this number, which will be labelled L! to indicate that it's the large magnitude limit of a single-precision system with a three-byte fraction, works out to:

L!=2^+127*(1 — 256^−3)=1.701411 (733192644)*10^+38 (to 16sf)

The smallest negative number that can be handled is represented by the code set 01 80 00 00, and its positive equivalent by the set 01 00 00 00. The magnitude of this number, which is the same for any number of fraction bytes, will be labelled S and works out to:

S=2^−127*(0.5) =2.938735 (877055719) *10^−39 (to 16sf)

0 is flagged by setting the exponent byte to 00, and any set of code with an exponent byte 00 is treated as zero.

By inserting a few other values between +L! and +S, the theoretical overall code pattern for positive numbers can be established as shown in Fig 1. The same sequence of negative numbers gives the codes which are shown in Fig 2.

With three fraction bytes, the precision of this hypothetical package is normally designated as 7sf internally and 6sf printed out. Microsoft Basic is used in various versions on many microcomputers and I've tested it on the Apricot, NEC PC-8800, Sirius and Epson QX-10. The exponent base is 2, and the standard conventions are used for exponent offset, sign flag and zero flag as outlined previously. However, the FP code bytes are stored in reverse order in memory compared with the hypothetical model above, and two levels of decimal precision are offered using four-byte (single precision) and eight-byte (double precision) codes. The four-byte mode produces the same codes as the hypothetical model but stores them in a different order. The eight-byte mode uses one exponent byte and seven fraction bytes; the large magnitude limit is therefore marginally higher than in the single-precision mode, and works out to:

L# = 2^+127*(1−256^−7) = 1.701411834604692*10^+38 (to 16sf)

The short list of code patterns in Fig 3 is typical of the results obtained on the various machines using this package.

The last two lines reflect the fact that the theoretical codes for double-precision limiting numbers can't be produced by keying-in only 16sf. By keying in 17 or 18sf it's always possible to get closer to those codes and on the Apricot and Sirius the theoretical codes can be produced exactly with 17sf (. . . 6923E+38 and . . . 7188E-39).

On the NEC PC-8800 (and the Epson QX-10 in single-precision), it was found that some very small numbers just above the small magnitude limit are coded and printed out as 0 when input directly from the keyboard; although such numbers will be handled satisfactorily if they occur in the course of internal calculations and will then be printed out correctly. In such cases the small limit for input from the keyboard, denoted S(K), is:

S(K) = 9.403954 (806578301) E-39 (to 16sf)

The factor between the input small limit S(K) and the internal small limit S# (see last line of Fig 3) is exactly 3.2. This is unlikely to be a mere coincidence, and obviously has something to do with the way in which variable values are read into the FP system. In those packages where S(K) applies, a programmed single-precision input of (1/3.2) *9.409355E-39 will code correctly and will be printed out as 2.93874E-39. The same technique will work in double-precision using the full value of S(K).

As may be seen from the examples already discussed, the input routine in this package handles at least 7sf (four-byte) or 17sf (eight-byte), and sometimes more. The designated levels of output precision are 6sf (four byte) or 16sf (eight-byte). The magnitude range, if mentioned at all, is often given by a rather vague statement of the type: 'Numbers may be in exponent form, up to E±38.' It would be helpful if the magnitude range were stated exactly, or at least more precisely (for example, as 1.701E+38 down to 2.939E-39).

Crystal Basic contains a single-precision four-byte FP package, which codes to the same format as the single-precision Microsoft FP option with the same theoretical magnitude limits. The practical large magnitude limit is very slightly different, and +1.70141107E+38 codes as FB FF 7F FF, but the input small magnitude limit exhibits exactly the same features as those for the Microsoft-inspired N88-Basic on the NEC PC-8800. That is, an input of 2.938736E-39 will code and print out as 0, but an input of (1/3.2)*9.409355E-39 will code and print out as 2.93874E-39.

The input magnitude range is therefore 1.701411E+38 down to 9.403955E-39, and the package offers an internal precision of 7sf with 6sf printed out, which is typical of the FP packages in many small home micros. Versions 2.2

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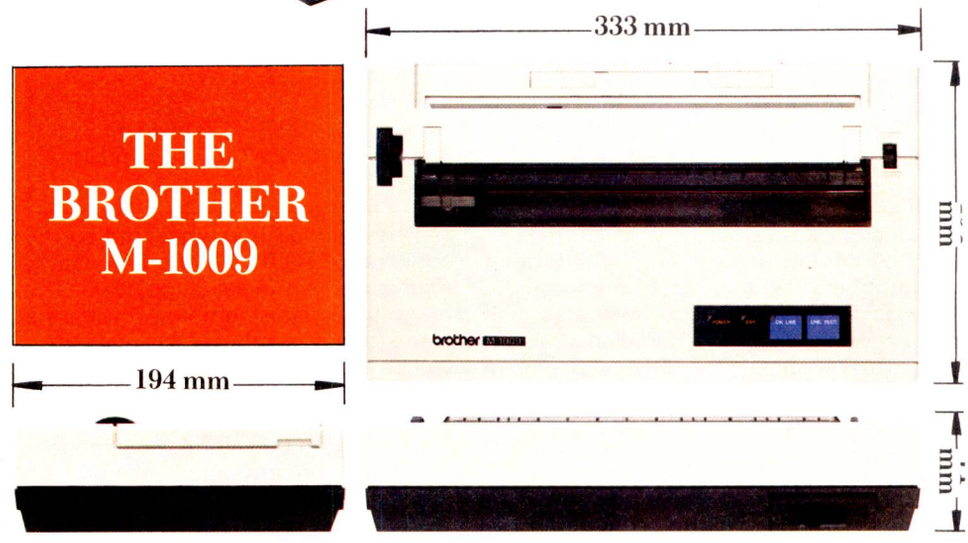


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and 3.1 are used extensively on Sharp micros, and Version 4.1 has recently appeared on the Tatung Einstein. It is interesting to note that Tatung is proposing to offer a supplementary machine code FP system, offering all the most common arithmetic routines with output to 15sf and automatic formatting to overcome the output limit of 6sf, which is a fairly severe handicap in financial programming.

BBC Basic uses an exponent base of two and the standard conventions for exponent offset and sign flag, but allocates four bytes to F and thereby achieves an internal precision of one part in 2^32 (better then 9sf). The code is laid out with exponent byte first, followed by the most significant byte of F. The large magnitude limit is slightly different from those previously encountered because there are four fraction bytes, and works out to:
L = 2^+127*(1−256^−4) = 1.701411834 (208551)*10^+38 (to 16sf)

The code pattern for positive numbers and zero is shown in Fig 4.

The equivalent negative numbers are coded by setting the top bit of F1. The last two examples in Fig 4 illustrate the fact that BBC Basic, unlike the packages previously mentioned, handles those numbers which code with an exponent byte of 00 and a valid value of F as non-zero numbers. The small magnitude limit is therefore S(0) = (2^−128)*(0.5+256^−4) instead of the more usual value S = (2^−127)*(0.5), and the code for the number 0 is five 00 bytes. Note that the input routine handles 10, and sometimes 11 significant decimal figures, and that by inputting to such precisions it's possible to produce the correct code patterns for the limiting numbers of the FP system on the BBC Micro. The designated output precision is 9sf.

Sharp Basic SP-5025 uses an exponent base of two, but is otherwise quite unlike any of those mentioned above. It uses the top bit of the exponent byte as its sign bit (one= positive). The remaining seven bits of this byte are used to store the exponent, offset by +40H. The top bit of F1 is set to 0 if N=0, and is set to 1 for all other numbers.

There are four fraction bytes, and the code is further complicated by its unusual storage order, which is:
N = (2^E)*(F) codes as EE F4 F3 F2 F1
where EE equals E+C0H for positive numbers, or E+40H for negative numbers, and F1 is the most significant byte of F and has its top bit set if N<>0.

In this package, the large and small magnitude limits are quite different from those of other packages because of the reduced range available for E, and they work out to:
L = 2^+63*(1 − 256^−4) = 9.22337203 (4707292)*10^+18 (to 16sf)
S = 2^−64*(0.5) = 2.71050543 (1213761)*10^−20 (to 16sf)

The overall FP code pattern for Sharp SP-5025 is shown in Fig 5.

The four-byte fraction gives an internal precision of one part in 2^32 (better than 9sf). The FP input routine in SP-5025 is unusual in that it will completely ignore any input beyond its designated limit of 9sf, and also because it doesn't allow the E notation. For these reasons, L and S could only be input in full (that is, with all necessary leading or trailing zeros) and to 9sf, and this produced the codes in Fig 5. (Attempts were made using the XXXX*10^nn format, but the ^ notation proved slightly inaccurate as is usual on small FP packages using base two.)

The designated output precision of Sharp SP-5025 is 8sf. Its magnitude range of 9.22337203E+18 down to 2.71050544E-20 is adequate for general purposes, but can cause difficulties in some scientific calculations. As all Sharp machines run on RAM-based interpreters, other packages are available to help overcome this problem.

NewBrain Basic is the most unusual package of all those tested here. The numeric base for the exponent E is 16 but as the stored exponents change in steps of two, the effective base as far the fraction F is concerned is 256. This means that none of the fraction bits may be used as a sign bit, since the limits of F in this case are (1/256 =< F < 1.0). The sign bit (one = negative) is therefore placed in the otherwise redundant bottom bit of the exponent byte. Negative exponents are stored in 256 complement form to give a theoretical range for E from +126 (stored as 7EH) down to −128 (stored as 80H). The exponent byte is followed by five fraction bytes, and zero is flagged by setting the top fraction byte F1 to 00. The theoretical magnitude limits are much wider than usual owing to the

| | | EE | F1 | F2 | F3 | F4 |
|---|---|---|---|---|---|---|
| L = + 1.7014118343E+38 | codes as | FF | 7F | FF | FF | FF |
| N = + 3.141592653 | codes as | 82 | 49 | 0F | DA | A2 |
| N = + 65535 | codes as | 90 | 7F | FF | 00 | 00 |
| N = + 65535.00001 | codes as | 90 | 7F | FF | 00 | 01 |
| S = + 2.938735877E-39 | codes as | 01 | 00 | 00 | 00 | 00 |
| S(0) = + 1.469367939E-39 | codes as | 00 | 00 | 00 | 00 | 01 |
| N = 0 | codes as | 00 | 00 | 00 | 00 | 00 |

*Fig 4 Code pattern for positive numbers and zero using BBC Basic*

| | | EE | F4 | F3 | F2 | F1 |
|---|---|---|---|---|---|---|
| N = +L | codes as | FF | FD | FF | FF | FF |
| N = +6 | codes as | C3 | 00 | 00 | 00 | C0 |
| N = +1 | codes as | C1 | 00 | 00 | 00 | 80 |
| N = +0.5 | codes as | C0 | 00 | 00 | 00 | 80 |
| N = +S | codes as | 80 | 07 | 00 | 00 | 80 |
| N = 0 | codes as | 80 | 00 | 00 | 00 | 00 |
| N = −L | codes as | 7F | FD | FF | FF | FF |
| N = −6 | codes as | 43 | 00 | 00 | 00 | C0 |
| N = −1 | codes as | 41 | 00 | 00 | 00 | 80 |
| N = −0.5 | codes as | 40 | 00 | 00 | 00 | 80 |
| N = −S | codes as | 00 | 07 | 00 | 00 | 80 |

*Fig 5 Overall FP code pattern for Sharp SP-5025*

| | | EE | F1 | F2 | F3 | F4 | F5 |
|---|---|---|---|---|---|---|---|
| N = +2.0458691298E+150 | codes as | 7E | 09 | FF | FF | FF | F1 |
| N = +1E99 | codes as | 54 | 01 | D4 | 2A | EA | 28 |
| N = +65536 | codes as | 06 | 01 | 00 | 00 | 00 | 00 |
| N = +256 | codes as | 04 | 01 | 00 | 00 | 00 | 00 |
| N = +1 | codes as | 02 | 01 | 00 | 00 | 00 | 00 |
| N = +0.25 | codes as | 00 | 40 | 00 | 00 | 00 | 00 |
| N = +1/256 | codes as | 00 | 01 | 00 | 00 | 00 | 00 |
| N = +1/65536 | codes as | FE | 01 | 00 | 00 | 00 | 00 |
| N = +1E−99 | codes as | AE | 8B | FB | EA | 76 | CC |
| N = +1E−128 | codes as | 96 | 6E | E8 | 23 | 3E | 42 |
| N < +1E−128 | codes as | 00 | 00 | 00 | 00 | 00 | 00 |
| N = +0 | codes as | 02 | 00 | 00 | 00 | 00 | 00 |

*Fig 6 Overall code pattern for positive numbers and zero using NewBrain Basic*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| N = −2.0458691298E+150 | codes as | 7F | 09 | FF | FF | FF | F1 |
| N = −0.25 | codes as | 01 | 40 | 00 | 00 | 00 | 00 |
| N = −0 (as keyed in) | codes as | 03 | 00 | 00 | 00 | 00 | 00 |

*Fig 7 Odd exponent bytes*

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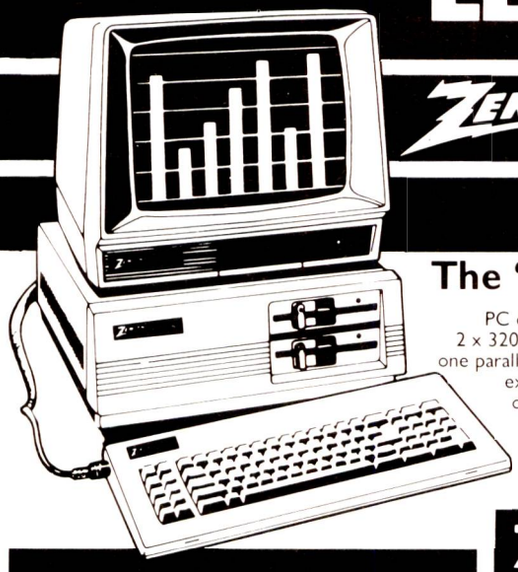

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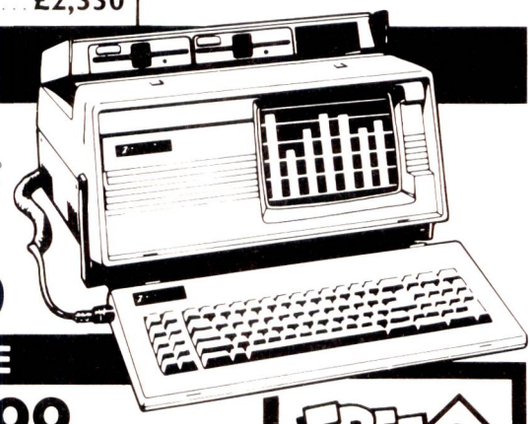

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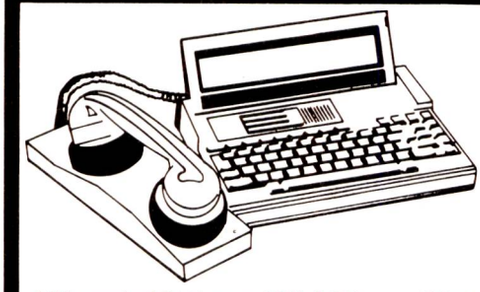

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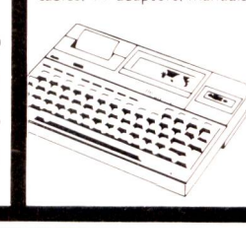



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base of 16 and work out as follows:
L = 16^+126*(1 − 256^−5) = 5.237424972629069*10^+151 (to 16sf); and
S = 16^−128*(1/256) = 2.9134143481250 94*10^−157 (to 16sf)

The NewBrain handbook clearly states that inputs are permitted up to E±99, and that internally the machine will handle up to E+150 (the internal limit for E− is not stated). By using expressions of the type N = XXXXXX*E±99 the machine could be forced to accept and code values beyond E+99, although it would not print them out. It was established that the input magnitude limits are 2.0458691298E+150 and 1E−128, and that inputs smaller than 1E-128 are coded as six 00 bytes and treated as 0. The overall code pattern for positive numbers and zero is shown in Fig 6.

Note that the exponent byte for a positive number is always even. The overall pattern for the equivalent negative numbers differs from Fig 6 only in the exponent bytes, which are all one higher due to the sign flag being set and are therefore odd (Fig 7).

The input routine handles 11sf and the internal precision is stated as '10 or more sf'. This variable precision arises from the fact that the number of significant bits available in the fraction F is not constant but varies between 33 (10sf) and 40 (12sf), depending on the position of the first significant bit. In the worst case, the NewBrain offers marginally higher internal precision than the BBC and Sharp SP-5025, and a much wider magnitude range, at the cost of one extra byte per variable.

The NewBrain prints out a rather conservative 8sf and the practical magnitude limits are well within its theoretical capabilities. At the top end, where one might expect that the fraction F will code up to a 'full house' of FFs, the top byte of F will not go above 09H. The reason for this particular limit is not obvious. At the bottom end the limit of exactly 1E-128 is obviously deliberate, and gives the impression that it may have been part of some original specification for the machine.

Sharp double-precision disk Basic SP-6115 uses a base of 10 for the exponent and BCD coding for the eight bytes of the fraction F, each byte storing two decimal digits. The top bit of the exponent byte is used for the sign flag (one = negative), and the remaining seven bits of the exponent byte store the exponent offset by +40H. The bytes are stored in the order:
F1 F2 F3 F4 F5 F6 F7 F8 EE

The 'fraction' represented by F1-F8 is in fact a whole number, and the imaginary decimal point occurs to the right of F8. As F is not limited to the range (0.1 => F >1.0), there's more than one possible code set for any number with less than 16 significant digits. 0 is flagged by setting the exponent byte to 00. The primary code pattern for positive numbers and zero is shown in Fig 8. The equivalent negative numbers are coded by setting the top bit of EE.

SP-6115 was used to check all the 16-figure numbers given in this text. In the course of performing these checks, a bug was found when calculating numbers small enough to force the machine to print out an answer in negative E format. The fault occurs when dividing, if the first significant figure of the numerator is smaller than the first significant figure of the denominator. In such a case, the first BCD digit of F1 is a non-significant 0 and the negative exponent in the answer is printed out one less than it should be, even though the code stored is arithmetically correct. Thus, for example, 1/(2E20) codes as 05 00 00 00 00 00 00 00 1D (right) and prints out as 5E-20 (wrong), whereas 4/(2E20) codes as 20 00 00 00 00 00 00 00 1D (right) and prints out as 2E-20 (right).

The bug can be dealt with in Basic by asking the machine to print out the answer multiplied by one: 1/(2E20)*1 codes as 50 00 00 00 00 00 00 00 1C (right) and prints out as 5E-21 (right).

The stored code for 1/2E20 in the first case is not the same as the stored code for 1/2E20 in the second case, although both are correct arithmetically speaking. This is an example of the possibility that a number may have more than one valid code set in this package. Since the fault does not occur when similar calculations give rise to answers printed out in full (which SP-6115 does up to E±15), or when the answer is printed out in positive E format, it appears that the problem arises in the FP output routine when it's asked to read codes which have leading zeros in the fraction, and also imply printed output in negative E format. It's interesting to note that the Basic trick of multiplying by one gets round this bug by scaling the code so that the leading 0 disappears.

An FP package cannot be used to calculate its own magnitude limits. For this reason SP-6115, with its precision of 16sf and its relatively wide magnitude range of 9.999999999999999E+78 down to 1E-48, was found to be extremely useful for calculating the theoretical limits of other packages; likewise those for the NewBrain, which were done by asking SP-6115 to calculate powers of 1.6 instead of 16, and then applying the appropriate correcting factor in powers of 10. As a check, 2^63 and 2^127 were calculated by hand, and SP-6115 was found to be accurate in both cases. For the record, the results are shown in Fig 9.

In general terms, the decimal precision of any FP package which uses an exponent base of 10 and a BCD coded fraction is defined for both input and output by the number of significant BCD digits in the fraction. In this particular package, certain arithmetic procedures may lead to results which code with leading zeroes in the fraction and thereby lose a corresponding number of significant figures. Such procedures were carefully avoided throughout, and on the evidence of the above figures it seems reasonable to assume that all the 16sf limits calculated under SP-615, and included in this article, are accurate.

A short Basic program will find the FP code pattern for your micro. The number to be input is defined as the first variable, and then the stored code for this variable is located, PEEKed out byte by byte, and printed onscreen. If your Basic includes the command VARPTR the program is very easy, as VARPTR will, on most machines, point to the lowest byte of the FP code for the specified numeric variable:

```
10 INPUT "Decimal number"; AA
20 PRINT:PRINT "AA = ";AA;" codes
   as";
30 FOR L=0 TO 3:
   N=PEEK(VARPTR(AA)+L)
40 PRINTN;" ";
50 NEXT L
60 PRINT:PRINT:GOTO 10
```

This program is for four-byte code. The variable L in line 30 should be adjusted if necessary to suit your code.

| | | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | EE |
|---|---|---|---|---|---|---|---|---|---|---|
| +9.999999999999999E+78 | codes as | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 7F |
| +1234567890123456 | codes as | 12 | 34 | 56 | 78 | 90 | 12 | 34 | 56 | 40 |
| +1 | codes as | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 01 | 40 |
| +0.1 | codes as | 10 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 30 |
| +1E−48 | codes as | 10 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 01 |
| 0 | codes as | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |

*Fig 8 Primary code pattern for positive numbers and zero using Sharp SP-6115*

2^63 by hand = 9223372036854775808
2^63 by SP-6115 = 9.223372036854776E+18
2^127 by hand = 170141183460469231731687183715884105728
2^127 by SP-6155 = 1.701411834604692E+38

*Fig 9 Results of calculating powers by hand and using SP-6115*

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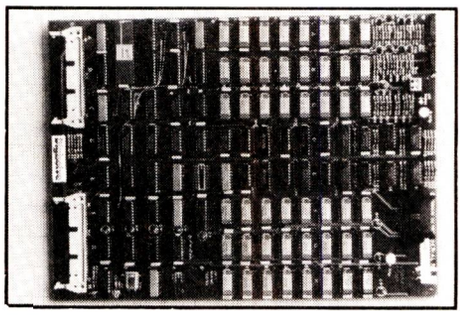

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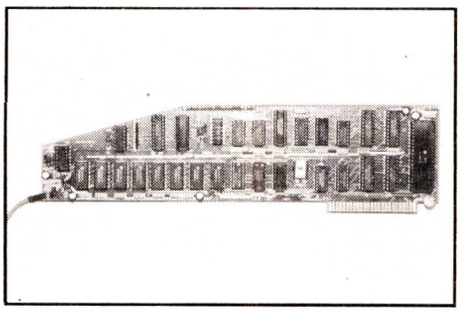

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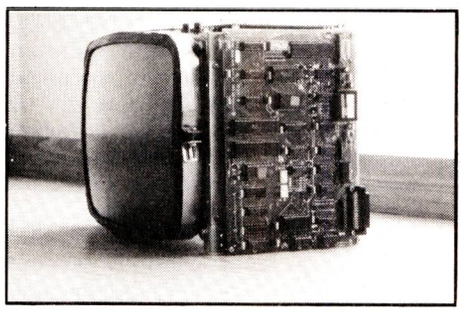

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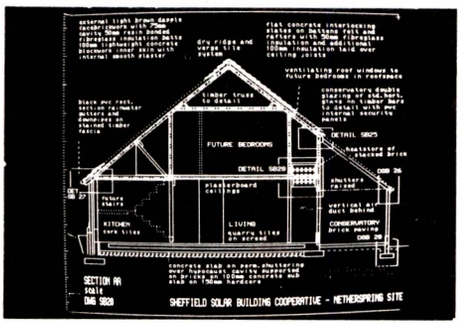


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If you're not sure how many bytes your machine uses for its FP code, a little trial and error with a known variable such as pi will soon establish this point. If your machine has HEX$ as well as VARPTR you can change lines 30-40 to give a printout in two-character hexadecimal instead of decimal:

```
30 FOR L=0 TO 3:N$=
    HEX$ (PEEK(VARPTR(AA) + L)): IF
    LEN(N$) + 1 THEN N$ '= "0" + N$
40 PRINT N$;" ";
```

If your machine does not have VARPTR things are a little more difficult, and it may help to know how the names of numeric variables are stored. The usual method with two-character names is to convert each letter to its ASCII hex code and store the results in two bytes immediately before the FP code. A one-character name will, in this case, still occupy two bytes, the second being set to 20 H. In a multiple-precision package, the name bytes will be preceded by one extra byte denoting the length of the associated FP code. If your package allows long variable names, the name will occupy more than two bytes. For example, in some of the versions of Microsoft Basic tested here, the first two name bytes are coded as before, but the third name byte carries a count of the number of extra name bytes which follow, and each of these is stored in ASCII hex with its top bit set.

Whatever method is used to store variable names, another easy method of locating the FP code in memory is to use the machine's internal pointer to the start of the numeric storage area, which will normally locate the name of the first numeric variable in a program. Sharp SP-5025 stores this pointer at 4640H (17984D), SP-6115 stores it at 5CBAH, and Crystal Basic 2.2 stores it as documented for the machine in question. PEEK the pointer locations, multiply the hi byte by 256 and add the lo byte, and you have the decimal location of the stored name of the first variable; correct this location to skip the name and you'll find the FP code. The new line 25 does this for a system where the name code occupies two bytes, and line 30 is changed to PEEK from that location upwards:

```
25 P = 256*(PEEK(Hi))+PEEK(Lo)+2
30 FOR L = 0 TO 3:N=PEEK(P+L)
```

If you have no idea where the first variable is stored, you must find it by some other method as I did on the BBC and the NewBrain. The BBC handbook shows that any Basic program starts at 3584D, so a short program was written to accept a keyboard variable and then PEEK 100 locations starting at 3584D. This was run in the 80-column mode with an input 3.1415926536, and the printed output was then scanned to find the top of the tokenised program text. A few bytes above it, as had been hoped, sat the recognisable FP code for pi in five bytes. At this stage the listing was as follows:

```
10 INPUT"DECIMAL NUMBER? "AA
20 PRINTAA;" CODES AS";
30 FORL=0TO4
40 N=?(3689+L)
50 PRINTN;
60 NEXT
70 PRINT:PRINT
80 GOTO10
```

This program was later modified by adding a subroutine, called between lines 40 and 50, to change N to a two-character hexadecimal string N$ and by printing out N$ instead of N in line 50. Any change in the length of the program creates a new value for the location in line 40, but it isn't difficult to keep track of this when the original location has been found.

## Conclusion

For brevity, all limits quoted here are given to 6sf. In all cases they are taken from more exact figures quoted during this article.

The theoretical magnitude range that can be handled internally by a conventional FP package with an exponent base of 2 and a full exponent byte is 1.70141E+38 down to 2.93874E-39. In some versions of Microsoft Basic (for example, NEC PC-8800) and in Crystal Basic, the FP input small limit is 9.40396E-39, although numbers down to 2.93874E-39 are still handled internally. Later versions of Microsoft Basic (Sirius, Apricot) will accept inputs down to 2.93874E-39. The Epson QX-10 is strange here, as it exhibits one of these small limits in single-precision and the other small limit in double-precision. The BBC Micro also has an exponent base of 2 and a full exponent byte, but codes down to 1.46937E-39 because any code set with a zero exponent byte and valid fraction bytes is treated as a non-zero number.

The NewBrain has a much larger range, from 2.04586E+150 down to 1.00000E-128, because its exponent base is 16 instead of 2. (Theoretically, the NewBrain should be able to handle an even wider range, from 5.23742E+151 down to 2.91342E-157.)

Sharp SP-5025, on the other hand, has a much smaller range, from 9.22337E+18 down to 2.71050E-20, because the top bit of its exponent byte is used as a sign flag. To compensate, Sharp offers a double-precision disk Basic SP-6115. This operates with an exponent base of 10 and thereby achieves a range from 9.99999E+78 down to 1.00000E-48. Unfortunately, this otherwise very useful package has a bug in it which produces a factor of 10 error in a printed answer (but not in the internal FP code) under certain circumstances. In Basic, this bug may be avoided by a somewhat tedious though simple trick, but a good machine code patch to remove the bug altogether would be very welcome.

The standard type of FP package used on many small machines uses a three-byte fraction to give 6sf printed out, which is inadequate for small business applications and many scientific purposes. The standard solution in the past has been to offer a double-precision option which uses a seven-byte fraction to give 16sf printed out. The disadvantage of this on a small micro is that the FP code for each double-precision number takes up eight bytes of storage space, and *all* numeric variables carry one extra label byte.

Alternative approaches have been adopted on Sharp, NewBrain and BBC computers, where different compromise solutions have resulted in one-precision FP packages giving outputs to 8 or 9sf by using five- or six-byte FP codes. Another possibility is being explored on the Einstein, where a supplementary machine code package extends the output precision of Crystal Basic from 6sf to 15sf. All the packages tested (except SP-6115) accept FP inputs to a higher precision than that designated for FP outputs; in SP-5025 this difference is deliberately limited to one digit.

If your Basic has the function VARPTR, or if you know where the FP code for the first defined variable is stored, simple programs such as those given here will reveal how your machine codes FP inputs. Otherwise you could write a short provisional program variable such as pi, and then finalise the program by trial and error. Once the program is running correctly, it will help you to learn a lot more about your FP coding system.

In the course of preparing this article, I examined a number of different methods of coding FP variables. The BBC package appears to handle FP codes very accurately within its own limits, and of all the packages tested offers the best compromise between range, precision and code length.

I suggest, however, that something like the BBC package, but with one extra fraction byte to give six bytes in all and output to 11sf is an even better compromise for small micros, and will avoid the code lengths and programming complications associated with double-precision options and specially defined variables.

*PCW*'s Benchtest of the Sinclair QL (September 1984) revealed that Sir Clive has fitted his latest micro with an FP package having a magnitude range of E±615 and a precision of 8sf. My reaction was to wonder how many bytes it takes to store a QL variable: I think the answer may be five. Can you work out why? Five may be the wrong answer, but the logic is interesting.




# Datatalk

*Transmitting data over the public telephone network can pose security problems. Datatalk is a communications package for the IBM PC and compatibles which has the built-in advantage of sophisticated encryption routines. Peter Bright investigates.*

Ever get the feeling that someone is watching you? Paranoia? Probably, but you can never be sure. If you use your micro and the public telephone lines to transmit important data to friends and colleagues, how can you be sure that no-one is eavesdropping on the line and stealing your data?

Up until now there has been very little micro users could do to protect their data. Mini and mainframe installations can afford expensive private lines and encryption hardware, but such facilities are beyond the means of the average micro user.

Now a small company called Datasoft in Ilminster, Somerset, has come up with a combined terminal and data encryption package called Datatalk. This allows you to code your data and transmit it to colleagues safe in the knowledge that even if someone is listening, he won't be able to understand a word of what you're saying . . .

Datatalk runs on the IBM PC or compatibles and is supplied on one 5¼in distribution disk. It is available either with or without encryption: I tested the encryption version.

The code for the review system was contained in a file called DATACODE.EXE. This took up very nearly 100k, although the non-encryption version isn't quite as big.

When "DATACODE" is typed, the system displays the copyright banner and the serial number. As my copy was a one-off version, the sign onscreen also displayed my name — it's a great ego boost seeing your name in lights! The sign is displayed for a few seconds before the system goes into the top level menu.

Before we go any further it's worth pointing out that Datatalk uses a hierarchy of menus to issue commands. Commands are selected by *highlighting* the word in the menu hitting RETURN. In practice, this is very much like the system used in Lotus 1-2-3. To move the cursor to the word you either type the first letter of the command, or use the cursor keys or the space bar to move the cursor to the desired command. ESCape will usually get you back to the previous level.

Datatalk also makes use of the IBM's function keys. Hitting F1 at any time opens up a context-sensitive help window. The set-up of the other function keys varies according to where you are in the package, but F8, for example, will usually get you a disk directory.

It's possible to assign strings of up to 40 characters to the function keys. Because the system uses the unshifted function keys for system commands, you can only assign strings to SHIFTed function keys. As well as assigning strings, you can also assign control or escape sequences to a function key. This makes it very easy to set up, say, log-on sequences.

You can save different sets of function key settings in disk files, so you can re-assign function keys simply by calling up a new file.

The top level menu has six options — Setup, Editor, Transfer, Monitor, Data-Code and Terminal.

Selecting 'Setup' brings up a submenu which lets you play around with the baud rate, word length, stop bits and parity of the RS232 communications line. In addition to the normal baud rates, the evaluation copy of the software also allowed me to work at 1200/75 and 75/1200 baud. This is unusual because the RS232 controller on the IBM can't strictly run at split baud rates in full duplex. Data can be lost if it attempts to send and receive data at the same time, so I wasn't inclined to use it.

You can store a number of system and function key settings in disk files so that you can recall them easily if different remote systems need different settings.

'Monitor' allows you to set up the system to work with either IBM monochrome, colour or black & white composite monitors.

Unusually for a communications program, Datatalk is supplied with a built-in 'Editor'. Once the editor has been selected from the main menu, the system opens up three windows. The top window shows a portion of the current text in the editor, the middle window is a menu and the bottom window shows the status of the editor. My version of the software had a nasty habit of flashing 'TEXT EDITOR IS EMPTY' when I entered the editor, something I found extremely annoying.

The menu window gives you the option of loading or saving a disk file, entering the editor screen, or clearing the contents of the editor.

Whenever you are loading a file, you have the option of typing 'DIR' instead of the filename. This opens up a new window which displays a directory of the current disk; you can then happily scroll through the list of files until you highlight the required file. If you hit RETURN, the filename you selected will be written into the command lines.

An interesting feature of the review system was its use of illegal filenames. For example, you could happily create a disk file called 'FR ED', save it and call it up later. However, if you went into DOS and tried to do anything with the file you would get a 'File Not Found' error. Far from getting annoyed with this 'bug', I found it useful because no-one else could read nor delete my files.

The editor screen is entered by selecting EDIT from the menu. The editing window displays 75 characters by 13 lines in reverse video (that is, white on black). This idea looks pretty, but because there is a great deal of white on the screen, I found that it flickered more than usual which was very distracting.

The editing facilities are extremely basic. Although the document window can only show 75 characters by 13 lines, the editor can actually hold up to 256 characters by 200 lines. Extended cursor control facilities are provided so

that you can use the editing screen as a window on the document as a whole.

You can insert and delete characters and lines, but no block functions are available, so you can't do block deletes, for example.

All in all I found the editor adequate for knocking up messages for remote systems. Its great advantage is that you can enter it while you are still logged on to the remote system. I got into the habit of logging on, preparing replies locally, and then downloading them. This was much easier than fighting the strange line editors which Telecom Gold and TBBS provide.

'Terminal' mode provides all the features you would expect of a modern micro terminal emulation program. When it is selected, the top 23 lines of the screen display the input from the remote system and the 24th line is used to display status.

The two most useful keys when you are in terminal mode are F8 and Alt-F10. F8 calls up the main menu, so you can change the comms settings, use the editor, and so on while remaining online to the remote system. If the remote system sends you data while you are doing something else, Datatalk buffers it up and displays it when you return to the terminal screen.

Alt-F10 finishes with terminal mode and returns you to the main menu. I was expecting the command for this to be ESCape, just as it is for most other things. However, some remote systems need ESCape, so you can't use this as a local command.

In addition to the basic terminal functions, Datatalk also has very comprehensive facilities for uploading and downloading disk files to and from remote systems.

At the lowest level, you can echo data to the printer or to a disk file for later processing. You can also easily send the contents of an ASCII disk file to a remote system.

Datatalk makes use of the XModem file transfer protocol. This very commonly used data checking protocol allows you to transfer binary .COM or .EXE files as well as normal ASCII files. I tried it with an ACT Apricot running Async and it worked well.

If you are transferring files between two machines which both use Datatalk packages, you could also use the Datatalk protocol. This has the advantage of allowing multiple files to be transferred using ambiguous filenames: for example, if you wished to transfer all .COM files, you could specify *.COM. I didn't test this because I only had access to one IBM PC during the review.

## Encryption

As more and more people use the telephone lines to transmit important data, so the incentive increases for people to eavesdrop on the line and steal data. Encryption gets around this problem by encoding the data so that it doesn't make sense and is extremely difficult to decode. Unfortunately it has previously only been applied in expensive mini and mainframe applications; nothing to my knowledge has been available for micros.

The people at Datasoft first developed Datatalk as a communications package for the medical profession. This application required a high degree of security to be built into the system to ensure that eavesdroppers could not read patients' records.

Understandably Datasoft isn't too keen to talk about how the encoding algorithms work except to say that they use a 'two keyshifting substitution' method. This works by generating an encryption table and then applying that and a user-defined key to the unencrypted data. The result, according to Datasoft, is a datafile that is unconditionally secure as long as the file isn't any longer than 10k.

Assuming that you are a new user of the system, the first thing to do is to create an encryption table, of which there are two different types: text and data. Text mode can only deal with ASCII characters — it doesn't handle control characters or binary files. Generally the only time you would use this kind of table would be when your communications system could only handle ASCII data. While this method is secure, it isn't as secure as a data mode table. Data mode tables can handle all kinds of data ranging from ASCII to binary .COM and .EXE files.

Both types of table are created in exactly the same way. First of all, you select 'Table' from the encryption sub-menu, then you select the 'Generate' option. The system then asks what type of data table you want to create, and goes on to ask for a 'Table Creation Key'. This can be anything up to a 40-character string and is used as the basis for the encryption table. After you have entered the key, the system thinks for a while (my Olivetti took just under a minute, but IBMs can take up to three minutes).

While it is thinking, the system is actually using complex (and secret) algorithms to generate the encryption table. When it has finished, it asks for a filename and saves the table to disk. The disk files always take up 10241 bytes — no more, no less.

You can generate any number of different encryption tables; the only restriction being disk space and the fact that you can loose track of which tables you are using. You can load a new table into the system at any time.

In addition to the encryption table, you also need to have an 'encryption key' — another string of up to 40 characters. When you encrypt the file, the system combines the key, table and your file to produce the encrypted file. You can change the key at any time but, unlike the encryption tables, keys aren't stored on disk. You can only successfully decrypt a file if you use the same table and key which were used when it was encrypted, so it isn't a good idea to forget the key.

Encrypting and decrypting files is very straightforward. The first thing to do is to look at the status screen to ascertain that you have the correct encryption table and key installed in the system.

To encrypt the file, you simply select 'ENCRYPT'. The system asks which file you want to encrypt and then asks for a filename for the encrypted file. The encryption process is surprisingly fast: it encrypted a 20k WordStar WS.COM program file in 23 seconds. The encrypted files always end up the same length as the original, but the structure is totally incomprehensible.

Decrypting a file is just as straightforward as encrypting; the only problem is to make sure that you are using the right table and key. If you choose the wrong ones, the system won't tell you but the decrypted file will be gibberish. Decryption takes about the same amount of time as encryption.

## Documentation

The documentation supplied with the review system was a professionally presented typeset 30-page booklet. The trouble was that although it looked nice, it was badly written. At the time of writing, Datasoft was well aware of these problems and was planning to rectify them. Fortunately, I found that the context-sensitive help screens were very useful, so by and large I didn't have to refer to the manual.

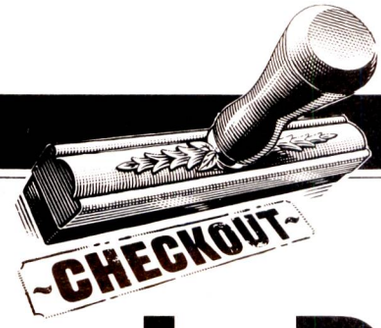
## Conclusion

I liked Datatalk a great deal. As a communications/terminal package it is average, but with the addition of the encryption algorithms Datatalk goes a level above its competitors.

Most people agree that communications is becoming a major growth area in computing. It is also agreed that as the use of public telephone lines for micro communications grows, so does the likelihood of people eavesdropping on the line. Datatalk provides an effective method of protecting transmitted data. It would also be useful in a normal office environment where you might want to protect sensitive data or secret programs from prying eyes.

In use Datatalk had a couple of minor quirks. The screen can get very cluttered and confusing when you have four or five different windows open simultaneously, and there's also an overdose of inverse video flashing error messages. But overall these quibbles are outweighed by the sheer usefulness of the package.

*Datatalk is manufactured by Datasoft of East Street, Ilminster, Somerset and distributed by Thorn EMI. The encrypted version costs £225 and the unencrypted version £135 (ex VAT).* END




# Koala Pad

*Martin Banks draws your attention to the Koala Pad, a touch-sensitive graphics unit for the Commodore 64 which allows aspiring computer artists to draw quality pictures easily.*

Have you ever looked at someone else's computer-generated graphics and said to yourself: 'I wish I could do that . . .', and then given up on the idea because of the amount of program coding needed to achieve worthwhile results? I have. I've looked at some of the clever graphics around and thought it would be fun to try, if only it could be done more quickly and easily than the techniques currently presented.

The Koala Pad is an extremely simple device which enables graphics to be implemented with the utmost of ease, with virtually no tricks or skills to learn and with results that are interesting and entertaining, even for absolute beginners. The Pad has some weaknesses, but then it's not intended to be a professional 'hi-tech' device.

It is particularly aimed at the home and hobbyist market, and interfaces directly with the Commodore 64, the Atari range, the Apple II and the IBM PC in the US. As can be seen from the latter systems it has pretensions towards business use, although its capabilities might be found to be wanting if put to serious use. In the UK the Pad is marketed by Audiogenic, which is concentrating its efforts on the Commodore 64 market for now, and it's this machine which was used in the review.

## Hardware

The Koala Pad is manufactured by Koala Technologies Corp of California. The hardware consists of a touch-sensitive pad which measures 3.5ins by 4ins. This sits in a case measuring 6.5ins by 8ins which incorporates two keys, both of which perform the same function. The case is designed to be held in one hand (either left or right) with the thumb over the adjacent key. The other hand is then free to work with the pad area, either with the stylus provided, a finger, or with any other reasonably pointed and hard object.




## Software

The software has been produced by Audio Light Inc of California. It takes the form of three packages — Koalapainter, Koalaprinter and the Instant Programmer's Guide. These are fairly self-explanatory, with the first intended for the production of graphics, the second provides hard copy output of the results of the first, and the third package is aimed at those hobbyists keen to interface the Pad to other programs.

Audiogenic has produced an Anglicised version of the Koalapainter package that incorporates a slightly different menu and minor modifications which allow 'circular' circles to be drawn; the American version produces slightly elliptical ones. The cassette tape forwarded by Audiogenic, and specifically checked out as OK, refused to load on the 64, so the test was conducted with the original American software shipped with the Pad. The company supplies in either audio cassette or floppy disk format, as required.

## In use

Getting started with the Pad is straightforward with the 64, as its input signals mimic those of a standard joystick. The Pad is simply connected to port one of the computer, the cassette is loaded into the player, and you're ready to begin.

Enter LOAD "KPAINT" in response to the prompt; after the tape has been started there's about a minute to wait before the READY prompt appears again. Key in RUN and wait a further five or six minutes. The main menu then appears. This consists of a number of separate boxes, all containing a different command or function collected together in a rectangle. This constitutes the system's display area which is surrounded by a coloured border.

Now is the time to pick up the Pad and stylus, and twiddle with the television's volume control. This is necessary be-

cause, when the main menu is displayed, there is a continual and annoying mixture of buzz and white noise. The sound should not be turned off, however. Pressing the stylus onto the Pad will produce a bleeping sound from the television, which indicates that you can select from the main menu or change to the drawing in progress.

Move the stylus up the Pad and an arrow cursor appears on the screen's display area. Locate this in any of the boxes, press one of the two keys and the function or command in the selected box will become the current task.

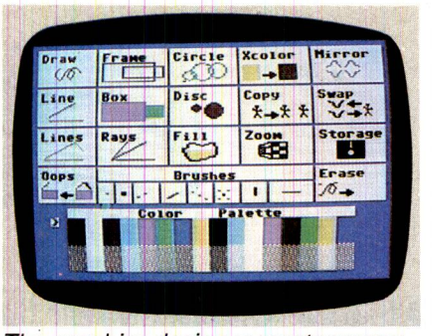
Here's how it works in practice. The boxes contain such commands as DRAW, FRAME, CIRCLE, XCOLOUR (change colour), MIRROR, LINE, BOX, DISC, COPY, SWAP, LINES, RAYS, FILL, ZOOM, STORAGE, OOPS, BRUSHES, ERASE and, at the bottom of the display, a rectangular colour palette with 32 different colours or shades. To get started, move the cursor to the DRAW box and press one of the keys on the pad. Next, move the cursor down to the bottom of the Pad until the bleeping is heard, when a key should be pressed again. This removes the main menu and leaves a blank display area inside the coloured border. Now move the cursor back up the screen into the display area; the arrow will appear accompanied by the selected command word, in this case DRAW.

Move the cursor to the point where you wish to start DRAWing, then press the key and keep it pressed; now move the cursor around and draw your picture. To move the cursor without drawing, either take the stylus off the Pad and relocate it or, more conveniently because you can see the movement, release the key until the cursor is in the right place. There are eight 'brushes' which can be selected for this purpose, all with a different effect. There's a narrow point for thin lines, broad brushes, and multiple brushes which allow you to draw several lines at once.

My major problem occurred when I placed the stylus on the Pad in DRAW command as it was impossible to keep the cursor still. The amount of movement was small, no more than a Commodore sprite or two, but the effect was tremendous. It was impossible to produce a straight line in free-hand, and every movement was subject to considerable deviation from the straight and narrow.

Audiogenic says this is expected of the device, partly because it isn't intended for such 'professional' hand drawing capabilities, and partly because it has a reasonable set of automatic drawing commands which largely overcome the problem. One major reason for the problem, according to the company, is that the Pad is so small that the drawing area is tiny: therefore, the merest hint of a hand tremor is translated into a major movement on the screen.

The automatic graphics commands




*The graphics designer master menu provides a wide selection of tasks*

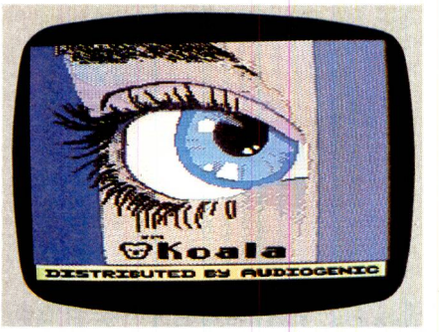
incorporated into the software fall into two main categories: the linear ones, and the solid ones. The former contains LINE and LINES, FRAME, CIRCLE and RAYS. With each of these the basic approach is the same. Select the command from the main menu, then press a key on the Pad. Having selected the function which illuminates its selection by blinking in the menu, and brush and colour (both are chosen by placing the cursor over the selection and pressing a key on the Pad), return to the drawing display. Again, this is achieved by moving the stylus to the bottom of the Pad until the bleeping is heard and a key can be pressed.

Locating the cursor at the start point and pressing the key will fix the end of a line, the centre of a circle, or the top left and corner of a rectangle. Move the cursor around until you have selected the position for the end of the line, diameter of the circle or bottom right-hand corner of the rectangle and press the key again. The image will appear on the display as selected.

This is an extremely quick and easy way to create basic graphical shapes, and with imagination can be used quite effectively. It also overcomes the wobbly cursor problems.

The BOX and DISC commands are used in exactly the same way as FRAME and CIRCLE; the only difference being that once completed, the enclosed area is filled in with the background colour of the border. The same effect can be obtained on other enclosed areas you have drawn by using the FILL command; simply locate the cursor over the area, which can be quite small, and press a key. Be sure, however, that you haven't left any holes through which the colour can 'escape', otherwise everything will be painted the same colour. The colour to be used for FILL is chosen by returning to the main menu and placing the cursor over the desired shade in the palette.

Of the other commands, XCOLOR allows you to re-fill an area with another colour choice, MIRROR reproduces what you DRAW in one corner of the screen as mirror images in the other three corners, COPY provides a 'step and repeat' facility for copying all or part of a drawing to another location, and ZOOM allows you to select a portion of the drawing and expand it into a much-enlarged window.




*Designing graphics is simple: every command and colour is provided*

The SWAP command allows you to move picture information from one window to the other. ERASE wipes out the whole picture you have created, while OOPS simply cancels the last drawing command. STORAGE is fairly self-explanatory, being the picture saving and retrieving routine. It was here that the only weakness in the documentation was found, in that the retrieval routine, GET, is not fully explained in the manual.

There is an addendum sheet that accompanies the Pad which corrects the error, but you must remember to refer to it (guess who didn't first time round?). When GETting a stored picture, you first have to go through the NAME routine, which allows you to name a picture file prior to SAVEing it in order to identify the file to be retrieved. The GET routine is then used exactly as described in the manual.

## Documentation

The documentation supplied with the unit is clear and concise, and contributes well to easy operation.

## Prices

The Koala Pad costs £79.95 including VAT and is only available for the Commodore 64 at present. It is marketed by Audiogenic, 39 Suttons Industrial Park, London Road, Reading R66 1AZ. Tel: (0734) 664646.

## Conclusion

The Koala Pad and its software is easy to use and quick to give results. The system is high on entertainment value, but also educational and 'artistic'. It has some drawbacks, most notably the wobbly cursor and the need for two-handed operation which could prove a problem, but at the price it's an excellent exploitation of technology.

It also demonstrates how technology can be applied to business applications at a reasonable price. The Pad is a worthy competitor to a mouse and, although there wasn't sufficient time to fully evaluate the Instant Programmer's Guide package which allows you to write interfaces to other programs, it's a relatively easy task to accomplish.

Most of all, though, the Pad will appeal to all those budding computer artists who want to get on and draw the pictures but don't want to waste time forever programming sprites. END

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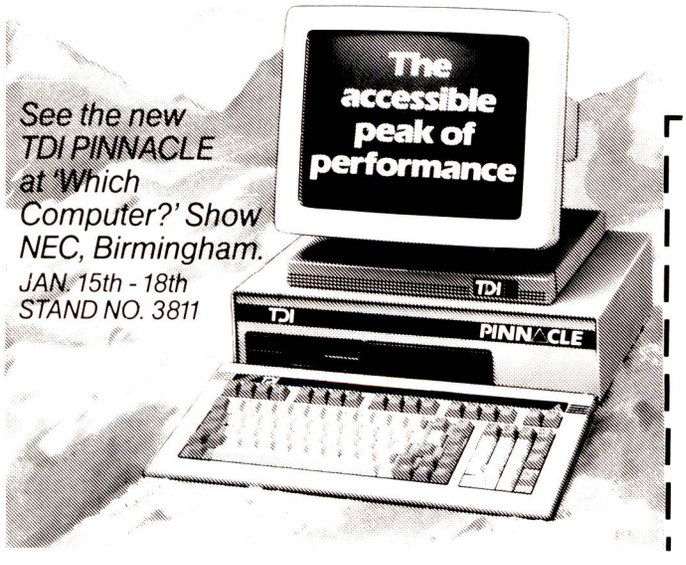


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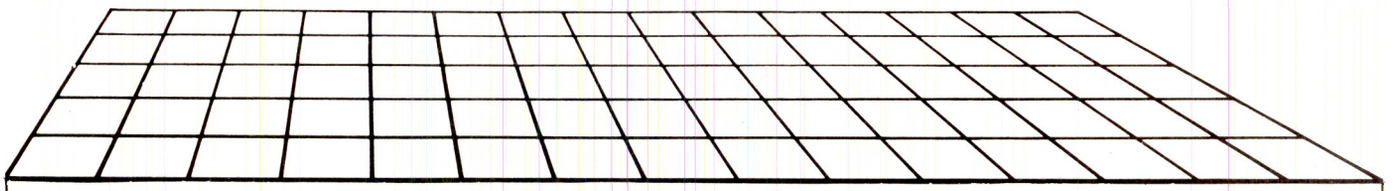

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SOFTWARE

# Retrieve II

*Kathy Lang examines Derwent Data Systems' Retrieve II, a data management system report generator with many unusual features, not least of which is voice recognition.*

Derwent Data Systems' Retrieve II is a data management system for a wide variety of micros which stores information in files containing records of a regular structure. Each record uses the maximum amount of space which may be necessary for the largest record entered.

Thus far, that description could apply to many data management systems available for systems such as the Apricot and the IBM PC. But Retrieve II has some unusual features, including the ability to tailor the entire system's image to specific requirements. This flexibility has made it especially popular in Japan, where a version of Retrieve II is available in Kanji, the language of 4500 characters. For the average British user, one advantage of this flexibility is that you can rename Retrieve II commands: for example, the SORT AND PRINT command could be renamed SPRINT.

Retrieve II's other unusual feature is its ability to accept voice input. This allows you, if you have the necessary hardware, to specify menu options, commands, and even file and field names by talking to your computer rather than pressing keys. The new Apricot Portable, for example, has voice recognition included in the basic system, and a version of Retrieve II is available for that model.

You must train the system to recognise your voice; having done so, the Retrieve II manual for the Apricot includes full instructions on how to set up your version of the package to work with your voice. There are limitations on vocabulary size, but these limits should suffice in the kind of straightforward application for which voice input might be appropriate.

What of the more prosaic features of the package? As is common with this type of software, these are a mixture of excellent, adequate and unhelpful. Retrieve II allows you to set up a display format for entering and editing records, and to make enquiries and produce reports based on these records. The enquiry processor is extremely flexible and powerful; the reporting facilities provide basic facilities simply, and powerful features in a more complex way. You can specify tasks by using menu options together with commands for producing reports, or you can use commands directly for all tasks. Any sequence of commands may be entered in a file and executed from there, either directly or via menus which Retrieve II helps you to set up. You can control the execution of stored commands, thus providing the basics of a programming facility. Retrieve II also gives unusually detailed and extensive support to dealers and large users who want to produce tailored systems based upon these facilities.

| | |
|---|---|
| Maximum file size | 32,000 |
| Max record size | 1020 |
| Max no fields | 255 |
| Max field size | 255 |
| Max digits | 16 |
| Max prime key length | 255 |
| Special disk format? | N |
| File size fixed? | N |
| Link to ASCII files? | YV |
| Data types | C,N,D, Time+ |
| Fixed record structure? | Y |
| Fixed record length stored? | Y |
| Amend record structure? | Copy |
| Link data files? | No |
| No data files open | 1 |
| No sort fields | 5 |
| No keys | 1 |
| Max key length (chars, fields) | 255,1 |
| Subsidiary indexes kept up-to-date | NA |
| Data validation | Good |
| Screen formatting | C |
| Unique keys | 1M |
| Report formatting | D,C,L, |
| Store calculated data | IN |
| Totals and statistics | S |
| Store selection criteria | P |
| Combining criteria | And,Or |
| >1 criterion/field? | Y |
| Wild code selection? | SW |
| Browsing methods | AF+ selections |
| Interaction methods | M+C,LT |
| Reference manual+ | *** |
| Tutorial guide+ | *** |
| Reference card+ | N |
| Online help+ | ** |
| Hot-line? | D |

*Fig 1 Features and constraints*

For those who want to try out the system before they buy, there's a 'sampler' version of the package which allows you to create up to 20 records; this comes with a simple, well-produced booklet explaining the basic features. Derwent estimates that a novice can use the sampler to set up and use a simple data file in 20 minutes, a claim it says is based on tests with genuine novices. The sampler is sold through dealers at a recommended price of £20, refundable if you purchase the full system, and this is a good way to try Retrieve II on your own computer.

## Constraints

The main features and constraints of Retrieve II are shown in Fig 1. The date format is DD/MM/YY, and the 'time' data type saves a lot of tedious data handling in applications requiring time-based calculations.

The major limitation is the restriction to one keyed field for direct access. When editing, you can retrieve records directly by entering the unique key, or by setting a filter to select a set of records to be edited. The selection in this case involves reading the file sequentially, which could take a long time for a large file, especially on a floppy disk.

Direct access, while much faster, is limited to the single unique key field. For some applications, this might be a disadvantage: one shared by many packages in this part of the market, but one of which you should be aware.

## File creation and indexing

The first step in creating a Retrieve II file is to define the name and type of each field in the record and, for text fields, the length of each field. The package uses a simple form-filling technique to obtain this information. Other attributes can also be defined at this stage: entry of a field value may be mandatory, conversion to upper case letters may be requested, and validation can be set up, including both pattern matches and range checks. In addition to values entered from the keyboard, fields may contain calculated values; these may depend on the values of other fields as well as constants.

At the same time, the display layout is defined: you enter the row and column position the field is to occupy when the record is displayed onscreen for data entry or amendment. This format may occupy more than one screen per record, but I find it easier to specify screen layout using a 'paint-a-screen' technique rather than by using column and row coordinates, especially when the program gives you so little help with the position of already-defined fields.

The first field in a Retrieve II record is a unique field which may, if you request it, be used to index the file, thus permitting fast direct access on this field. If you don't want to use this feature, or have no obvious unique field to use, you can ask Retrieve II to supply a unique value for this field as each record is entered.

## Data input and updating

Retrieve II uses the same mechanism for entering records and for amending records retrieved directly. To retrieve an existing record, you enter the key field value and the record will be displayed for editing. To add a new record, just type in the value for the key field. If you decide at any stage of entry or amendment to change your mind about amending or creating this record, entering an asterisk in the first character position of a field will void this entry. An existing record will be left unchanged. This void character is used throughout Retrieve II to allow you to abandon tasks without penalty — a very helpful feature.

The process of entering and editing fields is rather less helpful: you enter each field in sequence, and are then asked whether any fields need changing. If you have corrections to make, you must enter the number of each incorrect field in turn and retype it — there's no facility for direct screen editing under cursor control.

*'Retrieve II's other unusual feature is its ability to accept voice input. This allows you, if you have the necessary hardware, to specify menu options, commands, and even file and field names by talking to your computer rather than pressing keys.'*

To amend a set of records, you enter the enquiry processor and execute the CHANGE command. This allows you to specify criteria which must be met before a record is presented for editing. When the change command has been issued Retrieve II will go through the file, pulling out each record which meets the criteria and displaying it to be amended.

Similarly, you can define a set of records which are to be deleted automatically. The same selection process is used when viewing, and when changing and deleting records.

## Screen display

When displaying records for amendment, the format used is that specified in the data definition (called a dictionary by Retrieve II). A file may have several dictionaries, allowing you to have several different display formats. A dictionary must contain a reference to every field in the file. A field may, however, be described as 'hidden', so it's possible to set up different formats for controlling the display, and update records containing a mixture of confidential and public information.

For viewing record sets, two alternative formats are provided: you can view one record per line, with fields set out across the screen; or one field per line. The latter is the format used by Retrieve II if the record won't fit on a single screen line, but you can also request it if you prefer it. Such records can be selected using the criteria described under 'Selection & sorting', and sorted into order if that is required. Totals may be produced on numeric fields. Where several sort fields are used sub-totals can be produced, and the display may start on a new screen when a sorting field changes.

The fields chosen for display in these lists can be specified when the file dictionary is set up, or you can specify the fields to be shown when the display request is issued.

A sensible compromise is probably to define in the dictionary those fields which you most often want listed in a report, and to override this specification when necessary. A typical request for a list of all records using only a few fields might be:

LIST PERSONNEL SHOW NAME AGE SALARY

If the request is issued in this form, the list will be displayed one screen at a time.

## Printed reports

Any sets of records retrieved through the enquiry processor may be printed or sent to a file as alternatives to screen display. If more powerful formatting facilities are required, you need to use Retrieve II's formatting program. This takes directives from a file of commands set up using the Retrieve II editor and provides the ability to produce very flexible reports, including personalised letters and lengthier documents. Indeed, the editor and formatter constitute a powerful word processor, and the formatter includes some very unusual commands for a data management

```
LIST PERSONNEL WITH SALARY>5000 AND SALARY<10000 AND +
     (DEPT="ACCTS" OR DEPT="SALES")
```

*Fig 2 A complex command to list a set of records*

```
SORT PERSONNEL BY DEPT WITH SALARY>5000 AND SALARY<10000 AND +
     (DEPT="ACCTS" OR DEPT="SALES") BREAK_ON DEPT+
     TOTAL SALARY
```

*Fig 3 A sorted command to list a set of records*

| | | |
|---|---|---|
| BM1 | Time to add one new record | 3secs |
| BM2 | Time to select record by primary key | 3secs |
| BM3 | Time to select record by secondary key | NA |
| BM4 | Time to access 20 records from 1000 sequentially on 3-character field (same field as in BM2 key) | 1min 10secs |
| BM5 | Time to access record using wild code | 1min 48secs |
| BM6 | Time to index 1000 records on 3-character field | NA |
| BM7 | Time to sort 1000 records on 5-character field | 17mins 35secs |
| BM8 | Time to calculate on one field per record and store result in record | NA |
| BM9 | Time to total three fields over 1000 records | 5mins 48secs |
| BM10 | Time to add one new field to each of 1000 records | 23mins 55secs |

Time to import a file of 1000 records: 32mins 34secs

*Fig 4 Benchmarks*

system report generator, such as the ability to generate an index, and to number figures and sections sequentially as they're encountered in the file.

A particularly interesting feature is the ability to include paragraphs of text from document files in reports. The names of these paragraph files may themselves be field values from the database, so a very flexible system can be built up for applications such as personnel management. For example, the standard information about a member of staff — name, salary, department, and so on — can be recorded in a Retrieve II data file, together with the names of paragraph files containing textual descriptions of job history and current performance. Reports can then bring together both the structured and textual information in a highly selective and well laid out report.

The flexibility of these formatting features is enhanced by the ability to include in a formatted report any sequence of commands which can be carried out by the enquiry processor. The report can thus include sorted lists of records, totals and sub-totals, with page-breaks when sub-total fields change, and so on.

It should now be obvious that the reporting features of Retrieve II are exceptionally powerful and flexible. The means of setting up reports is, however, not the easiest I have encountered. The commands to the formatter are reasonably straightforward, but if they are to be entered within Retrieve II you must use the system's own editor. This is a buffered editor using indirect commands of the type familiar to generations of mainframe programmers, but not perhaps the easiest tool to master if your experience is confined to screen-based editing facilities of the WordStar kind.

You can use another editor but you must leave Retrieve II and return to test the command file you have created, a process which gets rather tedious until you become familiar with the package.

## Selection & sorting

Selection, whether to decide which records to display for editing, for viewing in a list on the screen or printer, or for storing in a text file for subsequent word processing, is achieved by using modifiers to command words in the enquiry processor. Two types of criteria can be used: you can filter all records according to tests on the values of fields in file records; or you can continue extracting records until certain conditions are met (the two types of criteria can be used together). In either case, several tests may be used simultaneously.

Individual tests are constructed using the usual range of comparison operators (equal, not equal, less than, greater than, and so on). Tests on text fields may refer to the whole field, or test for the start, the end, or any part of the string containing a particular set of characters. Where several tests are used, they may be combined with And or Or in any sequence, and brackets can be used to ensure that the result is satisfactory. A complex command to list a set of records showing the fields specified in the dictionary for reporting is shown in Fig 2 (the plus sign indicates that a command is continued on the next line).

*'Retrieve II is a powerful and flexible package for applications requiring varied reporting, either in terms of the different report elements or in the way they're laid out. It is particularly valuable for applications which need to store and calculate clock times . . .'*

Records which you need to report on to the display or printer may first be sorted into any desired order. Up to five sort fields can be specified, and you may ask for a new page or screen to be started as each sort value changes. If totals have been requested, sub-totals are printed when sort field values change. The SORT command not only carries out the sorting, but also activates the output requested. A command to produce the same output as the example in Fig 2, but sorted by department and giving totals of salaries for these records together with a sub-total within each department, is shown in Fig 3.

## Calculation

Calculated fields may be set up when the record structure is defined. The usual arithmetic operators are used, and brackets are permitted. You can also show counts, averages and totals when displaying or printing groups of records.

## Multiple files

Retrieve II does not allow the connection of several structured data files. It does, however, allow you to bring in several different text files when merging information into a report via the formatter. For an application with a mixture of structured and free-format textual information, this could prove to be an acceptable approach.

## Tailoring

Any sequence of commands available in the enquiry processor may be stored in a file for subsequent execution, via

```
DDS Retrieve II
Data Management System
copyright (C) Derwent Data Systems
Serial: DD999999
Version 2.04
Please enter today's date ?DD/MM/YY
Registered user: Derwent Data Systems
```

*On loading, the above screen appears*

```
Master Menu
Enter selection number (...)
 1. Describe a file
 2. Print file description
 3. Create or amend records
 4. Enquiry processor
 5. Text editor
 6. Text format processor
 7. Read a text file
 8. Help!
 9. Delete a file
10. Example session
11. Terminate session
```

*Fig 5: the master menu options*

```
File definition procedure
File name: ?.....        Record length:
1. How many fields?:
2. Data file name. .:
3. Data file type. .:
4. Screen title. . .:
———— File security ————
5. Update permitted:
6. Update password.:
7. Access password.:
```

*Beginning the database . . .*

```
12/5/83      Contacts Information      Page: 1
1. Surname    :? . . . . . .
2. Forename   :
3. Street     :
4. City       :
5. County     :
6. Post-Code  :
```

*Option 3 on the menu*

either the RUN command or a menu set up using Retrieve II's facilities for creating tailored menus. When taken together with the facilities of the Retrieve II programming language, RBP, these facilities make it possible to provide a tailored system with a reasonable degree of flexibility. The commands for conditional execution are limited to a 'test and jump' pair, much like the Basic 'IF . . GOTO'. Parameters can be passed to an RBP program upon execution, allowing you to set up general purpose programs for a variety of specific tasks.

Other RBP commands allow you to interact with the person executing the program, and to interpret his response to prompts. You can also 'chain' out to the operating system to execute a sequence of system commands, so that you could, for example, set up a report and send the print image to a file, go to the operating system to set up a background print, and return to Retrieve II to do some more work on your data while the report is printed.

In addition to the facilities directly provided by RBP, considerable flexibility is also available through the extensive information provided on Retrieve II's internal construction. This, for example, allows the system developer to set up Help files at appropriate stages in a tailored system, and to modify the Help files which are supplied with Retrieve II.

## Security & housekeeping

When setting up a file, you can specify a password which must be given before the file can be accessed at all, and another (which could, of course, be the same characters) to be given before amendment is allowed. This simple procedure should be sufficient protection in most applications against unauthorised access.

Commands are provided within Retrieve II to take security copies of complete files (if necessary partitioned over several floppy disks), to restore such files, and to copy records selected from individual files using the criteria described under 'Selection & sorting'. You can issue commands to delete files and to show the disk directory; you can also link out to the operating system to perform tasks there and return to Retrieve II.

## Links with outside

Files in ASCII text format may be imported into Retrieve II provided they consist either of records which occur one per file line with fields separated by commas, or one field per file line. The system creates files in either format, so data files can be created for use with many word processors including WordStar's MailMerge. Since formatted reports may also be sent to a file, you can create text data files of a very wide variety of formats using Retrieve II's text formatter.

## User image

One of Retrieve II's best features is the flexibility of its methods of issuing commands. In particular, it gives you the ability to use the menu approach until you're comfortable with the package and can rely entirely on commands. The command processor is very forgiving, allowing a variety of 'noise' words which are ignored, and also permitting you to rename commands to your own taste. For people who want to tailor systems for others, this flexibility extends to the ability to store command sequences, and to adapt the Help facilities easily and quickly.

I also liked the way the simple reporting facilities are provided; with practice, most users can get exactly the information they want with very little effort. The ability to void almost any operation with a single character is another good feature.

## Documentation

The Retrieve II sampler has its own booklet to show you how to get started. This is typeset and nicely illustrated—a foretaste, I hope, of what the main documentation will look like.

## Conclusion

Retrieve II is a powerful and flexible package for applications requiring varied reporting, either in terms of the different report elements or in the way they're laid out. It is particularly valuable for applications which need to store and calculate clock times, since, unlike most of its competitors, Retrieve II provides specific features to handle such data.

The package provides a reasonable range of functions for system developers, particularly with the amount of information which Derwent supplies to allow you to hook into the system. If you need to tailor the look of a package to particular requirements — not just foreign languages, but other specialised vocabularies—or if you need voice input, the special features make Retrieve II an interesting proposition. Try the excellent sampler before you buy, to get a feel for the package and what it can and cannot provide. END

## Summary

| | |
|---|---|
| Package type | Fixed format, fixed length records; one date file, links to many text files. Powerful reporting, some tailoring including construction of menus. Voice input. Modifiable command vocabulary. |
| Systems supported | MS-DOS, PC-DOS |
| Ease of use | Very variable; enquiries easy, record creation less easy. |
| Cost (ex VAT) | £375 (sampler £20). |
| Supplier | Derwent Data Systems, 18 Norfolk Street, Sunderland, Tyne and Wear SR1 1EA. Tel: (0783) 652026 |

| Package | Cost (£) | Summary |
|---|---|---|
| Condor 3 | 295 | Fixed record structure, two data files available at once. Good 'post' feature for updating related files. Only one index per data file. Otherwise very like dBaseII, although some people find it easier to use. |
| 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'; can store sets of commands to tailor system. |
| InfoStar | 375 | Upgraded version of long-standing DataStar, same family as WordStar. Reporting features powerful (for example, can extract information from more than one data file) but hard to use. Only one key at any one time. Screen entry and reporting separate. |
| Pearl | 190 | Economical storage of varying length records, indexes kept up-to-date, paint-a-screen formatting for screen and reports, entry screens can read from several files at once. |
| Rescue 3 | 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. |
| Retrieve II | 375 | Combination of menus and commands, powerful selection using sequential access. One key used for all direct access. All prompts and messages are held on file, so the package can be quickly adapted to many (human) languages. Uses limited voice input. |

*Fig 6 Comparison of similar data management packages*

# On your marks

*See how they run:* PCW *presents its Benchmarks round-up.*

Bumper to bumper they turn into the final straight, with only seconds between them. Which will be first across the line? Will the Sage II, primed with p-code, stay at the front for the second year running, or will the new model from the old firm of IBM steal victory? Read on . . .

Breathless readers should by now have realised that the time has come round again for the Great *PCW* Benchmarks Round-up. Ever since the magazine started back in February 1978, we've been testing machines with a set of Basic programs designed to measure the speed at which they execute certain important routines. For this issue we've compiled the results, taken the averages for each machine and listed them in order.

As we've sorted the results according to this average speed, we've had to ignore machines for which we haven't got a complete set of timings. This time we've also omitted some of the systems which are no longer being sold, but compensation figures are included for the Macintosh whose Basic wasn't available when the machine was Benchtested in March '84 (for more on Mac Basic see next month's issue).

To answer the opening question, the Sage II has held off all-comers to stay top of the list for the second year running. But last year's runner-up, Future Computers' FX-20, has slipped to seventh place, being replaced by the Crystal from Aston Technology. IBM's PC AT, with a late burst on Benchmark eight, comes in third, closely pursued by two PC clones, Olivetti's M24 and the MAD1. The PC itself comes in lower, but is the highest placed machine reviewed in 1981 which is still on the list.

In case you're wondering, the B beside all these systems stands for business. Among the portables (Ps) Hewlett Packard is in front with its HP110, although the Jonos follows closely behind. Depending on how you define the home market (the Hs), either the Advance 86 or the BBC B leads that particular part of the field, hotly pursued by the Amstrad CPC 464. In fact, the BBC is the highest placed machine from 1982 when it came third.

Nineteen eighty-four saw the demise of the 8-bit micro in the business market. The rush towards IBM compatibility has meant that the majority of new business machines are 16-bit and faster than their 8-bit rivals. Only the Jonos matches the 16-bit machines by using a faster-than-usual Z80B processor.

But home micros still stick with 8-bit technology. The only major exception to this is the Sinclair QL which uses the Motorola 68008 8/16/32-bit central processor. However, despite having a theoretical processing advantage over its home rivals, SuperBasic as tested was very slow and the QL only managed 31st place behind machines like the Memotech and the BBC B.

The two fastest machines — the Sage II and the Crystal — both use the Motorola MC68000 processor and both run compiled versions of Basic. The combination of a fast processor and compiled code singles them out as being different from the rest. The IBM PC AT, using the new Intel 80286 central processor chip, made a brave attempt to beat them, but expect to see both the top machines defeated this year as more machines adopt the Intel 80286 or the very fast 12MHz versions of the Motorola MC68000.

Although the Apple MacIntosh uses the same Motorola MC68000 processor as the Sage II, it only came in at twelfth place. This is mainly because we used an early pre-release version of MacBasic which was very bad at maths. Hopefully, later versions will be able to add up faster.

Looking at the top twenty positions, 1984 was obviously a good year for speed with 15 new machines listed. But before getting carried away with the idea of hurtling around the silicon at speed, a note of caution has to be struck. The figures may be interesting, but they don't make a good basis for deciding which machine to buy. At the very least you have to consider which Benchmarks are most appropriate to the kind of programs you want to run: for example, do your programs make heavy use of arithmetic operations or array access? And none of the Benchmarks calculates operations such as string handling, graphics or input/output, although we put forward some proposals for disk Benchmarks in our November issue.

What the Benchmarks do cover can be seen from the accompanying programs (each routine is repeated 1000 times to allow timing with a stop-watch). BM1 tests an empty FOR . . . NEXT loop. The other Benchmarks, with the exception of BM8, proceed by adding extra functions to the basic routine: BMs 3 and 4 show the difference between using constants and variables in the same formula; BM5 adds a GOSUB routine, so you can see how GOSUBs slow you down; BM6 DIMensions an array; and BM7 writes data into that array. Finally, BM8 tests the machine's maths and trig functions.

One irregularity affecting BM8 should be mentioned. To save a Benchtester time, this Benchmark originally tested only 100 loops instead of 1000. Where necessary, these figures have been multiplied by 10 to give them the same weight as the others when calculating the averages. Since the beginning of 1983, however, Benchtesters have had to curb their patience until all the 1000 loops have been completed.

Much to the irritation of its opponents, Basic remains the most important microcomputer language. We already have tests for Pascal (see our December issue) and Forth, and we'd be interested in any proposals readers have for other languages. Given Basic's stranglehold on the market, though, it looks as though the Basic Benchmarks will continue to serve their (limited) purpose.

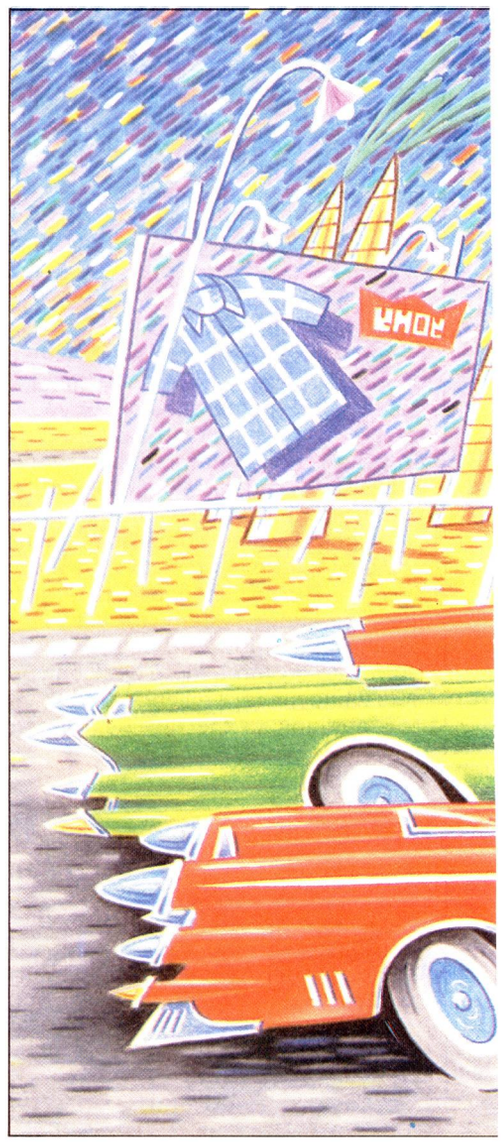

*Illustration by Terry Kennett*




## *Benchmark programs*

```
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
```




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# HARDWARE

| CAT | Machine | Issue | BM1 | BM2 | BM3 | BM4 | BM5 | BM6 | BM7 | BM8 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| B | Sage II (p-code) | Feb83 | .50 | .70 | 1.30 | 1.70 | 2.10 | 5.10 | 6.40 | 18.00 | 4.47 |
| B | Crystal | Jul84 | .70 | 1.70 | 4.60 | 3.90 | 4.30 | 7.70 | 13.60 | 18.70 | 6.91 |
| B | IBM AT | Dec84 | .80 | 2.20 | 4.90 | 5.10 | 5.60 | 9.40 | 15.00 | 13.90 | 7.11 |
| B | Olivetti M24 | Sep84 | .80 | 2.50 | 5.20 | 5.20 | 5.70 | 10.00 | 15.30 | 16.60 | 7.66 |
| B | MAD1 | Sep84 | .70 | 2.60 | 5.50 | 5.70 | 6.20 | 10.90 | 16.80 | 17.30 | 8.21 |
| B | Xerox 16/8 | Feb84 | 1.20 | 3.60 | 7.40 | 7.70 | 8.70 | 16.00 | 4.70 | 24.70 | 9.25 |
| B | Future FX-20 | Oct83 | 1.20 | 3.40 | 6.80 | 7.00 | 7.90 | 14.50 | 22.20 | 17.50 | 10.06 |
| B | Compudata Tulip | Oct83 | 1.00 | 3.70 | 6.00 | 6.10 | 7.80 | 15.50 | 23.30 | 17.50 | 10.11 |
| P | HP 110 | Jul84 | 0.65 | 3.40 | 6.60 | 6.80 | 7.70 | 14.20 | 21.80 | 21.90 | 10.38 |
| P | Jonos | Apr84 | .80 | 2.50 | 6.70 | 6.70 | 7.20 | 12.70 | 20.10 | 34.40 | 11.39 |
| H/B | Advance 86 | Jul84 | 1.10 | 3.50 | 7.50 | 7.60 | 8.30 | 14.90 | 23.20 | 26.10 | 11.53 |
| B | Apple Macintosh | Mar84 | .24 | .65 | 6.00 | 6.40 | 7.10 | 8.60 | 15.90 | 52.30 | 12.15 |
| B | Tycom Microframe | Jan84 | 1.50 | 4.10 | 8.10 | 8.40 | 9.70 | 18.00 | 27.60 | 21.50 | 12.36 |
| B | HP 150 | May84 | 1.40 | 4.30 | 8.70 | 7.50 | 10.30 | 18.40 | 28.10 | 26.70 | 13.18 |
| P | Wren | Apr84 | 1.20 | 3.10 | 7.60 | 7.50 | 8.40 | 15.30 | 23.80 | 39.00 | 13.24 |
| B | Commodore 715 | Jan84 | 1.10 | 6.50 | 12.00 | 12.30 | 14.20 | 22.10 | 35.30 | 7.20 | 13.84 |
| B | II Professional | May83 | 1.00 | 4.20 | 9.30 | 9.70 | 10.50 | 19.00 | 29.50 | 31.00 | 14.28 |
| B | WaveMate Bullet | Feb84 | 1.20 | 3.70 | 7.80 | 8.40 | 13.70 | 20.40 | 32.60 | 27.40 | 14.4 |
| H | Acorn BBC B | Jan82 | 1.00 | 3.10 | 8.20 | 8.70 | 9.10 | 13.90 | 21.40 | 51.00 | 14.55 |
| H | Amstrad CPC-464 | May84 | 1.09 | 3.28 | 9.16 | 9.61 | 10.20 | 19.03 | 30.18 | 34.20 | 14.59 |
| B | ACT Sirius 1 | Feb82 | 1.80 | 5.30 | 10.70 | 11.10 | 12.90 | 24.20 | 37.10 | 27.90 | 16.38 |
| B | Shelton SigNet | Apr83 | 1.10 | 3.40 | 9.60 | 9.30 | 10.00 | 18.10 | 28.90 | 51.30 | 16.46 |
| B | ACT Apricot | Oct 83 | 1.60 | 5.20 | 10.60 | 11.00 | 12.40 | 22.90 | 35.40 | 34.40 | 16.69 |
| B | Sharp MZ-80B | Apr84 | .60 | 4.50 | 8.50 | 11.50 | 13.00 | 19.00 | 27.50 | 50.00 | 16.83 |
| B | Dimension 68000 | Sep84 | 1.60 | 5.80 | 11.30 | 10.70 | 13.40 | 23.20 | 41.50 | 29.20 | 17.09 |
| B | IBM PC | Nov81 | 1.50 | 5.20 | 12.10 | 12.60 | 13.60 | 23.50 | 37.40 | 35.00 | 17.61 |
| B | LSI M4 | Apr83 | 1.90 | 4.80 | 11.50 | 11.50 | 12.40 | 19.80 | 30.90 | 50.80 | 17.95 |
| B | Torch (MBasic) | Jan83 | 1.50 | 4.20 | 10.60 | 10.40 | 11.60 | 21.10 | 33.00 | 55.00 | 18.43 |
| H | Memotech RS128 | Oct84 | 1.90 | 5.30 | 11.70 | 11.40 | 13.30 | 22.60 | 40.80 | 43.70 | 18.84 |
| B | Apricot F1 | Oct84 | 2.00 | 6.00 | 12.20 | 12.50 | 14.10 | 25.80 | 39.80 | 38.60 | 18.88 |
| H | Sinclair QL | Jun84 | 2.10 | 6.40 | 10.70 | 10.30 | 13.20 | 26.10 | 61.80 | 25.80 | 19.55 |
| B | NEC APC | Sep83 | 2.30 | 2.30 | 13.70 | 17.60 | 17.80 | 32.00 | 34.80 | 37.10 | 19.7 |
| B | Osborne 01 | Nov81 | 1.40 | 4.40 | 11.70 | 11.60 | 12.30 | 21.90 | 34.90 | 61.00 | 19.9 |
| H | Acorn Electron | Oct83 | 1.10 | 4.00 | 11.10 | 11.80 | 12.40 | 18.70 | 28.70 | 72.50 | 20.04 |
| H | Tatung Einstein | Aug84 | 11.70 | 6.05 | 11.42 | 12.55 | 14.03 | 22.46 | 35.17 | 49.99 | 20.42 |
| B | Tandy TRS-80 II | Jun80 | 1.00 | 5.00 | 13.00 | 13.00 | 14.00 | 23.00 | 35.00 | 60.00 | 20.5 |
| H | Sharp MZ-700 | Feb84 | .40 | 3.40 | 9.50 | 8.60 | 9.40 | 17.70 | 32.70 | 82.70 | 20.55 |
| P | Osborne Encore | Aug84 | 1.90 | 6.60 | 14.20 | 14.60 | 15.80 | 28.30 | 44.00 | 47.80 | 21.65 |
| H | IBM PC Junior | Mar84 | 1.90 | 6.40 | 11.20 | 15.00 | 16.50 | 29.30 | 46.60 | 47.40 | 21.79 |
| B | Superbrain | Aug80 | 1.60 | 5.20 | 14.00 | 13.90 | 14.80 | 26.30 | 43.20 | 56.00 | 21.88 |
| B | NCR Dec. Mate V | Aug83 | 1.60 | 4.80 | 12.80 | 12.80 | 13.70 | 24.30 | 38.50 | 69.00 | 22.19 |
| B | Apple III | May82 | 1.70 | 7.20 | 13.50 | 14.50 | 16.00 | 27.00 | 42.50 | 75.00 | 24.68 |
| P | Sharp PC-5000 | May84 | 1.98 | 5.82 | 15.80 | 16.90 | 19.10 | 33.00 | 55.40 | 52.20 | 25.03 |
| B | Epson QX-10 | Jul83 | 2.30 | 6.40 | 15.80 | 15.80 | 16.50 | 31.90 | 52.90 | 65.80 | 25.93 |
| B | Xerox 820 | Jan82 | 1.70 | 5.50 | 15.50 | 15.10 | 16.20 | 28.90 | 46.10 | 80.00 | 26.13 |
| H | NewBrain | Jul82 | 2.00 | 5.80 | 19.20 | 17.50 | 19.20 | 32.00 | 48.80 | 70.00 | 26.81 |
| B | Philips P2000 | Dec81 | 1.90 | 5.90 | 15.80 | 15.70 | 16.70 | 29.80 | 47.20 | 85.00 | 27.25 |
| H | Commodore Vic20 | Sep81 | 1.40 | 8.30 | 15.50 | 17.10 | 18.30 | 27.20 | 42.70 | 99.00 | 28.69 |
| H/B | Apple II | Aug79 | 1.30 | 8.50 | 16.00 | 17.80 | 19.10 | 28.60 | 44.80 | 107.00 | 30.39 |
| H | Commodore Plus/4 | Oct84 | 2.00 | 9.80 | 18.20 | 18.70 | 18.80 | 34.80 | 55.30 | 101.10 | 32.34 |
| P | Epson PX-8 | Jun84 | 3.00 | 8.00 | 19.50 | 19.00 | 22.50 | 40.00 | 62.50 | 89.00 | 32.94 |
| H | Sharp MZ-80K | Jun82 | 1.40 | 9.40 | 16.30 | 22.50 | 25.40 | 36.80 | 51.10 | 102.00 | 33.11 |
| B | Sharp MZ-5600 | Nov84 | 1.50 | 7.20 | 19.80 | 20.20 | 21.60 | 32.80 | 53.80 | 115.20 | 34.01 |
| H | CBM 8032 | Sep80 | 1.70 | 10.00 | 18.40 | 20.30 | 21.90 | 32.40 | 51.00 | 119.00 | 34.34 |
| H | Dragon 32 | Aug82 | 1.60 | 10.20 | 19.70 | 21.60 | 23.30 | 34.30 | 50.00 | 129.00 | 36.21 |
| H | Colour Genie | Jun83 | 2.70 | 10.60 | 25.00 | 25.80 | 28.90 | 47.80 | 73.10 | 104.30 | 39.78 |
| H | Sony HB-75 | Sep84 | 2.10 | 6.00 | 16.80 | 18.30 | 19.30 | 31.20 | 44.80 | 216.30 | 44.35 |
| H | Oric Atmos | May84 | 1.90 | 15.50 | 25.50 | 27.70 | 33.30 | 44.00 | 67.20 | 140.10 | 44.4 |
| H | Sp.Video SV-328 | Mar84 | 2.30 | 5.70 | 18.20 | 20.00 | 20.90 | 32.80 | 45.10 | 235.70 | 47.59 |
| P | Grid Compass | Jun84 | 8.50 | 11.90 | 25.10 | 22.50 | 27.80 | 125.10 | 158.30 | 29.70 | 51.11 |
| H | Sinclair ZX-81 | Jun81 | 4.50 | 6.90 | 16.40 | 15.80 | 18.60 | 49.70 | 68.50 | 229.00 | 51.18 |
| P | Epson HX-20 | Dec82 | 2.70 | 15.30 | 33.10 | 32.80 | 35.30 | 59.10 | 100.60 | 133.30 | 51.53 |
| H | ZX Spectrum | Jun82 | 4.80 | 8.70 | 21.10 | 20.40 | 24.00 | 55.30 | 80.70 | 253.00 | 58.5 |
| P | Tandy Model 100 | Aug83 | 3.50 | 9.50 | 26.50 | 29.50 | 31.50 | 43.00 | 64.00 | 321.00 | 66.06 |
| H | Atari 400/800 | Oct80 | 2.30 | 7.40 | 19.90 | 23.20 | 26.80 | 40.70 | 61.50 | 431.00 | 76.6 |
| H | Texas TI99/4A | Mar82 | 3.00 | 9.00 | 24.00 | 24.80 | 26.20 | 61.90 | 84.60 | 384.00 | 77.19 |
| P | Casio PB-100 | May83 | 8.00 | 39.00 | 82.00 | 80.00 | 105.00 | 160.00 | 220.00 | 341.00 | 129.4 |
| P | Sharp PC1500 | Jun82 | 15.00 | 70.00 | 121.00 | 122.00 | 178.00 | 293.00 | 383.00 | 510.00 | 211.5 |

END

# Database dossier

*Kathy Lang presents an up-to-date comparison of the database packages reviewed by* PCW *since the series began in March 1982.*

Since this series reviewing data management systems began in March 1982, a total of 32 packages have been covered. In December 1983 and January 1984, we summarised all the packages which had been reviewed up to that point, where suppliers provided the information for this to be done. This article brings the story up to the end of October 1984, and covers articles published to January 1985, again on the basis of information provided by suppliers. Space restrictions have made it impossible to repeat the text comments made last year on new releases during 1983, but you should be able to tell from Fig 1 which packages had new releases during 1983 and for which you should therefore refer to the December 1983 article. This article brings all the tables up-to-date, and adds brief details about new versions of packages which were issued during 1984. Several suppliers have told me that they will have a major new release available by the time you read this or soon after, and this is duly noted in Fig 1.

Several packages underwent minor or major changes during 1984, or will do so soon. For example, Aspect had a new release due before the end of 1984 which will bring major performance enhancements, and some improvements to functions. The major change there will be the addition of a word processing facility, based on the ability to have text fields of virtually unlimited length.

Condor has been enhanced by major improvements to the COMPUTE features, processing of several COMPUTE statements in one pass. A default report format is available, and the documentation has been much improved. A menu-driven option is available for beginners who would prefer that approach; on the IBM PC colour is available. In addition, you can now get graphics and communications options integrated with Condor; these will be followed by spreadsheet and word processing options early in 1985, when I hope to do a new full review.

At the time of writing Data Master is proposing to add graphics and word processing options by the end of 1984, and at the same time the provision of a new manual. (Conditional processing is already available, contrary to my statement in the May review—my apologies for the error.) When these changes are made, the name of the package will revert to its American name of DataEase. Sapphire will still be the sole importer, and will use the term DataMaster to refer to DataEase plus the 'added value' options it supplies, such as a consultancy/programming facility, as well as maintenance.

dBaseII now has a menu facility for novices, as well as a new set of manuals. These two changes should go a very long way to making this popular package much easier to use.

Delta has some new features includ-

| Package | Supplier | Telephone | Cost £ | Date reviewed | Systems supported | Version reviewed | Package type |
|---|---|---|---|---|---|---|---|
| Aspect | Microft Technology | (01) 352 7876 | 400 (40) | Oct 84+$ | 80, MS, PC | 1.9.13 | E, S |
| Beta | Ormskirk Computers | (0695) 77043 | 195/295 | Aug 83 | UCSD-P | UCSD-P | N,S |
| BusiFile | Eurobeta Info Systems | (0704) 44511 | 350 | Jan 84+ | Lisa, UCSD-P | 1.0 | N, S |
| BusiPost | Carter-Parratt | (01) 644 4355 | 195 | Feb 83*+ | MS, PC | MS, 2.30 | N, D |
| CardBox | Caxton | (01) 379 6502 | 155 | Aug 82 | 80, 86, MS, PC | 80 | N, M |
| Condor | Granite Chip Micros | (0224) 571825 | 95/195/295 | Nov 82*! | 80, 86, MS | MS,2.11.09 | N, S |
| Data Master | Sapphire Systems | (01) 554 0582 | 495 | May 84+$ | MS, PC | 2.1 | N, S |
| dBaseII | Ashton-Tate | (0908) 568866 | 438 | May 82+ | 80, 86, MS, PC | MS, 2.41 | N, S |
| dBaseIII | Ashton-Tate | (0908) 568866 | 495 | Nov 84 | PC | PC, 1 | N, M |
| DBMSIII | GW Computers | (01) 631 4818 | 575/295 | Jun 82*$ | 80, 86, MS, PC | MS, 7B | E, S |
| Delta | Compsoft | (0483) 898545 | 495 | Oct 83+$ | 80, MS | MS, 2.1 | N, S |
| DMS+ | Compsoft | (0483) 898545 | 195 | (Oct 83) | 80, MS | MS, 1.0 | N, S |
| Everyman | Vector International | (01) 943 1257 | 475/MU neg | Feb 84+$ | 86, MS | 4.4 | E, M |
| Files & Folders | ACT Pulsar | (021) 455 7000 | 295 | Dec 84 | MS, PC | 1.11 | N, S |
| FMS80 | InfoData | (0635) 32741 | 250/350/545 | Apr 82* | 80, 86, MS, MU | 80, 3.1 | N, S |
| Framework | Ashton-Tate | (0908) 568866 | 495 | Aug 84 | PC | PC, 5.1 | N, S |
| Friday! | Ashton-Tate | (0908) 568866 | 195 | Jul 84 | 80, MS | MS, 1.03 | N, F |
| AIMS+/BPI-IM | Thames Computer Systems | (01) 609 5599 | 395 | Apr 84+ | PC, WPC | 3.0 | N, S |
| InfoStar | Tamsys | (07535) 56747 | 375 | Sep 83 | 80, 86, MS, PC | 80 | N, S |
| MicroPen | Intelligence Ireland | (0001) 988555 | 125/225 | May 83 | 80, 86, MS, MU | 80 | N, S |
| Omnis | Blyth Computers | (050270) 371 | 175/345/495 | Jul 83! | UCSD-P | UCSD-P, 9/84 | N, S |
| Optimum | Professional Software | (021) 445 1039 | 225/450 | Nov 83 | 80, 86, MS, PC, UNX, MU | 80, VII | N/A, S |
| Pearl | Softgen | (01) 938 2435 | 195 | Oct 82*+ | 80, MS | MS | N, S |
| Personal Data Base | Micro Technology | (0892) 42949 | $125 | March 84 | PC | | N, S |
| Rescue 3 | Grade One | (04574) 63819 | 375 | Apr 83+! | 80, 86, MS, PC, MU | MS, 3 | N, S |
| Retrieve II | Derwent Data Systems | (0783) 652026 | 495 | Jan 85 | 80, MS, PC | 2.04 | N, S |
| Search & Find | XITAN | (0703) 334711 | 250 | Dec 83+ | 80, 86, MS, PC | 80 | N, F |
| Sensible Solution | O'Hanlon Systems | (0753) 78844 | 565 | Sep 84+ | 80, 86, PC, MS, MU | MS, 2.0C | E, F |
| SuperFile | SouthData | (01) 229 2724 | 515/975 | Jan 83*+ | 80, 86, MS, MU | 80 | N, M |
| Symphony | Lotus | (0753) 840281 | 550 | Aug 84 | PC | PC, 1 | E, S |
| System Builder | Aston Technology | (021) 359 4861 | 750/550 | Jun 84+ | Pick, Revelation | Pick | E, M |
| Tomorrow's Office | Stage One Software | (0202) 735656 | 195/395/595 | Jun 83+ | MS, PC | MS, 2.0 | N, S |

*Notes:* Date reviewed: *=complete new version released in 1983, see *PCW*, Dec '83. !=complete new version released in 1984, see text. $=complete new release expected end 1984/early 1985, see text. +=changes made falling short of full new release. Systems supported: 80=CP/M-80, 86=CP/M-86, MS=MS-DOS, PC=PC-DOS, MU=one or more full multi-user versions (that is, with field or record locking). Version reviewed: system as above/package version, summarised here. Package type: N=novice, E=experienced users, A=advanced users, S=structured data, F=free text, M=either.

*Fig 1 Packages and suppliers*

| Package | Data types | Fixed record structure | Fixed record stored | Amend record structure | Link data files | Number data files simult'y | Number sort fields | Number keys | Max length keys (ch/fld) | Subsidiary indexes updated |
|---|---|---|---|---|---|---|---|---|---|---|
| Aspect | N, C, D, Ref | Y | N | Y | Y | 12/Level | 49 | 1/Level | 720, 6/level | NA |
| Beta | N, C, D, L, T | Y | Y | CO | N | NP | 1 | 2 | 32, 1 | UTD |
| BusiFile | N, C, D, R, L, M | Y | Y | CO | Y | 9 | 1 | 3 | NS | New D |
| BusiPost | F | Y | N | N | N | NP | 1 | 3 | F | UTD |
| CardBox | C | Y | N | Y | N | NP | NP | UL | 32, UL | UTD |
| Condor | C, D, I, N | Y | Y | CO | BA | 2 | 32 | 1 | 127, 8 | NA |
| DataMaster | N, C, D, L, T, £, R | Y | Y | Y | Y | UL | 255 | UL | 255, 1 | UTD |
| dBaseII | N, C. L | Y | Y | CO | F | 2 | UL* | UL | 100, UL | 7 UTD |
| dBaseIII | N, C, D, L, Memo | Y | N | CO | Y | 10* | NS | 7 | 100, NL | UTD |
| DBMSIII | N, C, D | Y | Y | CO | EX | 12 | NS | 1* | R#, 69 | Batch |
| Delta | N, C, D, R | Y | Y | CO | TR | 1+8 | 5+ | UL | 100, 5 | Batch |
| DMS+ | N, C, D, R | Y | Y | CO | N | NA | 5+ | UL | 100, 5 | Batch |
| Everyman | C, N, D, L, TS | Y | Y | CO | Y | UL | 1 | 1* | 60, 1 | NA |
| Files & Folders | N, C, D, L, T, S# | Y | Y | CO | Y | 3 | 5 | Variable | NS | UTD |
| FMS80 | C, D, I, N, V | Y | Y | CO | Y | 19 | UL, 255* | UL | 255, UL | UTD |
| Framework | N, C | Y | Y | Y | NA | NA | UL | NA | NA | NA |
| Friday! | N, C, L | Y | Y | CO | N | NP | 5 | 1 | 64, 5 | NA |
| IM | N, C, D | Y | Y | CO | RP | 3 | 5 | 1 | 38, 5 | NA |
| InfoStar | C, N | Y | N | CO | RP | 1 | 25 | 1 | 120, 25 | Batch |
| MicroPen | C | Y | Y | N | N | NP | NP | 1 | NS, 1 | NA |
| Omnis | N, C, D, L, S# | Y | Y | CO | Y | 12@ | 9 | 12 | 79, 1 | UTD |
| Optimum | N, C, D | Y | Y | Y | YF | UL | 15 | 4 | 255, 1 | UTD |
| Pearl | N, C, D | Y | N | Y | RO | 9 | 5 | 50 | 80, 1 | UTD |
| Personal Data Base | N, C | Y | Y | NO | N | NA | 2 | NA | NA | NA |
| Rescue 3 | N, C, D, R, etc | Y | Y | Y | N | NP | 5 | 10 | 60, 1 | UTD |
| Retrieve II | C, N, D, T, S#+ | Y | Y | CO | N | 1 | 5 | 1 | 255, 1 | NA |
| Search & Find | C | N | N | NA | Y | UL | NA | UL | 20/UL | Batch |
| Sensible Solution | C, N, D, Overlay | Y | Y | CO | Y | 16 | NS | 9+ | 72, 1 | UTD |
| SuperFile | N, C, I | N | N | Y | DY | DY | 36 | 5K | UL | Batch |
| Symphony | N, C, D, T, M | Y | Y | Y | Memory | ML | 3 | NA | NA | NA |
| System Builder | N, C, D | Y | N | Y | Y | UL | 16 | UL | 99999,1 | UTD |
| Tomorrow's Office | N, C, D | Y | Y | CO | TR/Y | M+T/30 | 3 | 15 | 128, 3 | Batch |

*Notes:* General: UL=unlimited, NP=not possible, NS=not stated. Data types: C=character, N=numeric (inc. decimal point), I=integer, D=date(*=MM/DD/YY format only), $=money format, V=varying length, L=Logical (Y or N), etc=extra formats, R=reference (table lookup). Amend record structure: CO=only by copying data file. Link data files: BA=batch process, F=full, EX=own format, TR=master+transaction, RP=in reporting only, DY=directory used, so unnecessary, RO=read only, PL=through programming language. Number of sort fields: @=total of files and indexes, *=possible but unnecessary within package, +=by index only — may effect ability to write out file in ASCII format in alternative order. Number of keys: *=+record number. Max length of keys: first figure is character limit, second is field limit. Subsidiary indexes updated: BA=batch process, UTD=Kept up-to-date automatically. Tommorrow's Office figures are: main package/with MultiFile upgrade.

*Fig 2 Features and constraints*

ing conditional processing and a new manual, and a stablemate in the shape of DMS+, which is effectively a version of Delta without transaction processing or tailored menus. A new release of Delta, plus some new associated packages, is due early in 1985, and I hope to review all these then.

Everyman now permits the use of colour on an IBM PC. A new full release will be available in 1985, providing significant performance enhancements as well as the ability to restructure the database without copying the data.

Omnis has been completely revised, and is now available in three versions, ranging from a simple, single-file version to one capable of handling up to 12 data files at once. Multi-user versions are available, and the package can be tailored to provide bespoke applications. New functions include flexible field formats, powerful computation, and very flexible searching. Again, I hope to do a detailed review of the new product in the immediate future.

Pearl now provides a programmer's toolkit and a run-time version, giving system developers the necessary facilities to tailor complete systems. Note also that Pearl Software has moved and been renamed.

Rescue 3 has been enhanced to allow use of several files together when entering and retrieving data, and a multi-user version is available. There are improvements to several retrieval

| Package | Max file size | Files span disks | Max rec size | Max no fields | Max char fld size | Max precn digits | Special disk format | Filesize fixed | Link to ASCII data |
|---|---|---|---|---|---|---|---|---|---|
| Aspect | OSL | N | 3500/500 per level | 500 | 120 | 30 | N | N | YV |
| Beta | 9999 | N | 512 | 32 | 64 | 10 | Y | Y | PL |
| BusiFile | 16384 | N | 1024 | 100 | 64 | 10 | N | Y | YF |
| BusiPost | 32000 | Y | F, 800 | F53 | 31 | NA | Y | N | WO |
| CardBox | 65535 | N | 1404 | 26 | 1404 | NA | N | N | WO |
| Condor | 65535 | N | 1024 | 127 | 127 | 18 | N | N | YV |
| Data Master | 65535 | N | 8000 | 255 | 255 | 14 | N | N | YV |
| dBaseII | 65535 | N | 1000 | 32* | 254 | 10 | N | N | YV |
| dBaseIII | OSL | N | 4000/512k | 128 | 254/4K | 19 | N | N | YV |
| DBMSIII | 32000 | N | 1400 | 20* | 79 | NS | N | N | PL |
| Delta | 65535 | N | 2000 | 90 | 80 | 14 | N | N | YF |
| DMS+ | 32000 | N | 2000 | 90 | 80 | 14 | N | N | YF |
| Everyman | OSL | N | 32767 | MD | 60 | 9 | N | CO | YF |
| Files & Folders | OSL | N | NS (1 scr, 18*78) | 1sc | 78 | NS | N | N | YF |
| FMS80 | 65535 | N | 65025 | 255 | 255 | 19 | N | N | YV |
| Framework | ML | N | ML | ML | ML | 15 | N | N | YV |
| Friday! | OSL | N | 999 | 32 | 32 | 10 | N | N | YV |
| IM | DSD | N | 1200 | 100 | 75 | NS | N | N | OP |
| InfoStar | 8Mb | Y | 65025 | 255 | 255 | 14 | N | N | YF |
| MicroPen | 32750 (not OSL) | N | 1024 | 100 | 78 | NA | N | N | PL |
| Omnis | 4*Disk limit | Y | ML | 120 | 79 | 11 | N | Y | YF |
| Optimum | OSL | N | 4000+ | 50 | 255 | 16 | N | N | PL |
| Pearl | OSL | N | varies | 250 | 80/132 | 16 | N | N | YV |
| Personal Data Base | OSL | N | 1000 | 20 | 50 | NS | N | N | PL |
| Rescue 3 | 32760 | N | 1024 | 100 | 60 | 14 | N | N | YV |
| Retrieve II | 32000 | Y | 1020 | 255 | 255 | 16 | N | N | YV |
| Search & Find | 32767 | N | UL | NA | NA | NA | Y | N | YV |
| Sensible Solution | OSL | N | Memory limit | 100 | 255 | 15 | N | N | YF |
| SuperFile | OSL | NS | 20000 | UL | OSL | NA | N | N | YV |
| Symphony | ML/8191 | N | 256*240 | 256 | 240 | NS | N | N | YV |
| System Builder | 999,999 records | N | 32000 | 200 | 99999 | 11 | N | N | YF |
| Tomorrow's Office | 30KM+60KT | Y | 508/254M+254T | 90 | 78 | 10 | Y | N | YF |

*Notes:* General: OSL=operating system limit, M=master record(s), T=transaction records, F=fixed, *=subfields allowed in addition, NA=not available, NS=not stated. Max record size, max number fields: F=fixed by package. File size fixed when file created: CO=Yes, but size can be increased by copying data file. Link to ASCII data: PL=by programming only, WO=write only, YV=yes, can vary formats, YF=yes, one format only.

*Fig 3 Features and constraints*

facilities, and batch updating is provided. There is also a new manual, much improved in many respects, including a reference summary, a tutorial introduction and a more understandable reference manual. (But the menu map seems, regrettably, to have been omitted.) This version of Rescue 3 is distributed by the suppliers, Grade One of Glossop (tel: (04574) 63819).

It is now possible to buy ready-filled databases for use with Superfile; the first are the Times Top 1000 companies database, and certain areas of Census data. Southdata also now markets a 'rulefinder', which can search a Superfile database for what are known as 'hidden associations'.

When we reviewed Symphony and Framework, only pre-release versions of the manuals were available. The pukka manuals for both are of excellent quality, and should make the packages as easy to use as is possible, given that they have such breadth of function.

Finally, System Builder has a complete new set of manuals, as well as some enhancements to the enquiry and report facilities, and full field editing.

Figs1-6 are summaries of the 'Features and Constraints' information which appears in each review in this series, plus the supplier information from the summary box. Fig 7 summarises the Benchmarks, from which you will see that several different computer systems were used for testing during 1984. In Fig 8, you will find a comparison of timings of one package on three computer systems — Sirius with floppy disks, and IBM PC with floppy disks and with hard disk. This should go some way to help you in comparisons across systems. For detailed information about how the 'synthetic' data set used for these Benchmarks is constructed, see *PCW* January 1984.

Before I finish, I'd like to repeat the comments I made on copyright in the December 1983 round-up article. Most readers will know that material in *PCW* is protected by copyright, as is any published material in the UK which is a signatory to the Berne Convention. However, a few do not, so I'd like to take this opportunity of reminding all readers that *the material in this article is protected by copyright law. The article may not be copied or redistributed, in whole or in part, in any form without the written permission of the copyright holders.* If you want to use the material, write to the *PCW* editor.

I would like to thank all the suppliers who provided me with help and with new information and versions of their products.

I should like particularly to thank Ashton-Tate, in the person of Ian Turner, for making it possible for me to provide the cross-machine comparisons of the Benchmarks.

| Package | Data validation | Screen formatting | Unique keys | Report formatting | Store calculations | Aggregation |
|---|---|---|---|---|---|---|
| Aspect | G | C | AM | D, C | IN, BA | Full |
| Beta | G | P, D | 1M | D, L | IN, ED | T+ST |
| BusiFile | A | P, D | 1M | C, D, L | IN, BA | T+ST |
| BusiPost | G | D | N | D, L | N | N |
| CardBox | N | P | N | P, I | N | N |
| Condor | A | P | OP | P | BA | S |
| DataMaster | G | P | OP | P, D, L | IN, BA | S |
| dBaseII | A(D) | P, D | N | P, C, D | IN, ED, BA | Full |
| dBaseIII | A | D, C, P | N | D, C, (P) | IN, ED, BA | Full |
| DBMSIII | M | D | 1M | C | IN, BA | Full |
| Delta | A | P, D | 1M | C, D, L | IN, BA | Full |
| DMS+ | A | P, D | 1M | C, D, L | IN, BA | Full |
| Everyman | G | D | AM | D | IN, ED, BA | T+ST |
| Files & Folders | A | P | OP | PAS | IN, ED | Full |
| FMS80 | A | C, D, WP | OP | C, D | IN, BA | Full |
| Framework | A | P, D | NA | P, D | IN, BA | Full |
| Friday! | A | C | N | C, L | IN, BA | T+ST |
| IM | G | P, D | N | P, D, L | IN, BA | T+ST |
| InfoStar | G | P | OP | P, D, I | IN, BA | T+ST |
| MicroPen | N | WP | N | WP+L | N | N |
| Omnis | G | P | OP | P, L | IN, BA | T+ST |
| Optimum | G | P, D | 1M | P, L | IN, BA | T/Full |
| Pearl | A | P | OP | P | IN | Full |
| Personal Data Base | A | P | NA | D | NO | T |
| Rescue 3 | G | C | OP | C, I | IN, BA | S |
| Retrieve II | A | C | 1M | D, L, C | IN | S |
| Search & Find | N | NA | N | D, I | N | N |
| Sensible Solution | G | P | OP | P | IN, ED, BA | Full |
| SuperFile | G | PD | OP | P | IN, ED | T+ST |
| Symphony | G | PD | OP | P, D | IN, BA | Yes |
| System Builder | G | C | 1M | D, C, L | IN, BA | T+ST |
| Tomorrow's Office | A | P+QA | OP | C | IN, BA | Full |

*Notes:* Data validation: G=good, A=adequate, M=minimal, N=none, D=DIY. Screen/Report formatting: D=default format supplied, C=must specify columns and rows by number, P=paint-a-screen, QA=question-and-answer, WP=through a word processor (separate program except in Search & Find and FMS80), L=letter writer, I=special link to WP (usually WordStar Mail-Merge) for output. Unique keys: 1M=one is mandatory, OP=optional (package checks if requested), NO=not required or checked. Store calculations: IN=on input, or updating in batch, ED=while editing interactively, BA=batch process to change specified fields/records. Aggregation: Full=full calculation facilities, S=statistics, totals and sub-totals, T+ST=totals and sub-totals, T=totals only. Optimum entry is for Executive/Professional versions.

*Fig 4 Features and constraints*

| Package | Store selection criteria | Combine criteria | Several tests/field | Wild codes | Browsing |
|---|---|---|---|---|---|
| Aspect | P | A, O, N | Y | SW | PK |
| Beta | N | A, P | Y | SS | PE |
| BusiFile | N | M+1P | Y | SW | AF |
| BusiPost | N | A | Y | SW | PE |
| CardBox | N | A, N | Y | SW | AK |
| Condor | P | A, O* | Y | SW | AF+ |
| DataMaster | P | A, O, N | Y | SW | AF |
| dBaseII | P | A, O, N | Y | SW | AF |
| dBaseIII | P | A, O, N | Y | SW | AF+ |
| DBMSIII | P | A* | Y* | N | AF |
| Delta | M | A, O | Y | SW | AK |
| DMS+ | M | A, O | Y | SW | PE |
| Everyman | P | A, O | Y | SW | AK |
| Files & Folders | N | A, O | Y | SS | AK |
| FMS80 | M | A, O | Y | SW | AK |
| Framework | N | A, O, N | Y | SW | AF |
| Friday! | M | A, O, N | Y | SW | AF |
| IM | N | A | N | SW | AF |
| InfoStar | M | A, O | Y | SW | AF |
| MicroPen | N | A | N | SW | AF |
| Omnis | P | A, O, N | Y | SW | AF+ |
| Optimum | P | A, O | Y | SW | PE |
| Pearl | M | A | N | SS | AK |
| Personal Data Base | N | A, O | Y | SS | AF |
| Rescue 3 | M | A, O, N | Y | SW | AK |
| Retrieve II | P | A, O | Y | SW | AF+ |
| Search & Find | N | A, O, N | N | SW | AF |
| Sensible Solution | P | A, O, N | Y | SW | AK |
| SuperFile | P | A | Y | SW | AF |
| Symphony | M | A, O, N | Y | SW | AF |
| System Builder | P | A, O | Y | SW | AF |
| Tomorrow's Office | P | A, O, N | Y | SW | PE |

*Notes:* Store selection criteria: N=not available, P=permitted but not mandatory, M=mandatory. Combination of selection criteria: A=AND (must pass all tests), O=OR (may pass any one test), N=Not (must not pass test; note that some packages which don't have this operator *do* have a 'not equal to' comparison operator for single tests), P=may set permitted level, eg, 2 means at least two criteria must be satisfied. Condor: *=allows only one method of combination in any one set of tests. DBMSIII: +=also allows Or within a single field. Omnis: OR assumed where same field tested for equality more than once. More than one test allowed per field: * DBMSIII allows several specified alternatives in one field. Wild codes: wild codes searching allowed, with SS=field must start with specified character(s), SW=field may contain specified character(s). Browsing: File may be browsed in order as follows: PE=primary key for editing, any field for viewing, AK=any key for viewing or editing, AF=any field for viewing or editing, AF+=as AF plus selection based on several fields.

*Fig 5 Features and constraints*

| Package | User image types | Reference manual | Tutorial Guide | Reference Card | Online help | 'Hot Line' |
|---|---|---|---|---|---|---|
| Aspect | M, C, FT | ** | None | None | ** | F |
| Beta | M | ** | ** | N | N | F |
| BusiFile | M, LT | *** | ** | Soon | ** | NS |
| BusiPost | M | ** | ***** | *** | **** | NS |
| CardBox | M+C | *** | **** | ** | **** | F |
| Condor | M, C, LT | *** | *** | ***** | *** | NS |
| DataMaster | M, C, LT | ** | **** | N | **** | P |
| dBaseII | M, C, FT | **** | **** | ***** | **** | D |
| dBaseIII | M, C, FT | **** | **** | **** | **** | D |
| DBMSIII | M+C, PL | * | * | N | ** | FP |
| Delta | M, LT | *** | *** | **** | *** | P |
| DMS+ | M | *** | *** | *** | *** | P |
| Everyman | M, C, LT | ** | ** | N | *** | NS |
| Files & Folders | M | ** | *** | None | *** | D |
| FMS80 | M, C, FT | *** | *** | N | *** | P |
| Framework | M, C, FT | **** | **** | **** | **** | D |
| Friday! | M | ** | ***** | **** | **** | D |
| IM | M | N | *** | N | *** | P |
| InfoStar | C | * | *** | *** | *** | D |
| MicroPen | M | *** | N | N | ** | P |
| Omnis | M+C, LT | *** | NT | **** | *** | F |
| Optimum | M, C, FT, PL | * | *** | N | *** | NS |
| Pearl | C+M | **** | **** | *** | *** | NS |
| Personal Data Base | M | N | **** | N | *** | NS |
| Rescue 3 | M, LT | *** | ** | ** | ** | NS |
| Retrieve II | M+C, LT | ** | *** | N | ** | NS |
| Search & Find | M | *** | ** | N | *** | NS |
| Sensible Solution | M, FT | ** | *** | N | *** | D |
| SuperFile | M, PL | *** | *** | N | ** | NS |
| Symphony | M, C, FT | **** | **** | **** | **** | D |
| System Builder | M, LT, PL | NT | NT | NT | **** | D |
| Tomorrow's Office | M, C, LT | ** | *** | N | **** | F |

*Notes:* User image types: M=menus, C=commands, LT=limited tailoring, FT=full tailoring, PL=interface to conventional programming language. Where commas are used, this means alternatives; plus signs mean these approaches are used together. Documentation and Help: rating from 1 to 5 stars, N=not provided. 'Hot Line': telephone support provided: F=free from supplier, P=from supplier for payment (usually annual), NS=not stated, D=depends on dealer.

*Fig 6 Documentation and Help*

| Package | System Used | BM1 | BM2 | BM3 | BM4 | BM5 | BM6 | BM7 | BM8 | BM9 | BM10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aspect$ | Sirius/F | Inst | 8secs+ | NA | 6m 29s | 8secs+ | NA | 28m 10s | 54m 30s | 6m 55s | MD |
| Beta | Sirius/F | 2s/rec | 2s/rec | 2s/rec | 2m 10s | 1m 30s | NA | 11m 40s | NP | 2m 40s | 30m 44s |
| BusiFile | Lisa/H | 3secs | Inst | Inst | Inst/3sec | 2sec/2sec | (50sec) | NP(max 167) | 4m 20s | NT | F |
| BusiPost@ | Sirius/F | Inst | Inst | NP | 2m36s | Inst | NA | 37m30s | NP | NP | NP |
| CardBox | Sirius/F | Inst | Inst | Inst | 1m40s+Inst | 8s+Inst | NP | NP | NP | NP | MD |
| Condor | Sirius/F | 2s/rec* | 2s/rec* | 2s/rec* | 5s/rec* | 2s/rec* | 2m10s | 8m10s | 5m30s | 35s | 4m18s |
| Data Master $ | Sirius/F | Inst | Inst | Inst | 4sec/rec | Inst | 1hr 12m | 1m50s* | 42m | 1hr35m@ | 2hr30m@ |
| dBaseII | IBM PC-XT/H | Inst | Inst | Inst | 20secs* | Inst | 2m 25s | 45s | 45s | 35s | 1m 5s |
| dBaseIII | IBM PC-XT/H | Inst | Inst | Inst | 50s inc scrl | Inst | 1m 50s | 1m 55s | 3m 25s | 1m 25s | 1m 58s |
| DBMSIII$ | Sirius/F | 3s/rec | Inst | NT | 4s/rec | NP | as BM7 | F | 18m35s | 12m30s | PL |
| Delta | Sirius/F | 2s/rec | 3s/rec | 3s/rec | 4m15s | 10s+3s/rec | 4m4s | 3m30s | 9m55s | 12m9s | 26m15s |
| Everyman $ | Sirius/F | 4secs | 4secs | NA | 12s/rec | 10s/rec | NA | NP | 21m45s | 22m58s | NT |
| Files & Folders | Apricot/H | Inst | Inst | Inst | 1m40s | Inst | 14m5s | 14m20s | NA | 3m31s | 22m4s |
| FMS80 | Sirius/F | 5s/rec+35s | 3s/rec | 3s/rec | 3m5s | 5s+2s/rec | 4m35s | 30m50s* | NT | 10m | 34m12s |
| Friday! | Sirius/F | 2secs | 6secs | NA | 13secs | 14secs | 14m47s | 12m24s | 6m55s | 2m20s | 19m30s |
| IM ■ | IBM PC/F | 2secs | 7secs | NP | 6m7s | 7m7s | NP | 48m40s | 21m45s | NT | NT |
| InfoStar | Sirius/F | Inst | Inst | Inst(+BM6) | Inst | Inst | 1m20s | 5m | 1hr11m | 2m30s | 1hr23m |
| MicroPen | Sirius/F | 6s/recs | 2/rec | as BM3, 1 key | NT | NT | 1hr20m* | NP | NP | NP | NP |
| Omnis | Apricot/H | Inst | 3secs | 3secs | 6s/12s | 6s/5s | 13m10s | 19m45s+ | 17m33s | 14m30s | 22m20s |
| Optimum | Sirius/F | 2secs | 3s/rec | NT | 12m55s | 12m54s | NP | 56m56s | 1hr45m | 57m20s | MD |
| Pearl | IBM PC-XT/H | Inst | Inst | Inst | 50secs | Inst/Inst | 3m | 7m25s | NA | 1m14s | MD |
| Personal Data Base | IBM PC/F | Inst | 4s | NA | 3s/18s | 3s/5s | NA | 17m40s | NA | 14m35s | P |
| Rescue 3 | Sirius/F | Inst | 3s/rec | 3s/rec | 1m5s+3s/rec | 1m15s+3s/rec | see rev | 4m10s | NP | 3m | MD |
| Retrieve II | Sirius/F | 3secs | 3secs | NA | 1m10s* | 1m48s* | NA | 17m35s | NA | 5m48s | 23m55s |
| Sensible Solution@ | Sirius/F (Signet/H) | 5secs (Inst) | 3s (Inst) | 3s (Inst) | 18m53s (1m) | 3s (Inst) | 1hr25m (15m40s) | NA (NA) | 49m27s (10m25s) | 23m20s (6m25s) | 28m53s (5m40s) |
| SuperFile | Sirius/F | Inst | Inst | Inst | NA | Inst | NT* | 2hr18m@ | PL | 1m30s | Inst |
| Symphony | IBM PC (in memory) | Inst | Inst | 3sec/Inst | NA | 3sec/Inst | NA | 1m10s | 12s | 5s | 3s |
| Tomorrow's Office | Sirius/F | Inst | 3s/rec | 53s+Inst+BM6 | 7s/rec | 3s/rec | 5m | 4m45s | 8m | 5m20s | 40m |

*Notes:* BM1 tests time to add one record (figures do not include time to enter data from keyboard)
BM2 tests time to select record by primary key
BM3 tests time to select record by secondary key
BM4 tests time to access 20 records from 1000 sequentially on 3-character field (matches in 3rd, 53rd, 103rd and every succeeding 50th record). Same field used as BMs 3, 5 & 6
BM5 tests time to access records using 'wild code' — as BM4, but only first letter of field given for matching
BM6 tests time to index 1000 records on 3-character field
BM7 tests time to sort 1000 records on 5-character field
BM8 tests time to calculate on one field per record and store result in record
BM9 tests time to add one new field to each of 1000 records
BM10 tests time to add one new field to each of 1000 records

@ Scaled up figures. Original tests were done on: Optimum — 250 records, BusiPost — 600 records, Sensible Solution (Sirius version) — 150, DataMaster (BM9 and 10 only) — 100 records; Superfile sort (BM7) — based on SF's estimate of sort as 60% complete. Where two figures are shown: for BM1 the times are given as 'access time per record'/'time to update index at end of session'. For BMs 2,3,4,5 the times are given as 'access time to first record in this search operation'/'access time for each subsequent record'.
*Condor — means '+10 seconds per search session' (possibly including several search operations).
*dBaseII and Retrieve II — times are access to list of 20 records.
*Data Master (BM7) — figure is for index on 25-char field (not 3-char field).
*FMS80 — allows Sort only on primary key field, indexing replaces sorting completely otherwise.
*SuperFile — indexing only necessary after a substantial number of changes.
NA = Not Applicable, NT = Not Tested, NP = Not Possible, Inst = <2 seconds, PL = function requires use of programming language (for example, Basic), F = test not timed because of failure during execution, MD = time to Modify Data format only, + = includes time to display records where this is inseparable, F = Floppy disk system, H = Hard disk system. Times are based on version of package as supplied to me by September 1983 for reviews published in 1983, and as at date of review for those published in 1984, except Omnis (major new release) and dBaseII. ■ Faster version now available but not retested. $ = new version due late '84/early '85 with performance improvements expected.

*Fig 7 Benchmarks 1 to 10 summarised*

| System | BM1 | BM2 | BM3 | BM4 | BM5 | BM6 | BM7+ | BM8 | BM9 | BM10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sirius F | 2s | Inst | Inst | 1m7s* | Inst | 10m50s | NA (31m45s) | 4m55s | 1m20s | 6m8s |
| IBM PC,F | 2s | 2s | 2s | 1m5s* | 2s | 7m50s | 2m43s (28m15s) | 2m57s | 1m10s | 2m57s |
| IBM PC XT,H | Inst | Inst | Inst | 20s* | Inst | 2m25s | 45s (8m) | 45s | 35s | 1m5s |

*Notes:* F = Floppy disk. H = Hard disk. + First figure for fast sort available only under DOS 2.0 upwards — not available on the Sirius. * = (see Fig 7).

*Fig 8 Comparison of dBaseII Timings*

END

SOFTWARE

# The sound of music

*Whatever your tastes in music there are software packages that promise to meet them. However, you only have to listen to a section of computerised Bach, offered on each package reviewed here, to appreciate that promises can sometimes be hard to deliver. Jane Dorner names the tune.*

## MusiCalc

MusiCalc is the most versatile, and most expensive, of the three programs reviewed here. It sets its sights very high.

Whether you like rock, classical, country, jazz, pop, blues, new wave or other, this program is said to be for you!

It comes with a very clear and well-written owner's manual, which includes a quick start-up section — a snack to whet the appetite for the main course. It also sets down its basic concept so that even if you don't manage to explore the program's hidden depths, you have a clear idea of where you could take it next.

The package can be used in a variety of ways: to create sounds using 32 pre-programmed tunes and the same number of rhythm patterns, which can be merged in random or more considered ways; to write, edit and transpose songs, produce an endless variation of backing, and save them onto disk; to learn about synthesizers and sequencers; and, finally, to generate sound effects.

I found composing on MusiCalc extremely cumbersome. I know conventional scoring isn't fashionable, but memorising all the scoring procedures necessary in this program is an obstacle to creativity. It works on a grid pattern with two matrices, the 12 semitones of the scale on the vertical axis and the note number (sub-divided into its smallest value in any given piece) on the horizontal axis (Fig 1). Scoring is done by marking asterisks and diamonds in the correct places. The temptation to make visual patterns rather than musical ones is overwhelming.

But for those who find complex writing methods no obstacle — or if you follow the instructions in the tutorials — the creative phase of the exercise now begins in earnest, because you start to use the computer like a synthesizer. That is, you control the shapes of the sound waves. You set your three voices to simulate, say, flute, drum and bass guitar. You then alter the volume and quality of sound attack, or set up instructions so that certain frequencies can be cut off to give unusual results, or alter the resonance of a voice from dull to bright, and the timbre can be changed in a variety of ways.

The procedures are complex, and require a great deal of patience and an excellent memory — rather like learning another language. However, the instructions are helpful and technical terms are explained, although the capacities of the sequencer are not given as much attention as the synthesizer.

The difference, briefly, is that a synthesizer is a device that makes sound electronically: a sequencer repeats patterns, altering them so that they mutate throughout the piece. One function a computer can easily perform is to reiterate the repeated phrases that occur in music of all kinds, but it was very difficult to discover how to do this

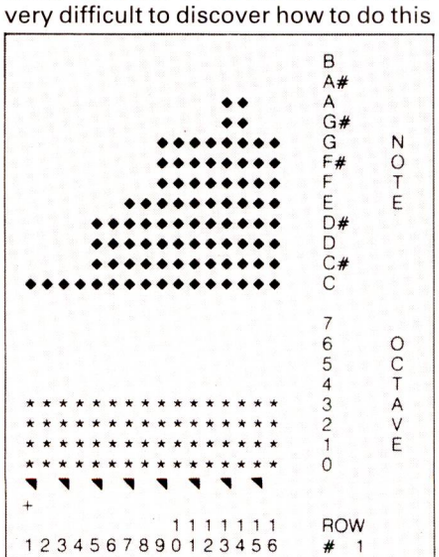


*Fig 1 Example of grid pattern showing horizontal and vertical axes*

in MusiCalc. Constant searching through the manual did *eventually* reveal the answer in a section entitled 'Links'.

Was this program written for another computer and translated for the Commodore? If so, it would explain why so much care and effort has been taken over a program that demands a much better sound quality than the Commodore supplies. But that is not to say the sound is poor — it's undoubtedly the best of the three.

## Music Master

Music Master, another Commodore 64 program, offered the next best sound quality. At its most basic level, this package can be used as a musical toy to improvise sounds or to superimpose a simple tune on top of a number of pre-selected basic rhythm patterns. All that's necessary is to familiarise yourself with the letter names on the computer that correspond to the notes on a piano keyboard shown in the lower half of the screen. For example, 'K' corresponds to the note 'C', 'L' to 'D' ':' to 'E', and so on. It's a little awkward at first, but constant use removes any difficulties.

The Commodore's three voice channels can be isolated or played in duo or trio. Each channel offers a choice between these sounds: electric piano, drum, clarinet, synthesizer, nasal, flute, violin, banjo and synthesizer bass. Any one of these voices can be used for the 34 pre-programmed rhythms, and the machine will obligingly play along as a robot accompanyist to even the most hesitant, one-fingered melody line. You can have two patterns going at once but they won't change key; they are just patterns, and not a rhythmic pulse.

So far, so good. It's not unlike an advanced Casio machine, but the program gives opportunity for a much greater variation of synthetic sound. It can be used like a word processor to edit

*Illustration by Colin Sullivan*




sounds, repeat sections and adjust tempo. Pieces can be written in three parts, recording one voice at a time, and then storing the result for later use or adjustment. There are a wide range of effect controls that will intrigue those well versed in the possibilities of polyphonic synthesizers; for example, synchronisation, ring modulation, gate filtering, and such special effects as vibrato, phasing and chorus. 'What these terms actually mean,' says the manual 'is unimportant, as a little experimentation will reveal the type of bell and gong effects that can be achieved.'

In fact, no synthesizer user would be satisfied with these sounds. A ring modulator, for example, should be very rich in harmonics and produce a haunting bell-like quality. This might be apparent if the system were wired up to a high-quality hi-fi set, or passed through a midi-interface to a superior audio-system. Fed through an ordinary TV set, the program only offers a taste of what it would be like to use a synthesizer without the wall of sound that makes it attractive.

But then, it's a fraction of the price and could get you interested in the possibilities of electronic music, even if you subsequently move on to something more aurally satisfying. There are many possibilities for producing polyphonic sounds which can be realised once you're familiar with the program.

The manual doesn't complement the program: it's confusingly arranged and not written in plain English. It's aimed at hobbyists at the lower end of the market, and a more helpful manual might provide easy access to the program's capabilities. Tutorials would be welcome, perhaps offering a familiar tune and then showing the user some of the ways in which it could be varied. (There is, apparently, one demonstration file but six attempts to locate it proved abortive and, in any case, there didn't appear to be developments to be built on it.) I read nearly halfway through the booklet before I had any idea where to start with this program.

Moreover, reading the manual is a greater effort than it need be. It's a little off-putting to be told: 'the detuning algorithm used in Music Master is simple. The detuning parameter is added to the 16-bit frequency, which the SID chip requires, and the result placed in the relevant frequency registers of the SID chip. Thus detuning is an absolute perturbation.' Well, I suppose one must put up with the odd technical note, but is it necessary to say 'Music Master initialises with presets 1 (electric piano) . . .' instead of 'When you switch on , voice 1 will sound like . . .'?

It's a pity the manual is confusing because the program is structured so that it can be adequately used at any level of complexity. It has the edge over MusiCalc (though it's much more limited) due to it costing less than half the price—and has the great advantage that tunes can be composed in a natural way with a simulated keyboard and self-regulating timing.

## Music Typewriter

The simplest of the three programs is Music Typewriter for the Spectrum. This package sets up a music stave onscreen with a choice of bass or treble clef, key signature, time signature, tempo and direction of note tails. An overlay to be placed over the computer keyboard simulates a piano keyboard, so that notes can be tapped and will simultaneously sound and appear as correct notation onscreen. It's possible to compose your own tunes or follow a score, but you have to decide on a note value before you tap it and the program presupposes a basic knowledge of music theory. Mistakes can be easily corrected if noticed immediately, but if you want to edit a piece when you've heard the playback, it's necessary to master the art of remembering the number of the bar you wanted to alter and what was wrong with it.

Having completed a successful piece, it's possible to transpose it into another key, but you can't shift a whole piece up or down an octave, nor can you go from major to minor. This is a pity — both capacities are very useful. Presumably they're not offered because the semitones in major and minor keys come inbetween different degrees of the scale, and this program hasn't found a way of devising a conversion. In fact, the programmers and the manual writers have seen fit to ignore the existence of minor scales altogether. The transposition faculty is very useful and if you had a ZX printer, the benefit of being able to print out instant top copies of a piece in any major key is considerable.

But hold on, there's a snag. To conform to accepted music theory, your piece has to be in simple duple or triple time. The Spectrum can't cope with compound time, although it claims to be able to. Indeed, in its billing it offers everything up to 15/8 time, a signature that I've never come across though it may appear in abstruse modern music.

The difficulty arises in the computer's seeming inability to cope with a sense of the first beat of the bar. Similarly, it loses the subtleties of variation of emphasis within a bar. I wouldn't quarrel with this if it at least conformed to the correct rules of musical notation by implying the subdivisions in the bar, if not actually sounding them. But it won't, for example, join three quavers together for a correct 6/8, 9/8 or 12/8 rhythm, nor does it complete rests according to the rule book.

The manual does mention triplets, but testing didn't reveal what it thought these were. There's a device whereby a numeral 3 can be put on top of any note (crotchet, quaver, even semibreve) but I don't recognise this as a symbol in common use on a single note, nor could I fathom what, in the computer's terms of reference, it meant. In general, the user manual is lamentably thin and unhelpful, and even contains grammatical and proof-reading errors, which don't inspire confidence.

Music Typewriter has other faults. It claims to be an educational tool, but an educationalist would have to be very wary of something which presents music that doesn't conform to the grammar of music writing. Ironically it's interesting because it illustrates by default how complex and subtle music theory is. A good teacher might use the positive aspects of this program to devise an instructive teaching aid by setting experimental questions which the pupil could solve with the computer's aid. But for the home user, the fact that it's insufficiently worked out is a drawback. As for professional musicians, I'm curious to learn that they can 'profit from an impressive range of facilities like transposing.' Transposing is the *only* facility: professionals will have to look elsewhere. END

### Summary

| Package | Machine | Format | Price | Supplier |
|---|---|---|---|---|
| Music Master | CBM 64 | Tape | £17.95 | Supersoft, Winchester |
| | (Amstrad version planned) | Disk | £19.95 | House, Canning Road, Wealdstone, Harrow, Middlesex |
| MusiCalc | CBM64 | Disk | £49.99 | Paradox Group, The Metropolitan, Enfield Road, London N1 |
| Music Typewriter | Spectrum | Tape | £9.95 | Romantic Robot, 113 Melrose Avenue, London NW2 |




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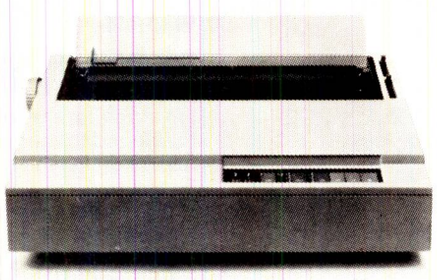

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# TJ'S WORKSHOP

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## SPECTRUM ERROR ROUTINE

This routine, for either Spectrum, enables you to disable the BREAK key and provide various options for other errors.

The routine must be activated initially, or, if continuing after a break for an error, with RAND USR onerror. This will replace the contents of the address on the stack pointed to by ERR SP with an address in this routine, so that it will be called whenever the Basic interpreter finds an error.

You can set any of five modes, by POKEing errmode.
Mode 1 — report all errors normally.
Modes 2 to 5 — disable BREAK key, report OUT OF MEMORY; and for all other errors:
Mode 2 — report normally.
Mode 3 — GOTO next line.
Mode 4 — GOTO 9990.
Mode 5 — clear program before reporting error.
Mode 3 is for anticipated errors.
Mode 4 is for unexpected errors. There's a choice of exiting or returning to the main menu.
Mode 5 enables you to load a Basic program and leave nothing to list after a loading error.

After an error, PEEK errnumb will return the error number, and the line and statement numbers where the error occurred will be in OLDPCC and OSPCC. The routine RASPs before reporting an error and is relocatable.

*Rosemary Oakeshott*

```
9000 REM error routine
9002 REM
9004 CLEAR PEEK 23730+256*PEEK 2
3731-135: REM lower ramtop
9006 LET onerror=PEEK 23730+256*
PEEK 23731+1
9008 LET errmode=onerror+28: LET
 errnumb=onerror+27
9010 FOR i=onerror TO onerror+13
4: READ a: POKE i,a: NEXT i
9012 REM
9014 REM
9016 DATA 33,16,0,9,235,42,61,92
,115,35,114,237,75,118,92,201
9018 DATA 58,58,92,60,40,110,205
,198,31,24,2,0,1
9020 DATA 35,35,119,35,86,1,244,
255,9,229,21,40,78,254,21,40,51,
21,40,71
9022 DATA 42,69,92,34,110,92,35,
21,40,6,33,9990-256*INT (9990/25
6),INT (9990/256),21,32,38
9024 DATA 254,4,40,51-0*14: REM
1*14 will clear program before r
eporting no room
9026 DATA 205,115,30,58,71,92,50
,112,92,253,203,1,254,33,0,0,253
,116,38,253,116,55,34,11,92,205,
176,22,253,112,0,195,125,27
9028 DATA 21,32,14,237,91,83,92,
42,89,92,43,205,229,25,34,75,92
9030 DATA 22,0,253,94,254,33,144
,26,205,181,3,225,195,3,19
9032 REM
9034 REM Activate Error Routine
9036 REM
9038 LET errdef=2: REM or what y
ou will
9040 POKE errmode,errdef: REM un
necessary if errdef=1
9042 RANDOMIZE USR onerror
Example of mode 3.
-------------------
  40 REM to input b in range 1 t
o 10
  50 POKE errmode, 3: REM on err
or goto next line
  60 INPUT b: IF b>=1 AND b<=10
THEN  GO TO 80
  70 BEEP .5,-8: GO TO 60: REM O
ut of range, Stop in input,divid
ing by 0 or other error.
  80 POKE errmode,errdef
  90 REM
```

## BBC MACHINE CODE REPLACEMENT

I'm sure that the following has happened to many users of Acornsoft Forth on the BBC or Electron.

You're developing an application and you attempt to TYPE a string; the screen clears and you seem to have inadvertently changed screen modes. This has the unfortunate side-effect of overwriting your buffer area and probably the top of the dictionary, which will cause a crash of the most fatal kind and you have to re-load the whole system.

The reason for this is that you've provided TYPE with an incorrect address or length count, resulting in a 'garbage' string containing VDU control codes being output: it's one of these codes which changed the mode.

I have written a screen containing a machine code definition which intercepts the standard EMIT routine by modifying the execution vector called EMIT. Now, any attempt to print 'dangerous' control codes results in a circumflex followed by the corresponding ASCII character being output; code 22 will appear as '^V. Line feed, carriage return and other cursor controls are unaffected.

SCR £ 62 3E H

0 (A Safe EMIT for A/S FORTH)
1 FORTH DEFINITIONS HEX
2 CREATE &EMIT
3 48 C, A9 C, 5E C, 20 C, EE C, FF C,
4 68 C, 18 C, 69 C, 40 C,

```
    95 C, 00 C,                    12
 5  4C C, '(EMIT) , B5 C, 00 C,    13
    29 C,                          14
 6  7F C, F0 C, F7 C, C9 C,        15
    20 C, B0 C,
 7  F3 C, C9 C, O7 C, 90 C,
    E3 C, C9 C,
 8  10 C, B0 C, DF C, 90 C,
    E9 C,
 9
10  ' &EMIT OF + ' &EMIT CFA
    !
11  DECIMAL
```

To install the definition, load the screen, then type
ASSIGN EMIT TO-DO
& EMIT
To restore normal EMIT, type
ASSIGN EMIT TO-DO (EMIT)

*Richard Clarke*

# COMMODORE 64 MACHINE CODE AUTO-START

I am interested in running my own machine code programs on the Commodore 64, but I need some way to get them to auto-start when loading from tape. Using a Basic program to load them is one option, but since that uses extra memory space, it isn't very helpful.

Basic programs can be automatically started when loaded using SHIFT/RUN, so I decided to make my machine code program look like a Basic program and the result is shown here.

The number in single quotes is the start address (which can be as low as 2074, as in the example). A five-figure start address can be obtained by replacing the leading space with the extra digit.

To save the program on tape initially, start the program at SAVEIT and the usual SAVE messages will appear (verification is also possible). Note that only memory from 2048 to PROGTOP is saved. When loaded by SHIFT/RUN, the program will load and start with the first Basic line, which is a call to the machine code routine at 2074. The main body of the program is executed and a return (via the RTS) is made to the line following the SYS statement, which returns to the Basic monitor.

When LISTed, the program appears as follows:
10 SYS 2074

Also, as with Basic, the machine code program can be re-run at any time by typing RUN.

*W H Turner*

```
0000            ;
0000            ; Example of Commodore 64 M/C
                          program with autostart
0000            ;
0000  FFBA      SETLFS=$FFBA  ;Kernel Set Logical File routine
0000  FFBD      SETNAM=$FFBD  ;Kernel Set File Name routine
0000  FFD8      SAVE=$FFD8    ;Kernel Save routine
0000            ;
0000  FB        FREKZP=$00FB  ;Spare page zero address for Save
0000            ;
0000  0800      *=2048        ;Start of BASIC program area
0800            ;
0800  000C08    BASIC   .BYTE   0,12,8,10,0,158,
                          2074',0 ;10 SYS 2074
080C  000049            .BYTE   0,0,73,0,140,1,32,0,0
0815            ;
0815  081A      *=2074        ;Start of Machine code program
081A            ;
081A            START
081A            ;
081A            ; Program body
081A            ;
081A  60                RTS
081B            ;
081B  081B      PROGTOP=*     ;Top of Machine code program
081B            ;
081B  A901      SAVEIT  LDA     #1          ;This
081D  A201              LDX     #1          ;chunk
081F  A0FF              LDY     #255        ;of
0821  20BAFF            JSR     SETLFS      ;code
0824  A904              LDA     #LDEMO      ;was
0826  A23F              LDX     #<DEMO      ;lifted
0828  A008              LDY     #>DEMO      ;from
082A  20BDFF            JSR     SETNAM      ;the
082D  A900              LDA     #<2048      ;Commodore 64
082F  85FB              STA     FREKZP      ;Programmer's
0831  A908              LDA     #>2048      ;Reference
0833  85FC              STA     FREKZP+1    ;Guide
0835  A21B              LDX     #<PROGTOP   ;page 293-294
0837  A008              LDY     #>PROGTOP   ;modified
0839  A9FB              LDA     #<FREKZP    ;and
083B  20D8FF            JSR     SAVE        ;corrected.
083E  60                RTS             ;Save complete
083F            ;
083F  44454D    DEMO    .BYTE   'DEMO'  ;Filename
0843  04        LDEMO=*-DEMO            ;Length of filename
0843            ;
0843                    END     SAVEIT
```

# 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*

# QL JOYSTICK

QL users might want to use an Atari joystick with their machine but don't want to pay £5 for a special joystick lead. However, they may well have been sent a QL printer lead which, as most printers are of the centronics type, might well be useless to them. To put that lead to good use, why not turn it into a joystick lead?

Remove the plug at the printer end of the lead. Then, taking a 9-way D plug (these are available from most electronics shops — for example, Tandy) solder the lead to it as shown below:

| Lead | Pin No |
|---|---|
| Red | 1 |
| Blue | 2 |
| White | 3 |
| Green | 4 |
| Orange | 6 |
| Black | 8 |

Take hold of the computer end of the lead and snap off the plastic clips, tidying this up with a sharp knife. Place the plug in something that will hold it firmly, with the side with two grooves facing upwards. With the sharp knife, cut out two more grooves in the plug on the right-hand side as shown in Fig 1; make the grooves to the same dimensions as the existing ones.

When you have done this, insert the plug in CTRL socket one (if it doesn't fit, cut some more out of the grooves). Now enter and run Listing two and plug a joystick into your lead. Moving the joystick should produce the correct reading onscreen, but if this is not so, re-check your connections.

Listing one is a simple procedure which will greatly improve the appearance of text by producing a slight shadow around it.

The procedure is called using the format SPRINT

"Text",x,y,DEPTH, DIRECTION. Where text could be a variable or text in quotes, x is the x coordinate on a scale of 0 to 511, y is the y coordinate on a scale of 0 to 255, DEPTH is the depth of the shadow (should be kept to 1 when using csize 0,0) and DIRECTION is the direction in which the shadow will be printed. The DIRECTION values are given below:



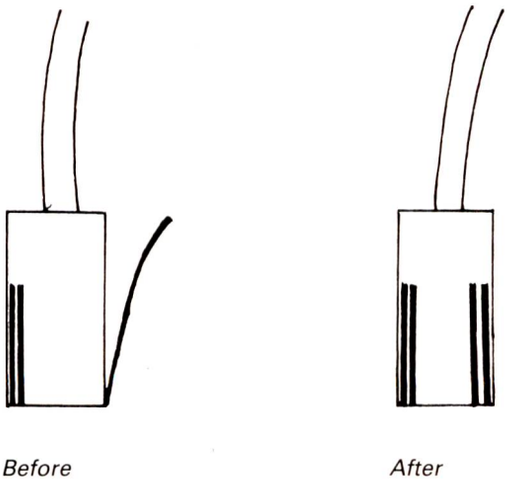

*Ian Bowker*

```
32000 DEFine PROCedure
      SPRINT(A$,X,Y,DEPTH,DIRECTION)
32010 CURSOR X,Y:PRINT A$
32020 OVER 1
32030 FOR I=1 TO DEPTH
32040 IF DIRECTION=2 OR DIRECTION=3 OR
      DIRECTION=4 THEN X=X+1
32050 IF DIRECTION=6 OR DIRECTION=7 OR
      DIRECTION=8 THEN X=X-1
32060 IF DIRECTION=8 OR DIRECTION=1 OR
      DIRECTION=2 THEN Y=Y+1
32070 IF DIRECTION=6 OR DIRECTION=5 OR
      DIRECTION=4 THEN Y=Y-1
32080 IF X<0 THEN X=0
32090 IF Y<0 THEN Y=0
32100 IF X>511 THEN X=511
32110 IF Y>255 THEN Y=255
32120 CURSOR X,Y:PRINT A$
32130 NEXT I
32140 OVER 0
32150 END DEFine SPRINT
```

*Listing 1*

```
100 MODE 4:PAPER 0:INK 7:CLS
110 CSIZE 3,1:UNDER 1:PRINT"JOYSTICK 1 TEST
PROGRAM":UNDER 0
120 INK 4
130 IF KEYROW(1)=2 THEN AT 5,10:PRINT"LEFT"
140 IF KEYROW(1)=16 THEN AT 5,10:PRINT"RIGHT"
150 IF KEYROW(1)=4 THEN AT 5,10:PRINT"UP"
160 IF KEYROW(1)=128 THEN AT 5,10:PRINT"DOWN
170 IF KEYROW(1)=64 THEN AT 5,10:PRINT"FIRE"
180 IF KEYROW(1)=0 THEN AT 5,10:PRINT"NONE"
190 AT 5,10:PRINT"      ":GOTO 130
```

*Listing 2*



*Before* *After*

*Fig 1*

# BBC MODE CHANGE

Here's a short program which enables you to change MODE on the BBC Micro with OS 1.20 without clearing the screen.

At first sight, all that's needed is to set up the correct parameters in the 6845 CRC controller and, although this will change MODE, the operating system has not been notified of the change, so some of the system variables will be incorrect.

Disassembly of the OS 1.20 ROM reveals that the MODE change routine starts at &CB1D. At &CBFO the screen clear routine seems to be entered, which is not required.

The short program below transfers the code between &CB1D and &CBFO to &2000 onwards. An 'RTS' instruction (opcode &60) is then inserted at location &20D3 so that the screen clear routine is not entered.

The rest of the program is an infinite loop which allows you to select the MODE you want to be in by pressing the appropriate number key. The MODE change routine is entered with the new MODE number in the accumulator; this is set by the value of A% in line 60.

The program is best run when the screen contains a lot of writing, as the effect when changing MODE is better.

```
10 FOR X = 0 TO &D3
20 X?&2000 = X?&CB1D
30 NEXT
40 ?&20D3 = &60
50 REPEAT
60 A% = GET - 48
70 CALL &2000
80 UNTIL FALSE
```

*Robert Turner*

ATARI FEATURES

Here are some useful features for any Atari machine.

A POKE 559,0 will turn off the screen display. Why should anyone want to do this? To make the program being executed perform 30 per cent faster. A POKE 559,34 restores the display to normal.

Another use for this technique is when the programmer wants an image to appear instantly without the user witnessing the image being drawn.

A PEEK into location 764 provides Atari Basic with a simple INKEY$ function; the value returned is an internal code representing the last key pressed. The location can be reset by a POKE 764,255.

*John R Owen*

# ENHANCING THE COLOUR GENIE

The Colour Genie has eight programmable function keys which prove to be very useful in making typing easier and quicker, but there is a catch: each key can only handle seven characters, and this is reduced to six using the automatic carriage return facility — that is, missing the final quote from the FKEY command as in the manual, results in some commands and data not fitting on a single key.

Fortunately, there is a way in which longer commands can be used with function keys — by using Basic tokens in the FKEY command, or by POKEing the token values into the memory containing the function key contents. The contents of function keys are stored in eight blocks of seven bytes starting at HEX4350. To cause an automatic carriage return, a maximum of six bytes should be used, the seventh byte being zero as should any of the six bytes not used.

Tokens for the Basic extension must each be preceded by a byte containing 255. This program enters function key 1 to contain CLS:LIST← which would not normally fit on a single key:

```
10 FOR I=&H4350 TO
      &H4356
20 READ A
30 POKE I,A
40 NEXT
50 DATA 132,58,180,0,0,0,0
```

**Explanation of data**

132 Token for CLS
58 ASCII colon
180 Token for LIST
0 Forces carriage return

I find such programmed keys a great advantage when programming in allowing me to type one key as opposed to three or four.

*Chris Warrington*

# TJ'S WORKSHOP

## VIC-20 RESET SWITCH

Have you ever tried an unusual POKE when typing in a program and found you've crashed the system? If you have and you own a VIC-20, then a 'reset switch' may be the answer to your problem.

You will need the following parts and a soldering iron:
(1) A simple push switch MS No FH59P.
(2) Some general solder MS No FR21X.
(3) A 0.156in 2×12 way edge connecter MS No BK74R.
(4) Some extra flexible wire MS No XR69A.
(5) A sticky label.

The reset switch will be connected to the VIC-20 user port (left of tape port looking from keyboard side).

Now perform the following operations:
(1) Cut two lengths of wire, each approx 25cm long.
(2) Look at the edge connecter with (gold) pins facing you.

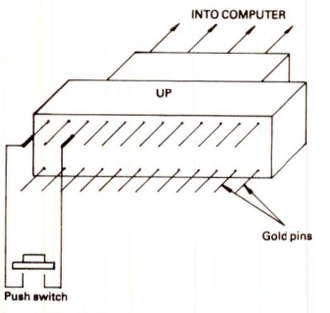
Label the top of the connecter 'UP' with your sticky label.
(3) Solder one piece of wire to the first pin on the left in the top row.
(4) Solder the other end to one pin on your push switch.
(5) Solder the other piece of wire to the third pin on the left in the top row.
(6) Solder the other end to the second pin on your push switch.

And there it is . . . a reset switch!

If you've correctly constructed your reset switch, you should now have a piece of hardware as shown in the diagram.

You should always try to insert the connecter into your VIC correctly. However, it's unlikely that incorrect insertion would cause damage, as in this case reset would not work.

*MJ Davies*




*Reset switch for VIC-20*

## APRICOT BASIC LOGOS

After you have created a logo using the LOGOEDIT utility (see the *Configurators Guide* included with the Apricot), you may want to display the logo in one of your Basic programs.

This short program shows how a logo can be printed on the screen using Basic, and is written for clarity rather than efficiency.

If no logo has been created using the LOGOEDIT utility, the preset 'apricot' logo will be printed.

*MD Dennis*

**Program**

```
 10 PRINT CHR$(14)

 20 PRINT CHR$(27)+"F"
 30 PRINT CHR$(27)+"E"

 40 PRINT CHR$(27)+"Y*=";

 50   FOR I=94 TO 114
 60     PRINT CHR$(I);
 70   NEXT

 80 PRINT CHR$(27)+"Y+=";

 90   FOR I=115 TO 125
100     PRINT CHR$(I);
110   NEXT
120   FOR I=32 TO 41
130     PRINT CHR$(I);
140   NEXT

150 PRINT CHR$(27)+"Y,=";

160   FOR I=42 TO 62
170     PRINT CHR$(I);
180   NEXT

190 PRINTS CHR$(27)+"G"

200 PRINT CHR$(15)
```

**Comments (not to be typed in)**

```
Switches into second character set.

Enters graphics mode.
Clears screen.

Positions cursor down 11, across 30.

}
} Prints top line of
} logo.

Positions cursor down 12, across 30.

}
}
} Prints middle line of
} logo.
}
}

Positions cursor down 13, across 30.

}
} Prints bottom line of
} logo.

Leaves graphics mode.

Returns to default character set.
```

The table below shows the 21 × 3 grid in which the logo is created using the LOGOEDIT utility and the respective character codes for each square in the grid. This is useful if the logo does not consume the whole of the 21 × 3 grid.

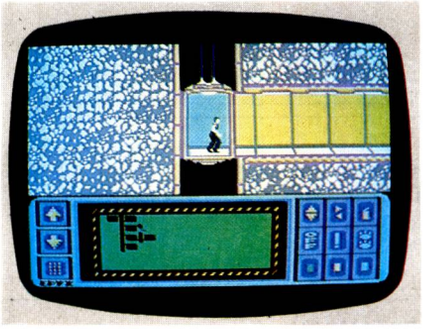
| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 |
| 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
| 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 |

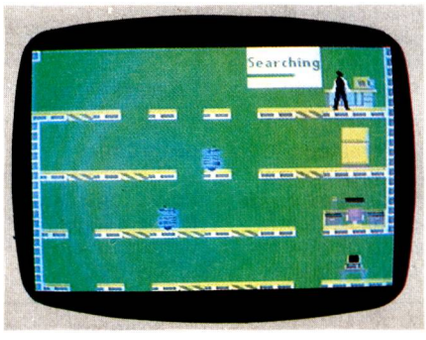
END

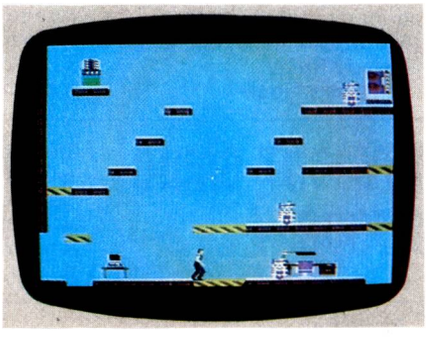
# SCREENPLAY



*Tony Hetherington tries to foil an evil doctor's bid to destroy the world, applies for the job of Master of Lore and dips into literary culture as he re-lives the strange days of Macbeth. All this and more in this month's best selection of games for the Commodore 64, Spectrum and Atari.*





## Nothing's impossible . . .

**Title: Impossible Mission**
**Computer: Commodore 64**
**Supplier: Epyx/CBS Software**
**Format: Disk**
**Price: £11.95**

'Another visitor . . . stay awhile . . . stay *forever*'. These are the game's opening words that not only set the scene, but the atmosphere too. Epyx has created a coherent software voice which also manages to sound wicked.

The voice belongs to the evil Dr Elvin whose bunker you have just entered. He has threatened the world with nuclear annihilation and it's your job to stop him. You are agent 4125 and, as you can guess, a few agents have been lost since 007: as you play the game you'll see where they went. You'll also see why this is the definitive platform game.

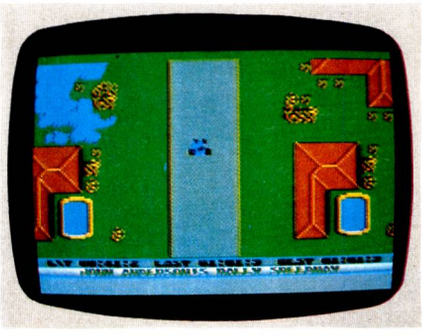
Your character is joystick controlled, and jumps and somersaults through 32 rooms. Each room consists of platforms, lifts, numerous objects to be searched and some anti-social robots.

Should you get past the human-seeking robots and reach an object (which can be anything including the kitchen sink), then you may search it. This is done by pushing your joystick up and waiting until the bar that appears is diminished; the length of this bar represents the time needed to search the object. When your search is completed you are told what you have found. This is usually nothing, but occasionally you unearth a piece of the puzzle that you must unravel in order to crack Dr Elvin's security and thereby foil his dastardly attempts to destroy the world.

Unfortunately the robots are a match for all but the best players as they cover your every move awaiting the chance to kill you, and their behaviour alters from one game to another. Routes through rooms aren't easy to discover, so the game keeps its appeal.

UK software houses could learn a lot from Impossible Mission — in terms of quality it's streets ahead. The character animation and the robots are impressive, but the sound is outstanding: as you run along the corridors it sounds like footsteps on a metal floor. The lifts make realistic noises as do the robots, but the most impressive is the voice.

'Kill him, my robots!' is a disturbing greeting as you enter a room, as is the 'Aaaaaaaargh!' when you plummet to your doom. Finally, should you fail in your mission, an evil laugh announces a report of your dismal performance.





## Life in the fast lane

**Title: Rally Speedway**
**Computer: Atari**
**Supplier: Adventure International**
**Format: Cartridge**
**Price: £28.95**

It's time to strap yourself in and head for the open road as you start this excellent rally car racing game. The game is played by one, or preferably two players who hurtle around a dry, wet or icy track that they devise themselves; the object being to complete a set number of laps in the shortest time.

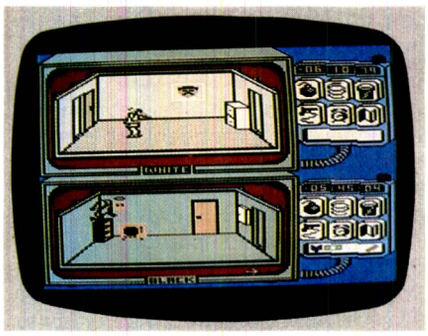
Time is lost either by crashing, or by a time penalty which is imposed if you're left so far behind that your car leaves the screen. A time penalty will cost you five seconds and a crash 10 seconds — plenty of time to rebuild a mangled car, I don't think!

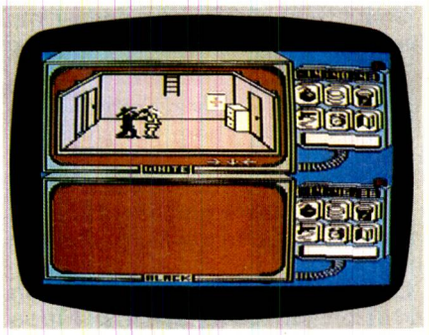
The object of the game is to stay on the track for more than a few seconds.

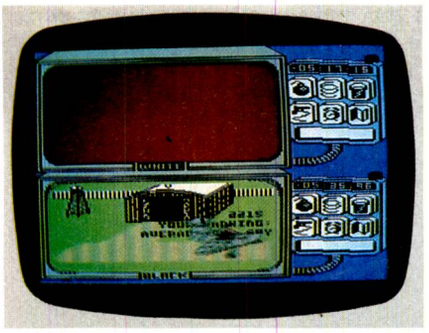
The author obviously realised that this might be a problem so you can race 'only in a computer' rather than 'in real life', which means that you can happily drive through the bushes, houses and pools that surround the course.

Once you have mastered the training you're ready for the real thing—a tussle between two equally skilled players and a no-holds-barred race. A timely ramming will either send your opponent crashing into a house, or at least push him off the track onto the grass which will slow him down, perhaps enough to earn him a time penalty.

Pitstop, which was reviewed last month, had rather average racing but excellent pitstop locations, whereas Rally Speedway features great racing but nothing else. A mixture of the two would be a winner.







# Tinker, tailor, micro, spy

**Title: Spy vs Spy**
**Computer: Commodore 64**
**Supplier: Beyond/First Star**
**Format: Cassette**
**Price: £9.95**

Two famous adversaries from *Mad* magazine come to life in this classic game of skulduggery, as you try to out-fox your enemy in an attempt to steal papers from an embassy.

Within a set time limit, you must escape through a hidden door carrying a top secret briefcase which contains passport, money, key and, of course, the secret plans. These are all hidden throughout the embassy in cupboards and behind paintings, and must be found. Unfortunately you can only carry one object at a time, except if things are put in the briefcase.

This is only a minor problem when compared to the lengths to which your opponent will go to steal your ill-gotten gains. These range from bashing you with a club to more subtle traps involving bombs, large springs and buckets of water. Traps can be laid above doors or in the hiding places. Both spies contribute to this mindless violence which makes the embassy a very dangerous place, particularly since spies have been known to be blown up by their own bombs.

There are ways to avoid most of the traps: for example, an umbrella found in a coat rack will protect you from electrifying water, but it's too late to remember this is you've already been fitted with a pair of wings and a halo. When this happens, your opponent pauses for a chuckle before continuing with his task.

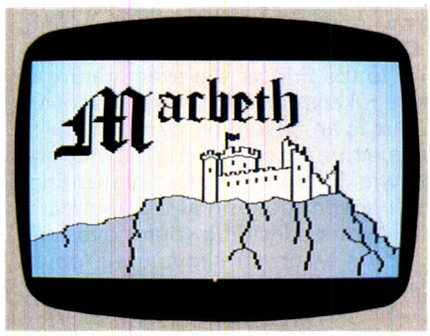
A demised spy soon returns after losing vital seconds, but well-timed revenge will turn the tables.

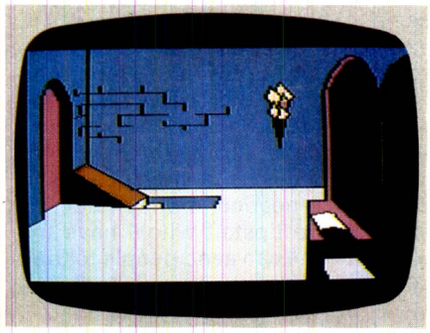
The spy who collects all the items isn't always the winner — a mugging could enable your enemy to steal the bag of goodies and make a run for his waiting plane. The winner is then rated on his performance and given an accolade ranging from 'knee high spy' up to 'good guy spy'.

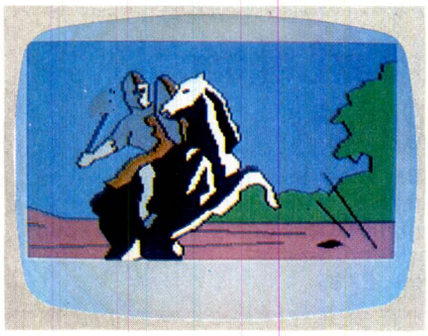
You can compete against either a human or computer opponent in a variety of embassies: these can incorporate just six rooms, or be one building split into two levels complete with holes hidden under carpets.

The screen graphics greatly enhance this game. Each spy has his own display of the room he is in which is transferred to a single display when they enter the same room. To the right of the displays are the trapulators, which are used to select the traps (with a joystick) or a map of the embassy.

The game has a soundtrack that will be whistled by the players long after the last bomb has exploded.





# Is this a game I see before me?

**Title: Macbeth**
**Computer: Commodore 64**
**Supplier: Creative Sparks**
**Format: Two cassettes**
**Price: £14.95**

Shakespeare's *Macbeth* is a powerful play and instils such feelings into actors that few will name it, simply referring to it as 'the Scottish play'. One actor was even killed in one of the supposedly cursed battle scenes. You can now play the adventure game.

There are four parts to the game, each an adventure in its own right. In the first you play Macbeth: all you have to do is slay Scotland's greatest adversaries, then discover and decode an 11th century runic script.

Macbeth features a delightful mix of text and graphics. Although the graphics are of the standard adventure game quality, many are animated and all are changed by your actions: for example, if you open a closed trap-door, when you look again the graphics screen is redrawn with the trap-door open. Similarly, objects taken and dropped by you appear or disappear from the picture. This feature is a great bonus, but to date has only been available on a few disk adventures.

After a quick change of clothes and sex, you're ready to take the part of Lady Macbeth as she attempts to murder the King. You must accomplish this and remain undetected within an hour.

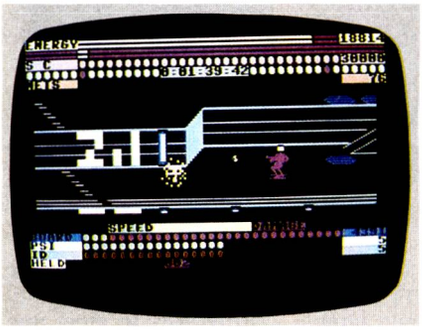
In the third part you're an assistant of the witches, and you must collect ten of the ingredients with which they'll bind Macbeth to his destiny. The balance of

text and graphics shifts here: the game is mostly visual with only a text window to enter your commands.

Finally, the game climaxes with Macbeth besieged in Dunsinane castle as you make one last attempt to seize the throne while withstanding the full force of the siege.

The package includes not only a text of the play, but also an instruction booklet which sheds light on the despicable deeds of those days.

Should you wish to delve deeper into the characters, you can use the psychoanalysis sessions that follow each part. Here you play either Macbeth or Lady Macbeth while they're interrogated by the royal psychiatrist. Many moods and feelings are revealed, and it adds an interesting and imaginative dimension to the game.




## Mind games

**Title: Psi Warrior**
**Computer: Commodore 64**
**Supplier: Beyond**
**Format: Cassette**
**Price: £9.95**

Psi Warrior is the follow-up by the company that produced the excellent Psytron, which is now available for the Commodore 64. There the similarity ends.

You are a Psi warrior whose mission is to destroy the strongest of the Psi creatures, the Source, which lurks in an ancient silo.

Unfortunately it lives 80 levels down and before you reach it you'll have to do battle with the Psi, Ids and Pupae. The Psi are bred from the mental energy of human minds and the Ids from man's animal instinct. The Pupae are disembodied human entities which are yet to turn into Psi or Ids.

They don't attack you physically but drain your Psi and Id energy; this should be avoided, since you use your Id energy as fuel with your Psi energy to control it.

You can also use Psi energy to teleport and levitate yourself, as well as to make yourself temporarily invisible.

You're armed with a Psi net gun and travel on a highly manoeuvrable hover board. The board is joystick controlled and although it's easy to use, you'll have to practise before you have sufficient skills to plunge into the depths of the silo.

Your Psi net gun fires nets which trap a Psi creature. You should be ready to move in close to drain its energy and perhaps even destroy it, but be wary — it may break free at any time.

The silo itself is a complex maze of 3D passages, teleport chambers, speed mats, slide ramps and recesses. Some of these gaps will be easily jumped, but others will require hard-earned and accurate skills.

It will take you a while to master this game's subtleties (for example, board control and the behaviour of the Psi creatures), so you can save your game position to either tape or disk.




## The art of social climbing

**Title: The Prince**
**Computer: 48k Spectrum**
**Supplier: Case Computer Simulations**
**Format: Cassette**
**Price: £7.95**

The Prince is a four-player adventure game in which you compete to become the Master of Lore to the Prince. The Master is the second most powerful person in the land, a position obviously worth fighting for as well as being worth lying, bribing, begging, stealing, dealing and blackmailing for. These are the 'talents' that the successful player must have.

The players take the parts of the four main characters who all have their own special power, or bargaining point. Grasper is a landowner who offers protection; Ambrose is a cleric who dispenses grace (this is essential — the Prince won't see anyone who hasn't been absolved from their wrongdoings); Porcus is a merchant who lends much-needed money; but it's Fernando the tipstaff who'll have the most fun — he can send people to trial.

You are ably supported by some computer-controlled characters which include Gamp, a 'buy-or-sell-no-questions-asked' stall holder, and a motley collection of spies and henchmen who are for hire.

One at a time you come to the keyboard where you have 10 inputs in which to control your character, explore the castle, hire and instruct spies and henchmen, and try to keep ahead of the others.

The next player does the same, and so on until the game is won. The winner is the first to present tokens of succession to the Prince; the exact nature of these tokens is left for you to discover.

This is an adventure game in which four people are competing but only one can win. Therefore a word of warning: don't spend too long at the keyboard. While you're deciding your moves and planning your strategy, your opponents are plotting against you.




## Riding the storm

**Title: Cyclone**
**Computer: 48k Spectrum**
**Supplier: Vortex**
**Format: Cassette**
**Price: £6.95**

A raging cyclone is approaching a group of islands and it's up to you to fly your helicopter through the storm to pick up vital supplies.

To the right of either a 3D view of the area you're in or a map of the islands, are the instruments with which you control your helicopter. These are altitude, speed, fuel and time remaining to complete your mission, the direction you're flying in and the strength of the wind. This strength will increase if you get close to the cyclone; get too close and you'll lose control of your helicopter and crash.

To score well in this game you'll need a steady hand and a cool nerve with which to hover over a crate of supplies while the cyclone draws near.

This is the follow-up to Vortex's TTL (Tornado Low Level) which, although it featured excellent 3D graphics, lacked the killer instinct that a fighter game should have. Cyclone, however, has the right combination of tension and skill that a helicopter pilot would endure in such a situation. END

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# BIBLIOFILE

*What do neo-surrealism and lengthy listings have in common? They're just two of the subjects covered by David Taylor in this month's book choice.*




## Trainspotting with RS232

**Title: RS-232 Made Easy: connecting computers, printers, terminals and modems**
**Author: Martin D Seyer**
**Publisher: Prentice-Hall Inc**
**Price: £19.20**

Not, on the face of it, an engrossing topic for a book. You can, after all, adequately describe RS232 in a sentence. RS232 is jargon for a serial interface: you bung the plug into the socket, thus connecting your computer to a modem, for example, or a typical daisywheel printer.

Provided you don't confuse a serial interface with a parallel one (the so-called centronics standard), which is usual for hooking up dot-matrix printers, I shouldn't have thought there was too much else to talk about. People don't as a rule queue up to buy books describing, say, coaxial jacks, or for that matter the life and times of a 13amp three-pin plug. What's so special about RS232?

Mr Seyer does his utmost to convince us that unravelling which-wires-do-what within RS232 is the key to grasping the theory of serial input/output in general, and communications technique in particular. It's a spirited attempt, but a good two-thirds of this book nevertheless consists of dreary appendices, painstakingly listing the pin configuration of umpteen devices, or copying out the Electronic Industries Association's laborious definition of standards.

The remaining third of the book is mostly about trains. It's an American railroad, mind you, so you'll need to know your boxcar from a caboose to grasp the various analogies with shunting data. In time, you do get briefed on setting up for modem transmissions — duples, parity, baud rates, and so on — but you start to nod off, too.

It would make life simpler to get dealers to supply the right cables along with any RS232 connected devices you might buy and to have fun *using* add-ons instead of messing about stripping down their connections. *RS-232 Made Easy* forgets that its subject doesn't need to be so difficult in the first place.

## Computer dating

**Title: How To Buy Software: The Master Guide To Picking The Right Program**
**Author: Alfred Glossbrenner**
**Publisher: Papermac**
**Price: £9.95**

A door-stopper of a paperback, this, and numbingly prolix in the way that all-American, catch-all handbooks by people with names like Alfred Glossbrenner often are. It's Mr Glossbrenner's ninth, making me wonder if he ever sleeps. I like to picture him hacking through the night in a stetson, a fat stogie clenched between his gold-filled teeth, a can of Budweiser at his side.

There are, he points out, only a hundred or so computer manufacturers and far fewer major ones, yet there are something like 40,000 separate software packages 'and they're multiplying like coat-hangers in a darkened closet.' Goshdarn it, for a moment there I feared Glossbrenner might be about to fling open the closet and take a look at every one of them.

In the event he majors on software types like the 'big four' accounting routines (general ledger, accounts receivable, accounts payable and payroll), spreadsheets, databases, communications, word processing, business graphics, educational software and games. They each get a chapter (25 in all) while other chapters crash-course through operating systems, programming languages and hardware configurations. Glossbrenner's *gee-whizz* exuberance never lets up for a moment.

Peppering his text are hundreds of 'SoftTips' — sometimes handy shortcuts through intractable procedures, sometimes blindingly obvious little homilies along the lines of *don't buy what you don't understand*, sometimes sidetracks into *well-I-never* land.

There is, it has to be said, a lot of useful information in this book (all of it, except a short appendix, directed at an American audience), but it also needs to be said that the relentless Mr Glossbrenner goes on and on and *on.*

Let's leave him with one of his typical SoftTips, which will give you the flavour: 'You can think of Compuserve's CB section as a gigantic, ongoing telephone conference call. The difference is that instead of speaking your comments, you type them in and read those made by others who are online. At least two couples who met on the system later got married — on the system. The minister was in one state, the parents and the happy couple were in several other states, and the wedding guests were scattered all over America. When it was all over, all the guests threw rice — by hitting the hyphen keys on their computers.' Gee.

## 'Life's too short'...

**Title: Basic ROM User Guide for the BBC Microcomputer and Acorn Electron**
**Author: Mark Plumbley**
**Publisher: Adder (Cambridge)**
**Price: not known**

Those electronic swots who are almost freakishly fascinated with the innermost technical structures of BBC Basic or 6502 machine code are going to love this book. Those who aren't, aren't.

Mark Plumbley is, in short, an enthusiast's enthusiast: eager to sit up until the small hours with a pot of strong coffee and his disassembler, getting to intimate grips with BBC Basic, not as a language, but as a system.

In theory, this leads to better programming technique, and you won't catch Plumbley's apprentices using GOSUB when they can call PROC or FN. In practice, what it leads to is bags under the eyes — but fanatical fiddlers don't mind that when they're having such fun.

This isn't a book you read in the ordinary sense, it's one you labour through line by line, mental spanners in hand — a kind of theoretical workshop manual for those who can't rest until they've taken their toys to bits, until they've split the Acorn.

As such it's matchless, meticulous and mind-bendingly thorough. Whether or not you might consider that life's too short, I leave entirely to you.

## Art for art's sake

**Title: Computer Art and Graphics**
**Author: Axel Brück**
**Publisher: Element (Paul Petzold)**
**Price: £14.95**

Some risk again here of going bosseyed from tap-tapping lengthy listings, but working up to fancy graphics sounds like more fun than crunching ROM. In any case, we're told, it's not the idea at all to key in the provided (Basic) programs and stand back to gasp. You're supposed to have in your artistic imagination some exquisite design, then to use the book's examples of method and problem-solving to persuade your micro — any micro — to create your highly personal electronic canvas. The snag is that your results may prove a bit of a let-down against the wonderfully impressive, neo-surrealist colour plates which Herr Brück includes to demonstrate his gift.

The unfortunate fact is that without sophisticated (and expensive) gadgetry, such as very high resolution monitors, decent CAD software and fancy plotters, achieving computer graphics which can decently be called art is a terrible sweat.

Brück assumes that you can at least run to a plotter (he has a handy friend who knocks them up for him) and asserts that the rest doesn't really matter a damn if you're patient with his methods. He's pretty sniffy about the crude standards of average arcade-style games; his game is to plot a piece of artwork you might want to pin to the wall. And in time you do get there, by way of simple shapes, more sinuously complex ones, clipping routines, multi-dimensional techniques and controlled perspective.

It's hard work, made harder by the frequent need to tinker with Herr Brück's listings to match your particular Basic (his is Apple), but this is an interesting and unusual book, assembled by an accomplished artist who admits to knowing nothing about electronics, but who has an infectious enthusiasm and can show remarkable finishes.

## Misery and mystery can be yours...

**Title: Commodore 64 Data Files**
**Author: David Miller**
**Publisher: Prentice-Hall**
**Price: £8.95**

The purpose of this book, says the author, is to take some of the misery and mystery out of learning to use the Commodore 64's file structure. The pity of it is, of course, that the misery and mystery are there in the first place. My rather jaundiced view of the Commodore 64 is, I'm afraid, that it's an ageing machine. On the whole I'd rather not age with it, struggling to understand its quirky ways.

Most of this book consists of lengthy listings which, mercifully, can be ordered from California on disk. Some are just for drill and practice, others provide a mailing list, a home inventory, a magazine catalogue or a simple medical records file. If you choose to enter them from the book, note the author's ridiculous warning that they were printed out on a letter-quality machine which couldn't differentiate between number 1 and lower-case letter l, had slashless zero and no means of doing a proper up-arrow character.

Manipulating Commodore 64 files and creating your own programs are yours to discover with this book, says the blurb.

All yours, say I. END

# Happy-go-lucky C

*Les Hampson introduces the features of C, and explains how the language's versatility enables it to adapt to ever changing requirements.*

Which high-level language do you think is used to produce many of the spreadsheets, databases, word processing applications and the integrated products now appearing? Which language has Digital Research (of CP/M fame) adopted for system development? Not Fortran nor Pascal, and certainly not Basic, but C.

Why is C so popular with professional software writers? The answer is: because it is versatile, puts few constraints on what can be done, produces fast and compact programs, and allows software to be readily transferred between systems. Although C was conceived for 'systems programming' (which means writing things like operating systems), specifically developing the Unix operating system, it has proved useful for general applications.

C works well in many applications, and versions are available for almost all machines with disk drives. Some of the 8-bit versions are subsets of the language (for example, without floating point operations) but are still very useful; almost all 16-bit implementations provide the complete language. You probably don't want to write your own CP/M, a compiler, or an alternative to Multiplan, at least not just yet, but if you want an efficient, general purpose language, or need the flexibility of assembler without the headaches, then C has a lot to offer.

The name itself reflects that C is not a verbose language, so let's jump straight in with a sample to show that it can be fairly easily understood. Fig 1 compares a simple loop in C and in Basic; a lot can be learnt from this example. C does not use line numbers and the program can be laid out as required, although everything on one line would be going a bit far. The types and names of variables have to be declared before use, unlike Basic which provides a variable when a new name appears (or even a mistype). The braces { } enclose groups of statements and each of these is terminated by a semicolon.

The general approach will be familiar to anyone who uses Pascal, especially when you realise that the braces correspond to BEGIN and END. Although you can use expressions like x = x + 1, C has special operators such as '++' to increment and '+=' to add to a variable because these can be more efficient.

What the example does not show are the advantages of using C: for such a trivial program there aren't any, and Basic has the advantage of being easy to get started in and can be run immediately. But larger programs are better written in the structured way encouraged by C with full control over variables, rather than huge monolithic blocks of Basic with control jumping all over the place. A large, well written, C program, such as a text editor which might be 2000 lines, can be readily understood once you become familiar with the constructions used; on the other hand, a badly written C program can be very cryptic and difficult to unravel.

In Basic

```
10 for i=1 to 20 step 2
20 x=x+1
30 next i
40 print "finished ";x
50 end
```

In C

```
main()
  {
  int x,i;
  for(i=1,i<=20;i+=2)
                x++;
  printf("finished %d",x)
  }
```

*Fig 1 A simple loop in Basic and in C*

**Version 1**

```
/*
since 1 is always true (ie non zero) the loop will continue
until explicitly broken
*/

while(1)
   {
   c=getc(myfile);                /*get a character from file*/
   if(c==EOF) break;               /*exit loop at end of file */
   if(c==0) num_null=num_null+1;   /*increment if c is zero*/
   }
```

**Version 2**

```
while((c=getc(myfile))!=EOF)
            if(c==0) num_nul++;
```

*Fig 2 Two loops showing different constructions*

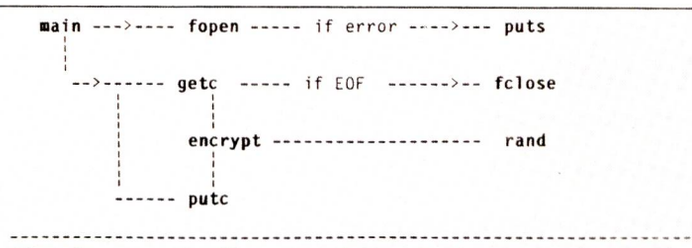


*Fig 3 Structure for file encryption program*

```
break continue
char short int long float double
extern unsigned static auto register
while for do if else goto return
switch case default
union struct
sizeof typedef
```

*Fig 4 Keywords in C with specific meanings*

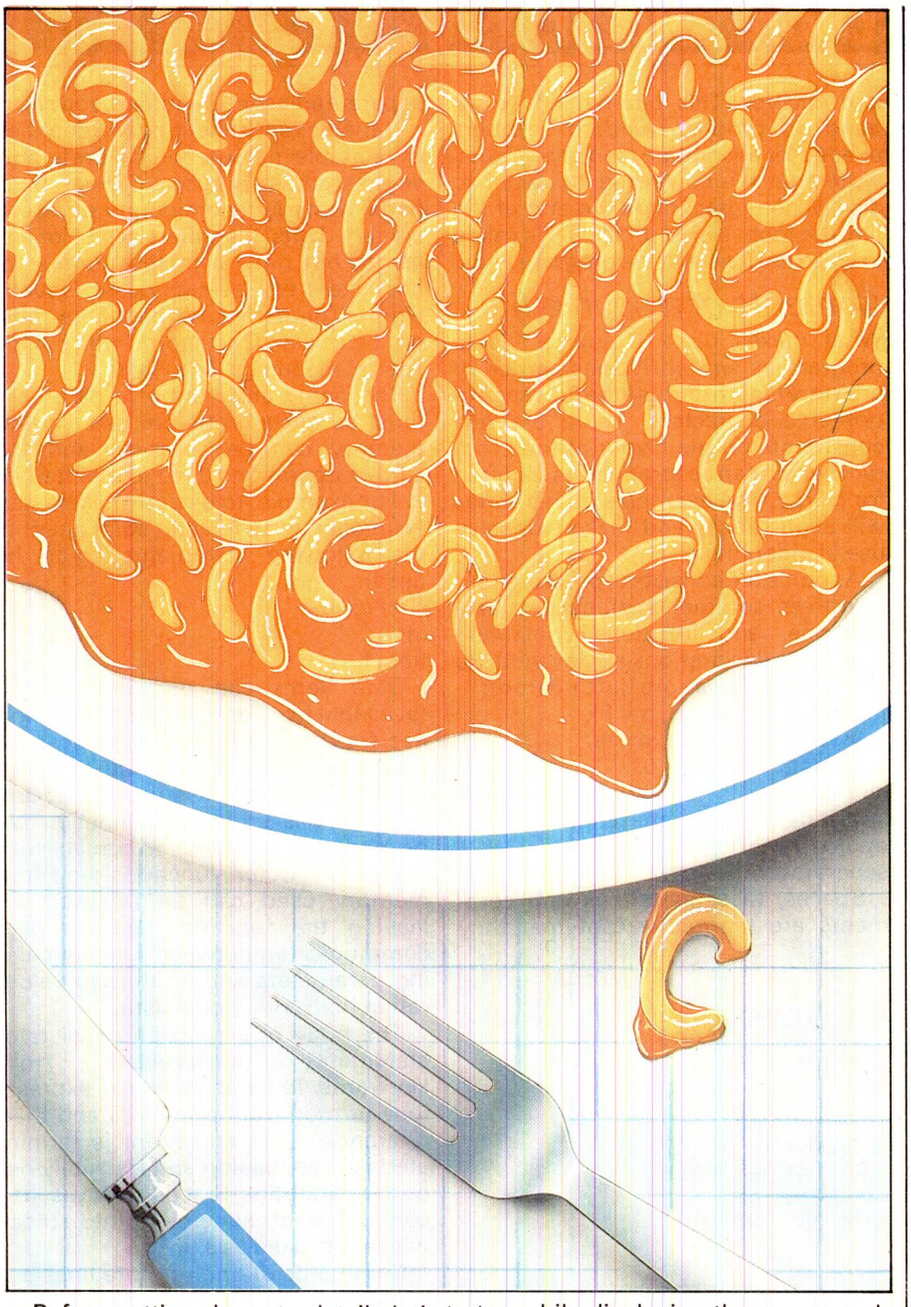

Illustration by Mark Watkinson

Before getting down to details let's look at another example. The first part of Fig 2 is another loop which gets characters from a file and counts the number of zeros. The loop is exited when the end of file is reached. The '= =' symbol tests equality, whereas '=' is used for assignment. In practice the second version, which does exactly the same job, would be preferred because it can be translated by a compiler into more efficient machine code. Although such concise constructions are common in C, they take some getting used to.

## Using C

In general, C has to be compiled — there's no instant gratification as with an interpreter. A suitable package will include compiler, linker, function library and a text editor of some kind. These will, of course, have been written in C. Many versions also have utilities for maintaining function libraries. A few have a symbolic debugger, which allows you to run programs step-by-step while displaying the source code and to check the values in variables. A few C interpreters have been written but are not widely used.

The language is defined in an excellent reference text (*C Programming Language* by Kernighan and Ritchie, Prentice Hall, 1978). No extensions to the standard are required or generally available, thus eliminating the problem of confusing variants found with other languages.

## Functions

Functions are the building blocks of a C program. A function is a series of instructions called by name to carry out operations such as read from a file, clear a display screen or manipulate numbers. These are much more powerful than the subroutines and defined functions of Basic, and have more in common with the built-in commands like 'sin' and 'mid$', except that you can write your own. A well-witten C program will be broken up into numerous fairly small functions, either because these are used repeatedly or just in the interest of clarity.

Functions can carry out actions and return a value; parameters can be passed to them and they can use local variables not known outside. The function 'getc' in the second example returns a character read from a file identified by the parameter 'my file'. It might use various local variables, but since these are internal to the function we don't need to worry about them and can't affect them. C programs must contain at least one function and must contain a function named 'main'. A program starts executing at 'main', otherwise this is just a function like any other. The smallest C program, which does nothing at all, is

```
main ( )
        {
        }
```

The name of a function is followed by brackets which enclose the names used to refer to any parameters passed to it. The braces then enclose the body of the function. One function can call another or even itself (that is, recursion) as required.

A reasonable first program, with only one defined function, might be:

```
main( )
    {
    char c;

    for(c=32;c<127;c++)
      printf("%d %x %c/n",c,c,c);
    }
```

This will display the ASCII character set and give the decimal and hexadecimal equivalents. The loop calls a standard library function 'printf' which displays the information according to the format string between the quotes (decimal number, hex number, character and then a new line). Notice that the variable 'c' has to be declared before being used, and that it is incremented using the special '++' operator. As well as the format string which tells 'printf' how we want the printout, the names of the variables (all 'c' in this case) are passed to it. The 'for' loop is controlled by three expressions which define an initial condition, a termination test, and a modification after each time through.

## Developing a program

C is a powerful and flexible language which can produce well-structured programs. Complex constructions can be elegantly expressed and data structures designed to suit the application. However, as in all things, there is a price to pay: the programmer is assumed to be right and few checks are made, which means that some errors can be truly spectacular. This 'Teach Yourself' series should lead you around common pitfalls, and as you write increasingly complex programs you will begin to appreciate the virtues of C and its brevity.

Large programs in C are best developed using a 'top down' approach — that is, dividing the overall objective

into logical sections and then into sub-tasks. Eventually a level is reached where the tasks can be conveniently constructed as C functions. It is also necessary to consider how information will be passed between the functions, and how data is best handled. Some planning effort before starting to write the program avoids the torture of sorting out tangled, unnecessarily complex and badly structured code.

C will not produce a fast-running program from poor ideas. The algorithms used are crucial in determining eifficiency, as in any language. For example, if you were writing a spelling checker, then the methods used to sort words into order, check against the dictionary and use memory for disk buffering would have a major effect on the time your program took to run.

Suppose we want a program to encrypt the data in a file so that it cannot be used by others. Fig 3 shows the functions which might be used.

The function 'main' first calls 'fopen' to access the file to be converted and to create a file for the encrypted version. If the files cannot be accessed, then 'puts' prints a message and the program finishes. A loop in 'main' uses 'getc' to get a character from the file, and passes it to 'encrypt'. This in turn needs to call 'rand' to produce random numbers needed for encryption, and finally 'putc' writes out the converted character to disk. When 'getc' finds the end of the file, the loop is exited; 'fclose' is called to close the files and the program ends.

## Contents of a source file

What makes up a C source file (a program as written)? Lines can be of arbitrary length and use the full range of printable characters. There are few constraints on the layout of the program, which can be arranged as required for clarity. The examples in this series will align braces and make extensive use of indenting.

A source file consists of preprocessor directives, comments, global data declarations, and functions containing local data declarations and executable statements. These are built up from:

| | |
|---|---|
| identifiers | —eg, my file |
| keywords | —eg, while |
| constants | —eg, 0 |
| character strings | eg, "this is a message" |
| operators | —eg, + |
| separators | —eg, ; |

Spaces, tabs, new lines and comments are ignored except that they separate adjacent identifiers, and so on.

Variables and functions are identified by suitable names, which preferably suggest their purpose. These must begin with a letter or underline and can contain digits. Identifiers can be of any length but only a limited number of characters will be significant (usually eight). The names of identifiers must not be certain C keywords which have special meanings (see Fig 4).

The name and type of a data item must be declared before use, so that memory can be reserved and the correct operations used to manipulate it. For example, to declare a *char*acter, an *int*eger and a *float*ing point quantity the following statements could be used:

```
char c;
int i;
float f;
```

Data items can be made global (available from any function) by being declared outside functions, or local to a particular function by being declared inside. This is very useful because any data which is 'private' to a function can be made local; there is no conflict with names in other functions and the memory used can be released on leaving the function. Data is best communicated between functions using parameters and a returned value, rather than with global data.

The body of a function consists of statements constructed from keywords, function calls and expressions formed from operators and their operands. Each statement is terminated by a semicolon and is usually put on a separate line. Braces can be used to combine single statements into a block which is treated as a unit.

Comments of one or more lines are enclosed by the symbols '/*' and '*/'. C statements can be terse, so comments should be generously used.

A source file can also contain preprocessor directives which are simply instructions to the compiler. The directives begin with the '#' symbol; they do not end with a semicolon since they are not C statements, and are dealt with before any translation takes place. The basic use is illustrated by:

```
#define MAXCOLS 80
```

This will cause all occurrences of MAXCOLS to be replaced by the numerical constant 80. This is preferable to scattering obscure numbers through a source file and makes changes easier. The replacement symbol does not have to be a number; it can equally well be, say, a function call or character string. It is also possible to define symbols with arguments in the form of 'macro' definitions.

## Function libraries

A program does not have to be contained in one source file. Larger

```
/*
elements of a program to encrypt data in a file called
original.fil into one called secret.fil
*/

#include "stdio.h"

/*
The above directive reads in the file stdio.h which is
contains essential input/output definitions, including FILE
*/

#define EOF -1
#define REQUIRED 1
#define NULL 0

main()                                  /*main function*/
     {
     int c;                             /*declare an integer*/
     FILE *in_file,*out_file;           /*declare file identifiers*/

     in_file=fopen("original.fil","r"); /*open for reading*/
     out_file=fopen("secret.fil","w");  /*open for writing*/

     if(in_file==NULL || out_file==NULL)
                  puts("File access error");  /*cannot open files*/
     else
          while(REQUIRED)               /*loop until broken*/
               {
               c=getc(in_file);         /*get a character*/
               if(c==EOF) break;        /*exit loop if end of file*/
               c=encrypt(c);            /*encrypt the character*/
               putc(c,out_file);        /*and write it to the file*/
               }

     fclose(in_file);                   /*close the files*/
     fclose(out_file);

     }                                  /*terminate at end of main*/


encrypt(x)                              /*encryption function*/
char x;                                 /*declare parameter passed*/
     {
     x=x^rand();                        /*encrypt the char by XORing with a
                                          random number*/
     return x;                          /*return encrypted character*/
     }
```

*Fig 5 Skeleton encryption program*

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## Who's a clever boy, then?

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programs, especially, are likely to consist of several files which are separately compiled and finally linked together along with required library functions to give something which runs.

Where do all the functions required in a program come from? It may come as a surprise to discover that C provides no built-in access to display, keyboard, printer nor disk files. Nor does it provide basic operations such as adding one string of characters to the end of another or taking the sine of an angle. The language can be used to do all these things (given some way of interfacing with the operating system), but suitable functions have to be devised.

This sounds distressing, but fortunately the user is not required to write such functions because they will be provided in a library with the compiler; a program simply calls them. However, the library functions are not an intrinsic part of C. Most implementations try to follow the functions provided with Unix, but as they are not part of the language, this is in the hands of the software author. We will be looking at the functions you would expect to be provided with later on in the series.

Two basic functions which are always provided are 'getchar', which returns a character typed in, and 'putchar' which displays a character on the display. Using only these it is possible to experiment with many of C's features.

In writing your own programs, you will probably devise functions which are of general value. If these use local variables, passed arguments and a returned value, then they can *stand alone* and be added to a personal library. This is the 'toolbox' approach which leads to a specialised library to suit particular interests.

*'. . . if you want an efficient, general purpose language, or need the flexibility of assembler without the headaches, then C has a lot to offer.'*

The program in Fig 5 fleshes out the skeleton encryption program to illustrate C. It should be possible to understand how the program works and the way in which functions are used, even if some of the details are not yet clear.

The functions 'fopen', 'fclose', 'puts', 'getc' and 'putc' or equivalents would normally be in the supplied library. If the function 'rand' is not available, then a programmer could write his own version for inclusion in a personal library.

The function 'main' has been put first; this is common but not essential. Of course, if a program consists of several source files, then only one will contain main.

This program could be developed for actual use: a password could be entered and converted into a seed for the random number generator and the original file deleted once the converted version had been successfully stored. Since the XOR operation is reversible the same program could translate the file back to the original form (it would be best to include checks for file operation errors).

A number of questions arise. Why is a variable to hold a character c declared as 'int' in main, and x as char in encrypt? How can a number be XOR'ed with a function? Is it possible to call the program with the names of the files to be used rather than have them built into the program? The following four articles will cover these and many other points in detail. END

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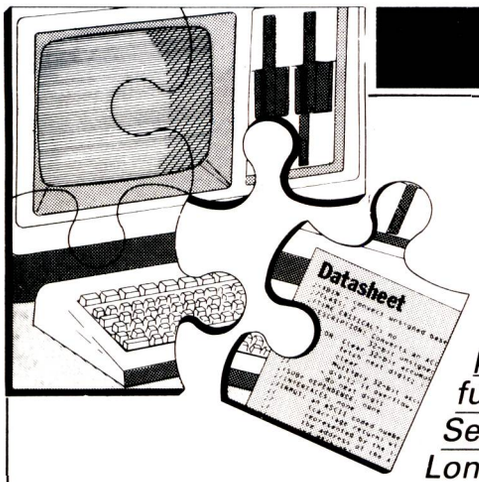


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*David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send 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 Sub Set, PCW, 62 Oxford Street, London W1A 2HG.*

## 6502 SUPER SET

Andrew Civil of Coventry took a brief look at the dozens of unspecified 6502 instructions (*PCW*, January 1984) and has found that $9F is more complex than was thought. Instead of storing A AND X to an absolute address indexed by X, it stores A AND X AND N to an absolute address indexed by Y. N is calculated as one more than the high order byte of the destination address — not much use unless you want to store a number to page $FE00.

## GRAPHIC DOTS

DOT-A from John Penfold of Harpenden, and DOT-B and DOT-C, both from Barrie Frost of Basildon (all in Datasheet 1) are just a few of the innumerable ways of writing two bits of graphics information to a target byte.

For the benefit of new readers, SubSet issued a challenge in November 1983 for an 'elegant solution' to the problem of placing this information. The first set of solutions, in 6502 and Z80 code, were printed in April 1984.

Just to make Z80 programmers try harder, the faster 6502 solution took only 43 clock cycles — at the cost of a 20-byte look-up table.

## DATASHEET 1

```
;============================================================
;= DOT       Place 2-bit graphics dot information.
;> ...       DOT-A. DOT-B. DOT-C.
;============================================================
;JOB         To replace the existing 2 bits of graphics
;           information in a target byte by new information
;           formed from an input 2-bit value.
;ACTION      Move new dot information to correct bit positions.
;           Construct mask in correct bit positions.
;           Mask out old dot information.
;           Merge in new dot information.
;------------------------------------------------------------
;CPU         Z80 (DOT-A is 8080).
;HARDWARE    1 byte of RAM containing graphics information.
;SOFTWARE    None.
;------------------------------------------------------------
;INPUT       16-bit pointer addresses target byte.
;           8-bit register holds dot number (0 to 3).
;           8-bit register holds new information in bit 1 (msb)
;           and bit 0 (lsb).
;                       Target      Dot no.     Info.
;             DOT-A       (DE)        C           A
;             DOT-B       (HL)        B           A
;             DOT-C       (HL)        B           C
;           Target byte format:
;               bit:   7   6   5   4   3   2   1   0
;               dot:   0   1   2   3   0   1   2   3
;              info:   <... msb ...>   <... lsb ...>
;OUTPUT      Target graphics byte contains new information.
;           Some input and other registers changed.
;ERRORS      If information and dot numbers exceed 03H.
;REG USE     DOT-A: PSW A C DE HL.
;           DOT-B: F A B C HL.
;           DOT-C: F A B C HL.
;STACK USE   None.
;RAM USE     None.
;LENGTH      DOT-A: 24.  DOT-B: 22.  DOT-C: 18.
;CYCLES      Dot number:          0       1       2       3
;           DOT-A:             225     178     131      84
;           DOT-B:             142     117      92      77
;           DOT-C (bit 1 = 0):  79     104     129     154
;           DOT-C (bit 1 = 1):  82     107     132     157
;------------------------------------------------------------
;CLASS 2      -discreet      *interruptable      *promable
;-****-       *reentrant     *relocatable        -robust
;                  (DOT-A is not relocatable.)
;============================================================
;
DOT-A  ADI  8       ;Propogate bit 1 into bit 4 by      C6 08
       DAA          ;decimal carry to high digit.       27
       ANI  11H     ;Mask out unwanted bits and store   E6 11
       MOV  L,A     ;split information in L.            6F
       MVI  H,0EEH  ;Set initial clearing mask in H.    26 EE
;
SHIFT  MOV  A,C     ;Get dot number and test if mask    79
       CPI  3       ;and information in correct bit     FE 03
       JNC  DONE    ;positions, exit loop if they are.  D2 lo hi
       DAD  H       ;Else shift both higher by one bit  29
       INR  C       ;to next lower dot number, count    0C
       JMP  SHIFT   ;off dot shift & loop until done.   C3 lo hi
;
DONE   LDAX D       ;Get target byte in A and           1A
       ANA  H       ;mask out old dot information,      A4
       ORA  L       ;then merge in new information      B5
       STAX D       ;and replace it.                    12
       RET          ;Exit, information placed.          C9
;------------------------------------------------------------
;
DOT-B  ADD  A,14    ;Propogate bit 1 to bit 4,          C6 0E
       AND  11H     ;mask out unwanted bits,            E6 11
       LD   C,A     ;and save information in C.         4F
       LD   A,3     ;Convert dot number to shift count  3E 03
       SUB  B       ;in A, setting Z if number was 3,   90
       LD   B,A     ;then store in B for quick DJNZ.    47
       LD   A,0EEH  ;Get initial mask in A at dot 3,    3E EE
       JR   Z,D-B2  ;and skip if in correct place.       28 05
;
D-B1   RLC  C       ;Else shift both information and    CB 01
       RLCA         ;mask to next dot position and      07
       DJNZ D-B1    ;repeat until in correct place.     10 FB
;
D-B2   AND  (HL)    ;Get target byte, masking out old   A6
       OR   C       ;information and merging new,       B1
       LD   (HL),A  ;then restore it.                   77
       RET          ;Exit, information placed.          C9
;------------------------------------------------------------
;
DOT-C  SRL  C       ;Shift bit 1 to bit 0 and bit 0     CB 39
       JR   NC,D-C1 ;to Cy, skip if a 0, else set       30 02
       SET  4,C     ;bit 4. Bit 0 now in in bit 4.      CB E1
D-C1   INC  B       ;Prepare for 1 to 4 rotations.      04
       LD   A,0EEH  ;Get initial mask to match info.    3E EE
;
D-C2   RRCA         ;Rotate mask and information 1 bit  0F
       RRC  C       ;to next higher dot position,       CB 09
       DJNZ D-C2    ;repeat until in correct place.     10 FB
;
D-C2   AND  (HL)    ;Get target byte, masking out old   A6
       OR   C       ;information and merging new,       B1
       LD   (HL),A  ;then restore it.                   77
       RET          ;Exit, information placed.          C9
;============================================================
```

## INTELLIGENT MOVES?

Hugh Dobbs of Waterford, Eire, is not too happy with the intelligent block moves of August 1984 and has submitted two pertinent comments and an improvement to IBT65.

Hugh's first point concerns IBTZ8, which will not effect the move if the destination is at the same location as the source. He thinks this is possibly a foolish decision if the system supports parallel banks of RAM or ROM when blocks may need to be copied from one bank to the other.

But IBTZ8 uses the automatically repeating LDIR and LDDR to perform the data transfers: these cannot be adapted to switch banks between the read and write operations, so an entirely different routine has to be written for bank-switch transfers.

His second point is not so easy to dismiss. None of IBTZ8, IBT65 and IBT68 will handle blocks which cut across the $FFFF-$0000 boundary in a 'wrap-around' situation. The fact that page zero is implemented as a pseudo-register area in the 6502 and as RESTART or interrupt locations in the Z80 doesn't eliminate the possibility of wrap-around transfers using these areas.

Hugh's IBT65 improvement shaves off one byte and two clock cycles and makes it relocatable. The two absolute jumps in IBT65 can each be replaced by the sequence:

'CLV; BVC label' to labels FWDLP and RVRSLP. These operate in the same time provided no page boundaries are crossed. The 16-bit comparison (instructions 9 to 13) is better done by the code in Fig 1. Carry doesn't need to be set if CMP is used for the low order byte as it does if SBC is used.

```
;...test relative positions of source and destination.
        LDA  M0      ;Compare source (M0,1) with          A5 M0
        CMP  M2      ;destination (M2,3), clearing        C5 M2
        LDA  M1      ;Carry only if destination is greater A5 M1
        SBC  M3      ;than source, else C = 1.            E5 M3
```

*Fig 1*

# 6809 ASCII TO 16-BIT

DECCON (Datasheet 2) from Martin Chadwick of Charlbury, Oxford, is an improvement to DECBIN (*PCW*, October 1983).

DECBIN used the 6809's MUL instruction to separately multiply the high and low order bytes of the partial result by ten. DECCON achieves greater speed and knocks off 21 bytes by using the tried and tested method of binary shifting and addition.

Another time and byte saving trick is to subtract the ASCII digits high nibble ($30) before testing to see if the character is a digit. Only one test is then needed to identify non-digit characters.

## DATASHEET 2

```
;*************************************************************
;* DECCON    ASCII decimal to unsigned 16-bit conversion.
;*************************************************************
;JOB         To convert an unsigned ASCII decimal string held in
;            memory to a 16-bit binary value in registers, or
;            return overflow information.
;ACTION      ON 16-bit overflow: [ Set overflow flag. Exit. ]
;            Clear 16-bit partial result accumulator.
;            Get 1st character and address next.
;            WHILE character is ASCII digit:
;            [ Strip ASCII digits hi-nibble.
;              Partial result = partial result * 10 + digit.
;              Get character and address next. ]
;-------------------------------------------------------------
;CPU         6809
;HARDWARE    Memory containing ASCII decimal number.
;SOFTWARE    None.
;-------------------------------------------------------------
;INPUT       X addresses the 1st (high order) byte of the ASCII
;            decimal number string. The string must terminate
;            with any non-digit character.
;OUTPUT      Y is changed.
;            C = 1: overflow has occurred. X and D unknown.
;            C = 0: conversion successfully completed.
;              D contains the binary equivalent.
;              X addresses the byte following the terminator.
;ERRORS      None.
;REG USE     CC D X Y
;STACK USE   2
;RAM USE     None.
;LENGTH      34
;CYCLES      38 + 73 * number of digits.
;            (Non-overflow and excluding leading zeros).
;-------------------------------------------------------------
;CLASS 2     -discreet      *interruptable     *promable
;-*****      *reentrant     *relocatable       *robust
;*************************************************************
;
DECCON CLRA             ;Zeroise binary result              4F
       CLRB             ;register D (A high byte, B low).   5F
;
NXTDGT TFR  D,Y         ;Move partial result to Y.          1F 02
       CLRA             ;Clear acc hi-byte, get next ASCII  4F
       LDB  ,X+         ;digit in lo-byte, indexing next.   E6 80
       SUBB #$30        ;Strip off ASCII digits hi-nibble   C0 30
       CMPB #$0A        ;and test for valid decimal digit.  C1 0A
       EXG  D,Y         ;Digit to Y, part result to D.      1E 02
       BCC  EXIT        ;Exit conversion done if not digit. 24 12
       BITA #$E0        ;Else test if * 10 by shifting will 85 E0
       BNE  EXIT        ;overflow and exit if so, Carry set. 26 0E
       LSLB             ;Shift partial result up one bit    58
       ROLA             ;for partial result * 2, and add    49
       LEAY D,Y         ;to new digit in Y.                 31 AB
       LSLB             ;Second shift gives                 58
       ROLA             ;partial result * 4.                49
       LSLB             ;Third shift gives                  58
       ROLA             ;partial result * 8 in D.           49
       PSHS Y           ;Put part result * 2 + new digit on 34 20
       ADDD ,S++        ;stack and add in, clearing stack.  E3 E1
       BCC  NXTDGT      ;Repeat if no overflow from add.    24 E1
;
EXIT   RTS              ;Exit okay (C = 0), overflow (C = 1). 39
;*************************************************************
```

# 6809 16-BIT TO DECIMAL

BCDCON (Datasheet 3) from FR Ellahi of Collingwood College, Durham, is part of a utilities program that he's writing for the Dragon. It isn't quite the inverse of DECCON as the result of the conversion is unpacked binary coded decimal (BCD), with each digit occupying the low nibble (bits 3 to 0) of a result location and the high nibble bits cleared to zeros. To convert unpacked BCD to ASCII decimal just OR, EOR or add $30 to each result byte.

I'm surprised that BCDCON should not be relocatable. The 6809 can load the index registers with table addresses by using an offset from the program counter.

Z80 users will find a routine utilising the power of ten look-up table for binary to decimal conversion on page 241 of William Barden's *The Z-80 Microcomputer Handbook*, published by Howard Sams.

## DATASHEET 3

```
;*************************************************************
;* BCDCON    Unsigned 16-bit to unpacked BCD conversion.
;*************************************************************
;JOB         To convert an unsigned 16-bit value held in
;            registers to a 5-digit BCD string held in memory.
;ACTION      Address highest power of ten & highest result byte.
;            REPEAT UNTIL all powers of ten processed:
;            [ Clear result byte.
;              REPEAT UNTIL binary value < 0:
;              [ Add 1 to result byte.
;                Subtract power of ten from binary value. ]
;              Subtract 1 from result byte.
;              Add power of ten to binary value.
;              Address next power of ten and result byte. ]
;-------------------------------------------------------------
;CPU         6809
;HARDWARE    None.
;SOFTWARE    None.
;-------------------------------------------------------------
;INPUT       D contains an unsigned 16-bit value.
;OUTPUT      D = 0. The unpacked BCD equivalent is contained in
;            memory at TABADR+10 (high order digit) to TABADR+14.
;            X addresses the result hi-byte.
;            U addresses the result + 1.
;            CC is changed.
;ERRORS      Re-entry would overwrite a partially formed value.
;REG USE     CC D X U
;STACK USE   None.
;RAM USE     10 bytes for powers of ten table + 5 bytes for
;            unpacked BCD result, must be contiguous but not
;            necessarily located with the routine.
;LENGTH      38 (routine: 23. Table: 10. Result store: 5.)
;CYCLES      Minimum: 238 (input $0000).
;            Maximum: 1078 (input $EA5F = decimal 59999).
;-------------------------------------------------------------
;CLASS 2     -discreet      *interruptable     *promable
;-**---      -reentrant     -relocatable       -robust
;*************************************************************
;
BCDCON LDX  #TABADR     ;Address ten thousands.          8E hi lo
       LEAU 10,X        ;Address result first byte.      33 0A
;
PLACEL CLR  ,U          ;Clear result location byte.     6F C4
;
DIVLP  INC  ,U          ;Inc for each subtraction and    6C C4
       SUBD ,X          ;subtract current power of 10    A3 84
       BHS  DIVLP       ;until gone below zero.          24 FA
;
       DEC  ,U+         ;Correct for 1 sub too many in   6A C0
       ADDD ,X++        ;result and remainder. Address   E3 81
       CPMX #TABADR+9   ;next 10↑n & result, repeating   8C hi lo
;
       BLS  PLACEL      ;until gone past 10↑0.           23 EF
;
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;
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       FDB  1000        ;10↑4 to 10↑0, to be repeatedly  03 E8
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       FDB  10          ;to give decimal digit result    00 0A
       FDB  1           ;at each decimal digit place.    00 01
;
       RMB  5           ;Reserve 5 memory bytes to hold  00 00 00
                        ;maximum of 5 digits result.     00 00
;*************************************************************
```

# SUBSET BOOKS

Some of the best routines from over four years of SubSet are now available in book form. Published by Century Communications, the titles are *Assembler Routines for the 6502* and *Assembler Routines for the Z80*.

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*Unsure which issue that useful Datasheet appeared in? Here's a handy 1983/4 Sub Set index to help you find it.*


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END

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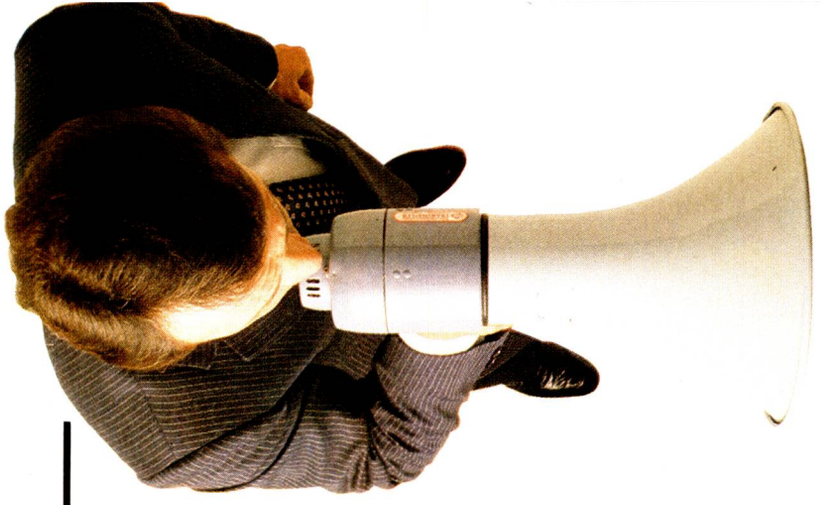

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# COMPUTER ANSWERS

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

## Catch 64

**I have read that interpreted Basic programs on the IBM PC are limited to a total size of 64k for the program and data. What's the point of buying, say, a 128k machine if a program has to fit into 64k? Do dBasell or dBaselll have similar limitations? I'm trying to decide on a language to develop programs for business use.**
***JS Norris, Fulwood, Sheffield***

You're quite right. Both MBasic and dBasell allow a maximum of 64k for programs and data; if you're only going to use these languages, there's not much point in buying extra memory.

The 64k limit exists because both MBasic and dBasell are translations of programs for smaller (CP/M) micro systems which only support 64k. The changes necessary to make use of the extra RAM are quite major, partly because of the way the programs are designed and partly because of the messy way the 8088 processor handles extra memory. It works with 64k 'segments', and special machine instructions are needed to switch from one segment to the next.

The extra RAM will come in useful if you purchase a word processor or other package written specially for the IBM machine. New programs (such as Lotus 1-2-3 and Symphony) make use of all the free memory. Most language compilers allow you to use two 64k areas — one for data, and one for the program.

Remember that this 64k limitation only applies to the information in the computer's memory at any instant. It's possible to 'overlay' programs and data from the disk drives, and swap them back and forth so that their total size can be much greater than 64k.

## Small Logo or Lisp?

**Are there any Logo or Lisp packages available for the VIC 20? If so, where, and how much do they cost?**
***Grant McFarlane, Clydebank, Scotland***

The VIC 20's small memory means that languages for the machine are rare. Even if you've got a 16k expander you still haven't really got enough memory to run Lisp, which is a notoriously greedy language. If you upgrade to the Commodore 64 you can obtain a good implementation of Logo from the manufacturers at a price of £34.95, but this is only available on disk.

Commodore could give no definite information about a Lisp interpreter for the 64, although I suspect that there may be one under development. Once again, you'll probably need a disk drive to run it.

Microsoft has implemented a package called MuLisp on a wide range of micros with the Z80 processor, and Lisp is also available from the manufacturers of the QL (Sinclair) and BBC Micro (Acorn).

## Musical micros

**I'm thinking of buying a BBC Model B, mainly to get the hang of computers. Is it possible to fit this machine with a music synthesizer to make a computer synthesizer? What software or add-ons are necessary for it to work? Can any synthesizer be used, or does it need a special adapter or socket?**
***BS Greeener, Jarrow, Tyne and Wear***

A year ago there were very few micros which could meet your specification — now there are many, following the publication of a new standard called MIDI (Musical Instrument Digital Interface).

MIDI is a standard which allows computers, sequencers and synthesizers to communicate down a simple two-wire cable. Almost all new synthesizers are built with a MIDI socket as standard, although it doesn't appear on older models. A lead or interface is needed to connect computer and synthesizer together.

The MIDI interface is available from a number of firms for the Commodore 64, Spectrum and BBC Micro at a cost of £50 with software. The interface itself is quite simple: in fact, two resistors are all that are needed if you have a Spectrum and Interface 1, so the quality and versatility of the software should guide your choice.

Most popular micros have built-in 'synthesizers' capable of playing three-part music, but the range of sounds available is limited and they all sound distinctly like 'computer music'. A Nottingham firm, LVL, supplies add-on, three octave keyboards for the BBC Micro and Commodore 64; these use the built-in sounds. The Spectrum is probably the weakest in sound facilities, and the Commodore 64 the strongest.

You should also consider the new range of MSX micros, some of which come from major synthesizer manufacturers like Yamaha. The standard sound facilities of MSX are average, but versatile add-on keyboards and synthesizers are being launched which could be ideal. Check out the Yamaha CX5 computer with the SFG01 synthesizer add-on; this has the advantage over MIDI that computer and synthesizer were designed together.

MIDI will also be available for MSX computers soon.

## Not recommended

**In the May issue of *PCW* there was an article called 'Monitoring progress', which explains how to turn Pye or Philips TVs into composite video monitors.**

**This is something I'd like to do but, unfortunately, I have a Decca set. Could you please explain how it can be done on my TV (if at all)?**
***Kiaran Smyth, Prestwich, Manchester***

In principle it's possible to convert most modern TV sets into monitors using the approach outlined in the article, but in practice it can be a very hazardous business.

I can't give specific instructions for a Decca TV since the alteration needed varies between models. It's certainly possible to convert most portable TV sets into video monitors, but you run the risk of injuring yourself or your computer unless you're *very* careful, *so don't do it.*

*PCW* can accept no responsibility for the consequences if you do decide to dissect your TV.

## Legal adventures

**My son and a friend are currently developing adventure programs and wish to market the software on a commercial basis. I would be most grateful for any advice you can offer, especially on the legal aspect of marketing.**

**As the authors are only 15 years of age, I'm particularly concerned as I feel that I may be held legally responsible for the actions of my son.**

**They propose to market the tapes by advertising in the computer press under a 'house name', and I feel that this may be illegal unless a proper company is set up.**
***A Freeman, Stonehaven, Scotland***

Your best bet is to talk the plan over with a bank manager, or contact the Small Firms Advisory Service. It can be reached via the 'freephone', and it doesn't charge for the first few consultations.

You're legally responsible for your son's actions until he reaches the age of 16, and for some of them until he's 18. To a great extent it will be your business rather than his, although it's worth discussing this in detail with a financial adviser. Remember that your tax affairs will also be affected.

Make sure that you're not distributing any copyright material as part of your programs — some software houses sell programming tools such as 'dungeon generators' or language compilers, and then insist that they're paid or credited if the tools are used in commercial software. It isn't clear whether or not this is legal, but in general you should play safe and ask permission before putting any part of someone's program on your tape.

You're allowed to use a trading name as long as the name of the real owner of the business appears on your letterhead, and on cheques. Your chequebook might read: A Freeman t/a Underage Software or something similar; the abbreviation t/a stands for 'trading as'. Once you have opened an account of this kind, you pay in cheques made out to the trading name alone. If you take someone's trading name you can be forced to stop, or even pay compensation, so it's worth spending a few pounds at your local Chamber of Commerce having a 'search' performed to make sure that no-one has pipped you to the post. If you're uncertain you can always add a place name, and become: Underage Software (Stonehaven).

If you're prepared to spend a hundred pounds you can set up or buy a limited company — otherwise you're personally liable for all trading debts. The cheapest way to become 'limited' is to buy an existing, non-trading firm 'off the shelf'. You don't get any choice of name, hence the odd-sounding names of a few micro parent companies, but it does mean that you're only liable for company debts up to a certain 'limited' amount. You can still use other names under the 'limited' umbrella, but you must print the main one (and its number) on your advertisements and notepaper. Limited companies also bring extra responsibilities, so you should take professional advice before buying one.

## Plugging the generation gap

**I have a BBC Model B and I'm wondering if it's possible to use an Apple printer, monitor and disk drives on it. If not, is there an interface available to do it?**
***Martin Singleton, Bromley, Kent***

The BBC Micro has a wide range of interfaces, which makes things fairly straightforward but you'll need to do some electrical experimentation — the exact amount required will depend on the models of disk, printer, and so on which you've already got.

Disconnect the power supply to both machines before you start wiring things up.

If the video monitor is monochrome, it should be compatible with the composite video output of the BBC machine — you'll just need a connecting cable to tie the two sockets together.

Most Apple printers use either the centronics or RS232 interface. On a BBC Micro the RS423 does the job of an RS232. If there are 10 or more wires between the printer and the Apple it's almost certainly a centronics printer, and should be connected to the socket under the BBC keyboard. An IDC connecter is needed at the Beeb end, and an Amphenol plug at the printer (this is a fairly standard lead, available from most computer shops). If there are less than 10 wires the interface is probably an RS232, and you should connect the printer to the five-pin DIN socket at the back of the BBC.

There are two different ways of wiring up an RS232, depending upon whether the printer or computer is 'boss' — the BBC Micro uses a reversible plug so that you can try both ways without tearing the plug to bits.

The disk drives are the trickiest parts to wire up, since they involve the most wires and the fastest transfer of data. If in doubt, don't try. Both computers use drives based on the Shugart 400 interface, and they both supply power to the drives from the computer. The Apple uses a combination cable to carry power and data, whereas the BBC Micro conveys the two separately.

The next step is to find a lead to connect the devices. The cable goes from the underside of the Beeb to an edge connecter on the inside of the disk drive. If a standard cable won't fit exactly, you're well advised to seek professional help.

I must warn you that your eventual system will be quite unwieldy — you'll need to swap a lot of cables around each time you want to use the other computer. In view of the hassle and potential for accidental damage, it might be a good idea to save up for separate peripherals for each machine.

## VIC 20 jumps!

**I have recently advanced into the world of machine code on my VIC 20, but I don't fully understand the counting of byte numbers when using jumps. Can you help?**
***Paul McLeod, South Shields, Tyne and Wear***

This seems to be the all-time favourite question among learner programmers — 6502, 6809 or Z80? All these machines use a technique called 'relative jumping' or 'branching', which is very useful but can be a little difficult to understand.

Most branch instructions consist of two bytes. The first tells the computer that a branch may be needed — perhaps only under certain circumstances: for example, if the least result was zero, or overflowed. The second byte tells the computer where to go if the circumstances are right — whether to go back or forward in the program, and how far back or forward to go. If the conditions are *not* right, the program just carries on with the instruction immediately after the branch instruction.

The topic is confusing because of the way that the new destination is specified — using something called a 'two's complement relative offset'.

A 'relative offset' is just a distance, in bytes, from one instruction to another. If one instruction is at location 100 and the other is at 87, the relative offset is 13 bytes.

The 'two's complement' part just means that the destination can be either side of the start — earlier or later in memory it's easy enough to represent a jump three bytes ahead — the relative offset is three, so that such a jump skips over three bytes. The code would be:

<jump byte>
<offset 3>
<skipped 1>
<skipped 2>
<skipped 2>
<carry on>

The computer executes this by finding the jump byte at the start, and then looking for the 'offset' which follows it: this is the value 3. The next byte the computer looks at is called 'skipped 1', but the branch instruction tells it to add an offset of 3 to 'where it is looking.' The result is that three bytes are skipped, and execution continues at 'carry on.'

Notice that the 'relative offset' is relative to the byte *after* the jump instruction, not relative to the start of the jump instruction. People often forget this. In relative jumps and branches the 'offset' is the number of bytes skipped, *not* the distance between the start and the destination.

We now have a system for skipping over any number between 0 and 255 bytes. In practice it's useful to be able to jump backwards as well as forwards. The answer is to allow values from 0 to 127 to represent forward jumps, and 128 to 255 to represent backward ones.

But here things get confusing, because we can't put negative values in a byte: we need to represent negative values from −1 to −128. The way we do it seems odd, but it keeps the processor simple. To convert a negative value between −1 and −128 into a positive value between 128 and 256, we add 256 to the negative version. To jump back four bytes (ending up two bytes before the start) we use an offset of 256−4, or 252. To jump back 128 bytes (to 126 bytes before the start) we use an offset of 256−128, or 128. This seems odd at first, but like most computer madness (K = K + 1?) it soons becomes second nature.

Let's say we wanted to write a program to do absolutely nothing. Unless we use a hardware approach (like turning the machine off), we can use a branch that jumps straight back where it came from. Since the branch itself is two bytes long, we need an offset of minus two. This gets stored as 256−2, or 254, so that the bytes:

<jump byte>
<254>

will leave the computer twiddling its thumbs forever. *Note for clever programmers*: what happens when the jump byte is 255? This corresponds to an offset of minus one, so that the computer jumps back into the middle of the jump instruction! Normally this is a disaster, but if you're programming a Z80 processor it has an interesting consequence. The byte 255, in the middle of the jump, represents an instruction called RST 56 — a one-byte instruction which tells the computer to make an immediate jump to location 56. Consequently, if the conditions are right for the jump, the computer goes directly to location 56 even if it's thousands of bytes away. So what you've got, quite by accident, is a conditional jump to location 56, all in two bytes! This isn't often useful, but it's interesting. END

# Up, up and away!

*Networking is fun and easy when you know how, but newcomers need fear no more. Peter Tootill's refresher course will get you up and 'online' in no time.*

Although the world of microcommunications has grown rapidly during the last 12 months, a lot of people are just beginning to explore it for the first time. In order to help newcomers or those who may be thinking of adding a modem to their system, here is some helpful advice on how to get your micro *online*.

Let's start with a little background information on microcommunications and also establish the hardware and software necessary to enable you to use your system with bulletin boards (BBS), Prestel and networks.

There are already large numbers of people using BBS for a variety of purposes: one of the most popular being the exchange of messages with other users. The other online systems, such as Prestel, provide you with a database of useful information.

In order to connect your micro to a telephone line, you will need an adapter. This is usually called a modem, and there are several types available. Prices start at around £60 and go up to around £500. A simple, single standard modem (that is, one that can be used for bulletin boards *or* viewdata — for example, Prestel — but not generally for both) will cost between £60 and £100. A more versatile one which will allow you to use bulletin boards and viewdata systems will probably cost between £150 and £200. Note that some BBS will accept 1200/75 viewdata type callers (see below) and although you *can* use Prestel at 300 bit/sec (without the graphics), you normally require a different type of modem for each family of system. As with anything you only get what you pay for. However, with many micros the modem is all the hardware you'll need; it simply plugs into the RS232 serial port on the computer. If your computer doesn't have a serial port, then you'll need to buy an interface to use a modem. These are readily available for most of the popular micros and some are listed in the table.

(Commodore 64 users should note that the RS232 port is not quite what it should be and needs either a special modem or an interface board to connect to an ordinary modem.)

The software you require for your micro is called 'terminal software'. This simply means that your micro acts like a terminal attached to a micro at the other end of the phone line. There are various sorts of terminal software and you will undoubtedly come across such terms as 'dumb' and 'smart' (this subject was covered last month), but dumb terminal software is all that you'll need for your first venture into using a modem. Most computers with a built-in RS232 interface will include a sample program in the manual. Alternatively, one will probably be provided with the interface if you have to buy it separately.

Failing this, user groups are good places to try for simple and sometimes for more sophisticated software. There are, for example, some very comprehensive public domain programs available for TRS-80 and CP/M systems from the respective users groups. *PCW* will also be publishing short dumb terminal routines for some of the more popular systems in Program File, so if you have one, please send it in to the programs editor. More sophisticated programs will also be considered if they are in Basic, or can be entered with a simple Basic loader and data statements.

## *UK commercial systems*

| System | Phone Number | Notes |
|---|---|---|
| Comet | — | Message handling business system giving subscribers facilities for leaving and retrieving messages; more details on (0527) 28515 |
| Distel | (01) 679 1888 | 300/300 baud rate; 24 hours daily; run by Display Electronics (new and surplus electronic and computer equipment, components, and so on); information about stock lines, credit card sales, and some message facilities; free service |
| Maptel | (0702) 552941 | 300/300 baud rate; 24 hours daily; run by Maplin (electronic components and microcomputers); information on stock levels, credit card sales to existing customers; free sevice |
| Micronet | — | Baud rates as for Prestel; subscriber system within the Prestel database specifically aimed at micro users; more details om (01) 837 3699 |
| Prestel | — | 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; subscriber database made up of individual pages provided by many different organisations (not by Prestel itself); details: dial 100 and ask for Freefone Prestel sales |
| Telecom Gold | — | Business subscriber system; more details on (01) 403 6777 |

One feature that is now becoming more common are BBS which provide a 1200/75 bits/sec (V23) service, either exclusively, or in addition to the normal 300 bits/sec (V21) service.

Using a remote system that talks to you at 1200 bits/sec certainly speeds things up, but one point is that even though a system may run at 1200/75 bits/sec (which is the same standard as Prestel), it doesn't mean that it will work problem-free with a Prestel terminal. This is because Prestel transmits a screenful of information and then pauses, waiting for the caller to press a key to select an item from the menu. Most BBS don't do this — they just keep transmitting — and you *may* find that when the screen is full a Prestel terminal will not scroll: the output simply starts again at the top of the screen and overwrites what is already there. But it is worth trying one or two to see how your system reacts as some Prestel terminals do scroll normally.

Some BBS do attempt to support Prestel standard terminals and even to transmit graphics characters and coloured text. Systems which can be used with a V23 modem are indicated in the table, and if they provide Prestel compatibility a separate note is added. Some dual speed systems do have teething problems, so bear with the sysop and keep trying if you can't get one to work at first.

*Next month I'll be looking at online systems and some of the associated problems and pitfalls.* END

## *UK free networks*

| Bulletin Board | Phone Number | Notes |
|---|---|---|
| BABBS-Bath | (0225) 23276 | 300/300 baud rate; 9pm-8am weekdays, 9am-noon weekends; Atari-based system |
| BABBS-Felixstowe | (0394) 276306 | 300/300 baud rate; 24 hours daily; Apple users' group |
| BABBS TWO-Basildon | (0268) 778956 | 300/300 baud rate; 24 hours daily; Apple users' group with special area for queries to Apple UK |
| Basug | (0742) 667983 | 300/300 baud rate; 24 hours daily |
| Bettisfield | (094875) 378 | 300/300 baud rate; 9pm-9am daily; remote CP/M system |
| Blandford Board | (0258) 54494 | 300/300 baud rate; 24 hours daily |
| CABB | (01) 631 3076 | 300/300 baud rate; 24 hours daily |
| CBBS SW | (0392) 53116 | 300/300 baud rate; 24 hours daily |
| CBBS Woking | (0626) 890014 | 1200/75 and 300/300 baud rates; 24 hours daily; jokes, jobs, reviews, news |
| CNOL Lancaster | (0524) 60399 | 300/300 baud rate; 24 hours daily; Clinical Notes Online service, mainly for medical users; works in conjunction with a database on the Datastar network |
| Computers Incorporated Newcastle | (0207) 543555 | 300/300 baud rate; 24 hours daily; primarily business-oriented |
| Forum 80 Hull | (0482) 859169 | 300/300 baud rate, 5-11.30pm weekdays, noon-11.30pm weekends; Bell 103 standard, midnight-8am daily; international electronic mail, library for up/downloading |
| Forum 80 SPA | (0926) 39871 | 300/300 baud rate; 11pm-midnight daily; TRS-80 and Genie users' group |
| Forum 80 Wembley | (01) 902 2546 | 300/300 baud rate; 7-10pm weekdays, midday-10pm weekends; electronic mail, library for downloading; ring and ask for Forum 80 |
| Hamnet Hull | (0482) 497150 | 300/300 baud rate; 6pm-8am daily |
| Liverpool Mailbox | (051) 4288924 | 300/300 baud rate; 24 hours daily; electronic mail, program downloading, TRS-80 information; messages for *PCW* can be left on the board and will normally be read by us within 24 hours |
| Mailbox-80 Stourport | (0384) 635336 | 300/300 baud rate; 6pm-8am daily |
| Manchester Open Bulletin Board | (061) 7368449 | 300/300 baud rate; 24 hours daily |
| MBBS-Mitcham | (01) 640 2617 | 300/300 baud rate; 10am-8pm Thursday and Sunday; BBC-based system with jokes, graffiti, electronic mail, and Atari and BBC sections |
| MG-Net CBBS London | (01) 399 2136 | 300/300 baud rate; 5-10pm Sunday; electronic mail, program downloading |
| Microweb Manchester | (061) 4564157 | 300/300 baud rate; 24 hours daily; *Micro User* magazine, mainly for BBC users |
| NBBBS-North Birmingham | (0827) 288810 | 300/300 baud rate; 24 hours daily |
| OBBS Manchester | (061) 4271596 | 300/300 baud rate; weekdays except 7pm-9pm, weekends except 10am-10pm |
| PIP-Sheffield | (0742) 667983 | 300/300 baud rate; 24 hours daily |
| Southern BBS | (0243) 511077 | 300/300 baud rate; 8pm-2am daily; ring-back system (dial the number, let phone ring once, and then ring back); messages, downloading |
| Stoke ITEC | (0782) 265078 | 300/300 baud rate; 24 hours daily; remote CP/M system |
| TBBS London | (01) 348 9400 | 300/300 baud rate; 9am-7am daily |
| TBBS London Metro | (01) 348 7840 | 300/300 and 1200/75 baud rates (including Prestel compatibility); 24 hours daily; temporary number for the TBBS Nottingham system |
| WABBS-Worthing | (0903) 42013 | 300/300 baud rate; 24 hours daily; ring-back system (dial the number, let phone ring once, and then ring back); Atari-based |

# NUMBERS

## *Mathematical mind-benders from Mike Mudge*

The notion of a congruent number has been familiar to some mathematicians for at least a thousand years. The defining algorithm leading to the construction of such numbers is easily illustrated by a simple example:
(i) Take three squares, $a^2<b^2<c^2$, which have a common difference, D (we say that they are in arithmetic progression): for example, $a^2= 1^2=1$, $b^2=5^2=25$, $c^2 = 7^2 =49$, here $D=49-25=25-1=24$.
(ii) Take the common difference, D, and write it in the form $Nd^2$, where N is square free: for example, $D=24=2^2\times6$.
(iii) N is then a *congruent number* (6 is such a number).

The congruent numbers 5, 6, 14, 15, 21, 30, 34, 65, 70, 110, 154, 190, 210, 221, 231, 286, 330, 390, 429, and 546, together with 10 more less than a thousand, were given on an Arab manuscript *c*900AD.

However, it was left to L Bastien in 1915 to establish the congruent number 101, for which the smallest associated integers are:
a=16281243707272699961,
b=2015242462949760001961
c=233914843530622500 6961,
d=118171431852779451900

**Algebraic formalism** We are solving $b^2 - a^2 = c^2 - b^2 = Nd^2$ and the problem is to discover which values of N are permissible.

Since $2b^2 = c^2 + a^2$ then $(2b)^2 = (c+a)^2 +(c-a)^2$, now writing $Nd^2=uv(u+v)(u-v)$ where u is even, v is odd and u and v have no common factor provides the starting point for much of the computation and theoretical study that has taken place. A summary of known results including 198 congruent and 135 non-congruent numbers less than a thousand is given by R Alter and T B Curtz (*Math Comp* vol 28, 1974, pp303).

It is now appropriate to acknowledge the assistance and advice of Robin Merson, one of this column's regular readers. He is responsible for the following new approach and also suggested the inclusion of this topic in the Numbers column.

We give the detailed algebra for odd N; the word of encouragement being that following through this analysis on your micro should readily yield the non-congruent number 105 which is not well known in the current literature: Set $u =4n_1p^2$, $v=n_2q^2$, $u+v =n_3r^2$, $u - v = n_4es^2$, where $n_1n_2n_3n_4= N$ and $e= +1$ or $e = - 1$.

So, we have the four equations $4n_1p^2+ n_2q^2=n_3r^2$, $4n_1p^2 - n_2q^2 = n_4es^2$, $8n_1p^2 = n_3r^2 + n_4es^2$, $2n_2q^2 = n_3r^2 - n_4es^2$.

Taking congruences modulo 8, it is seen that $n_2-n_3$ is divisible by 4, and $n_3+en_4$ is divisible by 8. These are linear restrictions. Taking congruences modulo each n in turn, we obtain quadratic restrictions: for example, $n_2n_3$ is a quadratic residue of $n_1$ by which we mean that there is a value of x for which $x^2 -n_2n_3$ is divisible by $n_1$. There are twelve such restrictions which are not completely independent.

Readers are invited to submit a program or programs to determine congruent and/or non-congruent numbers. They may reasonably restrict the search to numbers less than a thousand, although this is not obligatory.

Try the effect of making two or three of u,v,u+v, u−v, perfect squares; this is equivalent to having two or three of $n_1$, $n_2$, $n_3$, $n_4$ unity. To obtain some non-congruent numbers take a square free N, factorise it, allocate its factors in all possible ways to $n_1$, $n_2$, $n_3$, $n_4$, testing each allocation for the restrictions. If all ways fail, then N is non-congruent.

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 will be awarded to the 'best' entry received by 1 April 1985.

Please address entries to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, near Wolverhampton, Staffs WV4 5NF. Tel: (0902) 892141.

### *Tree-like structures, August 1984*

The 3× + 1 Problem, also known as Collatz', Kakutani's, Syracuse and Ulam's Problem or Hasse's Algorithm attracted considerable response. Volume one, number eight, June 1984 of *Quarch* (Archimedeans, Cambridge University Mathematical Society Newsletter) contains a detailed report on the state of the art; appropriate since this problem first prompted the newsletter in April 1980.

J C Lagarias, *The 3× + 1 problem and its generalisations,* American Mathematical Monthly, 1984/5 surveys the large amount of work done in this field. Responses from *PCW* readers included reference to R E Crandall's *Math Comp*, Vol 32, where the sequence $a_{n+1}=\frac{1}{2}a_n$, $a_n$ even and $a_{n+1} = da_n + 1$, $a_n$ odd is discussed. For d=1 this is trivial, if d=5,181 or 1093 the recurrence does *not* reduce to a cycle involving 1 for all $a_0$. For d=7, $a_0=3$ the behaviour is unknown.

Dr D Fisher supplied a one-line statement of the problem:

$$x_n + 1 = \tfrac{1}{2}(x_n 3 +(1-\cos\pi x_n)/2)^{(1-\cos\pi x_n)/2}$$

as a special case of a 'chaotic iteration', $x_n + 1 = Lx_n(1-x_n)$. No attempt was made to use any graphics to display tree-like structures; this topic will be returned to in a later problem.

This month's worthy prizewinner is Fred Salt of 'The Paddock', Flanders Road, Llantwit Major, South Glamorgan CF6 9RL. The work was carried out in Apple Pascal on a U200 (Apple compatible) computer with 48k RAM + a 16k language card; the results were displayed using an Epson MX80 FT III printer. A suitable prize will be sent to 'The Paddock'. Further enquiries relating to this work should be directed either to Fred Salt or myself.

---

*Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.*

*Expanded reviews of previous problems together with, subject to the approval of the contributor, copies of detailed programs from the prize-winning entry may also be requested.*

END

# LEISURE LINES

## *Brain-teasers courtesy of J J Clessa*

### *Quickie*

Put two pennies on the table. If you keep one fixed and roll the other around its edge, always touching, how many revolutions will it make? One, you might think? Try it and see.

### *Prize Puzzle*

I bought a book the other day — it was an exciting mystery story. But I discovered, after I was well into it, that a whole section of pages was missing. I calculated that the total of the page numbers on the missing sheets was 2567. What were the missing pages?

Answers, on postcards only, to: *PCW* Prize Puzzle, January 1985, Leisure Lines, 62 Oxford Street, London W1. Entries to arrive not later than 31 January 1985.

### *September Prize Puzzle*

Over 200 entries were received for this not too difficult logic problem. In fact, the most difficult bit for a Greek entrant was knowing what a 'postcard' was so that he could send in his (correct)

# LEISURE LINES

*continued*

solution. There were a lot of overseas entries in the bag this month, including ones from Papua, New Guinea and Saudi Arabia.

However, the winning entry came from a far more 'exotic' spot — Nuneaton — and was sent in by Mr Keith Kondaker.

**Solution:**

Bluebird
Auk
Cockatoo
Egret
Drongo

Congratulations, Keith, your prize is on its way.

Happy New Year and good puzzling for 1985 to all! END

# MICROCHESS

## *Dr John Nunn looks at the Super Constellation's performance in the Major Open at Brighton.*

**White: R Moss. Black: Super Constellation. Notes by Grandmaster Dr John Nunn.**

The Novag Super Constellation took part in last year's Championships held at Brighton. It played in the Major Open, a reserve tournament just below the Championship itself, and acquitted itself well against some good club players. The following game from this event illustrates the strengths and weaknesses of computer play.

| | | |
|---|---|---|
| 1 | e2–e4 | e7–e5 |
| 2 | Ng1–f3 | Ng8–f6 |
| 3 | d2–d4 | e5xd4 |
| 4 | e4–e5 | Nf6–e4 |
| 5 | Qd1xd4 | d7–d5 |
| 6 | e5xd6 e.p | Ne4xd6 |
| 7 | Nb1–c3 | Nb8–c6 |
| 8 | Qd4–f4 | g7–g6 |
| 9 | Bf1–d3 | Bf8–g7 |
| 10 | Bc1–d2 | |

(A rather insipid move. 10 Bc1–e3 is usual.)

10 ....Qd8–e7+?

(This check is tempting because it forces White to correct his last move by playing the bishop to e3. Unfortunately for Black, the queen is worse posted at e7 than at d8, since it is exposed to attack down the open e-file and by Nc3–d5.)

11 Bd2–e3 Nc6–e5?

(Sometimes it is worth spending two moves to exchange a knight for a bishop, but not here. Black now falls dangerously behind in development.)

| | | |
|---|---|---|
| 12 | 0–0–0 | Ne5xd3+ |
| 13 | Rd1xd3 | Bc8–e6 |
| 14 | Be3–d4 | ?–0 |
| 15 | Bd4xg7 | Kg8xg7 |
| 16 | g2–g4! | |

(An excellent move, starting a powerful kingside attack based on the advance of the two flank pawns.)

16 ....Nd6–e8

(The computer cannot formulate a plan to deal with this new threat and makes pointless moves. Black's only hope is to seek exchanges, so he should have tried 16 . . . Qe7–f6 17 Qf4–g3 Ra8–d8 followed by ....Nd6–c4 opposing rooks.)

| | | |
|---|---|---|
| 17 | h2–h4 | Qe7–f6 |
| 18 | Qf4–g3 | c7–c5 |
| 19 | h4–h5 | c5–c4 |
| 20 | Rd3–d4 | g6–g5 |
| 21 | Nc3–e4 | Qf6–f4+ |

(Black cannot avoid losing a pawn.)

| | | |
|---|---|---|
| 22 | Qg3xf4 | g5xf4 |
| 23 | Ne4–c5 | c4–c3 |

(23....Be6xg4 loses material after 24 Rh1–g1 f7–f5 25 Nc5–e6+ forking king and rook.)

| | | |
|---|---|---|
| 24 | Rd4xf4 | c3xb2+ |
| 25 | Kc1xb2 | Be6–c8 |

(Not only is black a pawn down, but his pieces lie scattered helplessly along the back rank.)

| | | |
|---|---|---|
| 26 | Rh1–d1 | b7–b6 |
| 27 | Nc5–d7 | Bc8xd7 |
| 28 | Rd1xd7 | h7–h6 |
| 29 | Nf3–d4 | Kg7–g8 |
| 30 | Nd4–f5 | Ne8–f6 |
| 31 | Nf5xh6+ | Kg8–g7 |
| 32 | Nh6–f5+ | Kg7–h7 |
| 33 | Rd7–d6 | Nf6–e8 |
| 34 | Rd6–h6+ | Kh7–g8 |

(Most human players would have resigned by now, but the Super Constellation continues plodding along.)

| | | |
|---|---|---|
| 35 | g4–g5 | Ne8–c7 |
| 36 | Nf5–d6? | |

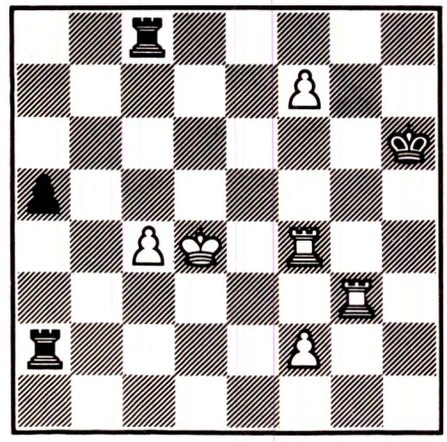
(White's position is so good that he can afford to make several mistakes and still win, but this move is the first sign of hesitation. Professional players are well aware that won games should be wrapped up as speedily and efficiently as possible, since every extra move increases the chance of a fatigue blunder. This applies especially to games against a machine unaffected by mortal weaknesses. Here 36 g5–g6 f7xg6 (36....Nc7–e6 37 g6–g7 Ne6xg7 38 Nf5–e7 mate) 37 Rh6xg6+ Kg8–h8 38 Rg6–h6+ Kh8–g8 39 Rf4–g4+ Kg8–f7 40 Rg4–g7+ Kf7–e8 41 Nf5–d6+ Ke8–d8 42 Rh6–h7 forces mate by Rg7–d7.)

| | | |
|---|---|---|
| 36 | | ....Nc7–e6 |
| 37 | Rf4–g4 | Ra8–d8 |
| 38 | Nd6–e4 | Kg8–g7 |
| 39 | Rh6–f6 | Ne6–c5 |
| 40 | Ne4xc5 | b6xc5 |
| 41 | Rg4–f4 | Rd8–d7 |
| 42 | h5–h6+ | Kg7–h7 |
| 43 | g5–g6+ | Kh7xh6 |
| 44 | g6xf7+ | Kh6–g7 |
| 45 | Kb2–c3 | Rd7–d4! |

(A little trick exploiting the position of White's king. If White plays 46 Rf4xd4 he loses both rooks after 46....c5xd4+.)

| | | |
|---|---|---|
| 46 | Rf4–f3 | Rd4–a4 |
| 47 | Rf6–f4 | Ra4–a6 |
| 48 | Kc3–c4 | Kg7–h6 |
| 49 | Kc4xc5 | Ra6xa2 |
| 50 | c2–c4 | a7–a5 |
| 51 | Rf3–g3 | Rf8–c8+ |
| 52 | Kc5–d4? | |

(Just when White could have brought the game to a speedy end, he makes a really serious mistake. 52 Kc5–b5 Ra2–b2+ 53 Kb5–a4 Rb2–b4+ 54 Ka4–a3 escapes from the rook checks, when White's threats of f7–f8=Q+ and Rf4–h4 mate cannot be met.)



52 ....Rc8xc4+!

(A stunning blow for White.)

53 Kd4xc4 Ra2–a4+
54 Kc4–b5?

(When a player is still punch-drunk from the effects of a blunder he is much more likely to blunder a second time. This move finally throws away the win which was still there by 54 Kc4–d5 Ra4xf4 55 Kd5–e6 Rf4xf2 56 Ke6–e7 Rf2–e2+ 57 Ke7–f8 Kh6–h7 58 Rg3–h3+ Kh7–g6 59 Kf8–g8 forcing Black to give up his rook for the pawn.)

54 ....Ra4xf4

(White emerges with an extra pawn, but it is of no significance and the Super Constellation forces a draw.)

| | | |
|---|---|---|
| 55 | Rg3–g2 | a5–a4 |
| 56 | f7–f8=Q+ | Rf4xf8 |
| 57 | Kb5xa4 | Kh6–h5 |
| 58 | Ka4–b4 | Kh5–h4 |
| 59 | Rg2–h2+ | Kh4–g4 |
| 60 | Kb4–c3 | Kg4–f3 |
| 61 | Kc3–d2 | Rf8–a8 |
| 62 | Kd2–e1 | Ra8–a1+ |
| 63 | Ke1–d2 | Ra1–b1 |
| 64 | Kd2–c2 | Rb1–f1 |
| 65 | Kc2–d2 | Rf1xf2+ |
| 66 | Rh2xf2+ | Kf3xf2 |

½–½

(A quite unbelievable save by the Super Constellation.) END

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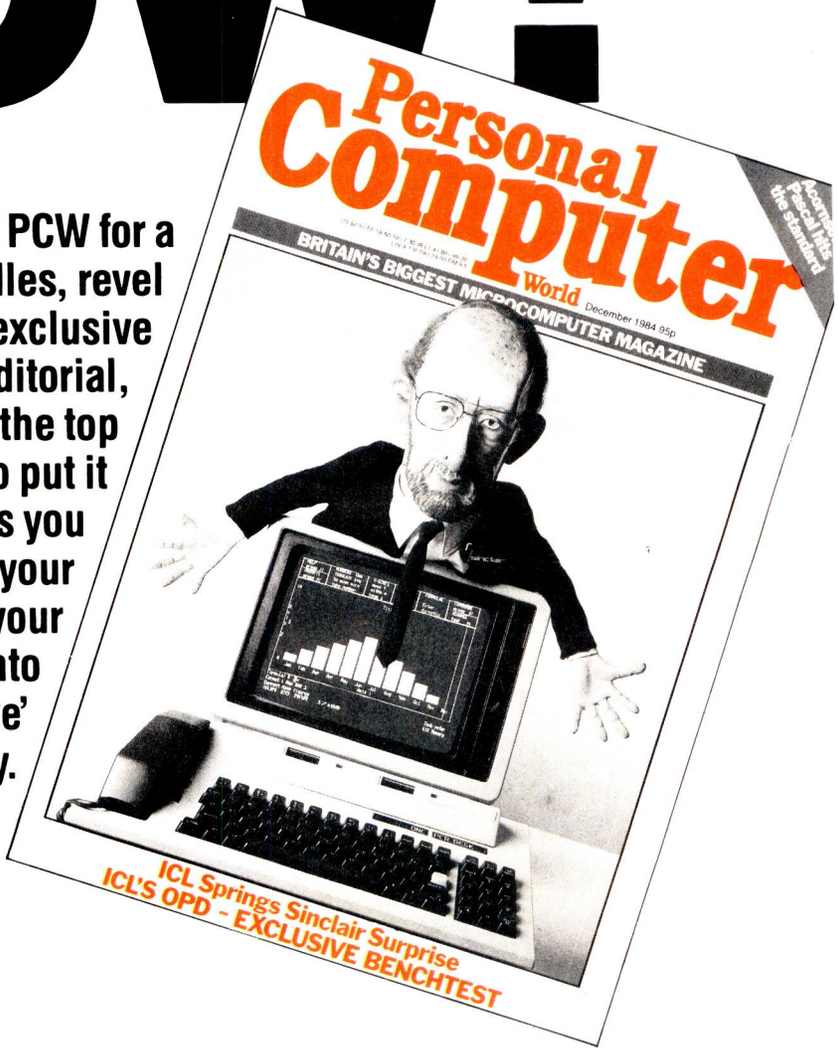

# DIARY DATA

*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.*

| | | |
|---|---|---|
| Birmingham | (NEC), Which Computer? Show. Contact: Cahners Exbns Ltd, (01) 891 5051 | 15-18 Jan |
| Swansea | (Leisure Centre). Micro Show. Contact: Temple Conferences & Exbns, (0202) 304641 | 17-29 Jan |
| London | (Barbican). Hi-Technology & Computers In Education Exbn — HITAC. Contact: Computer Mkt Place Exbns Ltd, (01) 930 1612 | 23-26 Jan |
| London | (Kensington & Chelsea Town Hall). Apricot & Sirius Computer Show. Contact: Paradox Group Ltd, (01) 241 2354 | 5-7 Feb |
| London | (Barbican). Computer Graphics User. Contact: (01) 486 1851 | 19-21 Feb |
| USA | Anaheim. Computer Conference & Exbn — COMDEX/winter. Contact: Interface Group Inc, 300 First Ave, Needham, MA 02194 | 21-24 March |
| USA | Atlanta. COMDEX/spring. Contact as above | 6-9 May |

# ACC NEWS

*Rupert Steele keeps you up-to-date on computer clubs.*

If you have a new computer you may be finding it rather difficult to use, particularly if you're a first-time user. The quality of documentation accompanying computers has improved over the past few years, but much of it is still not of a high quality; this is where computer clubs come in.

There are three main types of computer club. These are: machine users' groups; local computer clubs; and Computer Towns. The first group is likely to be the best for gaining detailed technical information and 'fixes' for your micro. They usually operate through a newsletter, for which you pay an annual subscription of around £10. Some users' groups are no longer clubs but have, in effect, become specialist publishers. For some of the best-selling machines, this market has been monopolised by commercial magazines aimed specifically at users of a particular micro.

If, however, you're looking for something that will teach you more about 'computing' rather than the machine's details, then you should consider joining a local computer club. Some of these are machine-specific (for example, the BBC Micro, the Commodore 64 or the Spectrum) which may be helpful, although there are also benefits in a club that covers all micros. Here, you'll find a wide variety of computer hobbyists, from the most dedicated to the absolute beginners. At a local computer club, you'll meet people who'll be able to explain difficult concepts in computing, and popular meeting places are pubs, church halls or educational establishments.

The idea behind Computer Towns is to get everyone interested in computing. The organisers bring along a number of computer sytems which are laid out in a room for the public to use. There's no membership system as such: users just turn up and the organisers try to keep order. This kind of meeting is recommended for those who don't already have their own computers, as it gives a chance to find out about computing *before* parting with the cash.

The Association of Computer Clubs (ACC) is the national body that represents all three types of computer club. It has been running in its present form for a year, and has well over 100 clubs which are affiliated to the ACC with voting rights at the ruling council (which consists of representatives of all the affiliated clubs). The ACC is non profit-making and strictly for amateur clubs. It provides a number of services, including insurance schemes for public liability and equipment damage risks, the ClubSpot 810 area on Prestel, various publicity schemes and general advice.

The ACC also provides a starter pack for people considering setting up their own computer club, as well as a service to put people in touch with their local club or the user group appropriate to their machine. For this purpose we run a database containing details of all the computer clubs we are aware of. Your club should be on it — contact me and make sure. If you have any ideas about what else the ACC should be doing, or if you want full details of how the Association can help you or your club, write to me.

## *Club news*

Good news for Memotech MTX users! A new Memotech user group produces a monthly magazine containing programs, reviews, queries and competitions. The annual subscription is £7 and for details you should send an SAE to: Memotech Owners Club, 23 Denmead Road, Harefield, Southampton SO2 5GS.

Two Scottish clubs have contacted me. One is the Perth and District Amateur Computer Society, whose secretary is Mr John Sanderson, of 4 Maple Place, Perth PH1 1RT. Why not drop him a line? The other is the Pennyburn Computer Users Club. It has around 40 members, and meets on Monday evenings for programming and Tuesday evenings for games. Both meetings are 6.30pm to 9.30pm at the local community centre in Cranberry Moss. The secretary is James Brown, who lives at 12 Newark Square, Pennyburn, Kilwinning, Ayrshire KA13 6NA.

Moving south to Staffordshire, we find Richard Underhill, of 19 Lodge Hill, Tutbury, Burton-on-Trent, Staffs DE13 9HF, who writes to tell me of the EBITZ computer club. This club produces a newsletter every two months and aims to cover the Burton-Derby area. Contact Richard on (0283) 814008. David Butler (age 13) of 48 Priory Lands, Stretton, Burton-on-Trent, Staffs DE13 0HJ, writes to tell me that he runs a VIC-20 Junior User Club in the Burton-on-Trent area. Why not drop him a line to find out how it's going?

And there's always the Thame Computer Club. This group meets on the first and third Friday of each month at the Tamworth Voluntary Activities Centre, Ludgate Street (off Hospital Street), Tamworth. Membership (which is at the committee's discretion, so don't spit on the floor) comes in a variety of packages (including 'family'), with the basic rate being £5 per annum. The club caters for all levels of expertise including beginners, professional programmers and hardware hackers, and runs

# ACC NEWS

*continued*

various starter courses as well as the occasional equipment demonstration and visit to shows. Members can obtain some discounts via the club: very sensibly, a very cheap (25p) temporary membership is available so that you can try it out. There's a small additional charge per meeting. For details, write to Bob Overton, 67 Quince, Amington, Tamworth, Staffordshire, or ring the chairman, Tony Beckett on Tamworth 53473 (evenings).

Moving to Derbyshire, a few more clubs can be found. I had a note recently from George Reyner, the treasurer of the Derby Micro Society. Why not write to him at 36 Underhill Close, Sunnyhill, Derby, DE3 7RH for more details? Meanwhile, those of you in the area with a fertiliser interest may want to know more about the Fison Computer Club. It's only open at present to Fisons employees and their immediate family, but if you're in that line, write to John Carter at 112 Boulton Lane, Alvaston, Derby DE2 0FE.

Finally, there's the Chesterfield Microcomputer Users' Group. The secretary is Mr A Croft, and his address is 37 Church Street South, Birdholme, Chesterfield, Derby S40 2TG.

For more information on any aspect of the ACC, write to me: Rupert Steele, 17 Lawrie Park Crescent, London SE26 6HH or tel: (01) 370 0601. END

# TRANSACTION FILE

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● CENTRONICS 730/Tandy LPII printer. Normal, enlarged, condensed print, friction or tractor print. Manual, excellent condition, £110. Christchurch, Dorset. Tel: 0425 72441.

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● CONTROL data type BR5A6. Hard disk drive 60MB capacity, fully maintained and recently serviced £325. Also Apple II+ look alike £300 ono. Ken. Tel: 066689 307

● TRS-80 Model III. 48k, twin disk drives, Newdos, Ldos, Scripsit, £500. Tel: 0296-25467 (Aylesbury).

● NEWBRAIN AD. With PSU, leads, handbooks, technical manual, NewBrain Dissected book, Forth (in EPROMs), Chess, Othello, Tycoon, Pages, and other software. As new, £150 ono. Tel: 0206 866749 after 7pm.

● TANGERINE Vero cased system. Processor, expansion, RAM, disc controller and mother boards. ASCII keyboard, switch mode PSU. Double sided disc drive, manuals and software £550 ono. Tel: Gary, Coventry 305802.

● NEC 8001 business computer, 24k, Microsoft Basic, 32k RAM RGB hi-res, monitor 80 × 25, 7 colour display, CP/M, compatible printer. Cost £850. Bargain £300 or Dragon 64 + cash. Ted, Tel: 01-673 7877 evenings only.

● BBC model B Acorn 100k disc drive. Epson MX-100III dot matrix printer, Zenith monochrome monitor, and View wordprocessor chip. Brand new, original packaging £950 ono. Tel: Darlington 54263.

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Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

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● Apple IIE. 80 column text card/61k language card. Mint condition, in original package with manual etc. Sale due to upgrading. Best offer over £25 accepted. Tel: Northampton (0604) 858395.
● Commodore 8032. Commodore 8050 disc drives, Microline 783A printer, interface etc. Complete with all leads, Compsoft, DMS, Diamond program. Nearest offer to £1900. Phill Spruce. Tel: Billericay (02774) 51263.
● Magazines WANTED. Back issues of PCW, Byte, etc. etc. All offers considered. Colin Watters, 23A Strathblaine Road, Wandsworth SW11 1RG. Tel: 01-223 7404.
● Apricot. Good condition, MSDos, CPM 86, etc. Some software, plenty of spare disks, £1400. Tel: Barrow-in-Furness (0229) 33173.
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● NEC 8001. With high resolution colour monitor and dual disk drive and expansion unit. WordStar, dBasell and games included. £600. Tel: (London) 01-226 6332 (after 4.30pm).
●Commodore 64 disk drive, cassette recorder, joystick, Simons Basic. Books and games. All for £480. Write to De. Scott, 49 Rowfant Road, Balham SW12 7AP. No callers please!
● Acorn DES with manual £85. Tandon DSDD drives, 80 track 640k, £99 each. 48k Spectrum + software £89. Cheetah Sweetalker £19. ZX printer £29. Tel: 01-892 1909.
● High speed printer DRE 8820, Bi-dir dot matrix, serial and parallel interface, print width max 220 characters £480 ono. Tel: 0935 872308.
● Sharp MZ-80K. 48k RAM, integral monitor and tape, several programs, and relevant literature, £150 or sensible offer. Tel: Swansea (0792) 851392 eve.
● Sharp MZ 80A. 48k personal computer, inbuilt monitor and data recorder. Mint condition. Includes over £200 of software. Unwanted present sell for only £250 ono. Tel: Yin-Man, 01-733 2166 extn 77 room 40.
● Hewlett Packard HP87A, HP82901M dual disk drive. All manuals, cables, etc. As new condition. £950. Eversley (0734) 733386 eve, or Bracknell (0344) 424898 ext 6101 day.
● Epson HX-20 portable. 16k, with micro-cassette drive. One year old, excellent condition. Carrying case, manuals and some software, £290 ono. Tel: Farnborough (0252) 548756 (eves).
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● BBC model B for sale. C/W manual, disk filing system interface, utilities disk, many business and games programs. Cost new £600+, £450 ono. Tel: 01-299 1640 or 063-081 331.
● Tandy model 100. Portable, 24k memory, as new condition, boxed, £550. Osborne double density, with over 40 programs including dBasell, language compilers, utilities, many business applications. £865. Tel: 01-543 6585.
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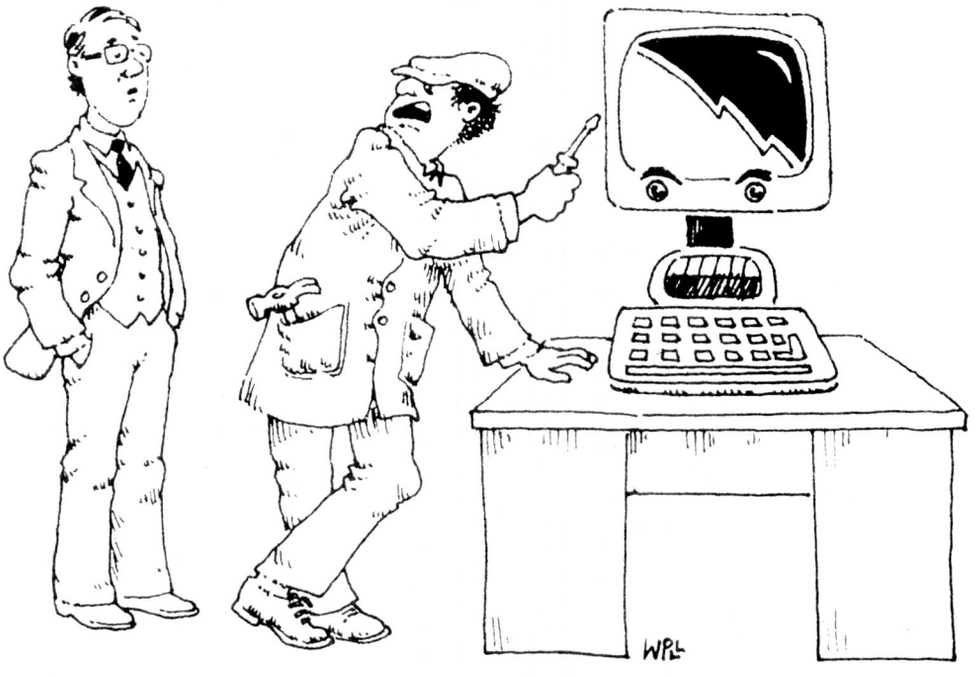
● Sanyo MBC-1000. Plus second DSDD drive, 63k, CP/M. Some software including WordStar. Used only once £700 ono. Also BBC model B with disk drive. Any offers. Tel:0691-659201.
● HP41C with card reader. Three memory modules, manuals, £80. Tel: Lester Gilbert (069171) 2391.
● PET 2016. With cassette, tapes, manual, programs. Good condition. £175 ono. Tel: Royston (0763) 44098 after 6pm and weekends.
● Aculab floppy tape drive for TRS-80 Model-1. Assorted wafers and programs. Extended Basic. Cost £200 accept £80. Data Dynamics Teletype 20mA plus interface for TRS-80 Model-1 £35. Tel: Fairseat 823126.
● Epson HX-20 portable. As new complete with manuals, case, charger, paper and cassettes £295 ono. Tel: 061-440 8088, Alan, or 0257 481241 Mike. END




*'And wot you 'ave 'ere, squire, is your medium resolution monitor illegally converted into an international dictator.'*

# WRITING FOR PCW

## *Your chance to contribute to the magazine.*

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, 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 you submit as well.

Bear in mind that it's worth taking a look at the Back Issues advertisement to see what sort of things we have already published — after all there's no point in reinventing the wheel. And please be sure to tell us if you've contacted another magazine (perish the thought): it would be very awkward if the same article appeared elsewhere. Frankly, we're more likely to accept something which has been offered exclusively to us.

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

# MICROMART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PCW Jan

## MICRO ARTS

**SOFTWARE AND MAGAZINE**

Micro Arts is a forum organisation for people working in microtechnology and the arts. The magazine covers micro art, music, general debate and other more speculative areas. The Software label will build up a catalogue of new artist's work (work for any micro is welcomed). Art software includes anything that falls outside existing straightjackets eg graphics, literary, interactional etc.

**Computer art — what to do with your Micro**
*Free magazine with all software*

**SOFTWARE:** Spectrum 48 or 16k.
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BBC Model B.
MA3: Vol 1 by Martin Rootes — 6 graphics programs.
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***Please contact***
**MICRO ARTS (P), PO Box 587**
**London SW4 9PH**
**Tel: 01-720 4456**


# 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. (Commodore 64 owners should use the Brackets program printed in the June issue to make control codes understandable.)*

*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.*

*We'll do our best to return any submissions that are sent in with the appropriate postage and packing, but please keep a copy of everything yourself.*

*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.*

Home computer owners often complain of a 'boring lull' about three weeks after purchasing a micro: they've typed in small Basic programs and played *ad infinitum* the few games they could afford after buying the machine. Typing in listings from a magazine can help fill this void as it provides a source of cheap software as well as a means of increasing Basic knowledge by modifying the typed-in software — alteration of a large program can give you the necessary skills to start your own major project.

Considering that the vast majority of computer sales are at Christmas, a lot of people will be feeling at a loose end. This month's selection of programs is designed to keep you busy.

Program of the month is a space adventure/strategy game of epic proportions for up to 28 players. On the arcade side there is Falcon Attack for the Commodore 64 and Meteor Attack for the Atari. From the board game side there is a truly excellent draughts program for the BBC.

Other programs this month are MTX Old command, a TRS-80 machine code parser for inclusion in adventure games, a Commodore 64 screendump and a training program to help you overcome the annoying cursor key layout on the BBC Micro.

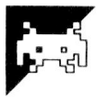

*Games*


*Scientific/mathematic*


*Business*


*Toolkit/utilities*


*Educational/Computer Aided Learning*



## Program of the Month

## Space Wars

### by Andrew Poulter

Space Wars is a space adventure game for two to 28 players. It's more a

strategy game than an adventure game, with a number of objectives. The most obvious scenario is for each side (Rebel, Federation or Neutral) to battle it out against each other until one side is victorious.

Another alternative is to designate one ship as a leader within a fleet: when it is destroyed that side has lost.

The game is divided into a number of phases as described below:

*Equipment:* this occurs only once at the beginning of the game. In this phase you equip your ship with items such as lasers, computers, scanners, and so on. Each item is described in detail along with its cost. Try to construct a balanced fleet of attacking and communicating vessels.

After equipping each ship the game consists of a number of game turns, each turn consisting of four phases which are as follows.

(1) *Information:* any ship that has been recently hit will flash during this stage.

(2) *Options:* there are seven options. These are:

(a) Communicate with other ships.
(b) Transfer credits.
(c) Examine message received.
(d) Engage tractor base.
(e) Use directional scanners.
(f) Attempt planet landing.
(g) Engage self-destruct.

Most of this is fairly obvious; communication with other players is limited to 64 characters and can only take place via the computer. No player should watch another entering his/her move.

(3) *Fire:* this is straightforward, but, remember, although you can use lasers as often as you want, you only have a limited supply of photon torpedoes.

(4) *Manoeuvre:* direction is referred to as 'DV' and can take four value 1 to move up, 2 to move right, 3 to move down and 4 to move left relative to your ship's position.

The galaxy is 32 by 32 sectors which are referred to by alpha (horizontal) and beta (vertical) coordinates. Speed is measured as a percentage of the speed of light with 10 per cent equalling one sector per game turn.

The program uses user-defined graphics, which means that any unfamiliar character should be looked up in the table at the end of the program and the equivalent letter typed while in graphics mode.

Don't be put off by the length of the listing: the effort is worthwhile.

```
   1 DEF FN m()=((PEEK 23730+PEEK 23731*256)-(PEEK 23653+PEEK 23654*256))/1024
   5 RANDOMIZE
   6 FOR f=USR "b" TO USR "q"+7: READ a: POKE f,a: NEXT f
   7 FOR f=USR "k" TO USR "l"+7: READ a: POKE f,a: NEXT f
   8 DATA 0,BIN 11000,BIN 110,BIN 11111,BIN 110,BIN 11000,0,0,0,0,BIN 10000000,B
IN 11100000,BIN 10000000,0,0,0,255,1,BIN 101111,BIN 111111,BIN 101111,1,255,0,12
8,0,BIN 11000110,BIN 11111100,BIN 11000110,0,128,0,255,BIN 11111,BIN 1111111,BIN
 111111,BIN 1111111,BIN 11111,255,0,BIN 110000,BIN 10011000,BIN 11011110,BIN 111
11100,BIN 11011110,BIN 10011000,BIN 110000,0
   9 DATA BIN 1,BIN 10011,BIN 111,BIN 111,BIN 111,BIN 11,BIN 1,0,BIN 11000000,BI
N 11100000,BIN 11110000,BIN 11110000,BIN 11110000,BIN 11100000,BIN 11000000,0
  15 INPUT "Number of space ships? (2-28)",no
  16 IF no<2 OR no>28 THEN GO TO 15
  20 DIM r$(30): DIM g(32,32): DIM p(no,30): DIM p$(no,20): DIM c(no): DIM a(no)
: DIM m$(no,66)
  25 GO SUB 9980
  30 BORDER 6: PAPER 6: CLS : LET sh=1
  32 GO SUB 9972
  34 INPUT "What is the name of your ship?",a$: LET p$(sh)=a$
  36 CLS : INK 1: PRINT "EQUIPMENT STAGE": INK 5: PRINT "
    ": INK 0
  40 PRINT '''"You have "¡c(sh)¡"Cr"'"with which to equip your ship."
  50 PRINT '"You MUST buy all of the compul- sory items and as little or as muc
h of the additional equipmentas you like (or can afford)."
  51 GO SUB 9970
  52 GO SUB 9965
  55 PRINT AT 20,0;"You have "¡c(sh)¡"Cr left"¡: INPUT "Which ship type do you w
ant?",f
  56 IF f=1 THEN LET p(sh,1)=1: LET p(sh,2)=3: LET p(sh,3)=7: LET p(sh,4)=50: L
ET c(sh)=c(sh)-100: GO TO 60
  57 IF f=2 THEN LET p(sh,1)=2: LET p(sh,2)=2: LET p(sh,3)=7: LET p(sh,4)=100:
LET c(sh)=c(sh)-300: GO TO 60
  58 IF f=3 THEN LET p(sh,1)=3: LET p(sh,2)=2: LET p(sh,3)=6: LET p(sh,4)=300:
LET c(sh)=c(sh)-500: GO TO 60
  59 GO TO 55
  60 GO SUB 9959
  70 PRINT AT 20,0;"You have "¡c(sh)¡"Cr left"¡: INPUT "Which engine type do you
 want?",f
  75 IF f=1 THEN LET p(sh,5)=1: LET c(sh)=c(sh)-500: GO TO 80
  76 IF f=2 THEN LET p(sh,3)=p(sh,3)-1: LET c(sh)=c(sh)-200: GO TO 80
  77 IF f=3 THEN LET p(sh,3)=p(sh,3)-2: LET c(sh)=c(sh)-75: LET p(sh,2)=p(sh,2)
-1: GO TO 80
  78 GO TO 70
  80 GO SUB 9955
  85 PRINT AT 20,0;"You have "¡c(sh)¡"Cr left"¡: INPUT "Which laser do you want?
",f
  86 IF f=1 THEN LET p(sh,6)=15: LET c(sh)=c(sh)-600: GO TO 95
  87 IF f=2 THEN LET p(sh,6)=10: LET c(sh)=c(sh)-250: GO TO 95
  88 IF f=3 THEN LET p(sh,6)=7: LET c(sh)=c(sh)-100: GO TO 95
  89 IF f=4 THEN LET p(sh,6)=5: LET c(sh)=c(sh)-50: GO TO 95
  90 GO TO 85
  95 GO SUB 9951
 100 PRINT AT 20,0;"You have "¡c(sh)¡"Cr left"¡: INPUT "Which computer do you wa
nt?  "¡f
 102 IF f=1 THEN LET c(sh)=c(sh)-125: LET p(sh,7)=1: LET p(sh,8)=95: LET p(sh,9
)=10: GO TO 110
 103 IF f=2 THEN LET c(sh)=c(sh)-75: LET p(sh,8)=80: LET p(sh,9)=5: GO TO 110
 104 IF f=3 THEN LET c(sh)=c(sh)-50: LET p(sh,8)=65: LET p(sh,9)=1: GO TO 110
 105 IF f=4 THEN LET c(sh)=c(sh)-10: LET p(sh,8)=55: GO TO 110
 109 GO TO 100
 110 GO SUB 9946
 115 PRINT AT 20,0;"You have "¡c(sh)¡"Cr left"¡: INPUT "Which type do you want?"
,f
 116 IF f=1 THEN LET c(sh)=c(sh)-65: LET p(sh,10)=(10-p(sh,1))*7: GO TO 120
 117 IF f=2 THEN LET c(sh)=c(sh)-60: LET p(sh,10)=(10-p(sh,1))*5: GO TO 120
 118 IF f=3 THEN LET c(sh)=c(sh)-50: LET p(sh,10)=(10-p(sh,1))*3: GO TO 120
 119 GO TO 115
 120 GO SUB 9941
 125 PRINT AT 20,0;"You have "¡c(sh)¡"Cr left"¡: INPUT "Which type do you want?"
,f
 126 IF f=1 THEN LET c(sh)=c(sh)-170: LET p(sh,11)=25: GO TO 135
 127 IF f=2 THEN LET c(sh)=c(sh)-125: LET p(sh,11)=10: GO TO 135
```

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# PROGRAM FILE

```
 128 IF f=3 THEN  LET c(sh)=c(sh)-100: LET p(sh,11)=7: GO TO 135
 129 IF f=4 THEN  LET c(sh)=c(sh)-75: LET p(sh,11)=5: GO TO 135
 130 IF f=5 THEN  GO TO 135
 131 GO TO 125
 135 GO SUB 9936
 140 PRINT AT 20,0;"You have ";c(sh);"Cr left";: INPUT "Which type do you want?"
,f
 141 IF f=1 THEN  LET c(sh)=c(sh)-200: LET p(sh,12)=1: GO TO 150
 142 IF f=2 THEN  LET c(sh)=c(sh)-100: LET p(sh,12)=2: GO TO 150
 143 IF f=3 THEN  LET c(sh)=c(sh)-50: LET p(sh,12)=3: GO TO 150
 144 IF f=4 THEN  LET p(sh,12)=4: GO TO 150
 145 GO TO 140
 150 GO SUB 9932
 155 PRINT AT 20,0;"You have ";c(sh);"Cr left";: INPUT "Which type do you want?"
,f
 156 IF f=1 THEN  LET c(sh)=c(sh)-375: LET p(sh,13)=3: GO TO 165
 157 IF f=2 THEN  LET c(sh)=c(sh)-200: LET p(sh,13)=2: GO TO 165
 158 IF f=3 THEN  LET c(sh)=c(sh)-100: LET p(sh,13)=1: GO TO 165
 159 IF f=4 THEN  GO TO 165
 160 GO TO 155
 165 GO SUB 9927
 170 PRINT AT 20,0;"You have ";c(sh);"Cr left";: INPUT "Which type do you want?"
,f
 171 IF f=1 THEN  LET c(sh)=c(sh)-350: LET p(sh,14)=1: GO SUB 9895: GO TO 180
 174 IF f=2 THEN  GO TO 180
 175 GO TO 170
 180 GO SUB 9923
 185 PRINT AT 20,0;"You have ";c(sh);"Cr left";: INPUT "How many do you want ?",f
 186 IF f<0 THEN  GO TO 185
 187 LET p(sh,15)=f: LET c(sh)=c(sh)-95*f
 210 GO SUB 9915
 215 PRINT AT 20,0;"You have ";c(sh);"Cr left";: INPUT "Do you want this device
 (Y/N)  ";a$
 220 IF a$(1)="y" OR a$(1)="Y" THEN  LET c(sh)=c(sh)-1: LET p(sh,17)=1: GO TO 23
0
 225 IF a$="n" OR a$="N" THEN  GO TO 230
 227 GO TO 215
 230 IF C(SH)<0 THEN  CLS : PRINT AT 0,0; FLASH 1;"WHO CAN'T COUNT THEN": FLASH
0: GO SUB 9970: GO TO 32
 240 LET p(sh,20)=INT (RND*4)+1: LET x=INT (RND*32)+1: LET y=INT (RND*32)+1: LET
 a=g(x,y): IF a<>0 THEN  GO TO 240
 250 LET g(x,y)=64+sh: LET p(sh,24)=x: LET p(sh,25)=y
 260 IF sh<no THEN  LET sh=sh+1: GO TO 32
 300 REM Start
 310 LET sh=1: GO SUB 9972
 311 IF p(sh,1)=0 THEN  CLS : PRINT AT 10,0;"your space-ship no longer exists":
GO SUB 9970: GO TO 4999
 312 LET p(sh,10)=p(sh,10)-1: IF p(sh,27)<0 THEN  LET p(sh,27)=p(sh,27)-1
 313 IF p(sh,10)<=0 THEN  PRINT AT 15,0;"You have run out of energy your crew ha
s died because the life- support systems failed": GO SUB 9970: GO TO 4999
 314 IF p(sh,7)=1 THEN  IF RND<.05 THEN  LET p(sh,4)=p(sh,4)+1
 315 IF p(sh,26)=1 THEN  LET p(sh,26)=0: PRINT "You are in hyperspace and you
are incapable of doing anything else.": GO TO 317
 316 GO TO 320
 317 LET x=INT (RND*32)+1: LET y=INT (RND*32)+1: IF g(x,y)<>0 THEN  GO TO 317
 318 LET g(x,y)=64+sh: GO TO 4999
 320 PAPER 0: INK 7: BORDER 0: CLS
 325 IF p(sh,27)=1 THEN  PRINT AT 1,31; INK 2; FLASH 1;"T"; FLASH 0
 330 IF m$(sh)(1)<>" " THEN  PRINT AT 2,31; INK 4;"M"
 335 IF p(sh,12)=1 THEN  PRINT AT 1,0; INK 4;"L"
 336 IF p(sh,12)=2 THEN  PRINT AT 1,0;"M"
 337 IF p(sh,12)=3 THEN  PRINT AT 1,0;"S"
 338 IF p(sh,12)=4 THEN  PRINT AT 1,0;"V"
 339 IF p(sh,17)=1 THEN  PRINT AT 2,0; INK 2;"S"
 340 IF p(sh,14)<>0 THEN  PRINT AT 3,0; INK 5;"C"; INK 7
 345 FOR f=1 TO INT (RND*30)+20: LET x=INT (RND*238)+8: LET y=INT (RND*120)+46:
PLOT x,y: NEXT f
 350 PRINT AT 16,0;"Speed=";p(sh,19);"0% LS";TAB 20;"DV ";p(sh,20)
 355 PRINT AT 17,0;"AC=";p(sh,3);: PRINT TAB 20;"MC=";p(sh,2)
 360 PRINT AT 18,0;"Energy";
 365 LET a=p(sh,10): IF a>26 THEN  LET a=26
 370 FOR f=1 TO a
 380 IF f<3 THEN  INK 2: PRINT " ";
 390 IF f<6 AND f>3 THEN  INK 6: PRINT " ";
 400 IF f>=6 THEN  INK 4: PRINT " ";
 410 NEXT f
 411 INK 7: PRINT '"PT ";: FOR f=1 TO p(sh,15): PAPER 1: LET a=f: IF a>10 THEN
 LET a=a-10
 412 PRINT a;
 413 NEXT f
 414 PAPER 0
 420 PRINT '"Shields";
 425 LET a=p(sh,4): IF a>25 THEN  LET a=25
 430 FOR f=1 TO a
 435 IF f<3 THEN  INK 2: PRINT " ";
 436 IF f<6 AND f>3 THEN  INK 6: PRINT " ";
 437 IF f>=6 THEN  INK 4: PRINT " ";
 438 NEXT f
 439 INK 7
 450 PRINT '"Bullion ";c(sh);"Cr";TAB 13;"POS:Alpha";p(sh,24);" Beta ";p(sh,25)
 460 GO SUB 9901: BEEP 1,0
 500 REM Battle summary
 505 PRINT AT 0,0; INK 2;"PLEASE WAIT BATTLE DATA": BEEP 1,0
 510 LET A=9-P(sh,13)*2
 520 FOR f=1 TO no
 530 IF p(f,24)<p(sh,24)-a THEN  GO TO 560
 535 IF p(f,24)>p(sh,24)+a THEN  GO TO 560
 540 IF p(f,25)<p(sh,25)-a THEN  GO TO 560
 545 IF p(f,25)>p(sh,25)+a THEN  GO TO 560
 550 IF p(f,23)<>0 THEN  PRINT AT 9+p(f,25)-p(sh,25),15+p(f,24)-p(sh,24); FLASH
1; INK a(f);CHR$ (143+p(f,1)*2);CHR$ (144+p(f,1)*2): IF f=sh THEN  GO SUB 650
 555 FLASH 0
 560 NEXT f
 562 IF p(sh,1)=0 THEN  GO TO 4999
 565 BEEP 1,0: GO SUB 9891
 600 IF p(sh,23)=0 THEN  GO TO 720
 660 FOR f=p(sh,23) TO 1 STEP -1
 670 LET p(sh,4)=p(sh,4)-1
 680 IF p(sh,4)>0 AND p(sh,4)<23 THEN  PRINT AT 21-p(sh,4),f;"
 690 NEXT f
 695 LET p(sh,23)=0
 700 IF p(sh,4)<=0 THEN  LET p(sh,1)=0: PAPER 0: CLS : FLASH 1: PRINT AT 12,0;"Y
OUR SHIP HAS BEEN BLOWN UP": LET g(p(sh,24),p(sh,25))=0: FLASH 0
 710 RETURN
 720 LET go=4
 730 LET go=go-1: IF go=0 THEN  PRINT AT 1,1;"Time is short you must press";go-2
,1;"on": GO SUB 9891: GO TO 1400
 732 BEEP 1,0: GO SUB 9893: PRINT AT 0,0; INK 4;"OPTIONS PHASE
"
 735 INK 5: PRINT AT 1,1;"Options are:"
 740 PRINT AT 2,1;"1.Communicate with other ships"
 745 PRINT AT 3,1;"2.Transfer credits"
 750 PRINT AT 4,1;"3.Examine messages received"
 755 PRINT AT 5,1;"4.Engage tractor beam"
 760 PRINT AT 6,1;"5.Use directional scanners"
 765 PRINT AT 7,1;"6.Attempt planet landing"
 770 PRINT AT 8,1;"7.Engage self-destruct"
```

# PROGRAM FILE

```
 777 PRINT AT 10,1;"8.End option phase"
 780 INPUT "Which option do you require? "$a
 785 IF A<1 OR A>8 THEN  GO TO 780
 786 IF a=8 THEN  GO TO 1400
 790 IF A<>1 THEN  GO TO 880
 800 GO SUB 9893: PRINT AT 1,1;"Enter your message using G/M4";AT 2,1;"format"
 805 LET a=1: LET b=3: LET b$=""
 810 IF INKEY$<>"" THEN  GO TO 810
 820 IF INKEY$="" THEN  GO TO 820
 825 LET a$=INKEY$: IF CODE a$=13 THEN  GO TO 850
 830 LET b$=b$+a$: PRINT AT b,a;a$; FLASH 1;">"; FLASH 0: BEEP .05,0: LET a=a+1:
 IF a=29 THEN  LET b=4: LET a=1
 845 GO TO 810
 850 PRINT AT 7,1;"Enter the name of the ship you";AT 8,1;"wish to send the mess
age to": INPUT a$
 855 FOR f=1 TO no
 860 IF p$(f)(1 TO LEN a$)=a$ THEN  IF RND>p(f,18) THEN  LET m$(f)=b$: LET m$(f)
(65 TO 66)=STR$ sh: FLASH 1: PRINT AT 9,1;"Message transmission sent and";AT 10,
1;"acknowledged": FLASH 0: BEEP 1,0: GO SUB 9891: LET f=no
 865 NEXT f
 866 IF CODE SCREEN$ (9,1)<>77 THEN  PRINT AT 9,1;"Message transmission lost": G
O SUB 9891
 870 GO TO 730
 880 IF a<>3 THEN  GO TO 920
 885 GO SUB 9893: IF m$(sh)(1)=" " THEN  PRINT AT 1,1;"No message received": GO
SUB 9891: GO TO 730
 890 PRINT AT 1,1;m$(sh)(1 TO 29);AT 2,1;m$(sh)(30 TO 59);AT 3,1;m$(sh)(60 TO 64
)
 900 PRINT AT 5,1; INK 6;"Received from ship:";AT 6,1;p$(VAL a$(sh)(65 TO 66))
 905 LET p(sh,18)=0: FOR f=1 TO 66: LET m$(sh)(f)=" ": NEXT f
 910 GO SUB 9891: GO TO 730
 920 IF a<>2 THEN  GO TO 990
 930 GO SUB 9893: IF c(sh)=0 THEN  PRINT AT 1,1;"You have no bullion": GO SUB 98
91: GO TO 730
 940 PRINT AT 1,1;"How much do you wish to";AT 2,1;"transfer?": INPUT a
 950 IF a<0 THEN  GO TO 940
 955 IF a>c(sh) THEN  GO SUB 9893: FLASH 1: PRINT AT 1,1;"You have not got that"
;AT 2,1;"amount": BEEP 1,0: FLASH 0: GO TO 940
 960 PRINT AT 2,1;"Which ship do you wish to send";AT 3,1;"this bullion to?": IN
PUT a$
 970 FOR f=1 TO no
 975 IF p$(f)(1 TO LEN a$)=a$ THEN  LET c(f)=c(f)+a: LET c(sh)=c(sh)-a: PRINT AT
 5,1;"Transaction successfull": BEEP 1,0: LET f=no
 980 NEXT f
 985 GO SUB 9891: GO TO 730
 990 IF a<>4 THEN  GO TO 1040
 995 GO SUB 9893: IF p(sh,13)=0 THEN  PRINT AT 1,1;"You have no tractor": BEEP 1
,0: GO TO 730
1000 PRINT AT 1,1;"Which ship do you wish to use";AT 2,1;"it on?": INPUT a$
1010 FOR f=1 TO no
1020 IF p$(f)(1 TO LEN a$)=a$ THEN  IF p(f,24)>p(sh,24)-7 AND p(f,24)<p(sh,24)+7
 THEN  IF p(f,25)>p(sh,25)-7 AND p(f,25)<p(sh,25)+7 THEN  IF p(f,1)+p(f,3)<10-p(
sh,13) THEN  PRINT AT 4,1;"Tractor successfully locked";AT 5,1;"on target": LET
 p(f,27)=2: LET p(f,19)=0: LET f=no
1030 NEXT f
1035 GO SUB 9891: GO TO 730
1040 IF a<>5 THEN  GO TO 1100
1045 GO SUB 9893: IF p(sh,12)=0 THEN  PRINT AT 1,1;"You have no scanners": BEEP
1,0: GO TO 730
1050 PRINT AT 1,1;"Which direction vector do you";AT 2,1;"want?": INPUT a
1055 IF a<1 OR a>4 THEN  GO TO 1050
1060 IF a=1 THEN  LET e=p(sh,24)-(9-p(sh,12)*2): LET b=p(sh,24)+(9-p(sh,12)*2):
LET c=p(sh,25)-(9-p(sh,12)*2): LET d=p(sh,25)
1061 IF a=2 THEN  LET e=p(sh,24): LET b=p(sh,24)+(9-p(sh,12)*2): LET c=p(sh,25)-
(9-p(sh,12)*2): LET d=p(sh,25)+(9-p(sh,12)*2)
1062 IF a=3 THEN  LET e=p(sh,24)-(9-p(sh,12)*2): LET b=p(sh,24)+(9-p(sh,12)*2):
LET c=p(sh,25): LET d=p(sh,25)+(9-p(sh,12)*2)
1063 IF a=4 THEN  LET e=p(sh,24)-(9-p(sh,12)*2): LET b=p(sh,24): LET c=p(sh,25)-
(9-p(sh,12)*2): LET d=p(sh,25)+(9-p(sh,12)*2)
1064 IF E<1 THEN  LET E=1
1065 IF C<1 THEN  LET C=1
1066 IF B>32 THEN  LET B=32
1067 IF D>32 THEN  LET D=32
1068 GO SUB 9893: FOR f=e TO b: FOR g=c TO d
1069 IF g(f,g)>128 THEN  PRINT AT 1,1;"Planet    ";AT 2,1;"Alpha";f;" Beta";g;"
 ";: GO SUB 9891: GO SUB 9893: GO TO 1090
1070 IF g(f,g)>64 THEN  LET a=g(f,g)-64: GO SUB 9893: PRINT AT 1,1;"Spaceship ";
p$(a);AT 2,1;"Alpha ";f;"Beta ";g;"    ";: GO SUB 9891: GO SUB 9893
1090 NEXT g: NEXT f
1095 GO TO 730
1100 IF a<>6 THEN  GO TO 1190
1110 GO SUB 9893: LET a=p(sh,24)-1: LET b=p(sh,25)-1
1130 FOR f=p(sh,24)-1 TO p(sh,24)+1: FOR g=p(sh,25)-1 TO p(sh,25)+1
1135 IF f<1 OR f>32 THEN  GO TO 1150
1140 IF g>32 THEN  GO TO 1150
1145 IF g(f,g)>128 THEN  PRINT AT 1,1;"Suitable planet found";AT 2,1;"Alpha ";f;
"Beta ";g;"  ": BEEP .2,0
1150 NEXT g: NEXT f
1155 IF CODE SCREEN$ (1,1)<>83 THEN  PRINT AT 1,1;"No suitable planet": BEEP 1,0
: GO TO 730
1160 IF p(sh,19)>0 THEN  PRINT AT 4,1;"Speed too great for landing": BEEP 1,0: G
O TO 730
1170 GO SUB 9000
1180 GO TO 730
1190 IF a<>7 THEN  GO TO 1400
1195 GO SUB 9893
1200 PRINT AT 1,1;"Are you sure you wish    self    AT 2,1;"    ?": INPUT a$
1210 IF a$(1)="Y" OR a$(1)="y" THEN  GO TO 1230
1220 IF a$(1)="N" OR a$(1)="n" THEN  GO TO 730
1225 GO TO 1200
1260 FOR f=p(sh,24)-1 TO p(sh,24)+1: FOR g=p(sh,25)-1 TO p(sh,25)+1
1270 IF f<1 OR f>32 THEN  GO TO 1300
1280 IF g<1 OR g>32 THEN  GO TO 1300
1290 GO SUB 9893: IF g(f,g)>128 AND g(f,g)<192 THEN  LET a=g(f,g)-64: IF p(a,11)<
>50 THEN  LET p(a,1)=0: PRINT AT 6,1;"You have blown up ship";AT 7,1;"INK a(a);p
$(a): BEEP 1,0
1300 NEXT g: NEXT f
1310 LET p(sh,1)=0: PAPER 2: BORDER 2: CLS : PRINT AT 12,5;"SH 1;"YOU
HAVE BLOWN UP!": FLASH 0: GO SUB 9891
1320 GO TO 4999
1400 GO SUB 9893: PRINT AT 0,5; INK 2;"FIRE PHASE"
1410 PRINT AT 1,1;"Do you wish to fire lasers?": INPUT a$
1415 IF a$(1)="Y" OR a$(1)="y" THEN  GO TO 1430
1420 IF a$(1)="N" OR a$(1)="n" THEN  GO TO 1460
1425 GO TO 1410
1430 PRINT AT 2,1;"Enter co ordinates of target": INPUT "Alpha "$a: INPUT "Beta
"$b
1440 IF a<1 OR a>32 THEN  GO TO 1430
1445 IF b<1 OR b>32 THEN  GO TO 1430
1450 GO SUB 9893: IF g(a,b)>64 AND g(a,b)<128 THEN  LET a=g(a,b)-64: PRINT AT 1,
1;"TARGET SELECTED": PRINT AT 2,1; INK a;CHR$ (143+2*p(a,1));CHR$ (144+2*p(a,
1)): PRINT AT 3,1;p$(a): BEEP 1,0: IF (RND*10000+1)<=p(sh,8)*(100-p(a,11)) T
HEN  PRINT AT 4,1; FLASH 1;"TARGET    ": FLASH 0: BEEP 1,0: LET p(a,23)=p(a,23)
+p(sh,6)
1460 GO SUB 9893: PRINT AT    ;"wish to fire photon ";AT 4,1;"torpedoes?"
: INPUT a$
1470 IF a$(1)="Y" OR a$(1)="y" THEN  GO TO 1490
1475 IF a$(1)="N" OR a$(1)="n" THEN  GO SUB 9893: GO TO 1530
```


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**SPECIFICATIONS**
**Hardware:**

Processor — Z80A microprocessor operating at 4MHz
Memory — 64K bytes of RAM; 4K bytes of ROM
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Printer Port — Centronics-compatible
**Software:**

Operating Systems — CP/M 2.2 with enhanced BIOS and CCP
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**FEATURES:**
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★ 16 BI-DIRECTIONAL I/O LINES: 40 mA output drive
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★ Optional DMA addition to the OMEGA; up to four Megabits/sec throughput over SCSI/PLUS bus
★ BIOS support for SCSI Winchester controllers.

**DESCRIPTION:**
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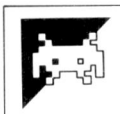
# PROGRAM FILE

```
1480 GO TO 1460
1490 IF p(sh,15)<1 THEN  GO SUB 9893: PRINT AT 1,1;"You have no photon torpedoes
": BEEP 1,0: GO TO 1530
1499 PRINT AT 3,1;"Enter co-ordinates of target": INPUT "Alpha ";a: INPUT "Beta
";b
1500 IF a<1 OR a>32 THEN  GO TO 1490
1510 IF b<1 OR b>32 THEN  GO TO 1490
1520 GO SUB 9893: LET p(sh,15)=p(sh,15)-1: IF g(a,b)>64 AND g(a,b)<128 THEN  LET
 a=g(a,b)-64: PRINT AT 1,1;"TARGET SELECTED": PRINT AT 2,1; INK a(a);CHR$ (143+2
*p(a,1));CHR$ (144+2*p(a,1)): PRINT AT 3,1;p$(a): PRINT AT 4,1; FLASH 1;"TARGET
HIT"; FLASH 0: BEEP 1,0: LET p(a,23)=p(a,23)+12: GO SUB 9893
1530 GO SUB 9893: PRINT AT 0,0; INK 5;"Manoeuvre phase"
1531 IF p(sh,27)<>0 THEN  LET p(sh,27)=0: GO SUB 9893: PRINT AT 1,1; FLASH 1;"Yo
u are being held in a tractor";AT 2,1;"beam": FLASH 0: GO SUB 9891: GO TO 4999
1535 IF p(sh,5)=0 THEN  GO TO 1540
1536 IF p(sh,5)=1 THEN  PRINT AT 1,1;"Do you wish to jump into hyper-";AT 2,1;"s
pace?": INPUT a$: IF a$(1)="Y" OR a$(1)="y" THEN  PAPER 5: BORDER 5: INK 1: CLS
: PRINT AT 15,0;"Hyperspace jump activated": GO TO 4999
1537 IF a$(1)="N" OR a$(1)="n" THEN  GO SUB 9893: GO TO 1540
1538 GO TO 1536
1540 PRINT AT 1,1;"Do you wish to:";AT 2,1;"1..Accelerate";AT 3,1;"2..De-acceler
ate";AT 4,1;"3..Stay at current speed": INPUT a
1550 IF a=1 OR a=2 THEN  PRINT AT 5,1;"By how much?": INPUT b: GO TO 1570
1560 IF a=3 THEN  GO TO 1610
1565 GO TO 1540
1570 IF b>p(sh,3) THEN  PRINT AT 5,1;"Your ship is not capable of";AT 6,1;"such
performance": GO SUB 9893: GO TO 1530
1580 IF a=1 THEN  LET p(sh,19)=p(sh,19)+b: IF p(sh,19)>7 THEN  LET p(sh,19)=7
1590 IF a=2 THEN  LET p(sh,19)=p(sh,19)-b: IF p(sh,19)<0 THEN  LET p(sh,19)=0
1600 PRINT AT 16,6; FLASH 1;p(sh,19);"0"; FLASH 0
1610 GO SUB 9893
1620 IF p(sh,19)=0 THEN  GO TO 4999
1630 PRINT AT 21,13;r$(6,28 19);AT 16,23;c(sh,20);AT 21,13;"POS:Aloha";p(sh,24);
"Beta";p(sh,25): LET f=p(sh,24): LET g=p(sh,25): LET a=p(sh,19): LET b=p(sh,2):
LET c=p(sh,20): PRINT AT 1,1;"Do you wish to:";AT 2,1;"1..Move one sector on cur
rent";AT 3,1;"vector";AT 4,1;"2..Rotate 90 degrees left";AT 5,1;"3..Rotate 90 de
grees right";AT 6,1;"4..Study galatic map"
1640 INPUT e
1645 IF e=4 THEN  GO SUB 9893: FOR f=1 TO INT (RND*30)+20: LET x=INT (RND*238)+8
: LET y=INT (RND*120)+46: PLOT x,y: NEXT f: GO SUB 9901: GO SUB 9891: GO SUB 989
3: GO TO 1630
1647 IF e<>1 THEN  GO TO 1660
1650 LET a=a-1: IF c=1 THEN  LET g=g-1
1652 IF c=2 THEN  LET f=f+1
1654 IF c=3 THEN  LET g=g+1
1656 IF c=4 THEN  LET f=f-1
1657 GO TO 1680
1660 IF e=2 THEN  LET b=b-1: LET c=c-1: IF c=0 THEN  LET c=4
1665 IF e=3 THEN  LET b=b-1: LET c=c+1: IF c=5 THEN  LET c=1
1680 PRINT AT 21,13;r$(1 TO 19);AT 16,23;c(sh);AT 21,13;"POS:Alpha";f;"Beta";g: IF a
>0 THEN  GO TO 1640
1690 IF b<0 THEN  PRINT AT 8,1;"Your ship cannot manoeuvre";AT 9,1;"that much":
GO SUB 9891: GO SUB 9893: GO TO 1630
1700 IF f>32 OR f<1 OR g<1 OR g>32 THEN  PRINT AT 8,1;"Your ship will be lost in
 the";AT 9,1;"deep recesses of space": GO SUB 9891: GO SUB 9893: GO TO 1630
1710 IF g(f,g)<>0 THEN  PRINT AT 8,1;"Navigation computer rejects co-";AT 9,1;"o
rdinates because of likelihood";AT 10,1;"of energy confrontation": PRINT AT 0,0;
"PRESS ANY KEY TO CONTINUE": PAUSE 0: GO SUB 9893: GO TO 1530
1720 LET g(p(sh,24),p(sh,25))=0: LET p(sh,20)=c: LET p(sh,24)=f: LET p(sh,25)=g:
 LET g(f,g)=64+sh
4999 CLS : BEEP 1,0: PRINT AT 15,0;"NEXT PLAYER"''"PRESS ANY KEY TO CONTINUE": P
AUSE 0: LET sh=sh+1: IF sh>no THEN  LET sh=1
5000 GO SUB 9972: GO TO 311
9000 GO SUB 9893: PRINT AT 1,1;"Input co-ordinates of planet";AT 2,1;"you wish t
o land on": INPUT "Alpha ";a: INPUT "Beta ";b: GO SUB 9893
9010 IF ABS (p(sh,24)-a)>1 OR ABS (p(sh,25)-b)>1 THEN  GO TO 9000
9020 IF g(a,b)<=128 THEN  GO TO 9000
9025 LET g(p(sh,24),p(sh,25))=0: LET p(sh,24)=a: LET p(sh,25)=b
9030 LET c=g(a,b)-128: IF c<>a(sh) THEN  PRINT AT 3,1;"The planet is defended an
d";AT 4,1;"hits you with powerfull lasers": LET p(sh,23)=p(sh,23)+INT (RND*20+1)
9040 BEEP 1,0: PRINT AT 5,1;"You have landed successfully"
9050 IF c=a(sh) THEN  PRINT AT 6,1;"You are given ";: LET d=INT (RND*100+1): LET
 c(sh)=c(sh)+d: PRINT d;"Cr";AT 7,1;"by the planet's citizens who";AT 8,1;"think
 you are doing a great";AT 9,1;"job": GO SUB 9891
9060 LET g(p(sh,24),p(sh,25))=64+sh: PRINT AT 10,1;"You can buy energy crystals"
: GO SUB 9891: GO SUB 9893: PAPER 6: GO SUB 9947: PAPER 6: PRINT AT 18,0;"You ha
ve ";c(sh);"Cr": INPUT "Which type do you wish to buy?": INPUT a: PAPER 0
9070 IF a<1 OR a>3 THEN  GO TO 9060
9080 IF a=1 AND c(sh)>=65 THEN  LET c(sh)=c(sh)-65: LET p(sh,10)=p(sh,10)+(10-p(
sh,1))*7: GO TO 9120
9090 IF a=2 AND c(sh)>=60 THEN  LET c(sh)=c(sh)-60: LET p(sh,10)=p(sh,10)+(10-p(
sh,1))*5: GO TO 9120
9100 IF a=3 AND c(sh)>=55 THEN  LET c(sh)=c(sh)-55: LET p(sh,10)=p(sh,10)+(10-p(
sh,1))*3: GO TO 9120
9110 PRINT AT 20,0;"Unfortunately you don't have";AT 21,0;"enough credits"
9120 GO SUB 9893: GO TO 4999
9891 REM Pause
9892 BEEP .03,9: BEEP .03,-1: BEEP .05,19: PRINT AT 0,0;"PRESS ANY KEY TO CONTIN
UE": PAUSE 0: PRINT AT 0,0;r$: RETURN
9893 REM Clear galaxy picture
9894 INK 5: PAPER 0: BORDER 0: PRINT AT 0,0;r$;"  ": FOR t=1 TO 15: PRINT AT T,
1;r$;: NEXT t: RETURN
9895 REM Disguising ship
9896 CLS : PRINT "As you have chosen a cloaking  system your ship can have the
  appearance to scanners of any  other type of ship.Pick the typeof ship you wi
sh to appear as."
9897 PRINT AT 10,0;"PRESS ANY KEY TO CONTINUE": PAUSE 0: GO SUB 9965
9898 INPUT "Which type of ship do you wish  to appear as? ";a
9899 IF a>0 AND a<6 THEN  LET p(sh,1)=a: RETURN
9900 GO TO 2020
9901 REM Printout of galaxy
9902 LET a=143+2*p(sh,1): INK a(sh): PRINT AT 8,15;CHR$ a;CHR$ (a+1)
9903 LET x=p(sh,24)-(9-p(sh,12)*2): LET y=p(sh,25)-(9-p(sh,12)*2)
9904 IF x<1 THEN  LET x=1
9905 IF y<1 THEN  LET y=1
9906 FOR f=x TO p(sh,24)+9-p(sh,12)*2
9907 FOR g=y TO p(sh,25)+9-p(sh,12)*2
9908 IF g>32 THEN  GO TO 9912
9909 IF f>32 THEN  GO TO 9913
9910 IF g(f,g)>128 THEN  LET a=g(f,g)-128: INK a: PRINT AT 8+(g-p(sh,25)),15+(f-
p(sh,24))*2;"  ": GO TO 9912
9911 IF g(f,g)>64 THEN  LET a=g(f,g)-64: INK a(a): PRINT AT 8+(g-p(sh,25)),15+(f
-p(sh,24))*2;CHR$ (143+2*p(a,1));CHR$ (144+2*p(a,1))
9912 NEXT g
9913 NEXT f
9914 RETURN
9915 REM Destruct mechanism info
9916 CLS : INK 2: PRINT "SELF-DESTRUCT MECHANISM": PRINT "
          ";TAB 4; INK 0;"ADDITIONAL"
9917 INK 0: PRINT ''"This is the last option in a  hopeless situation.By initi
atingthis mechanism the ship will ex-plode usually with enough force to cause al
l adjacent to explodeas well.It costs:  1Cr"
9918 RETURN
9923 REM Torpedoe info
9924 CLS : INK 2: PRINT "PHOTON TORPEDOES";TAB 18; INK 0;"ADDITIONAL": INK 2: PR
INT "                "
9925 INK 0: PRINT ''"There are only one type of thesand they cost:  95Cr."''''
''"These weapons automatically hit their designated targets with a fire power gre
```

# PROGRAM FILE

```
ater than an x-raylaser,but unlike a laser they  may only be used once."
9926 RETURN
9927 REM Cloak info
9928 CLS : INK 2: PRINT "CLOAKING SYSTEM";TAB 18; INK 0;"ADDITIONAL": INK 2: PRI
NT "                "
9929 INK 0: PRINT ''"1..Standard";TAB 18;"350Cr"'"2..None";TAB 16;"No cost"
9930 PRINT ''"The standard cloaking system   allows your ship to appear as  an
y other ship when it's scannedby another ship."
9931 RETURN
9932 REM Tractor info
9933 CLS : INK 2: PRINT "TRACTOR BEAMS";TAB 15; INK 0;"ADDITIONAL": INK 2: PRINT
 "              "; INK 0
9934 INK 0: PRINT ''"1..High power";TAB 18;"375Cr"'"2..Medium power";TAB 18;"200
Cr"'"3..Low power";TAB 18;"100Cr"'"4..No tractor";TAB 16;"No cost"
9935 RETURN
9936 REM Scanners info
9937 CLS : INK 2: PRINT "SCANNERS";TAB 15; INK 0;"ADDITIONAL": INK 2: PRINT "
       ": INK 0
9938 PRINT ''"1..Long range";TAB 18;"200Cr"'"2..Medium range";TAB 18;"100Cr"'"3.
.Short range";TAB 18;"50Cr"'"4..No scanners";TAB 15;"No cost"
9939 PRINT ''"Scanners are used to search the galaxy for other ships or for  pl
anets.If you have no scanners the range is concidered visual."
9940 RETURN
9941 REM Shield info
9942 CLS : INK 2: PRINT "SHIELDS";TAB 15; INK 0;"ADDITIONAL": INK 2: PRINT "
       ": INK 0
9943 PRINT ''"1..Super absorbent";TAB 25;"170Cr"'"2..High absorbent";TAB 25;"125
Cr"'"3..Medium absorbent";TAB 25;"100Cr"'"4..Low absorbent";TAB 26;"75Cr"'"5..No
 shield";TAB 23;"No cost"
9944 PRINT ''"Super absorbent shields are the only type that can survive the  bl
ast produced by a nearby ship self-destructing."
9945 RETURN
9946 REM Energy info
9947 CLS : INK 2: PRINT "ENERGY CRYSTALS";TAB 19; INK 0; FLASH 1;"COMPULSARY": F
LASH 0: INK 2: PRINT "                ": INK 0
9948 PRINT ''"1..Long life";TAB 18;"65Cr"'"2..Medium life";TAB 18;"60Cr"'"3..Sho
rt life";TAB 18;"50Cr"
9949 PRINT ''"These crystals supply all the  power neccessary to keep a ship ru
nning,should they ever be ex- hausted then the crew will die."
9950 RETURN
9951 REM Computer info
9952 CLS : INK 2: PRINT "SHIP COMPUTERS";TAB 15; INK 0; FLASH 1;"COMPULSARY": FL
ASH 0: INK 2: PRINT "                ": INK 0
9953 PRINT ''"1..High performance";TAB 21;"125Cr"'"2..Medium performance";TAB 22
;"75Cr"'"3..Low performance";TAB 22;"50Cr"'"4..Operating system";TAB 22;"100Cr"
9954 PRINT ''"The higher the performance of  the ship computer the more aff ec
tive the laser weapons are.  Also the higher performance com-puters can occasio
nally perform automatic repair to the ship.": RETURN
9955 REM Laser info
9956 CLS : INK 2: PRINT "LASER WEAPONS";TAB 15; INK 0; FLASH 1;"COMPULSARY": FLA
SH 0: INK 2: PRINT "                ": INK 0
9957 PRINT ''"1..X-ray";TAB 18;"600Cr"'"2..High power";TAB 13;"250Cr"'"3..Medium
 power";TAB 18;"100Cr"'"4..Low power";TAB 19;"50Cr"
9958 PRINT ''"The lower the number the higher the destructive power of the  la
ser.": RETURN
9959 REM Engine info
9960 CLS : INK 2: PRINT "ENGINE TYPES";TAB 15; FLASH 1; INK 0;"COMPULSARY": FLAS
H 0: INK 2: PRINT "                ": INK 0
9961 PRINT ''"1..Fusion type";TAB 18;"500Cr"'"2..Photon type";TAB 18;"200Cr"'"3.
.Rocket type";TAB 19;"75Cr"
9962 PRINT ''"The fusion engine gives the bestacceleration and manouverabilityco
mbined with the ability to  jump into hyper-space."
9963 PRINT "The photon engine gives the samemanouverability as the fusion  engi
ne but less acceleration."
9964 PRINT "The rocket engine gives the  worst performance in all  resp
ects.": RETURN
9965 REM Ship info
9966 CLS : INK 2: PRINT "SHIP TYPES";TAB 15; INK 0; FLASH 1;"COMPULSARY": FLASH
 0: INK 2: PRINT "              ": INK 0
9967 PRINT ''"1..Fighter";TAB 18;"100Cr"'"2..Cruiser";TAB 18;"300Cr"'"3..Battle
ship";TAB 18;"500Cr"
9968 PRINT ''"The bigger the ship the more  damage it can take while the  sm
aller ships can accelerate andmanouver better."
9969 RETURN
9970 REM Continue routine
9971 PRINT AT 21,0; FLASH 1;"PRESS ANY KEY TO CONTINUE": FLASH 0: PAUSE 0: RETUR
N
9972 REM Start of cycle
9973 BORDER 6: PAPER 6: CLS : FOR f=0 TO 7: BEEP .04,f: NEXT f
9974 INK 2: PRINT "SHIP ";sh: INK 0
9975 IF a(sh)=1 THEN  PRINT AT 7,0; INK 1;"FEDERATION SHIP"
9976 IF a(sh)=2 THEN  PRINT AT 7,0; INK 2;"REBEL SHIP"
9977 IF a(sh)=3 THEN  PRINT AT 7,0; INK 3;"NEUTRAL SHIP"
9978 PRINT AT 9,0; INK a(sh);p$(sh); INK 0;: PRINT AT 15,0; FLASH 1;"PRESS ANY K
EY TO CONTINUE": FLASH 0: PAUSE 0
9979 RETURN
9980 REM Set up routine
9981 CLS : FOR f=1 TO 4: LET x=INT (RND*32)+1: LET y=INT (RND*32)+1: IF g(x,y)=0
 THEN  LET g(x,y)=129: NEXT f
9982 LET f=f-1: NEXT f
9983 FOR r=1 TO 4: LET x=INT (RND*32)+1: LET y=INT (RND*32)+1: IF g(x,y)=0 THEN
 LET g(x,y)=130: NEXT r
9984 LET f=f-1: NEXT r
9985 FOR n=1 TO 4: LET x=INT (RND*32)+1: LET y=INT (RND*32)+1: IF g(x,y)=0 THEN
 LET g(x,y)=131: NEXT n
9986 LET n=n-1: NEXT n
9987 LET o=0: FOR f=1 TO no: LET a(f)=INT (RND*3)+1: IF f>1 THEN  IF a(f)<>a(f-1
) THEN  LET o=1
9988 NEXT f
9989 IF o=0 THEN  GO TO 9987
9990 LET fed=0: LET neu=0: LET reb=0
9991 FOR f=1 TO no: IF a(f)=1 THEN  LET fed=fed+1
9992 IF a(f)=2 THEN  LET reb=reb+1
9993 IF a(f)=3 THEN  LET neu=neu+1
9994 NEXT f
9995 LET a=(reb+neu+fed)/3: FOR f=1 TO no: IF a(f)=2 THEN  LET c(f)=INT (a/reb*1
000+INT (RND*500)+1)
9996 IF a(f)=1 THEN  LET c(f)=INT (a/fed*1000+INT (RND*500)+1)
9997 IF a(f)=3 THEN  LET c(f)=INT (a/neu*1000+INT (RND*500)+1)
9998 NEXT f
9999 RETURN
User defined graphics B = ▒ C = ▫ D = ▥ E = ▪▪ F = ▦ G = ▮▮ L = ▮ K = ▯
```



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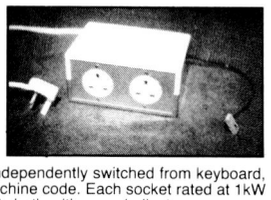

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# PROGRAM FILE

display is clear and colourful, and it's an excellent game.

The program is in two parts: type in listing one and save it as a file called 'D1', then type in listing two and save it as a file called 'D2'. When D1 is run it will automatically load D2. The second listing is a very tight squeeze in 32k, so it is absolutely *essential* that the program is typed in as printed with no extra spaces and that the line number increases by 1. Instructions are included in the program as long as you are familiar with the rules of draughts. Good luck: it plays a mean game.

```
>L.
  10REM*****************************
  15REM******                 *********
  20REM****** DRAUGHTS        *********
  30REM******    BY           *********
  40REM****** R.K.READING      *********
  50REM******                 *********
  60REM*****************************
  70MODE1
  80VDU23;8202;0;0;0;
  90VDU19,2,2,0,0,0
 100
 110REM******** MAIN PROGRAM *****
 120
 130PROCinstruct
 140PROCvar
 150PROCscreen
 160VDU28,0,31,8,0
 170COLOUR3
 180CHAIN"D2"
 190
 200REM******* SET UP VARIABLES ****
 210
 220DEFPROCvar
 230VDU23,224,0,0,0,3,7,15,31,31
 240VDU23,225,0,0,126,255,255,255,255,255
 250VDU23,226,0,0,0,192,224,240,248,248
 260VDU23,227,31,63,63,63,63,63,63,31
 270VDU23,228,255,255,255,255,255,255,255,255
 280VDU23,229,248,252,252,252,252,252,252,248
 290VDU23,230,31,31,15,7,3,0,0,0
 300VDU23,231,255,255,255,255,255,126,0,0
 310VDU23,232,248,248,240,224,192,0,0,0
 320VDU23,233,255,231,195,129,195,231,255,255
 330VDU23,234,0,0,0,192,224,240,248,248
 340VDU23,235,248,252,252,252,252,252,252,248
 350
 360C1$=CHR$224+CHR$225+CHR$226
 370C2$=CHR$227+CHR$228+CHR$229
 380C3$=CHR$230+CHR$231+CHR$232
 390C4$=CHR$224+CHR$225+CHR$234
 400D$=CHR$8+CHR$8+CHR$8+CHR$10
 410E$=CHR$288+CHR$288+CHR$288
 420
 430PC$=C1$+D$+C2$+D$+C3$
 440CC$=C4$+D$+C2$+D$+C3$
 450
 460PK$=C1$+D$+CHR$227+CHR$233+CHR$235+D$+C3$
 470REM********* DATA FOR PIECES POSITIONS ON BOARD ******
 480
 490CK$=C1$+D$+CHR$227+CHR$233+CHR$229+D$+C3$
 500SQUARE$=E$+D$+E$+D$+E$
 510
 520DIMY$(8,8)
 530 FORX=1 TO8
 540 LET Y$(X,X)=""
 550NEXT
 560
 570FOR T=1 TO 12
 580READ A,B,C,D
 590Y$(A,B)=CC$
 600Y$(C,D)=PC$
 610NEXT:RESTORE
 620ENDPROC
 630
 640
 650DEF PROCscreen
 660COLOUR131:CLS
 670GCOL0,0:MOVE352,944:MOVE352,144
 680PLOT85,1184,944:PLOT85,1184,144
 690COLOUR0
 700PRINTTAB(10,30);"DRAUGHTS BY R.K.READING";
 710
 720COLOUR129:F=0
 730FOR T=1 TO 64
 740READA,B
 750 IFT>32COLOUR130
 760PRINTTAB(9+(3*A),27-(3*B));SQUARE$;:REM**** PRINTS SQUARES ON BOARD **
 770NEXT
 780
 790COLOUR129:COLOUR3
 800FORS=1 TO 8
 810FORT=1 TO 8
 820IF S>4 THEN COLOUR0
 830PRINTTAB(9+(3*T),27-(3*S));Y$(T,S);:REM**** PRINTS PIECES ON BOARD ***
 840NEXTT
 850NEXTS
 860
 870COLOUR131:COLOUR0
 880PRINTTAB(13,1);"A  B  C  D  E  F  G  H"
 890PRINTTAB(13,28);"A  B  C  D  E  F  G  H"
 900N=8
 910FOR T=4 TO 25 STEP3
 920FOR O=9 TO 38 STEP29
 930PRINTTAB(O,T);N;
 940NEXTO
 950N=N-1
 960NEXTT
 970ENDPROC
 980
 990DATA2,6,1,3,4,6,3,3,6,6,5,3,8,6,7,3
1000DATA1,7,2,2,3,7,4,2,5,7,6,2,7,7,8,2
1010DATA2,8,1,1,4,8,3,1,6,8,5,1,8,8,7,1
1020DATA1,5,2,4,3,5,4,4,5,5,6,4,7,5,8,4
1030DATA2,1,4,1,6,1,8,1,1,2,3,2,5,2,7,2
1040DATA2,3,4,3,6,3,8,3,1,4,3,4,5,4,7,4
1050DATA2,5,4,5,6,5,8,5,1,6,3,6,5,6,7,6
1060DATA2,7,4,7,6,7,8,7,1,8,3,8,5,8,7,8
```

# PROGRAM FILE

```
1070
1080REM********* INSTRUCTIONS *************
1090DEF PROCinstruct
1100COLOUR2
1110PRINTTAB(10,2);"DRAUGHTS INSTRUCTIONS";
1120PRINTTAB(9,3);"========================";
1130COLOUR3
1140PRINTTAB(2,5);"This game follows the traditional ";
1150PRINTTAB(1,6);"rules of draughts.";
1160PRINTTAB(2,7);"You are white and you make the first";
1170PRINTTAB(1,8);"move.You enter the coordinate of the ";
1180PRINTTAB(1,9);"player you want to move first,(letter ";
1190 PRINTTAB(1,10);"then number without pressing 'RETURN'),";
1200PRINTTAB(1,11);"and then enter in the same way the";
1210PRINTTAB(1,12);"coordinate of the square you want to";
1220PRINTTAB(1,13);"move it too.";
1230PRINTTAB(2,14);"A king is represented by a normal ";
1240PRINTTAB(1,15);"player with a hole in the middle.";
1250PRINTTAB(2,16);"If you take and you can take again ";
1260PRINTTAB(1,17);"with the same player it will give you ";
1270PRINTTAB(1,18);"another go to move it.";
1280PRINTTAB(2,19);"You must take if you can.";
1290PRINTTAB(5,25);"<PRESS ANY KEY TO CONTINUE>";
1300A$=GET$
1310ENDPROC
>L.
    1*KEY 0 *TAPE|M DELETE 1,2|M FOR I%=0 TO TOP-PAGE STEP4:I%!&E00=I%!&1B00:NEX
T |M PAGE=&E00|M END|M RUN|M
    2*FX138,0,128
    3PROCv
    4E=1:F=4:P=1:L=1:Z=0:PROCg
    5IFG=1ORG=2GOTO9
    6IF DR=0V=1:GOTO14
    7IF DR=1 E=5:F=B:P=4:L=2:PROCg
    8IFG=1ORG=2THENV=1ELSEV=2:GOTO14
    9PROCp:PROCc
   10IFG=1ORG=2GOTO4
   11IF DR=0V=0:GOTO14
   12IF DR=1 E=1:F=4:P=1:L=1:PROCg
   13IFG=1ORG=2THENV=0ELSEV=2:GOTO14
   14PROCe
   15DEFPROCv
   16C1$=CHR$224+CHR$225+CHR$226
   17C2$=CHR$227+CHR$228+CHR$229
   18C3$=CHR$230+CHR$231+CHR$232
   19C4$=CHR$224+CHR$225+CHR$234
   20D$=CHR$8+CHR$8+CHR$8+CHR$10
   21E$=CHR$288+CHR$288+CHR$288
   22PC$=C1$+D$+C2$+D$+C3$
   23CC$=C4$+D$+C2$+D$+C3$
   24PK$=C1$+D$+CHR$227+CHR$233+CHR$235+D$+C3$
   25CK$=C1$+D$+CHR$227+CHR$233+CHR$229+D$+C3$
   26SQUARE$=E$+D$+E$+D$+E$
   27DIMY$(9,9)
   28FORX=0TO9
   29FORY=0TO9
   30IFX<1ORX>8ORY<1ORY>8Y$(X,Y)="E"ELSEY$(X,Y)=""
   31NEXT:NEXT
   32FORT=1TO12
   33READA,B,C,D
   34Y$(A,B)=CC$:Y$(C,D)=PC$
   35NEXT
   36D=0:T=0:O=1
   37ENDPROC
   38DATA2,6,1,3,4,6,3,3,6,6,5,3,8,6,7,3
   39DATA1,7,2,2,3,7,4,2,5,7,6,2,7,7,8,2
   40DATA2,8,1,1,4,8,3,1,6,8,5,1,8,8,7,1
   41DATA1,5,2,4,3,5,4,4,5,5,6,4,7,5,8,4
   42DATA2,1,4,1,6,1,8,1,1,2,3,2,5,2,7,2
   43DATA2,3,4,3,6,3,8,3,1,4,3,4,5,4,7,4
   44DATA2,5,4,5,6,5,8,5,1,6,3,6,5,6,7,6
   45DATA2,7,4,7,6,7,8,7,1,8,3,8,5,8,7,8
   46DEFPROCi
   47PROCcl
   48PRINTTAB(1,8);"ILLEGAL";
   49PRINTTAB(3,10);"MOVE";
   50FORJ=1TO1000:NEXT:CLS
   51VDU28,0,31,39,0:ENDPROC
   52DEFPROCpr
   53PROCcl
   54PRINTTAB(4,8);"YOU";SPC(6);"MUST";SPC(5);"TAKE";
   55FORJ=1TO1000:NEXT:CLS
   56ENDPROC
   57DEFPROCcl
   58COLOUR131:COLOUR0
   59VDU28,0,31,8,0
   60CLS
   61ENDPROC
   62DEFPROCg
   63G=0:DR=0
   64IFT=1GOTO73
   65A=1:B=1
   66IFO=0ANDP=4A=RND(3):A=A+A:B=6
   67IFL=1ANDY$(A,B)=PC$ORL=1ANDY$(A,B)=PK$GOTO73
   68IFL=2ANDY$(A,B)=CC$ORL=2ANDY$(A,B)=CK$GOTO73
   69IFO=0ANDP=4GOTO66
   70IFA=8B=B+1:A=0
   71IFB<9A=A+1:GOTO67
   72ENDPROC
   73K=E:DR=1
   74IFY$(A,B)=CK$ANDO=0AA=A:BB=B:K=0:PP=10:P=6:L=1:PROCg:P=4:L=2:A=AA:B=BB
   75IFK=0GOTO70
   76ONK GOSUB225,226,227,228,228,227,226,225
   77IFF-K<=1ANDY$(A,B)=PC$ORF-K<=1ANDY$(A,B)=CC$GOTO85
   78IFX>8ORX<1ORY>8ORY<1GOTO84
   79ONP GOSUB167,169,171,192,208,215
   80IFO=0ANDG=1ANDP=4O=1
   81IFG=1ENDPROC
   82IFY$(X,Y)=""G=2
   83IFO=0ANDY$(A,B)=CK$GOTO70
   84IFK<F THENK=K+1:GOTO76
   85IFT=1ENDPROC
   86GOTO69
   87DEFPROCp
   88PROCcl
   89VDU28,0,31,39,0
   90*FX21,0
   91PRINTTAB(1,4);"YOUR GO";
   92A$=GET$:A=ASC(A$)-64
   93PRINTTAB(2,6);A$;
   94B=GET:B=B-48
   95PRINTTAB(3,6);B;
```


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# PROGRAM FILE

```
   96C$=GET$:C=ASC(C$)-64
   97PRINTTAB(5,6);C$;
   98D=GET:D=D-48
   99PRINTTAB(6,6);D;
  100IFZ=0GOTO102
  101IFA=CC ANDB=DD GOTO102ELSEPROCpr:GOTO88
  102IFC<1ORC>80RD<1ORD>80RA<1ORA>80RB<1ORB>8PROC1:GOTO91
  103M=ABS(A-C)
  104N=ABS(B-D)
  105IFY$(A,B)=PC$ANDB>D GOTO107
  106IFM=1ANDN=1ORM=2ANDN=2GOTO108
  107PROC1:GOTO91
  108IFY$(A,B)=PC$ANDY$(C,D)=""ORY$(A,B)=PK$ANDY$(C,D)=""GOTO110
  109GOTO107
  110IFM=2GOTO113
  111IFG=1PROCpr:GOTO88
  112GOTO117
  113M=A-C:N=B-D
  114X=A-SGN(M)
  115Y=B-SGN(N)
  116IFY$(X,Y)=""ORY$(X,Y)=PC$ORY$(X,Y)=PK$GOTO107
  117COLOUR129
  118PRINTTAB(9+(3*A),27-(3*B));SQUARE$;
  119IFG=1PRINTTAB(9+(3*X),27-(3*Y));SQUARE$;:Y$(X,Y)=""
  120COLOUR129:COLOUR3
  121IFD=BY$(C,D)=PK$ELSEY$(C,D)=Y$(A,B)
  122PRINTTAB(9+(3*C),27-(3*D));Y$(C,D);
  123Y$(A,B)=""
  124Z=0
  125IFG=1:T=1:A=C:B=D:PROCg:T=0:IFG=1CC=C:DD=D:Z=1:GOTO88
  126ENDPROC
  127DEFPROCc
  128PROCc1
  129PRINTTAB(2,8);"I'M";SPC(13);"THINKING";
  130E=5:F=8:P=2:L=2:U=0
  131PROCg
  132IFG=1PROCco:ENDPROC
  133IFG=0V=0:PROCe
  134E=1:F=4:P=3:L=1
  135PROCg
  136IFG=1GOTO132
  137E=5:F=8:P=4:L=2:O=0
  138PROCg
  139IFG=1O=1:GOTO132
  140IFO=0O=1:GOTO138
  141E=5:F=8:P=5:L=2:W=0
  142PROCg
  143IFG=1GOTO132
  144IFW=0W=1:GOTO142
  145ENDPROC
  146DEFPROCco
  147PROCc1
  148A$=CHR$(A+64):X$=CHR$(X+64)
  149PRINTTAB(1,8);"I MOVE ";SPC(10);A$;B;" TO ";X$;Y;
  150VDU28,0,31,39,0
  151COLOUR129
  152PRINTTAB(9+(3*A),27-(3*B));SQUARE$;
  153IFU=1PRINTTAB(9+(3*XX),27-(3*YY));SQUARE$;:Y$(XX,YY)=""
  154COLOUR0
  155IFY=1Y$(X,Y)=CK$ELSEY$(X,Y)=Y$(A,B)
  156PRINTTAB(9+(3*X),27-(3*Y));Y$(X,Y);
  157Y$(A,B)=""
  158IFU=1:A=X:B=Y:T=1:PROCg:T=0:IFG=1GOTO147ELSEG=2
  159U=0:ENDPROC
  160DEFPROCe
  161PROCc1
  162IFV=1PRINTTAB(1,8);"I WIN";
  163IFV=0PRINTTAB(1,8);"YOU WIN";
  164IFV=2PRINTTAB(1,8);"A DRAW";
  165A$=GET$
  166END
  167IFY$(X,Y)=CC$ANDY$(XX,YY)=""ORY$(X,Y)=CK$ANDY$(XX,YY)=""G=1
  168RETURN
  169IFY$(X,Y)=PC$ANDY$(XX,YY)=""ORY$(X,Y)=PK$ANDY$(XX,YY)=""G=1:U=1:H=XX:I=YY:X
X=X:YY=Y:X=H:Y=I
  170RETURN
  171IFY$(X,Y)=CC$ANDY$(XX,YY)=""ORY$(X,Y)=CK$ANDY$(XX,YY)=""GOSUB173
  172RETURN
  173AA=X:BB=Y:M=A:N=B
  174R=1
  175ONR GOSUB229,230,231,232
  176IFY$(X,Y)="E"GOTO179
  177IFY$(X,Y)=CK$ORY$(X,Y)=CC$ANDR<3GOSUB183
  178IFG=1RETURN
  179IFR<4R=R+1:GOTO175
  180T=1:O=1:E=5:F=8:P=4:L=2:A=AA:B=BB:PROCg:T=0:O=0
  181IFG=1GOTO182ELSEA=M:B=N:E=1:F=4:P=3:L=1
  182RETURN
  183X$=Y$(X,Y)
  184Y$(X,Y)=""
  185S=1
  186ONS GOSUB233,234
  187IFY$(X1,Y1)=PK$ANDY$(X2,Y2)=""ORY$(X2,Y2)=PK$ANDY$(X1,Y1)=""ORY$(X2,Y2)=PC$
ANDY$(X1,Y1)=""Y$(X,Y)=X$:RETURN
  188IFS<2S=S+1:GOTO186
  189Y$(X,Y)=X$
  190G=1:A=X:B=Y:X=XX:Y=YY
  191RETURN
  192IFY$(X,Y)=""GOSUB194
  193RETURN
  194X$=Y$(A,B)
  195Y$(A,B)=""
  196XX=X:YY=Y
  197S=1
  198ONS GOSUB233,234
  199IFY$(X1,Y1)=PK$ANDY$(X2,Y2)=""ORY$(X2,Y2)=PK$ANDY$(X1,Y1)=""ORY$(X2,Y2)=PC$
ANDY$(X1,Y1)=""Y$(A,B)=X$:RETURN
  200IFS<2S=S+1:GOTO198
  201Y$(A,B)=X$
  202R=1:H=X:I=Y
  203ONR GOSUB228,227,226,225
  204IFY$(X,Y)="E"GOTO206
  205IFY$(X,Y)=CK$ANDY$(XX,YY)=PK$ORY$(X,Y)=CC$ANDY$(XX,YY)=PK$ORY$(X,Y)=CK$ANDY
$(XX,YY)=PC$ANDR<3ORY$(X,Y)=CC$ANDY$(XX,YY)=PC$ANDR<3RETURN
  206IFR<4R=R+1:GOTO203
  207G=1:X=H:Y=I:RETURN
  208IFY$(A,B)=CC$ORY$(A,B)=CK$ANDW=1GOSUB210
  209RETURN
  210R=1:XX=A:YY=B
  211ONR GOSUB232,231,230,229
  212IFY$(X,Y)=""ANDY$(XX,YY)=CK$ORY$(X,Y)=""ANDY$(XX,YY)=CC$ANDR<3G=1:A=XX:B=YY
:RETURN
```

```
213IFR<4R=R+1:GOTO211
214RETURN
215IFY$(A,B)=PC$ORY$(A,B)=CC$GOSUB217
216RETURN
217M=ABS(H-A):N=ABS(I-B):RR=SQR((M*M)+(N*N))
218IFRR<PP PP=RR:A1=A:B1=B:GOSUB220
219RETURN
220IFA1>H ANDB1>I K=1
221IFA1>H ANDB1<=I K=3
222IFA1<H ANDB1<=I K=4
223IFA1<=H ANDB1>I K=2
224RETURN
225X=A+1:Y=B+1:XX=A+2:YY=B+2:RETURN
226X=A-1:Y=B+1:XX=A-2:YY=B+2:RETURN
227X=A+1:Y=B-1:XX=A+2:YY=B-2:RETURN
228X=A-1:Y=B-1:XX=A-2:YY=B-2:RETURN
229X=XX-1:Y=YY+1:RETURN
230X=XX+1:Y=YY+1:RETURN
231X=XX-1:Y=YY-1:RETURN
232X=XX+1:Y=YY-1:RETURN
233X1=XX+1:Y1=YY+1:X2=XX-1:Y2=YY-1:RETURN
234X1=XX-1:Y1=YY+1:X2=XX+1:Y2=YY-1:RETURN
```

# Brimstone Part Three

## by Paul Gallagher

To use this program you'll need to have created an adventure party from Brimstone Part 1 published in November and solved Brimstone Part 2 published in December 1984. After the dangers of Brimstone 2 you finally make it to the local tavern where you can relax. Here the spoils of your previous adventures are shared among the survivors in your party, new experience and hit points are calculated, spells learnt, magical weapon bonuses accrued, and the replenishment of lanterns and rations accomplished. Each character can then be saved to tape individually, thus enabling them to adventure again together or in different groups.

If there is sufficient response to the Brimstone Trilogy we'll be publishing a detailed description of how to create your own dungeons. As stated in Part 1 the characters closely follow AD+D format, so your computer-generated characters can of course be used in a *standard* human-moderated game of Dungeons and Dragons.

```
10 'BRIMSTONE PART III:THE TAVERN.  coPywrite P. Gall@gher 1984
20 PCLEAR1:CLEAR650:DIM TF$(66),EV(66),WC(66)
30 GOSUB3040:GOSUB2790:FORX=1TOXX:LI(X)=0:FORY=1TO8:IFINSTR(1,E$(X,Y),"RATIONS")
<>0THENE$(X,Y)=""
40 IFINSTR(1,E$(X,Y),"TORCH")<>0THENE$(X,Y)=""
44 IFINSTR(1,E$(X,Y),"FLASK")<>0THENE$(X,Y)=""
48 IFINSTR(1,E$(X,Y),"LANTERN")<>0THENE$(X,Y)="LANTERN"
50 NEXTY,X:GOTO110
60 K$=INKEY$:RR=RND(20):IFK$=""THEN60ELSERETURN
70 FORK=1TO2000:NEXT:RETURN
80 FORC=17TO241STEP32:PRINT@C,STRING$(15,32);:NEXT:RETURN
90 CLS:PRINT@33,N$(X);" THE ";C$(X):RETURN
100 FORC=288TO448STEP32:PRINT@C,STRING$(32,32);:NEXT:PRINT@480,STRING$(31,32);:R
ETURN
110 IFR>1THENCLS:PRINT@33,"YOU HAVE NOT FOUND YOUR WAY OUT OF THE DUNGEON YET.IN
 FACT YOUR PARTY IS STILL STUCK IN ROOM";R:PRINT" YOU MUST RELOAD YOUR ADVENTURE
  INTO PROGRAM 'DANDD' AND MAKE  YOUR WAY BACK TO THE ENTRANCE.":END
120 FORX=1TOXX:IFH(X)<1THEN130ELSEGOSUB2860
130 NEXT:CLS:PRINT@235,"the tavern":GOSUB70:CLS:PRINT@33,"WELL DONE. YOUR PARTY
HAVE     SUCCESSFULLY MADE YOUR WAY BACK TO THE NEARBY VILLAGE AND ARE  NOW WA
RMING YOURSELVES WITH     TANKARDS OF THE LOCAL MEAD IN      'the tarnished swor
d'"
140 GOSUB70:PRINT:PRINT" AFTER A GOOD MEAL EVERY-ONE IS  FEELING MUCH RECOVERED
FROM THE RECENT DIFFICULTIES. DIVIDING  OF THE SPOILS IS CALLED FOR BY  ONE AND
 ALL.":PRINT@487,"<PRESS ANY KEY>";:GOSUB60
150 FORX=1TOXX:IFH(X)<1THEN170 ELSECLS:PRINT@33,N$(X);" PLACES :-":PRINT:FORY=1T
O5
160 PRINT" ";T$(X,Y):NEXTY:PRINT" AND";G(X);"GOLD.":PRINT:PRINT" ON THE TABLE.":
PRINT@487,"<PRESS ANY KEY>";:GOSUB60
170 NEXT:CLS:PRINT@33,"DO YOU WISH TO REVIEW":PRINT" THE SPOILS (Y/N)":GOSUB60:I
FK$="Y"THEN150
180 FORX=1TOXX:IFQ(X)>QQ THENQQ=Q(X)
190 TG=TG+G(X):FORY=1TO5:TT$(X,Y)=T$(X,Y):T$(X,Y)="":NEXTY,X:GT=TG
200 FORX1=1TOXX:IFH(X1)<1THEN220ELSEFORY1=1TO5:IFTT$(X1,Y1)<>""THENGOSUB860:GOSU
B920:X1=1:Y1=1
210 NEXTY1
220 NEXTX1:FORX=1TOXX:IFH(X)<1THEN240ELSE CLS:PRINT" ";N$(X);" HAS GAINED:":FORY
=1TO5:IFT$(X,Y)=""THEN230ELSEPRINT" ";T$(X,Y)
230 NEXTY:PRINT:PRINT" FOR ITEMS SOLD OR GOLD TAKEN    IN LIEU OF OTHER TREASURE
:":PRINTGE(X);"GP.":GOSUB60
240 NEXTX:GOSUB2390:GOSUB1270
250 IFCC=1THENGOSUB420
260 GOSUB1290
270 MP=MT+GT+FT:BE=MP/ET:CLS:PRINT:PRINT" EXPERIENCE GAINED (FROM COMBAT  AND GO
LD & GEMS DISCOVERED)     DURING YOUR RECENT ADVENTURE:"
280 PRINT:FORX=1TOXX:IFH(X)<1THEN290ELSEIE(X)=INT(BE*EM(X)):PRINT" ";N$(X);IE(X)
;"EXP.POINTS."
290 NEXT:GOSUB60:FORX=1TOXX:IFH(X)<1THEN360ELSEGOSUB90:PRINT:PRINT" EXPERIENCE B
ONUSES FROM MAGICAL ITEMS BROUGHT BACK....":PRINTAB(X);"EXP.POINTS"
300 PRINT" TOTAL EXPERIENCE GAINED =";IE(X)+AB(X)
310 E(X)=E(X)+IE(X)+AB(X)
320 PRINT" CURRENT TOTAL:";E(X);"E.P.":GOSUB2480:PRINT" NEW HIT POINTS=";NH
330 IFCB>0THENPRINT" CONSTITUTION BONUS=";CB;"HP"
340 PRINT" NEW TOTAL:";HP(X);"+";NH;:IFCB>0THENPRINT"+";CB;
350 HP(X)=HP(X)+NH+CB:PRINT"=";HP(X);"HP.";:GOSUB60
360 NEXTX:FORX=1TOXX:IFH(X)<1THEN380ELSEIFC$(X)="MAGICIAN"ORC$(X)="ILLUSIONIST"O
RC$(X)="CLERIC"ORC$(X)="DRUID"THENGOSUB490
370 IFMC=1THENGOSUB650
380 MC=0:NEXTX:GOSUB1320:GOSUB1560:GOSUB1920:GOSUB2200
390 FORX=1TOXX:IFH(X)<1THEN400ELSEGOSUB2860
400 NEXT:GOSUB2700'*SAVE CHARACTERS*
410 CLS:PRINT@203,"GOOD LUCK":PRINT@234,"IN YOUR NEXT":PRINT@267,"ADVENTURE":END
420 '*** DEAD COMRADES ***
430 CLS:PRINT@35,"A BONUS FOR THE THOUGHTFUL.":GOSUB70
440 PRINT@97,"YOU WERE UNFORTUNATE TO LOSE A  GOOD COMRADE DURING YOUR RECENT AD
VENTURE,BUT WERE SUFFICIENTLY CONSIDERATE TO CARRY THE BODY  OUT OF THE DUNGEON
```

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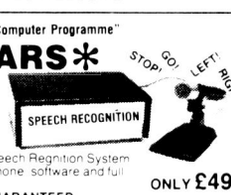


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# PROGRAM FILE

```
 FOR A DECENT BURIAL.":GOSUB70
450 ONRND(3)GOTO460,470,460
460 FG=100*RND(100):FT=FG*XX:PRINT" YOUR DEAD COMRADE, YOU NOW      DISCOVER, CO
MES FROM A WEALTHY  FAMILY CLAN, AND IN APPRECIATION OF YOUR WORTHY DEED HAVE AGR
EED TO AWARD EACH OF YOU";FG;"IN     GOLD AND GEMS.":GOSUB60:RETURN
470 FG=10*RND(100):FT=FG*XX:PRINT" THE FAMILY OF THE DEAD COMRADE  ARE VERY GRAT
EFUL AND IN      RECOGNITION OF YOUR FORMER      FRIENDSHIP PRESS YOU TO ACCEP
T  A GIFT OF";FG;"GP EACH.":GOSUB60:RETURN
480 '** SCROLLS & SPELLS **
490 MC=0:GOSUB90:PRINT@97,"YOU HAVE THE FOLLOWING SPELLS:":PRINT
500 FORY=1TO8:IFS$(X,Y)<>""THENPRINTY;S$(X,Y)
510 NEXT:GOSUB60:GOSUB90:PRINT@97,"YOU HAVE THESE ITEMS:":PRINT:FORY=1TO5:IFT$(X
,Y)<>""THENPRINT" ";T$(X,Y):MC=1
520 NEXT:PRINT@417,"DO YOU WISH A REVIEW OF YOUR    SPELLS & SCROLLS (Y/N)":GOSU
B60:IFK$="Y"THEN490
530 GOSUB90
540 PRINT@96," YOU MAY CONVERT SCROLLS INTO    SPELLS IF YOUR REQUISITE       A
BILITIES ARE HIGH ENOUGH.       YOU MAY ALSO PLACE SPELLS ONTO  SCROLLS TO PROVID
E SPACE FOR    MORE POWERFUL SPELLS IN YOUR    SPELL BOOK, BUT THIS WILL COST  G
OLD!"
550 SP=35:IFI(X)>9ANDI(X)<13THENSP=45
560 IFI(X)=13ORI(X)=14THENSP=55
570 IFI(X)=15ORI(X)=16THENSP=65
580 IFI(X)=17THENSP=75
590 IFI(X)=18THENSP=85
600 IFC$(X)="MAGICIAN"ORC$(X)="ILLUSIONIST"THENPRINT" YOUR CHANCE OF UNDERSTANDI
NG    A NEW SPELL IS";SP;"%"
610 IFC$(X)="CLERIC"ORC$(X)="DRUID"THENSP=100:PRINT" AS A ";C$(X);" YOU UNDERSTA
ND ALL    SPELLS OF YOUR LEVEL."
620 PRINT" DO YOU WISH TO AVAIL YOURSELF   OF THIS OPTION (Y/N)":GOSUB60:IFK$="N
"THENMC=0
630 RETURN
640 '*SPELL/SCROLL INTERCHANGE*
650 FORY=1TO8:IFS$(X,Y)=""ANDMC=1THENGOSUB790ELSENEXT
660 FORY=1TO5:IFT$(X,Y)<>""THEN670ELSENEXT:RETURN
670 GOSUB90:PRINT@129,"IN THIS GAME YOU ARE ALLOWED    TO HAVE ONLY A MAXIMUM OF
 EIGHT SPELLS IN YOUR SPELL BOOK, AND  YOUR BOOK IS NOW FULL.
680 PRINT" HOWEVER, YOU MAY CONVERT SPELLS INTO SCROLLS AND THEN ATTEMPT   TO ST
UDY OTHER SCROLLS WITH A   VIEW TO PUTTING THEM INTO YOUR  SPELL-BOOK."
690 PRINT" DO YOU WANT TO AVAIL YOURSELF   OF THIS OPTION (Y/N)":GOSUB60:IFK$<>"
Y"THENRETURN
700 GOSUB90:PRINT:PRINT" WHICH SPELL DO YOU WANT TO PUT  ONTO A SCROLL.":INPUTTC
$:FORY=1TO8:IFTC$<>S$(X,Y)THENNEXT:PRINT" YOU DO NOT HAVE A SPELL OF":PRINT" ";T
C$:GOSUB70:GOTO690
710 F=0:FORZ=2TO63:F=INSTR(13,TF$(Z),TC$):IFF=0THENNEXTZ:PRINT" THIS SPELL DOES'
NT SEEM TO EXIST":GOSUB70:GOTO690
720 IFGP(X)<5*EV(Z)THENPRINT" UNFORTUNATELY, YOU HAVE        INSUFFICIENT GOLD
TO ACHIEVE    YOUR DESIRES.":GOSUB70:RETURN
730 PRINT" THIS WILL COST YOU THE SUM OF  ";5*EV(Z);"GP IN TIME & MONEY.":PRINT"
 DO YOU WISH TO PROCEED (Y/N)":GOSUB60:IFK$<>"Y"THEN690
740 FORY1=1TO5:IFT$(X,Y1)<>""THENNEXT:GOSUB90:PRINT@161,"AH!AH! YOU NOT ONLY HAV
E A FULL SPELL-BOOK OF EIGHT SPELLS BUT  CARRY THE ALLOWED MAXIMUM OF    FIVE SC
ROLLS.YOU WILL HAVE TO   USE OR SELL SCROLLS AT THE NEXT OPPORTUNITY."GOSUB60:RE
TURN
750 T$(X,Y1)="SCROLL...OF "+TC$:S$(X,Y)="":GP(X)=GP(X)-5*EV(Z)
760 PRINT" scroll successfully written     IF YOU WISH TO PRODUCE A        FURTH
ER SCROLL PRESS 'Y'  OR 'S' IF YOU WANT TO PUT ONE OF YOUR  OTHER SCROLLS INTO YO
UR SPELL    BOOK.":GOSUB60:IFK$="Y"THEN690
770 IFK$="S"THEN650
780 RETURN
790 GOSUB90:PRINT@129,"WHICH SCROLL DO YOU WISH TO     STUDY & CONVERT TO A NEW
SPELL?"
800 F=0:INPUTTC$:FORY=1TO5:SC$=MID$(T$(X,Y),13,5):IFSC$=""THEN810ELSEF=INSTR(1,T
C$,SC$):IFF<>0THEN820
810 NEXTY:PRINT" YOU DO NOT HAVE A SCROLL OF":PRINT" ";TC$:GOSUB70:GOTO790
820 K=RND(100):IFK>SP THENPRINT" UNSUCCESSFUL.SPELL LOST UPON    BEING READ.":GO
SUB70:T$(X,Y)="":GOSUB490:RETURN
830 PRINT" successful":GOSUB70:FORZ=1TO8:IFS$(X,Z)<>""THENNEXTZ:RETURN
840 S$(X,Z)=MID$(T$(X,Y),13,18):T$(X,Y)="":GOSUB490:RETURN
850 '***** DICE THROWING *****
860 FORX=1TOXX:RC(X)=0:FORZ=1TO L(X):RT=RND(20):IFRC(X)<RT THEN RC(X)=RT
870 NEXTZ,X:FORX=1TOXX:IFRC(X+1)=RC(X) OR RC(X+2)=RC(X) OR RC(X+3)=RC(X) THEN 86
0 ELSE NEXT
880 FORX=1TOXX:RO(X)=RC(X):NEXT
890 FORX=1TOXX:MC(X)=X:FORY=X+1TOXX:IFRC(MC(X))<RC(Y)THENMC(X)=Y
900 NEXTY:N=RC(X):P(X)=RC(MC(X)):RC(MC(X))=N:NEXTX:RETURN
910 '*** CHOICE ROUTINE ***
920 CLS:PRINT:PRINT" AFTER A LENGTHY SESSION OF      DICE THROWING....":GOSUB105
0:PRINT:PRINT" THE FIRST CHOICE FALLS TO.....":FORY=1TOXX:FORX=1TOXX:IFRO(X)=P(Y
)THEN930ELSENEXTX,Y
930 GOSUB100:PRINT@289,N$(X);", WHO THREW ";P(Y)
940 K$="":PRINT@321,"WHICH ITEM DO YOU CHOOSE":PRINT" (YOU MUST TYPE THE DESCRIP
TION  PRECISELY, INCLUDING ALL DOTS.)":INPUT" ";TC$
950 FORZ=1TOXX:FORI=1TO5:IFTC$=TT$(Z,I)THEN970ELSENEXTI,Z
960 PRINT@449,"THAT ITEM IS NOT HERE":GOSUB70:PRINT@449,"":GOTO940
970 GOSUB1080:IFK$="A"THEN940
980 IFK$="G"THENGE(X)=GE(X)+EV(I):TG=TG-EV(I):PRINT" IT'S WORTH ";EV(I);"GOLD.":
GOSUB70:GOTO1020
990 IFK$="S"THENGE(X)=GE(X)+EV(T):GOSUB100:PRINT@385,"IT FETCHES";EV(T);"GOLD.":
TT$(Z,I)="":GOSUB70:GOTO1020
1000 FORJ=1TO5:IFT$(X,J)=""THENT$(X,J)=TC$:GOSUB1770:TT$(Z,I)="":GOTO1010ELSENEX
TJ
1010 FORX3=1TOXX:FORY3=1TO5:IFTT$(X3,Y3)=""THENNEXTY3,X3:RETURN
1020 PRINT@33,"NEXT CHARACTER...":NEXTY
1030 CLS:PRINT@33,"ITEMS REMAINING:":PRINT:FORX2=1TOXX:FORY2=1TO5:IFTT$(X2,Y2)="
"THEN1040ELSEPRINT" ";TT$(X2,Y2)
1040 NEXTY2,X2:GOSUB60:RETURN
1050 PRINT:FORY2=1TOXX:FORX2=1TOXX:IFRO(X2)=P(Y2)THEN1060ELSENEXTX2
1060 PRINT" ";N$(X2);" ROLLED A MAXIMUM OF";P(Y2):NEXTY2:GOSUB60:CLS:RETURN
1070 '** ITEM COMPATIBILITY **
1080 FORT=1TO66:IFTC$=TF$(T)THEN1100ELSENEXT
1090 IFT>66THENRETURN
1100 C1$=LEFT$(C$(X),1):IFWC(T)=1 THENRETURN
1110 IFWC(T)=2ANDC1$="M"THENRETURN
1120 IFWC(T)=3ANDC1$="I"THENRETURN
1130 IFWC(T)=4ANDC1$="C"THENRETURN
1140 IFWC(T)=5ANDC1$="D"THENRETURN
1150 IFWC(T)=6ANDC1$="F"ORC1$="P"ORC1$="R")THENRETURN
1160 IFWC(T)=7ANDC1$="C"ORC1$="D")THENRETURN
1170 IFWC(T)=8ANDC1$="F"ORC1$="P"ORC1$="R"ORC1$="C")THENRETURN
1180 IFWC(T)=9ANDC1$="F"ORC1$="P"ORC1$="R"ORC1$="T"ORC1$="A")THENRETURN
1190 IFWC(T)=10ANDC1$="M"ORC1$="C")THENRETURN
1200 IFWC(T)=11ANDC1$="M"ORC1$="D")THENRETURN
1210 IFWC(T)=12ANDC1$="M"ORC1$="I")THENRETURN
1220 IFWC(T)=13ANDC1$="F"ORC1$="P"ORC1$="R"ORC1$="D")THENRETURN
1230 IFWC(T)=14ANDC1$<>"C"ANDC1$<>"D"THENRETURN
1240 PRINT@320,"":PRINT" THIS ITEM IS NOT COMPATIBLE     WITH YOUR CHARACTER'S C
LASS.":PRINT" YOU MAY CHOOSE aGRAIN, sELL THIS ITEM OR TAKE EQUIVALENT gOLD.":GOS
UB60
1250 IFK$="A"ORK$="G"ORK$="S"THENGOSUB100:RETURNELSE1240
1260 '**** GOLD SHARE ****
```

# PROGRAM FILE

```
1270 GX=INT(TG/XX):GD=XX:FORX=1TOXX:IFH(X)<1THENGD=GD-1:GX=INT(TG/GD)
1280 NEXTX:CLS:PRINT" TOTAL REMAINING GOLD FOUND BY   THE PARTY IS";TG;"GP":PRIN
T" EQUAL SHARES AMOUNT TO.....  ";GX;"EACH.":GOSUB60:RETURN
1290 CLS:PRINT@33,"TOTAL GOLD NOW OWNED BY EACH    CHARRACTER IS:-":PRINT:FORX=1T
OXX:IFH(X)<1THEN1300ELSEGP(X)=GP(X)+GX+FG+GE(X)+AB(X):PRINT" ";N$(X);GP(X);"GOLD
."
1300 NEXTX:GOSUB60:RETURN
1310 '***** AC ADJUSTMENT *****
1320 FORX=1TOXX:IFH(X)<1THEN1540ELSEFORY=1TO5:K=0:K1=0:K2=0:K3=0:K4=0:K5=0:K6=0:
KK$="":KA$="":IFT$(X,Y)=""THEN1520
1330 K1=INSTR(1,A$(X),"SHIELD"):K2=INSTR(1,A$(X),"SHIELD+1"):K3=INSTR(1,A$(X),"S
HIELD+2"):K4=INSTR(1,A$(X),"CLOAK"):K5=INSTR(1,A$(X),"RING+1")
1340 IFK1<>0THENKA$=" & SHIELD":K=1
1350 IFK2<>0THENKA$=" & SHIELD+1":K=2
1360 IFK3<>0THENKA$=" & SHIELD+2":K=3
1370 IF(T$(X,Y)=TF$(11)ANDK2<>0ORK3<>0)OR(T$(X,Y)=TF$(33)ANDK3<>0)THENT$(X,Y)=
"":KA$=""
1380 IFT$(X,Y)=TF$(10)THENAC(X)=4:A$(X)="CHAINMAIL+1":T$(X,Y)="":K6=1
1390 IFT$(X,Y)=TF$(11)ANDK1=0ANDK2=0THENKA$=" & SHIELD+1":K=2:T$(X,Y)=""
1400 IFT$(X,Y)=TF$(11)ANDK1<>0ANDK2=0THENKA$="+1":K=1:T$(X,Y)=""
1410 IFT$(X,Y)=TF$(21)ANDK4=0THENKA$=" & CLOAK+1":K=1:T$(X,Y)=""
1420 IFT$(X,Y)=TF$(30)ANDK5=0THENKA$=" & RING+1":K=1:T$(X,Y)=""
1430 IFT$(X,Y)=TF$(32)THENAC(X)=3:A$(X)="CHAINMAIL+2":T$(X,Y)="":K6=1
1440 IFT$(X,Y)=TF$(33)ANDK1=0THENKA$=" & SHIELD+2":K=3:T$(X,Y)=""
1450 IFT$(X,Y)=TF$(33)ANDK1=0ANDK2=0THENKA$=" & SHIELD+2":K=3:T$(X,Y)=""
1460 IFT$(X,Y)=TF$(33)ANDK1<>0ANDK2=0THENKA$="+2":K=2:T$(X,Y)=""
1470 IFT$(X,Y)=TF$(33)ANDK2<>0ANDK3=0THENA$(X)=LEFT$(A$(X),K2-1):KA$="SHIELD+2":
K=1:T$(X,Y)=""
1480 IFT$(X,Y)=TF$(45)THENAC(X)=2:A$(X)="PLATEMAIL+1":T$(X,Y)="":K6=1
1490 IFT$(X,Y)=TF$(64)THENAC(X)=1:A$(X)="PLATEMAIL+2":T$(X,Y)="":K6=1
1500 IFK6=1ANDK4<>0THENKK$=" & CLOAK+1":K=K+1ELSEIFK6=1ANDK5<>0THENKK$=" & RING+
1":K=K+1
1510 IFKK$<>""ORKA$<>""THENA$(X)=A$(X)+KK$+KA$:AC(X)=AC(X)-K:IFAC(X)<-3THENAC(X)
=-3
1520 NEXTY:GOSUB90:PRINT@97,"YOUR PRESENT ARMOUR":PRINT" CONSISTS OF.....":PRINT
@192," ";A$(X)
1530 PRINT@257,"AND YOUR ARMOUR CLASS IS:";AC(X):PRINT@329,"----***----":GOSUB60
1540 NEXTX:RETURN
1550 '** SB & DB ADJUSTMENTS **
1560 FORX=1TOXX:FORY=1TO5:IFH(X)<1THEN1620ELSEK1=0:K6=0:K1=INSTR(1,T$(X,Y),"+"):
K2=INSTR(1,T$(X,Y),"."):IFT$(X,Y)=""ORK1=0THEN1620
1570 IFK1<>0THENK3$=LEFT$(T$(X,Y),K2-1):K4$=K3$+RIGHT$(T$(X,Y),2):K5=VAL(RIGHT$(
T$(X,Y),1))
1580 IFW1$(X)<>""ANDW2$(X)<>""ANDW3$(X)<>""THENGOSUB1630
1590 IFW1$(X)=""ANDK1<>0THENW1$(X)=K4$:T$(X,Y)="":GOSUB1710
1600 IFW2$(X)=""ANDK1<>0THENW2$(X)=K4$:T$(X,Y)="":GOSUB1710
1610 IFW3$(X)=""ANDK1<>0THENW3$(X)=K4$:T$(X,Y)="":GOSUB1710
1620 NEXTY,X:RETURN
1630 GOSUB90:PRINT@97,"YOU ARE CARRYING THE MAXIMUM OF THREE WEAPONS.":PRINT:PRI
NT" ";W1$(X):PRINT" ";W2$(X):PRINT" ";W3$(X)
1640 PRINT" DO YOU WISH TO SELL ONE OF      YOUR CURRENT WEAPONS,THUS       ALLO
WING YOU TO CARRY A NEW     ONE? (Y/N)":GOSUB60:IFK$="N"THENRETURN
1650 IFK$<>"Y"THEN1630ELSEWV=RND(200)
1660 PRINT@417,"WHICH ONE?";:INPUTK$:IFK$=W1$(X)THENW1$(X)="":K6=1
1670 IFK$=W2$(X)THENW2$(X)="":K6=1
1680 IFK$=W3$(X)THENW3$(X)="":K6=1
1690 IFK6<>1THEN1660
1700 GP(X)=GP(X)+WV:PRINT" YOU GET";WV;"GP FOR IT.":GOSUB70:RETURN
1710 GOSUB90:PRINT@97,"YOU HAVE JUST ADDED A -":PRINT@133,K4$:PRINT@161,"TO YOUR
 PERSONAL ARMOURY."
1720 IFINSTR(1,W1$(X),"+")<>0THENS1=VAL(RIGHT$(W1$(X),1)):D1=INT(S1/2)
1730 IFINSTR(1,W2$(X),"+")<>0THENS2=VAL(RIGHT$(W2$(X),1)):D2=INT(S2/2)
1740 IFINSTR(1,W3$(X),"+")<>0THENS3=VAL(RIGHT$(W3$(X),1)):D3=INT(S3/2)
1750 PRINT@225,"YOU NOW CARRY -":PRINT@257,"weaPon       strike   damage":PRINT@
302,"bonus    bonus":PRINT@321,W1$(X),S1;"      ";D1:PRINT" ";W2$(X),S2;"      ";D
2:PRINT" ";W3$(X),S3;"      ";D3:GOSUB60:RETURN
1760 '** ARTIFACTS BONUS **
1770 FORK=1TO66:IFTC$=TF$(K)THEN1780ELSENEXT
1780 IFK=24ORK=36ORK=37ORK=47ORK=48ORK=58ORK=59ORK=65ORK=66THEN1810
1790 IFK>66THENK=0:RETURN
1800 AB(X)=AB(X)+EV(K):RETURN
1810 IFQQ=0ANDK=24THENQQ=1
1820 IFQQ=1ANDK=36THENQQ=2
1830 IFQQ=2ANDK=37THENQQ=3
1840 IFQQ=3ANDK=47THENQQ=4
1850 IFQQ=4ANDK=48THENQQ=5
1860 IFQQ=5ANDK=58THENQQ=6
1870 IFQQ=6ANDK=59THENQQ=7
1880 IFQQ=7ANDK=65THENQQ=8
1890 IFQQ=8ANDK=66THENQQ=9
1900 FORK=1TOXX:Q(K)=QQ:NEXTK:RETURN
1910 '** QUEST STATUS **
1920 CLS:IFQQ>0THENPRINT@32,"THE QUEST FOR THE CROWN OF POWER":PRINT@97,"YOUR PA
RTY HAS DISCOVERED-"ELSERETURN
1930 ONQQ GOTO 2020,2010,2000,1990,1980,1970,1960,1950,1940
1940 PRINT" **THE ";TF$(66);"**"
1950 PRINT" THE ";TF$(65)
1960 PRINT" THE ";TF$(59)
1970 PRINT" THE ";TF$(58)
1980 PRINT" THE ";TF$(48)
1990 PRINT" THE ";TF$(47)
2000 PRINT" THE ";TF$(37)
2010 PRINT" THE ";TF$(36)
2020 PRINT" THE ";TF$(24)
2030 IFQQ<9THENPRINT@449,"YOUR QUEST MUST CONTINUE!":GOSUB60:RETURN
2040 GOSUB60:CLS:PRINT@33,"WELL DONE YOU HAVE RECOVERED    THE LOST CROWN OF POW
ER AND     ALL OF  THE GEMS OF CONTROL.":PRINT" THE GEMS FIT PERFECTLY INTO
VARIOUS MATCHING APERTURES      WITHIN THE CROWN."
2050 PRINT" WHEN COMPLETE AND PLACED ON     THE HEAD IT IMPARTS THE          ABIL
ITY OF THE CHARRACTER TO     INCREASE ANY   TWO OF THEIR     CHARRACTERISTICS    B
Y JUST      WISHING!":GOSUB60
2060 FORX=1TOXX:CLS:PRINT@33,"WHICH DO YOU WISH TO INCREASE?  BUT REMEMBER YOU
CANNOT RAISE   A CHARRACTERISTIC ABOVE 18 SO    DON'T WASTE YOU CHANCE."
2070 PRINT:PRINT" 1.STRENGTH.":PRINT" 2.INTELLIGENCE.":PRINT" 3.WISDOM."
2080 PRINT" 4.CONSTITUTION.":PRINT" 5.DEXTERITY.":PRINT" 6.CHARISMA."
2090 FORY=1TO2:PRINT@416,N$(X);" THE ";C$(X)
2100 GOSUB60:K=VAL(K$):IFK<1ORK>6THEN2100
2110 ONK GOTO 2120,2130,2140,2150,2160,2170
2120 S(X)=S(X)+RND(2):GOTO2180
2130 I(X)=I(X)+RND(2):GOTO2180
2140 W(X)=W(X)+RND(2):GOTO2180
2150 C(X)=C(X)+RND(2):GOTO2180
2160 D(X)=D(X)+RND(2):GOTO2180
2170 R(X)=R(X)+RND(2):GOTO2180
2180 PRINTK;" AND":NEXTY,X:RETURN
2190 '*** REPLENISH RATIONS ***
2200 FORX=1TOXX:IFH(X)<1THEN2320ELSEGOSUB90
2210 PRINT@161,"YOU HAVE CONSUMED ALL OF YOUR   SUPPLIES AND MUST REPLENISH
YOUR RATIONS IN READINESS FOR   ANY FUTURE ADVENTURE."
2220 PRINT" YOU HAVE ALSO USED UP ALL OF    YOUR TORCHES AND THE OIL IN     YOUR
 LANTERNS.":GOSUB60
2230 CLS:PRINT@33,"THE VILLAGE TRADERS ARE A WILY  BUNCH AND WORD HAS QUICKLY
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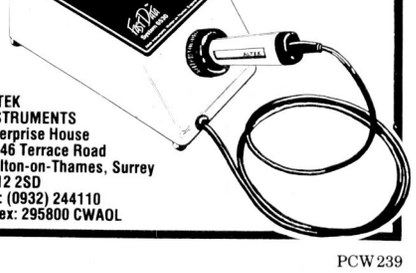

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# PROGRAM FILE

```
   CIRCULATED OF YOUR PARTY'S      GOOD FORTUNE AND YOUR MERRY      MHKING IN THE
 TAVERN."
2240 PRINT" CONSEQUENTLY, THEY HAVE          INCREASED THE PRICES OF THESE   ITEM
S AS FOLLOWS:"
2250 PRINT" RATIONS    40 GP EACH.":PRINT" TORCHES    12 GP/10":PRINT" OIL
  25 GP/FLASK."
2260 FORZZ=1TO2STEP0:PRINT@385,"DO YOU WISH TO REPLACE ANY OF   THESE ITEMS (Y/N
)":PRINT:GOSUB60:IFK$="N"THEN2320
2270 PRINT@385,"WHAT DO YOU WISH TO REPLACE?":PRINT" ":INPUTIR$
2280 IFINSTR(1,IR$,"RATION")<>0THENPRINT@385,"CERTAINLY.THESE RATIONS ARE     VE
RY SUBSTANTIAL AND WILL LAST  YOU A WEEK.":GP(X)=GP(X)-40:GOSUB2330
2290 IFINSTR(1,IR$,"OIL")<>0THENPRINT@385,"OIL FOR YOUR LANTERN?":PRINT" YES, TH
ERE YOU ARE.THAT SHOULD  LAST YOU SEVERAL HOURS!":GP(X)=GP(X)-25:LI(X)=LI(X)+10:
GOSUB2330
2300 IFINSTR(1,IR$,"TORCH")<>0THENPRINT@385,"TORCHES? WE ONLY SELL THEM IN   TEN
S. THERE YOU ARE, 10GP FOR   THE TOTAL.":GP(X)=GP(X)-12:LI(X)=LI(X)+10:GOSUB2330
2310 GOSUB60:IFK1=1THEN2230ELSENEXTZZ
2320 NEXTX:RETURN
2330 K1=0:FORY=1TO8:IFE$(X,Y)=""THEN2370ELSENEXT
2340 CLS:GOSUB90:PRINT" YOU ARE OVERLOADED. APART FROM  YOUR WEAPONS YOU ARE CAR
RYING":FORZ=1TO8:PRINT" ";E$(X,Z):NEXT:PRINT" DO YOU WISH TO DROP ANYTHING?  (
Y/N)":GOSUB60:IFK$="N"THENRETURN
2350 PRINT@417,"WHAT";:INPUTDI$:FORZ=1TO8:IFINSTR(1,E$(X,Z),DI$)<>0THENE$(X,Z)="
":K1=1:RETURN
2360 NEXT:GOTO2350
2370 E$(X,Y)=IR$:RETURN
2380 '*** ABILITY BONUS ***
2390 FORX=1TOXX:EM(X)=1
2400 IF$(X)>15ANDC$(X)="FIGHTER"THENEM(X)=1.1
2410 IFS(X)>15ANDW(X)>15ANDC$(X)="PALADIN"THENEM(X)=1.1
2420 IFS(X)>15ANDW(X)>15ANDI(X)>15ANDC$(X)="RANGER"THENEM(X)=1.1
2430 IFW(X)>15ANDC$(X)="CLERIC"THENEM(X)=1.1
2440 IFW(X)>15ANDR(X)>15ANDC$(X)="DRUID"THENEM(X)=1.1
2450 IFI(X)>15ANDC$(X)="MAGICIAN"THENEM(X)=1.1
2460 IFD(X)>15ANDC$(X)="THIEF"THENEM(X)=1.1
2470 NEXT:FORX=1TOXX:ET=ET+EM(X):NEXT:RETURN
2480 '*** EXPERIENCE/LEVEL ***
2490 IFC$(X)="MAGICIAN"THENE1=625:E2=2.01:HD(X)=4
2500 IFC$(X)="ILLUSIONIST"THENE1=560:E2=1.99:HD(X)=4
2510 IFC$(X)="CLERIC"THENE1=375:E2=2.03:HD(X)=8
2520 IFC$(X)="DRUID"THENE1=500:E2=1.9:HD(X)=8
2530 IFC$(X)="FIGHTER"THENE1=500:E2=2.04:HD(X)=10
2540 IFC$(X)="PALADIN"THENE1=690:E2=2.02:HD(X)=10
2550 IFC$(X)="RANGER"THENE1=560:E2=2.03:HD(X)=8
2560 IFC$(X)="THIEF"THENE1=312:E2=2.01:HD(X)=6
2570 IFC$(X)="ASSASSIN"THENE1=375:E2=2.01:HD(X)=6
2580 IFC$(X)="MONK"THENE1=560:E2=2.08:HD(X)=4
2590 IFC(X)=15THENCB=1
2600 IFC(X)>15THENCB=2
2610 IFC(X)=17AND(C$(X)="FIGHTER"ORC$(X)="PALADIN"ORC$(X)="RANGER")THENCB=3
2620 IFC(X)=18AND(C$(X)="FIGHTER"ORC$(X)="PALADIN"ORC$(X)="RANGER")THENCB=4
2630 IFC(X)<15THENCB=0
2640 NH=0:NL(X)=INT(LOG(E(X)/E1)/LOG(E2)):IFNL(X)>L(X)THENNH=RND(HD(X))
2650 IFNL(X)-L(X)=1THENNL(X)=NL(X):GOTO2680ELSEIFNL(X)<L(X)THEN2680
2660 IFNL(X)-L(X)>2THENE(X)=INT((E2^(L(X)+2))*E1-1)
2670 L(X)=L(X)+1:PRINT" EXCESS EXPERIENCE POINTS GAINED"
2680 PRINT" PRESENT LEVEL";L(X):PRINT" EXP. POINTS";E(X):RETURN
2690 '*****SAVE CHARACTERS*****
2700 CLS:PRINT@101,"*DO YOU WISH TO SAVE*":PRINT@135,"*THESE CHARACTERS*":PRINT@
206,"(Y/N)"
2710 GOSUB60:IFK$="N"THENEND
2720 PRINT:PRINT" THE CHARRACTERS WILL BE SAVED    IN SEPARATE FILES TO ALLOW
  THEM TO ADVENTURE IN DIFFERENT  GROUPS.":PRINT@417,"PREPARE TAPE.":PRINT" THEN
 PRESS ANY KEY.....":GOSUB60
2730 FORX=1TOXX:IFH(X)<1THEN2775ELSECLS:PRINT@228,"**SAVING**":PRINT@238,N$(X);"
**":OPEN"O",#-1,N$(X)
2740 PRINT#-1,N$(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)
2750 PRINT#-1,A$(X),AC(X),LI(X),E(X),Q(X)
2760 FORY=1TO8:PRINT#-1,E$(X,Y),S$(X,Y):NEXTY:FORY=1TO5:PRINT#-1,T$(X,Y):NEXTY
2770 CLOSE#-1:CLS:PRINT@228,"**";N$(X);:PRINT"**SAVED**":PRINT@417,"PRESS ANY KE
Y TO SAVE NEXT      CHARACTER.":GOSUB60
2775 NEXTX:RETURN
2780 '* LOAD ADVENTURE *
2790 CLS:PRINT@33,"PART III :THE TAVERN.":PRINT@97,"THIS PROGRAM ALLOWS YOU TO
   DIVIDE THE SPOILS FROM YOUR     LAST ADVENTURE."2800 PRINT@257,"PREPARE TO L
OAD YOUR PREVIOUSLY SAVED ADVENTURE.THEN PRESS ANY  KEY.":GOSUB60:CLS:PRINT@234,
"* LOADING *":PRINT@266,"* DUNGEON *"
2810 OPEN"I",#-1,"DUNGEON":INPUT#-1,XX:FORX=1TOXX
2820 INPUT#-1,N$(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)
2830 INPUT#-1,A$(X),AC(X),LI(X),E(X),Q(X),G(X),H(X),A(X),WE(X)
2840 FORY=1TO8:INPUT#-1,E$(X,Y),S$(X,Y):NEXTY:FORY=1TO5:INPUT#-1,T$(X,Y):NEXTY,X
:INPUT#-1,MT,R,L,CC
2850 CLOSE#-1:RETURN
2860 '** CHARACTER DISPLAY **
2870 CLS:PRINTN$(X);":";R$(X);" ";C$(X);"(LEVEL";L(X);")"
2880 PRINT@64,"STRENGTH":PRINT@96,"INTELLIGENCE":PRINT@128,"WISDOM"
2890 PRINT@160,"CONSTITUTION":PRINT@192,"DEXTERITY":PRINT@224,"CHARISMA"
2900 IFS(X)>18THENS(X)=18
2910 IFI(X)>18THENI(X)=18
2920 IFW(X)>18THENW(X)=18
2930 IFC(X)>18THENC(X)=18
2940 IFD(X)>18THEND(X)=18
2950 IFR(X)>18THENR(X)=18
2960 PRINT@78,"";:PRINTUSING"##";S(X):PRINT@110,"";:PRINTUSING"##";I(X):PRINT@14
2,"";:PRINTUSING"##";W(X)
2970 PRINT@174,"";:PRINTUSING"##";C(X):PRINT@206,"";:PRINTUSING"##";D(X):PRINT@2
38,"";:PRINTUSING"##";R(X)
2980 IFS(X)>17THENPRINT@80,"/";B$(X)
2990 PRINT@114,"GOLD";GP(X);"GP":PRINT@146,"BASIC";HP(X);"HP":PRINT@178,"HIT@ +"
;SB(X)
3000 PRINT@210,"DAMAGE@ +";DB(X):PRINT@242,"CARRY";WA(X):PRINT@256,"*WEAPONS* ";
W1$(X):PRINT@298,W2$(X);"  ";W3$(X)
3010 PRINT@320,"*ARMOUR* ";A$(X);"(AC";AC(X);")":PRINT@352,"*EQUIPMENT* ";:FORY=
1TO8:IFE$(X,Y)=""THEN3030
3020 PRINTE$(X,Y);",";
3030 NEXT:GOSUB60:CLS:PRINT@40,"*SPELLS*":PRINT:FORY=1TO8:PRINTY;S$(X,Y):NEXT:GO
SUB60:RETURN
3040 FORX=1TO66:READTF$(X),EV(X):NEXT:FORX=1TO66:READWC(X):NEXT:RETURN
3050 DATA POTION...OF HEALING,100,SCROLL...OF CURE LIGHT WOUNDS,100,SCROLL...OF
 eNTANGLE,100,SCROLL...OF mAGIC MISSILE,100
3060 DATA SCROLL...OF CHARM PERSON,100,SCROLL...OF sLEEP,100,SCROLL...OF COLOUR
SPRAy,100,RING.....OF wARMTH,500,WAND.....OF mAGIC MISSILES,4000
3070 DATA CHAINMAIL+1,600,SHIELD...+1,250,SWORD....+1,400,AXE.....+1,300,DAGGER
...+1,100,MACE....+1,350
3080 DATA POTION...OF EXTRA-HEALING,200,SCROLL...OF hOLD PERSON,200,SCROLL...OF
 INvULNERABILITY,350,SCROLL... OF bLINDNESS,-200,RING.....OF iNVISIBILITY,1500,CL
OAK....OF PROTECTION+1,1000
3090 DATA DAGGER...+2,200,SWORD....+2,800,AMULET OF GOLD & PLATINUM,5000,BAG....
.OF DEVOURING,-1
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# PROGRAM FILE

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3100 DATA POTION...OF iNVISIBILITY,250,SCROLL...OF CALL lIGHTNING,200,SCROLL...O
F iNVISIBILITY,250,SCROLL...OF PARALYzATION,300,RING.....OF PROTECTION+1,3000,WA
ND.....OF fIRE,4500
3110 DATA CHAINMAIL+2,1200,SHIELD...+2,500,AXE.....+2,600,SPEAR....+2,1000,RED P
EARL,500,SAPPHIRE,500
3120 DATA POTION...OF INvULNERABILITY,350,SCROLL...OF CURE DISEASE,300,SCROLL...
OF StRENGTH,300,SCROLL...OF lIGTHNING BOLT,200,SCROLL...OF fIREBALL,300,SCROLL..
.OF cHAOS,500,WAND.....OF FEAr,3000
3130 DATA PLATEMAIL+1,800,SWORD....+3,1400,EMERALD,500,STAR RUBY,500
3140 DATA POTION...OF gIANT STRENGTH,650,SCROLL...OF RAISE DEAD,500,SCROLL...OF
WALL OF fIRE,400,SCROLL...OF ICE SToRM,400,RING.....OF FEATHER FALL,1000,WAND...
..OF STRIKInG,6000
3150 DATA AXE......+3,1000,DAGGER...+3,300,MACE.....+2,700,FIRE OPAL,500,DIAMOND
,500
3160 DATA POTION...OF dRAGON CONTROL,800,SCROLL...OF cONFUSION,900,SCROLL...OF D
EATH SPELL(x),900,RING.....OF REGENERATION,5000,PLATEMAIL+2,1800,MOONSTONE,500,C
ROWN OF GOLD,8000
3170 DATA 1,7,5,2,2,2,3,1,1,8,8,9,6,14,8,1,10,2,4,1,1,14,9,1,1,1
3180 DATA 11,12,3,1,2,8,8,6,13,1,1,6,7,2,11,2,3,10,8,9,1,1,6,4
3190 DATA 5,2,1,10,6,14,8,1,1,1,5,2,1,8,1,1
```



# Meteor Attack

## by Nick Pearce

Occasionally I enjoy a good, traditional zap-'em game and I find there's no better machine than an Atari for games design. Meteor Attack will run on both the old Ataris and the new XLs, and occupies less than 16k.

Little is needed in the way of instruction: just protect the cities from the meteors with shots from the gun tower. The joystick controls the direction of the shots.

The game has all the usual features of arcade games — high scores, multi-wave and a two-player cooperative mode. My highest score is 28,700, which I'm sure will be beaten with little or no effort.

```
2 GRAPHICS 0:? ,"METEOR ATTACK":? :? "   by Nick Pearce, (c) Oct 84":?
4 GOTO 7000
200 FOR I=0 TO M:IF PEEK(PC+I)>4 THEN 390
210 BB=INT((PEEK(PX+I)-28)/8)+INT((PEEK(PY+I)-26)/8)*24:AA=S+BB
220 IF  NOT PEEK(AA) OR PEEK(AA)=13 OR BB<528 OR BB>550 THEN 300
225 POKE AA,3:SOUND 3,24,10,10:FOR J=0 TO 35:NEXT J
230 BLDNGS=BLDNGS-N1:SOUND 3,0,0,0:POKE AA,13:IF  NOT BLDNGS THEN POP :GOTO 700
300 POKE PY+I,0:POKE PX+I,INT(RND(0)*R1)+R2:POKE PCOLR+I,22:POKE PC+I,40
390 NEXT I
400 FOR I=0 TO N1:IF  NOT PEEK(HIT+I) OR PEEK(GUN+I)<>141 OR  NOT LIVES(I) THEN
490
420 SOUND 3,2,4,10:POKE 710,222:LIVES(I)=LIVES(I)-N1:GOSUB SHOW
430 FOR J=0 TO 44:NEXT J:SOUND 3,0,0,0:POKE 710,218:IF  NOT LIVES(I) THEN 450
440 POKE HIT+I,0:POKE FACE+I,135:GOTO 490
450 IF  NOT LIVES(0) AND  NOT LIVES(N1) THEN POP :GOTO 700
490 NEXT I
495 GOSUB SCORE
500 IF PEEK(CONSOL)=START THEN 700
600 POKE CH+PEEK(LEVEL),0:IF PEEK(LEVEL)<>127 THEN 200
610 LOOP=LOOP+N1
620 IF LOOP=120 THEN R1=85:R2=44
630 IF LOOP=210 THEN R2=80
640 IF LOOP=300 THEN R2=124
650 IF LOOP=390 THEN GOSUB PAUSE:R1=101:R2=14:POKE PSX,N1
660 IF LOOP=590 THEN GOSUB PAUSE:R2=142:POKE PSX,255
670 IF LOOP=790 THEN GOSUB PAUSE:N=N+N1:LOOP=0:R1=163:R2=44:POKE PSX,0:IF N=4 TH
EN N=3
680 M=N:GOTO 200
699 REM ** gameover
700 POKE AUTO,0:SOUND 3,0,0,0
702 POSITION 14,8:? #6;" GAME OVER ":GOSUB SCORE
710 IF PTS>HI THEN HI=PTS:GOSUB SHOW
720 FOR J=0 TO 900:NEXT J
799 REM ** begin
800 POSITION 2,0:? #6;"SCORE  LIVES  HIGH"
801 PTS=0:BLDNGS=10:LIVES(0)=3:LIVES(N1)=3:GOSUB SHOWPTS:GOSUB SHOW
803 FOR I=CH+120 TO CH+127:POKE I,255:NEXT I
804 FOR I=432 TO 455:POKE S+I,207:POKE S+I+120,78:NEXT I
805 FOR I=530 TO 540 STEP 2:POKE S+I,78:POKE S+I+9,78:NEXT I
806 POKE S+514,12:POKE S+517,12:POKE S+538,12:POKE S+541,12
807 POKE HIT,0:POKE HIT+N1,0:POKE FACE,138:POKE FACE+N1,135
808 POKE LEVEL,120:POKE SHIELD,10
810 TIME=400
820 POSITION 4,6:? #6;" meteor attack   "
825 POSITION 14,8:? #6;"   PRESS   "
830 POSITION 0,11:? #6;"RESET to finish"
835 POSITION 8,13:? #6;"OPTION=1 player ";:IF PEEK(SOLO) THEN ? #6;"<":GOTO 845
840 ? #6;" "
845 POSITION 16,15:? #6;"SELECT=2 players";:IF  NOT PEEK(SOLO) THEN ? #6;"<":GOT
O 855
850 ? #6;" "
855 POSITION 4,18:? #6;"START to play"
860 TIME=TIME-N1:IF  NOT TIME THEN 900
870 IF PEEK(CONSOL)=OPTION THEN POKE SOLO,N1
875 IF PEEK(CONSOL)=SELECT THEN POKE SOLO,0
880 IF PEEK(CONSOL)<>START THEN 835
900 POSITION 0,6:FOR I=N1 TO 7:? #6;B$;:NEXT I
910 IF  NOT TIME THEN POSITION 14,8:? #6;"PRESS START":POKE AUTO,N1
930 LOOP=0:R1=163:R2=44:M=3:N=N1:POKE PSX,0
950 FOR I=0 TO 3:POKE PY+I,32:POKE PX+I,0:POKE PC+I,0:NEXT I
990 GOTO 200
1899 REM ** score
1900 PTS=PTS+PEEK(DESTROY)*385:POKE DESTROY,0
1999 REM ** showpts
2000 N$=STR$(PTS):M$="000000":M$(7-LEN(N$))=N$:POSITION 6,N1:? #6;M$:RETURN
2099 REM ** show
2100 N$=STR$(HI):M$="000000":M$(7-LEN(N$))=N$:POSITION 19,N1:? #6;M$
2200 POSITION 14,N1:? #6;LIVES(0);" ";LIVES(N1):RETURN
3999 REM ** pause
4000 SOUND 3,90,10,8:J=LOOP*M*2+BLDNGS*585
4002 POSITION 4,6:? #6;J;" BONUS POINTS"
4004 PTS=PTS+J:GOSUB SHOWPTS
4005 J=0:FOR I=0 TO 3:IF PEEK(PC+I) THEN J=J+N1:GOTO 4090
4010 BB=INT((PEEK(PX+I)-28)/8)+INT((PEEK(PY+I)-26)/8)*24:AA=S+BB
```


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# PROGRAM FILE

```
4020 IF  NOT PEEK(AA) OR PEEK(AA)=13 OR BB<528 OR BB>550 THEN 4090
4030 POKE AA,13:BLDNGS=BLDNGS-N1:IF  NOT BLDNGS THEN POP :POP :POP :GOTO 700
4090 NEXT I:IF J THEN 4005
4100 SOUND 3,0,0,0:POSITION 4,6:? #6;B$(N1,17)
4190 RETURN
6999 REM ** intro
7000 ? "A city is threatened by meteors, its"
7200 ? "only protection is an energy shield"
7220 ? "and 2 laser canons."
7300 ? "You control the canons. They are"
7310 ? "capable of firing energy bolts in"
7320 ? "any of six directions depending on"
7330 ? "the up/centre/down position of the"
7340 ? "stick when the trigger is pressed."
7350 ? "Points are gained for each meteor you"
7360 ? "destroy."
7370 ? "The game ends when either both canons"
7380 ? "or all 10 buildings are destroyed!":?
7390 ? "ONE PLAYER OPTION"
7400 ? "Both canons controlled by joystick 1."
7410 ? "TWO PLAYER OPTION"
7420 ? "joystick1=left, joystick2=right canon":?
7800 ? ,"PRESS START";
7820 CONSOL=53279:START=6:SELECT=5:OPTION=3
7900 IF PEEK(CONSOL)<>START THEN 7900
7999 REM ** init
8000 RAMTOP=106:MYTOP=PEEK(RAMTOP)-12:POKE RAMTOP,MYTOP
8100 GRAPHICS 17:DL=PEEK(560)+256*PEEK(561):S=PEEK(DL+5)*256+PEEK(DL+4)
8120 POKE 708,102:POKE 709,136:POKE 710,218
8220 N1=1:PCOLR=704:AUDCTL=53768:SKCTL=53775:AUDF=53760:AUDC=53761:DESTROY=1609
8240 SHAPAGE=206:TAB=1536:LEVEL=1602:SHIELD=1601:PC=1556
8260 PX=1560:PY=1568:PSX=1608:SOLO=1604:AUTO=1605
8280 FACE=1610:GUN=1612:HIT=1618:GUNLOCX=1620:GUNHI=1626:GUNLO=1628
8300 DIM M$(8),N$(8),LIVES(N1),B$(40)
8310 B$(N1)=" ":B$(40)=" ":B$(2)=B$:HI=0
8320 SCORE=1900:SHOWPTS=2000:SHOW=2100:PAUSE=4000
8400 DIM FILL$(17):FOR I=N1 TO 17:READ J:FILL$(I)=CHR$(J):NEXT I
8410 DATA 104,104,104,133,208,160,0,132,207,104,104,145,207,200,208,251,96
8420 DIM COPY$(23):FOR I=N1 TO 23:READ J:COPY$(I)=CHR$(J):NEXT I
8430 DATA 104,104,104,133,206,104,104,133,208,160,0,132,205,132,207,177,205,145,
207,200,208,249,96
8440 DIM VBION$(10):FOR I=N1 TO 10:READ J:VBION$(I)=CHR$(J):NEXT I
8450 VBION$(3,3)=CHR$(MYTOP+4)
8460 DATA 104,162,0,160,0,169,7,76,92,228
8600 X=USR(ADR(FILL$),6,0):? #6,"WAIT"
8620 FOR I=4 TO 11:X=USR(ADR(FILL$),MYTOP+I,0):NEXT I
8800 FOR I=0 TO N1:X=USR(ADR(COPY$),224+I,MYTOP+I):NEXT I
8810 CH=(MYTOP)*256
8820 FOR I=CH+8 TO CH+119:READ J:POKE I,J:NEXT I:POKE 756,MYTOP
8901 DATA 0,0,4,64,16,2,40,0
8902 DATA 0,68,17,24,168,2,32,8
8903 DATA 0,4,64,42,29,186,64,20
8904 DATA 21,74,54,190,93,134,37,84
8905 DATA 56,124,124,126,126,62,62,28
8906 DATA 12,12,28,24,24,24,60,60
8907 DATA 0,6,14,28,24,24,60,60
8908 DATA 0,0,7,14,28,24,60,60
8909 DATA 48,48,56,24,24,24,60,60
8910 DATA 0,96,112,56,24,24,60,60
8911 DATA 0,0,224,112,56,24,60,60
8912 DATA 24,126,126,126,24,126,126,126
8913 DATA 0,0,0,0,0,24,52,90
8914 DATA 60,36,60,36,60,36,60,90
9000 FOR I=TAB TO TAB+7:READ J:POKE I,J:NEXT I
9010 DATA 3,12,48,192,252,243,207,63
9050 FOR I=1700 TO 1713:READ J:POKE I,J:NEXT I
9060 DATA 72,169,166,141,10,212,141,26,208,141,23,208,104,64
9070 POKE DL+27,134:POKE 512,164:POKE 513,6
9100 MT=(MYTOP+4)*256:FOR I=MT TO MT+707:READ J:POKE I,J:NEXT I
9200 DATA 216,173,69,6,240,48,169,0,141,132,2,141,133,2,206,71
9205 DATA 6,208,20,169,40,141,71,6,238,70,6,173,70,6,201,15
9210 DATA 208,5,169,2,141,70,6,173,70,6,141,120,2,173,70,6
9215 DATA 24,105,3,141,121,2,173,68,6,240,12,173,120,2,141,121
9220 DATA 2,173,132,2,141,133,2,169,62,141,199,2,173,67,6,240
9225 DATA 8,206,67,6,169,54,141,199,2,162,1,189,82,6,208,91
9230 DATA 169,3,157,80,6,189,74,6,157,76,6,188,120,2,152,41
9235 DATA 8,208,8,169,135,157,74,6,157,76,6,152,41,4,208,8
9240 DATA 169,138,157,74,6,157,76,6,152,41,2,208,8,169,2,157
9245 DATA 80,6,254,76,6,152,41,1,208,8,169,4,157,80,6,222
9250 DATA 76,6,56,169,5,253,80,6,157,78,6,189,74,6,201,135
9255 DATA 240,9,56,169,0,253,78,6,157,78,6,189,90,6,133,204
9260 DATA 189,92,6,133,203,160,0,132,77,189,76,6,145,203,202,16
9265 DATA 138,162,1,189,88,6,240,23,138,10,168,222,88,6,208,7
9270 DATA 169,0,153,1,210,240,69,189,88,6,153,0,210,208,61,189
9275 DATA 82,6,208,56,189,132,2,208,51,160,3,185,28,6,208,41
9280 DATA 189,84,6,153,28,6,169,194,153,36,6,189,78,6,153,48
9285 DATA 6,189,80,6,153,44,6,138,10,168,169,19,157,88,6,153
9290 DATA 0,210,169,74,153,1,210,208,3,136,16,207,202,16,164,162
9295 DATA 3,188,8,208,240,63,152,41,8,240,4,160,3,208,20,152
9300 DATA 41,4,240,4,160,2,208,11,152,41,2,240,4,160,1,208
9305 DATA 2,160,0,185,52,6,208,29,169,0,157,28,6,169,7,153
9310 DATA 52,6,169,32,153,20,6,238,73,6,24,173,10,210,41,240
9315 DATA 105,14,153,192,2,202,16,185,162,3,189,52,6,208,73,188
9320 DATA 4,208,240,68,152,41,4,240,18,160,0,189,24,6,16,1
9325 DATA 200,153,82,6,169,141,153,76,6,208,30,152,41,8,240,20
9330 DATA 169,7,141,67,6,206,65,6,208,15,169,10,141,65,6,238
9335 DATA 66,6,208,5,152,41,1,208,15,169,7,157,52,6,169,32
9340 DATA 157,20,6,169,62,157,192,2,202,16,175,162,3,189,20,6
9345 DATA 240,24,189,52,6,208,19,24,189,24,6,109,72,6,157,24
9350 DATA 6,24,189,32,6,105,2,157,32,6,189,28,6,240,46,24
9355 DATA 189,28,6,125,48,6,157,28,6,56,189,36,6,253,44,6
9360 DATA 157,36,6,169,44,221,28,6,176,14,169,211,221,28,6,144
9365 DATA 7,169,10,221,36,6,144,5,169,0,157,28,6,202,16,173
9370 DATA 169,0,133,209,162,3,189,52,6,240,23,230,209,222,52,6
9375 DATA 208,16,56,189,20,6,233,8,157,20,6,240,5,169,7,157
9380 DATA 52,6,202,16,225,165,209,240,3,24,105,10,160,4,153,1
9385 DATA 210,141,30,208,162,3,189,8,6,133,204,189,12,6,133,203
9390 DATA 169,0,160,255,200,145,203,192,7,208,249,189,32,6,157,12
9395 DATA 6,133,203,189,20,6,133,205,177,205,145,203,136,16,249,189
9400 DATA 24,6,157,0,208,138,72,72,189,4,6,133,209,188,16,6
9405 DATA 162,3,165,209,49,207,145,207,200,202,16,246,104,170,189,36
9410 DATA 6,157,16,6,168,189,0,6,133,209,162,3,165,209,17,207
9415 DATA 145,207,200,202,16,246,104,170,189,28,6,157,4,208,202,16
9420 DATA 149,76,98,228
9600 POKE 54279,MYTOP+4:POKE 623,17:POKE 53260,0
9620 POKE SHAPAGE,MYTOP:POKE 207,0:POKE 208,MYTOP+7:POKE SOLO,1
9640 FOR I=0 TO 3:POKE 1544+I,MYTOP+8+I:POKE 53256+I,0:NEXT I
9700 POKE AUDCTL,0:POKE SKCTL,3:POKE AUDF+4,34
9720 POKE GUNLOCX,115:POKE GUNLOCX+N1,139:POKE 1606,5:POKE 1607,50
9740 K=S+490:I=INT(K/256):J=K-I*256:POKE GUNHI,I:POKE GUNLO,J
9750 K=S+493:I=INT(K/256):J=K-I*256:POKE GUNHI+N1,I:POKE GUNLO+N1,J
9800 POKE 559,63:POKE 53277,3:X=USR(ADR(VBION$)):POKE 54286,192:GOTO 800
```

# BBC Flighting

## by John Bell

Flighting is a short and simple game aimed at people who are frustrated by the difficult layout of the BBC cursor keys. Mastering BBC Flighting should prepare you for those annoying commercial games which insist on using cursor control keys. Apart from this it's a colourful and addictive game in its own right. To prove that the later stages can be mastered there is a joystick option — although using this is not really entering into the spirit of things.

When run, you will be prompted with 'Joystick?'; reply 'N' unless really desperate. The screen will clear and a landscape is drawn together with a plane and red runway. The up and down keys alter your rate of climb (RCL) which in turn alters your altitude (ALT). The left and right keys alter the rate at which you turn (ALT): you keep turning until the opposite direction is pressed.

To start with, the plane is level. After the first landing the plane adopts more difficult attitudes. If you try to land with a speed greater than −5, you'll crash.

```
>LLLIST
  10 DIM S(72),C(72)
  20 PROCINIT1
  30 MODE2
  40 PROCINIT2
  50 PROCP(OX,OY,OB):PROCP(PX,PY,BK)
  60 PRINT TAB(8,0);PY-200;"   "
  70 PRINT TAB(8,1);RCL;"   "
  80 PRINT TAB(8,2);K1;"   "
  89 OX=PX:OY=PY:OB=BK
  90 IF PY<=200 GOTO (FNCHK(RCL,PX,BK))
 110 IF J$<>"Y" GOTO 140
 120 JY=(ADVAL(2) DIV 256-50)/10
 130 JX=(ADVAL(1) DIV 256-120)DIV 30
 140 K=K+INKEY(-122)-INKEY(-26)-JX:BK=BK+K
 150 RCL=RCL+INKEY(-42)-INKEY(-58)-JY
 160 IF RCL>15 RCL=15
 170 IF BK<=0 BK=72+BK
 180 IF BK>=72 BK=BK-72
 190 PX=PX-S(BK)*RCL
 200 IF PX<0 PX=1280-PX ELSE IF PX>1280 PX=PX-1280
 210 PY=PY+RCL-S(BK MOD36)*20
 220 IF BK<36 K1=BK ELSE K1=BK-73
 230 SOUND 1,-7,100-RCL,3
 240 SOUND 2,-7,100-RCL,3
 250 GOTO 50
 260
 270 DEFPROCP(X1,Y1,B1)
 280 MOVE X1-C(B1)*50,Y1-S(B1)*50
 290 DRAW X1+C(B1)*50,Y1+S(B1)*50
 300 MOVE X1,Y1:DRAW X1-S(B1)*20,Y1+C(B1)*20
 310 ENDPROC
 320
 330 DEFPROCCRASH
 340 GCOL0,1
 350 FOR I=0 TO 72
 360 SOUND 0,-15+(I/6),6,2
 370 MOVEPX,PY:DRAW PX-S(I)*RND(300),PY+C(I)*RND(300)+200
 380 NEXT
 390 ENDPROC
 400
 410 DEFPROCINIT1
 420 INPUT "Joystick "J$:PRINT "Please wait"
 430 FOR I=0 TO 72:S(I)=SIN(I/36*PI):C(I)=COS(I/36*PI):NEXTI
 440 ENDPROC
 450
 460 DEFPROCINIT2
 470 FOR I%=8 TO 13:VDU19,I%,0;0;:NEXT:VDU 19,0,6;0;23,1,0;0;0;0;24,10;10;1270;
800;
 480 @%=&2020A:K=10
 490 K=K+(K/5):MOVE 0,1025-K
 500 FOR J=0 TO 1300 STEP 200:GCOL0,4*SGN(RND(2)-1):MOVE J-200,1025-K:DRAW J,10
25-K:GCOL0,3*SGN(RND(2)-1):MOVE J-200,200+K:DRAW J,200+K:NEXTJ:IF K<300 GOTO 490
 510 MOVE 0,200:MOVE 0,200:GCOL0,5:FOR I=0 TO 1300 STEP 50:PLOT 85,I,200+RND(20
0):PLOT85,I+50,200:NEXT
 520 GCOL0,2:MOVE 0,0:MOVE 1300,0:PLOT85,0,200:PLOT85,1300,200
 530 PX=640:PY=520:BK=0:RCL=0:DES=0:K1=0:K=0
 540 MOVE 600,180:MOVE 600,200:GCOL0,1:PLOT85,680,180:PLOT85,680,200
 550 JX=0:JY=0:OX=PX:OY=-100:OB=BK
 560 GCOL0,8:MOVE 10,10:DRAW 10,800:DRAW 1270,800:DRAW 1270,10:DRAW 10,10:GCOL3
8:COLOUR 1
 570 PRINT TAB(0,0);"Alt  :"''"Rcl  :"''"Turn :"
 580 ENDPROC
 590
 600 DEFFNCHK(R%,X%,B%)
 610 IF R%<-5 OR (X%<600 OR X%>680) OR B%<>0 PROCCRASH:=30
 620 PX=640:PY=520:BK=RND(10):RCL=RND(5):DES=0:=50
```

# TRS-80 Adventure Parsers

## by Alan Kirk

Possibly the only redeeming feature of the outdated TRS-80 is the quality of its Basic: in particular the writing of text adventures is suited to this machine — typically a 48k adventure on the Spectrum would occupy, say, 32k on a TRS-80 and run much faster. This machine code utility will further im-


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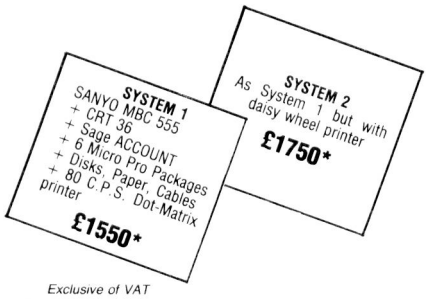


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prove the quality of any adventures written on a TRS-80 or Video Genie.

The program decodes sentences of the usual verb-noun format with the first three letters of each word being significant. To use the program in your own adventure you must use the code from 10 to 120 and the data from 140 to 490. You *can* use different line numbering, but 'LN' in line 30 *must* contain the line number of the first data statement.

To initialise the adventure decoder you need lines 600 to 690 with the strings VB$ and NO$ initialised to lists of three-character words. The decoder can then be used by inserting 'GET V,N' at the point in your program where you require sentence input. Any two variables can be used, but they must be defined as integers. The two numbers returned represent the position of the verb and noun on their own, so they can be tested for actions.

The length of the word table is limited to 249 characters which corresponds to 83 words. If any one of the returned values is 255, then the word is not in one of the tables.

The common one-letter commands are pre-programmed into the routine and will respond as follows:

| Command Entered | V | N | |
|---|---|---|---|
| D | 1 | 1 | (Down) |
| E | 1 | 2 | (East) |
| N | 1 | 3 | (North) |
| S | 1 | 4 | (South) |
| U | 1 | 5 | (Up) |
| W | 1 | 6 | (West) |
| L | 1 | 7 | (Left) |
| R | 1 | 8 | (Right) |
| H | 11 | 10 | (Help) |
| I | 10 | 9 | (Inventory) |

```
5 REM  ++++++++++++++++++++++++++++++++++++++
       + Adventure Decoder For GENIE/TRS-80 +
       +           By Alan Kirk             +
       +                                    +
       + 19/10/84              Version 1.2  +
6 REM  ++++++++++++++++++++++++++++++++++++++

10 CLS:CLEAR 100:DEFINT A-Z
20 PRINT"*** Adventure Decoder ***
Poking in data from line:"
30 A=32021:LN=140:RESTORE:FOR L=1 TO 36
40 CV=0:CK=0:FOR I=1 TO 10:READ A(I):CK=CK+A(I):NEXT
50 READ CV:IFCK<>CVTHENPRINT"Data error in line:";LN:END
60 FOR I=1 TO 10:POKE A,A(I):A=A+1:NEXTI
70 PRINT@89,LN;:LN=LN+10
80 NEXT L
90 REM ** Set up 'GET' vector in RAM **
100 POKE 16767,195:POKE 16768,53:POKE 16769,125
110 REM ** Activate Adventure Decoder **
120 POKE 16526,21:POKE 16527,125:X=USR(0)
130 REM

          ...........DATA.....................   CHECKSUM

140 DATA 221,42,128,65,33,53,125,34,128,65,       894
150 DATA 33,4,125,34,177,64,0,0,0,0,              437
160 DATA 0,0,0,0,0,0,0,0,0,201,                   201
170 DATA 0,0,17,37,125,205,181,125,254,44,        988
180 DATA 32,101,175,18,17,43,125,35,205,181,      932
190 DATA 125,254,58,40,4,254,0,32,84,229,         1080
200 DATA 175,18,33,37,125,205,13,38,237,83,       964
210 DATA 49,125,33,43,125,205,13,38,237,83,       951
220 DATA 51,125,33,5,125,6,16,205,217,5,          788
230 DATA 56,246,120,254,1,202,245,125,17,21,      1287
240 DATA 252,229,205,212,125,42,49,125,113,35,    1387
250 DATA 175,119,17,98,253,225,6,12,35,126,       1066
260 DATA 254,32,40,21,16,248,42,49,125,62,        889
270 DATA 255,119,35,54,0,42,51,125,119,195,       995
280 DATA 174,125,225,221,233,35,205,212,125,42,   1597
290 DATA 51,125,113,35,175,119,225,126,201,35,    1205
300 DATA 126,254,32,40,250,254,65,250,163,125,    1559
310 DATA 254,91,242,163,125,18,35,19,126,254,     1327
320 DATA 44,200,254,0,200,254,58,200,18,24,       1252
330 DATA 241,14,0,6,3,12,229,213,26,190,          934
340 DATA 32,8,19,35,5,32,247,209,225,201,         1013
350 DATA 209,225,203,127,32,5,19,19,19,24,        882
360 DATA 228,175,79,201,126,6,1,254,68,40,        1178
370 DATA 48,4,254,69,40,43,4,254,78,40,           834
380 DATA 38,4,254,83,40,33,4,254,85,40,           835
390 DATA 28,4,254,87,40,23,4,254,76,40,           810
400 DATA 18,4,254,82,40,13,4,254,73,40,           782
410 DATA 24,4,254,72,40,26,195,147,125,42,        929
420 DATA 49,125,62,1,119,35,175,119,42,51,        778
430 DATA 125,112,195,174,125,42,49,125,62,10,     1019
440 DATA 24,238,42,49,125,62,11,24,231,4,         810
450 DATA 254,73,40,24,4,254,72,40,26,195,         982
460 DATA 190,125,42,92,125,62,1,119,35,175,       966
470 DATA 119,42,94,125,112,195,217,125,42,92,     1163
```

# PROGRAM FILE

```
480 DATA 125,62,10,24,238,42,92,125,62,11,        791
490 DATA 24,231,0,0,0,0,0,0,0,0,0,                255
500 REM
          ..........END OF DATA.............
600 REM ** Start of DEMO Adventure **
609 REM ** You MUST define GET varibles eg. V and N **
610 CLS:CLEAR 500:DEFINT V,N
619 REM ** Disable BREAK key **
620 POKE 16396,7
624 REM ** Verb table at 32384.Noun table follows **
625 VB=32384:NO=VB+25:E$=STRING$(3,255)
629 REM ** Make VERB table in VB$. (Max 240 chars) **
630 VB$="SAVEXATHR"+E$: REM SAVe,EXAmine,THRow
639 REM ** Do the same for NOUN table **
640 NO$="HILFIECOR"+E$: REM HIL1,FIEld,CORn
650 A=VB:PO$=VB$:GOSUB660:A=NO:PO$=NO$:GOSUB660:GOTO680
660 FORI=1TOLEN(PO$):POKE A,ASC(MID$(PO$,I,1)):A=A+1
670 NEXT:RETURN
679 REM ** Tell A/D were the word tables are **
680 POKE 32120,VB AND255:POKE 32121,VB/256
690 POKE 32134,NO AND255:POKE 32135,NO/256

699 REM ** Get command from player **
700 PRINT"You are in a large field filled with corn.
Objects : A SCARE-CROW":PRINT"
--------> What now ? ";:GET V,N:PRINTSTRING$(63,45)
710 IF V=0 THENPRINT"
Sorry don't understand the verb":GOTO700
720 IF N=0 THENPRINT"
Sorry don't understand the noun":GOTO700
729 REM ** Jump to decoding routines **
730 ON V GOTO 800,850,900


800 REM ** Save Game **
810 '...CODE FOR SAVING GAME...
849 GOTO700

850 REM ** Examine **
860 '...CODE FOR EXAMINE...
895 PRINT"Nothing interesting"
899 GOTO700

900 REM ** THROW **
910 '...CODE FOR THROW...
949 GOTO700


and so on....
```

# MTX OLD

## by P Walker

I am assured by MTX500 and 512 programmers that one of the major dangers of programming an MTX is accidental erasure of a program. There are three software resets (PRINT USR (O),RST O and NEW), as well as hardware resets and misplaced POKEs all resulting in a lost program and re-initialised system variables. This utility provides a much needed OLD command to restore lost programs from one of the above-mentioned causes.

The program should be loaded and run before programming begins. The program places itself at the top of RAM, lowers RAMTOP and deletes its own listing, and is therefore transparent both to user and system. You can now type or load in a program. When you are ready to start debugging type (PRINT(USR(49010). If, for any reason, the program is cleared from memory, typing (PRINT(USR(49069)) while debugging will restore it.

To run on an MTX500 two minor changes are necessary:
(1) Change LD HL, 4069 to LD HL, 8069 in line 0.
(2) Change the two occurrences of LD IX, 4000 to LD IX, 8000 in line 2.

"OLD" FACILITY FOR THE MTX 512/500

```
0 CODE
     LD HL,≠4069   ;START ADDRESS OF "OLD"
     LD DE,≠BF72   ;ADDRESS "OLD" MOVED TO
     LD BC,≠0076   ;LENGTH OF "OLD"
     LDIR          ;MOVE "OLD" TO ≠BF72
     LD A,≠F6      ;OFF SET FOR (DJNZ) JUMPS USED IN "OLD"
     LD (≠BFA8),A  ;POSITION OF (DJNZ)
     LD (≠BFE4),A  ;POSITION OF 2nd (DJNZ) IN "OLD"
     RET
```


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# PROGRAM FILE

```
1 NEW
2 CODE
      LD IX,≠4000   ;START ADDRESS OF PROGRAM TO BE RELOADED---1st SECTION OF "OLD"---
      LD HL,≠BFE9   ;START ADDRESS FOR PROGRAM DATA TO BE SAVED
      LD B,≠08      ;COUNTER FOR PROGRAM DATA
      CALL ≠BF9F    ;CALL SAVE ROUTINE
      LD IX,≠FAA4   ;START ADDRESS OF VARIABLES TO BE SAVED
      LD B,≠0A      ;COUNTER FOR VARIABLE DATA
      CALL ≠BF9F
      LD A,(≠FACC)  ;TOP OF ARRAYS (LOW BYTE)
      CALL ≠BFAA    ;CALL SAVE ROUTINE
      LD A,(≠FACD)  ;TOP OF ARRAYS (HIGH BYTE)
      CALL ≠BFAA
      LD A,(≠FAD6)  ;TOP OF PAGE (LOW BYTE)
      CALL ≠BFAA
      LD A,(≠FAD7)  ;TOP OF PAGE (HIGH BYTE)
      JP ≠BFAA      ;JUMP TO SAVE ROUTINE AND RETURN TO BASIC
      LD A,(IX+0)   ;SAVE ROUTINE AT ≠BF9F---LOAD A,DATA BYTE
      CALL ≠BFAA    ;CALL SAVE ROUTINE
      INC IX        ;MOVE POINTER TO NEXT DATA BYTE
      DJNZ ≠BF9F    ;CHECK DATA COUNTER/ IF NON ZERO REPEAT ROUTINE
      RET           ;RETURN FROM ROUTINE
      LD (HL),A     ;SAVE ROUTINE AT ≠BFAA---SAVE DATA BYTE TO HL LOCATION
      INC HL        ;SET POINTER TO NEXT SAVE ADDRESS
      RET           ;RETURN FROM ROUTINE
      LD IX,≠4000   ;ADDRESS TO RELOAD PROGRAM---2nd SECTION OF "OLD"---
      LD HL,≠BFE9   ;START ADDRESS OF PROGRAM DATA
      LD B,≠08      ;COUNTER FOR PROGRAM DATA
      CALL ≠BFDB    ;CALL RELOAD ROUTINE
      LD IX,≠FAA4   ;ADDRESS OF VARIABLES TO BE RELOADED
      LD B,≠0A      ;COUNTER FOR VARIABLE DATA
      CALL ≠BFDB
      CALL ≠BFE6    ;CALL LOAD ROUTINE
      LD (≠FACC),A  ;RELOAD TOP OF ARRAYS (LOW BYTE)
      CALL ≠BFE6
      LD (≠FACD),A  ;TOP OF ARRAYS (HIGH BYTE)
      CALL ≠BFE6
      LD (≠FAD6),A  ;TOP OF PAGE (LOW BYTE)
      CALL ≠BFE6
      LD (≠FAD7),A  ;TOP OF PAGE (HIGH BYTE)
      RET           ;RETURN TO BASIC
      CALL ≠BFE6    ;RELOAD ROUTINE AT ≠BFDB
      LD (IX+0),A   ;RELOAD DATA BYTE INTO PROGRAM/VARIABLE SECTION OF MEMORY
      INC IX        ;MOVE POINTER TO NEXT MEMORY POSITION
      DJNZ ≠BFDB    ;CHECK DATA COUNTER/IF NON ZERO REPEAT ROUTINE
      RET           ;RETURN FROM ROUTINE
      LD A,(HL)     ;RELOAD ROUTINE AT ≠BFE6---RETRIEVE DATA BYTE
      INC HL        ;MOVE POINTER TO NEXT DATA LOCATION
      RET           ;RETURN FROM ROUTINE

  3 REM  C. P WALKER  1984
```

# Commodore 64 Screendump

## by Matthew Burt

Screendump allows the printing of high resolution or user-defined character screens on the Commodore MPS-801 printer. If a normal text screen is dumped, the standard '64 character set will be used instead of the MPS-801 set. There are two stages:

(1) Load and run to locate the routine in memory anywhere above B00 hex. There is a default option to put the routine above the Basic text and protect it.

(2) Call the specified address either from Basic or a machine code monitor.

The MPS-801 must be device four and contain paper that can accommodate 54 characters across.

Screendump leaves the printer in graphics mode, so ASCII character 15 must be sent before normal use.

Any screen that uses sprite graphics will be printed but the sprites will be invisible. The results with screens that use raster interrupts are, at best, highly unpredictable.

Lines 1000-1800 contain the data of the machine code routine in decimal. Lines 2040-2100 actually transfer the DATA into memory using a dummy OPEN in line 2060. Pay particular attention when typing lines 2000-2100. Any error here will not be detected in the same way as the DATA lines.

To prove the program works there are some example printouts of graphics dumps done with the utility. On running, the prompt

CODE ADDRESS (HEX) :

will be displayed. Type an address (such as C000 or C800 or 9000) or press RETURN for the top of memory option. If all is well, the message

CALL WITH SYS xxxx

will be displayed. Use this SYS to dump the screen to the MPS-801. Monitor users may wish to locate the code under the Basic ROM.

```
1000 DATA11,8,10,0,158,50,53,50,340
1010 DATA51,0,0,0,169,4,170,160,554
1020 DATA0,32,186,255,169,0,32,189,863
1030 DATA255,32,192,255,162,4,32,201,1133
```

# PROGRAM FILE

```
1040 DATA255,169,8,32,210,255,169,3,1101
1050 DATA56,237,0,221,10,10,10,10,554
1060 DATA10,10,133,35,173,17,208,41,627
1070 DATA32,141,94,1,240,14,169,8,689
1080 DATA45,24,208,10,10,101,35,141,574
1090 DATA92,1,144,23,174,24,208,138,804
1100 DATA41,14,10,10,101,35,141,93,445
1110 DATA1,138,41,240,74,74,101,35,704
1120 DATA141,92,1,169,0,141,95,1,640
1130 DATA169,0,141,96,1,141,97,1,646
1140 DATA169,128,133,36,169,1,133,37,806
1150 DATA32,183,0,144,6,165,37,5,572
1160 DATA36,133,36,6,37,238,95,1,582
1170 DATA165,37,16,236,165,36,32,210,897
1180 DATA255,173,95,1,170,56,233,7,990
1190 DATA141,95,1,238,96,1,208,3,783
1200 DATA238,97,1,173,97,1,240,200,1047
1210 DATA173,96,1,201,64,144,193,169,1041
1220 DATA13,32,210,255,142,95,1,224,972
1230 DATA203,144,173,32,204,255,169,4,1184
1240 DATA76,195,255,173,95,1,201,200,1196
1250 DATA144,2,24,96,41,248,133,34,722
1260 DATA160,0,132,35,10,38,35,10,420
1270 DATA38,35,101,34,144,2,230,35,619
1280 DATA10,38,35,10,38,35,10,38,214
1290 DATA35,133,34,173,96,1,41,248,761
1300 DATA101,34,133,34,173,97,1,101,674
1310 DATA35,133,35,172,94,1,240,7,717
1320 DATA109,92,1,133,35,144,39,74,627
1330 DATA102,34,74,102,34,74,102,34,556
1340 DATA109,92,1,133,35,32,54,1,457
1350 DATA160,0,132,35,10,38,35,10,420
1360 DATA38,35,10,38,35,133,34,165,488
1370 DATA35,109,93,1,133,35,173,95,674
1380 DATA1,41,7,168,173,96,1,41,528
1390 DATA7,170,32,54,1,10,202,16,492
1400 DATA252,96,120,165,1,72,165,35,906
1410 DATA41,127,201,16,144,11,201,32,773
1420 DATA176,7,105,192,133,35,169,251,1068
1430 DATA44,169,252,37,1,133,1,177,814
1440 DATA34,168,104,133,1,88,152,96,776
1450 DATA13,13,67,79,68,69,32,65,406
1460 DATA68,68,82,69,83,83,32,40,525
1470 DATA72,69,88,41,32,58,32,0,392
1480 DATA13,13,67,65,76,76,32,87,429
1490 DATA73,84,72,32,83,89,83,0,516
1500 DATA13,13,84,79,79,32,76,79,455
1510 DATA87,0,32,210,255,232,189,105,1110
1520 DATA9,208,247,96,90,45,25,62,782
1530 DATA61,255,124,75,100,4,20,113,752
1540 DATA164,167,248,110,159,172,239,56,1315
1550 DATA105,137,149,156,184,199,50,7,987
1560 DATA8,8,8,7,7,7,7,7,59
1570 DATA8,8,7,7,7,7,7,7,58
1580 DATA7,7,8,7,7,7,7,7,57
1590 DATA7,8,162,0,32,159,9,32,409
1600 DATA207,255,201,13,208,23,165,55,1127
1610 DATA233,98,133,55,133,34,165,56,907
1620 DATA233,1,133,56,133,35,208,55,854
1630 DATA169,63,76,210,255,162,0,134,1069
1640 DATA34,134,35,56,233,48,144,240,924
1650 DATA201,10,144,10,233,7,201,10,816
1660 DATA144,230,201,16,176,226,10,10,1013
1670 DATA10,10,162,4,10,38,34,38,306
1680 DATA35,176,213,202,208,246,32,207,1319
1690 DATA255,201,13,208,214,165,35,201,1292
1700 DATA11,176,5,162,40,76,159,9,638
1710 DATA162,26,189,165,9,133,36,189,909
1720 DATA192,9,133,37,24,160,254,177,986
1730 DATA36,121,36,255,145,36,200,208,1037
1740 DATA246,202,16,230,169,13,162,8,1046
1750 DATA133,36,134,37,160,0,177,36,713
1760 DATA145,34,200,208,4,230,35,230,1086
1770 DATA37,192,92,208,241,165,37,201,1173
1780 DATA9,208,235,162,24,32,159,9,838
1790 DATA166,35,202,138,166,34,32,205,978
1800 DATA189,32,68,166,108,2,160,0,725
2000 FORK=49152TO49792STEP8
2010 A=0:FORI=KTOK+7:READJ:POKEI,J:A=A+J:NEXT
2020 READJ:IFA<>JTHENPRINT"DATA ERROR IN LINE
     "(K-49152)/4*5+1000:STOP
```


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# PROGRAM FILE

```
2030 NEXT
2040 INPUT"SAVE TO DEVICE NO.";D
2050 IFD<1ORD=2ORD=3THEN2040
2060 OPEN1,3,0,"SCREENDUMP":POKE781,
2070 POKE251,0:POKE252,192
2080 POKE780,251:POKE781,167:POKE782,194:SYS65496
2090 IFPEEK(783)AND1THENPRINT
"SAVE UNSUCCESSFUL - TRY AGAIN"
2100 CLOSE1:END
```

```
INT
   PROG SP AC XR YR MR NV-BDIZC
   EA87 EA 37 DF 00 37 00100101
.M 33C 33C
          0C 0D 0E 0F 00 01 02 03
          04 05 06 07 08 09 0A 0B
.; 033C 01 00 C0 A7 C2 53 43 52
.X
READY.
LOAD"SCREENDUMP",8

SEARCHING FOR SCREENDUMP
LOADING
READY.
RUN

CODE ADDRESS (HEX) : C000

CALL WITH SYS49152
READY.
SYS49152
```

Renaissance

BY

LOUIS K SAVAIN

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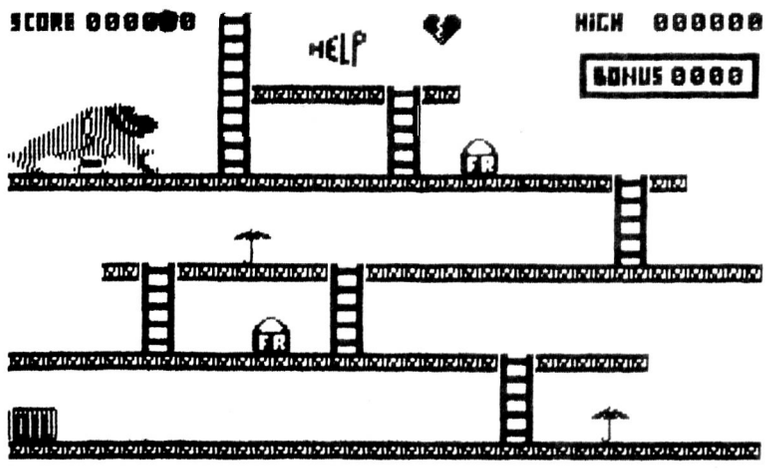

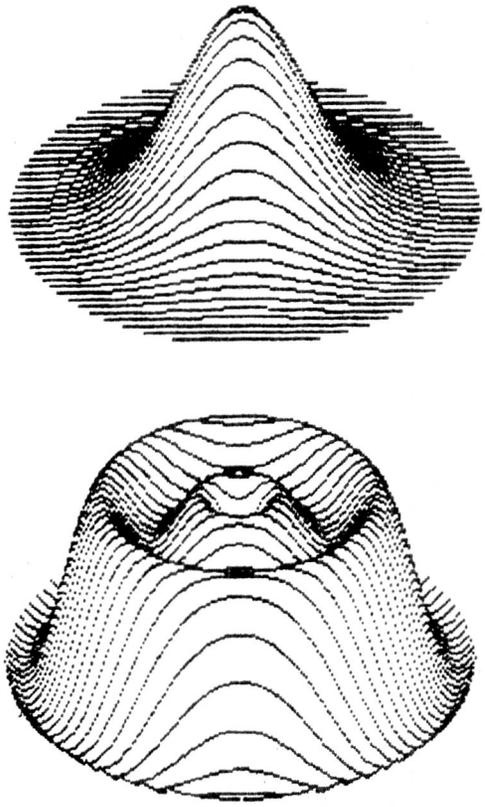

# QL 3D-Histogram Generator

## by Stewart Kessel

Although the QL is supplied with an excellent business graphics program, Easel, there's no facility within the package to represent figures in a 3D-histogram format. This program will accept a set of figures representing two years' data and plot them in 3D perspective against a grid.

With the use of SuperBasic the program is well structured, so it should be relatively easy to modify for such features as automatic scaling or height sorting of data.

The program should work on all QL's in both TV and monitor mode.

```
100 REMark **********************
110 REMark *                    *
120 REMark *  3D  HISTOGRAM     *
130 REMark *                    *
140 REMark *    GENERATOR       *
150 REMark *                    *
160 REMark *  Stewart  Kessel   *
170 REMark *                    *
180 REMark *  Copyright 1984    *
190 REMark **********************
200 MODE 4
210 PAPER #2,0:CLS #2:PAPER #1,0:CLS #1
220 WINDOW 1,450,240,31,0:PAPER 2:CLS:BORDER #1,2,7:SCALE #1,1023,0,0
230 init
240 getdata
250 MODE 8
260 WINDOW 1,450,240,31,0:PAPER 0:CLS:BORDER #1,2,5:SCALE #1,1023,0,0
270 grid
280 firstrow
290 secondrow
300 drawscale
```


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# PROGRAM FILE

```
310 key
320 GO TO 320
330 DEFine PROCedure firstrow
340 xpos=880:barno=1
350 FOR ypos=300 TO 80 STEP -20
360 IF h(1,barno) < h(2,barno)
361 height=h(2,barno):shade=1
362 ELSE
363 height=h(1,barno):shade=2
364 END IF
380 bar height*6,xpos,ypos,shade
390 xpos=xpos-50
400 barno=barno+1
410 END FOR ypos
420 END DEFine firstrow
430 DEFine PROCedure secondrow
440 xpos=918:barno=1
450 FOR ypos=280 TO 60 STEP -20
460 IF h(1,barno) < h(2,barno)
461 height=h(1,barno):shade=2
462 ELSE
463 height=h(2,barno):shade=1
464 END IF
480 bar height*6,xpos,ypos,shade
490 xpos=xpos-50
500 barno=barno+1
510 END FOR ypos
520 END DEFine secondrow
530 DEFine PROCedure grid:CLS:INK 7:FILL 0
540 FOR ygrid=100 TO 700 STEP 60
550 LINE 300,ygrid TO 900,ygrid+245
560 END FOR ygrid
570 inc=0
580 FOR xgrid=300 TO 900 STEP 50
590 LINE xgrid,100+inc TO xgrid,700+inc
600 inc=inc+20
610 END FOR xgrid
620 END DEFine  grid
630 DEFine PROCedure bar(h,x,y,shade)
640 REMark front
650 INK shade:FILL 1
660 LINE x,y TO (x+50),(y+20) TO (x+50),(y+20+h) TO x,(y+20+h) TO x,y
670 FILL 0
680 REMark top
690 INK 3:FILL 1
700 LINE x,(y+h) TO (x+50),(y+20+h) TO (x+20),(y+40+h) TO (x-30),
       (y+20+h) TO x,(y+h)
710 FILL 0
720 REMark side
730 INK shade:FILL 1
740 LINE x,y TO (x-30),(y+20) TO (x-30),(y+20+h) TO x,(y+h) TO x,y
750 FILL 0
760 REMark line up side
770 INK 0: LINE x+1,y+3 TO x+1,(y+h-3)
780 END DEFine bar
790 DEFine PROCedure init
800 DIM h(2,12)
810 DIM month$(12)
820 DIM myear$(12,9)
830 RESTORE 850
840 FOR n=1 TO 12:READ month$(n):END FOR n
850 DATA "J","F","M","A","M","J","J","A","S","O","N","D"
860 RESTORE 880
```

# PROGRAM FILE

```
870 FOR n=1 TO 12:READ myear$(n):END FOR n
880 DATA "January","February","March","April","May","June","July","August",
    "September","October","November","December"
890 END DEFine init
900 DEFine PROCedure key
910 bar 50,1150,300,1
920 bar 50,1150,100,2
930 CSIZE #1,3,1:INK 6
940 AT 6,21:PRINT"Key"
950 CSIZE #1,2,0
960 AT 22,28:PRINT histo1$
970 AT 17,28:PRINT histo2$
980 AT 21,18:PRINT "month":INK 7
990 AT 0,(32-LEN(title$))/2:INK 7:CSIZE 3,0:PRINT title$:CSIZE 2,0
1000 END DEFine
1010 DEFine PROCedure getdata
1020 INK 7:CSIZE 3,0:AT 1,3:PRINT"3D HISTOGRAM GENERATOR":CSIZE 0,0
1030 REPeat loop
1040 AT 3,3:PRINT"Title of graph (max 20 characters) ?";FILL$(" ",36)
1050 AT 3,40:INPUT title$
1060 IF LEN(title$) <=20 THEN EXIT loop
1070 END REPeat loop
1080 REPeat loop
1090 AT 5,3:PRINT"Title of histogram 1 (max 5 characters) ?";FILL$(" ",10)
1100 AT 5,45:INPUT histo1$
1110 IF LEN(histo1$)<=5 THEN EXIT loop
1120 END REPeat loop
1130 REPeat loop
1140 AT 7,3:PRINT"Title of histogram 2 (max 5 characters) ?";FILL$(" ",10)
1150 AT 7,45:INPUT histo2$
1160 IF LEN(histo2$)<=5 THEN EXIT loop
1170 END REPeat loop
1180 CSIZE 2,0:INK 0
1190 AT 9,4:PRINT"MONTH":AT 9,18:PRINT histo1$:AT 9,26:PRINT histo2$
1200 CSIZE 0,0:INK 7:row=0
1210 FOR table=12 TO 1 STEP -1
1220 AT 11+row,10:PRINT myear$(13-table)
1230 REPeat loop
1240 AT 11+row,38:PRINT FILL$(" ",5):AT 11+row,38:INPUT h(1,table)
1250 IF h(1,table) <= 100  AND h(1,table) >=0 THEN EXIT loop
1260 END REPeat loop
1270 REPeat loop
1280 AT 11+row,56:PRINT FILL$(" ",5):AT 11+row,56:INPUT h(2,table)
1290 IF h(2,table) <= 100 AND h(2,table) >=0 THEN EXIT loop
1300 END REPeat loop
1310 row=row+1
1320 END FOR table
1330 END DEFine getdata
1340 DEFine PROCedure drawscale
1350 INK 7
1360 REMark 0 to 100
1370 FOR scalepos=100 TO 700 STEP 60
1380 CURSOR 170,scalepos,0,0
1390 PRINT (scalepos-100)/6
1400 END FOR scalepos
1410 labely=50:dummy=1
1420 FOR labelx=400 TO 950 STEP 50
1430 CURSOR labelx,labely,0,0
1440 PRINT month$(dummy)
1450 labely=labely+20:dummy=dummy+1
1460 END FOR labelx
1470 END DEFine drawscale
```

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| AGF | Programmable Joystick | December 1983 |
| AMS | Disc Drive : 3in | January 1984 |
| Apple | Lisa | July 1983 |
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| **B** | | |
| British Micro | Mimi 801 | July 1982 |
| Brother | EP44 | April 1984 |
| **C** | | |
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| Canon | AS-100 | December 1983 |
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| Canon | X-07 | March 1984 |
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| Casio | 602p | May 1982 |
| Casio | FP-10 Printer | April 1982 |
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| Compudata | Tulipsystem 1 | October 1983 |
| Conchess | Monarch/Ambassador/ Escourter | March 1983 |
| Corvus | Concept | March 1983 |
| Currah | Microspeech Unit | January 1984 |
| **D** | | |
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| DCP Microdevelopments | Speech Pack | August 1982 |
| Digihurst | Microsight 1 | October 1983 |
| Digital Equipment | Rainbow 100 | November 1982 |
| Dragon Data Ltd | Dragon 32 | August 1982 |
| **E** | | |
| Eaca International | Colour Genie | June 1983 |
| Electroni-Kit | FX System | November 1983 |
| Electroplay | My Talking Computer | November 1983 |
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| Epson | HX-20 | December 1982 |
| Epson | FX-80 | July 1983 |
| Epson | PX-8 | June 1984 |
| **F** | | |
| Ferranti | Argus PPC | November 1983 |
| Fidelity | Prestige | February 1983 |
| Fortune | Fortune 32:16 | August 1983 |
| Future | FX20 | October 1983 |
| **G** | | |
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| GCE | Vectrex System | August 1983 |
| GCS | Ferrett | June 1984 |
| Gemini | Multiboard | February 1982 |
| GRiD | Compass | June 1984 |
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| Hewlett-Packard | 15C and 16C | September 1982 |
| **H** | | |
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| Hewlett-Packard | HP-125 | April 1982 |
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| **I** | | |
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| IBM | PC Junior | March 1984 |
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| IO Research Ltd | Pluto | December 1982 |
| **J** | | |
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| Jupiter Cantab | Ace | January 1983 |
| **L** | | |
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## T

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| PROGRAM | ISSUE |
|---|---|
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| 1-2-3 | November 1983 |
| 1982 Database Roundup | December 1982 |
| 1983 Database Roundup | December 1983 |
| 1983 Spreadsheet Roundup | December 1983 |
| **A** | |
| Accountancy Programs (General) | June 1983 |
| Aquila | September 1982 |
| **B** | |
| Benchmarks Explained (Reference Article) | January 1984 |
| Beta | August 1983 |
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| **C** | |
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| **D** | |
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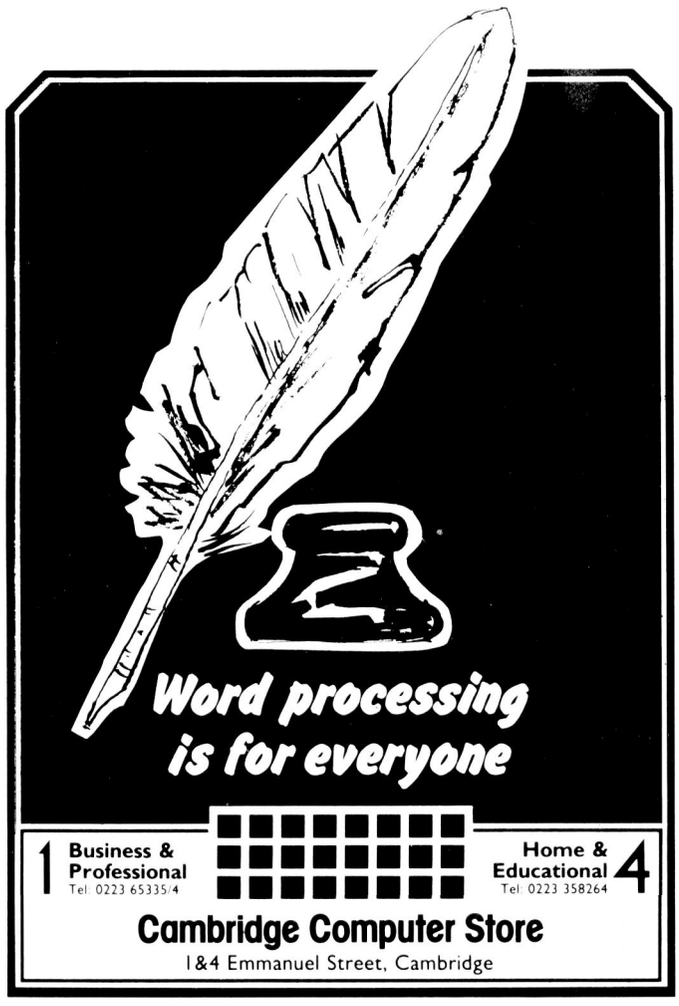





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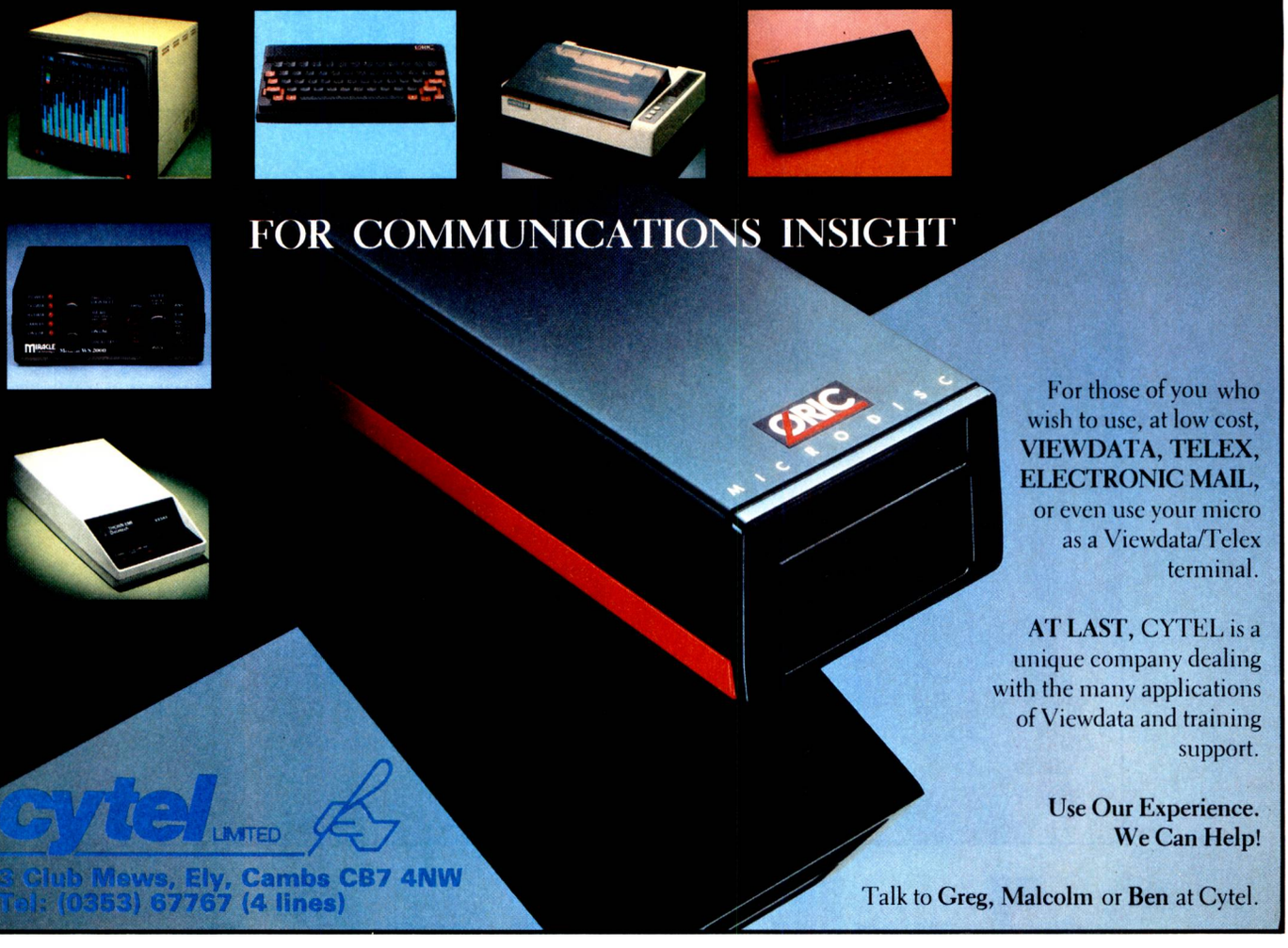


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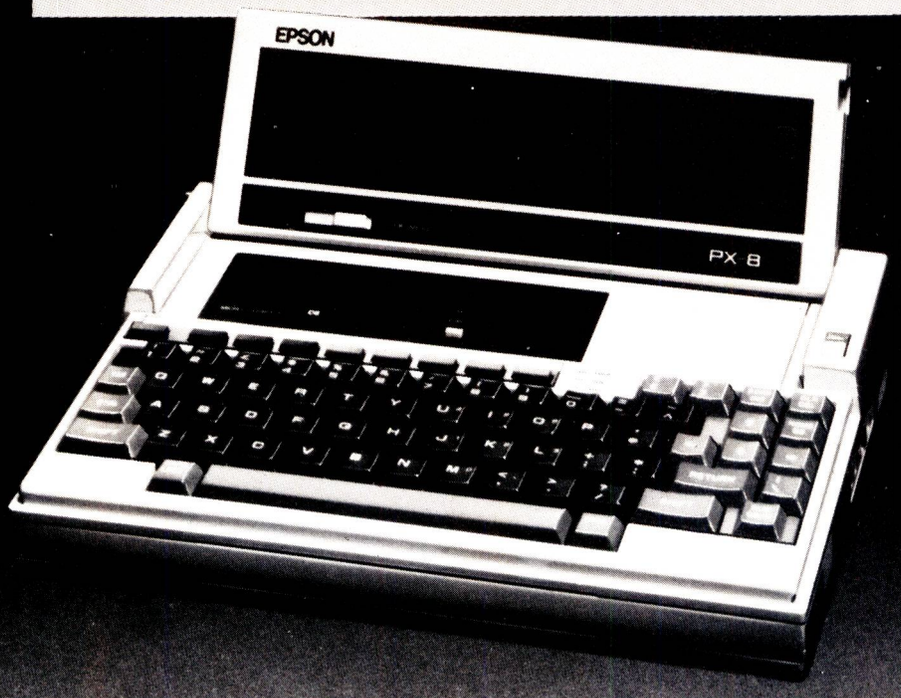


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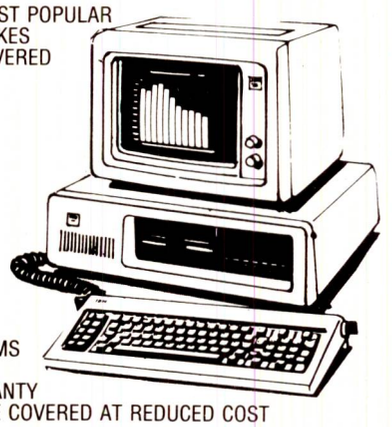

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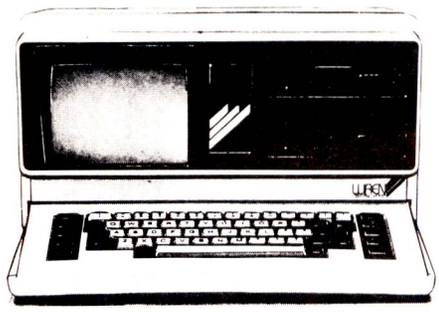

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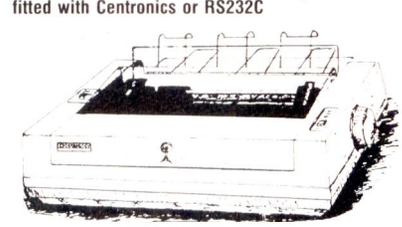

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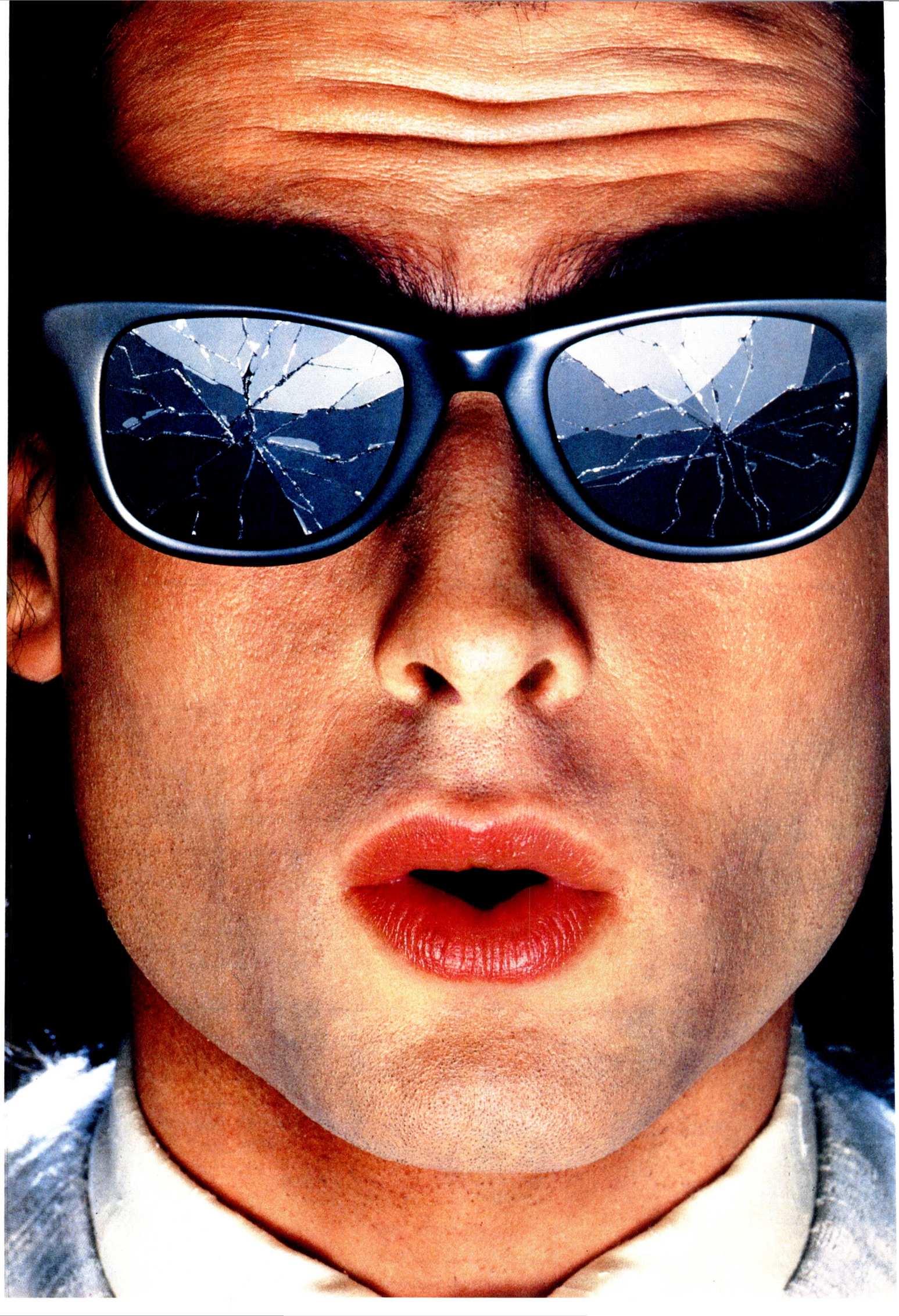

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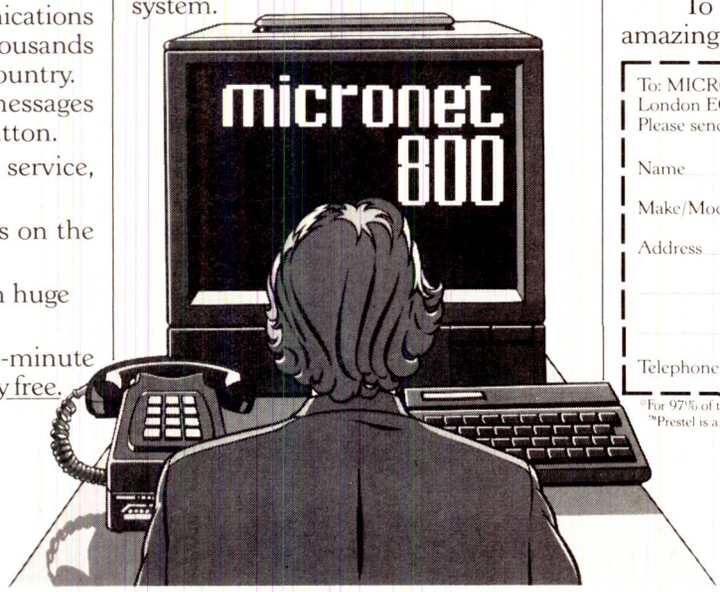


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**Bromley.** Computers Today, 31 Market Square. Tel: 01-290 5652.
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**Bromley.** Walters Computers, Army & Navy, 64 High Street. Tel: 01-460 9991.
**Chatham.** Boots, 30-34 Wilmott Square, Pentagon Centre. Tel: 0634 405471.
**Sevenoaks.** Ernest Fielder Computers, Dorset Street. Tel: 0732 456800.
**Sittingbourne.** Computer Plus, 65 High Street. Tel: 0795 25677.
**Tunbridge Wells.** Modata Computer Centre, 28-30 St Johns Road. Tel: 0892 41555.

### LANCASHIRE

**Blackburn.** Tempo Computers, 9 Railway Road. Tel: 0254 691333.
**Blackpool.** Blackpool Computer Store, 179 Church Street. Tel: 0253 20239.
**Burnley.** IMO Business Systems, 39-43 Standish Street. Tel: 0282 54299.
**Preston.** 4Mat Computing, 67 Friargate. Tel: 0772 561952.
**Preston.** Laskys, 1-4 Guildhall Arcade. Tel: 0772 24558.
**Wigan.** Wildings Computer Centre, 11 Mesnes Street. Tel: 0942 44382.

### LEICESTERSHIRE

**Leicester.** Boots, 30-36 Gallowtree Gate. Tel: 0533 21641.
**Market Harborough.** Harborough Home Computers, 7 Church Street. Tel: 0858 63056.

### LONDON

**W1.** Computers of Wigmore Street, 104 Wigmore Street. Tel: 01-486 0373.
**W1.** HMV, 363 Oxford Street. Tel: 01-629 1240.
**W1.** John Lewis, Oxford Street. Tel: 01-629 7711.
**W1.** Laskys, 42 Tottenham Court Road. Tel: 01-636 0845.
**W1.** Lion House, 227 Tottenham Court Road. Tel: 01-637 1601.
**W1.** Rother Cameras, 256 Tottenham Court Road Tel: 01-580 5826.
**W1.** The Video Shop, 18 Tottenham Court Road. Tel: 01-580 5380.
**W1.** Walters Computers, DH Evans, Oxford Street. Tel: 01-629 8800.
**WC1.** Transam Micro Systems, 59-61 Theobalds Road. Tel: 01-405 5240.
**W5.** Laskys, 18-19 Ealing Broadway Shopping Centre. Tel: 01-567 4717.
**W8.** Walters Computers, Barkers, Kensington High Street. Tel: 01-937 5432.
**SW1.** Peter Jones, Sloane Square. Tel: 01-730 3434.
**SE9.** Square Deal, 373-375 Footscray Road, New Eltham. Tel: 01-859 1516.
**Lewisham.** Laskys, 164 High Street. Tel: 01-852 1375.
**SE13.** Walters Computers, Army & Navy, 33 and 63 High Street, Lewisham. Tel: 01-852 4321.
**SE15.** Castlehurst Ltd, 152 Rye Lane, Peckham. Tel: 01-639 2205.
**EC2.** Devron Computer Centre, 155 Moorgate. Tel: 01-638 3339.
**N7.** Jones Brothers, Holloway Road. Tel: 01-607 2727.
**N14.** Logic Sales, 19 The Bourne, The Broadway, Southgate. Tel: 01-882 4942.
**NW3.** Maycraft Micros, 58 Rosslyn Hill, Hampstead. Tel: 01-431 1300.
**NW4.** Davinci Computer Store, 112 Brent Street, Hendon. Tel: 01-202 2272.
**NW7.** Computers Inc, 86 Golders Green. Tel: 01-209 0401.
**NW10.** Technomatic, 17 Burnley Road, Wembley. Tel: 01-208 1177.

### MANCHESTER

**Manchester.** Boots, 32 Market Street. Tel: 061-832 6533.
**Manchester.** Laskys, 61 Arndale Centre. Tel: 061-833 9149.
**Manchester.** Laskys, 12-14 St Marys Gate. Tel: 061-833 0268.
**Manchester.** Mighty Micro, Sherwood Centre, 268 Wilmslow Road, Fallowfield. Tel: 061-224 8117.
**Manchester.** NSC Computer Shops, 29 Hanging Ditch. Tel: 061-832 2269.
**Oldham.** Home & Business Computers, 54 Yorkshire Street. Tel: 061-633 1608.
**Swinton.** Mr Micro, 69 Partington Lane. Tel: 061-728 2282.

### MERSEYSIDE

**Heswall.** Thornguard Computer Systems, 46 Pensby Road. Tel: 051-342 7516.
**Liverpool.** George Henry Lee, Basnett Street. Tel: 051-709 7070.
**Liverpool.** Hargreaves, 31-37 Warbreck Moor, Walton. Tel: 051-525 1782.
**Liverpool.** Laskys, Dale Street. Tel: 051-236 3298.
**Liverpool.** Laskys, St Johns Precinct. Tel: 051-708 5871.
**St Helens.** Microman Computers, Rainford Industrial Estate, Mill Lane, Rainford. Tel: 0744 885242.
**Southport.** Central Studios, 38 Eastbank Street. Tel: 0704 31881.

### MIDDLESEX

**Enfield.** Laskys, 44-48 Palace Garden Shopping Centre. Tel: 01-363 6627.
**Harrow.** Camera Arts, 42 St Anns Road. Tel: 01-427 5469.
**Hounslow.** Boots, 193-199 High Street. Tel: 01-570 0156.
**Teddington.** Andrews, Broad Street. Tel: 01-977 4716.
**Twickenham.** Twickenham Computer Centre, 72 Heath Road. Tel: 01-892 7896.
**Uxbridge.** JKL Computers, 7 Windsor Street. Tel: 0895 51815.

### NORFOLK

**Norwich.** Bonds, All Saints Green. Tel: 0603 24617.

### NOTTINGHAMSHIRE

**Sutton in Ashfield.** H N & L Fisher, 87 Outram Street. Tel: 0623 54734.
**Nottingham.** Jessops, Victoria Centre. Tel: 0602 418282.
**Nottingham.** Laskys, 1-4 Smithy Row. Tel: 0602 413049.

### OXFORDSHIRE

**Abingdon.** Ivor Fields Computers, 21 Stert Street. Tel: 0235 21207.
**Banbury.** Computer Plus, 2 Church Lane. Tel: 0295 55890.
**Oxford.** Science Studio, 7 Little Clarenden Street. Tel: 0865 54022.

### SCOTLAND

**Edinburgh.** Boots, 101-103 Princes Street. Tel: 031-225 8331.
**Edinburgh.** John Lewis, St James Centre. Tel: 031-556 9121.
**Edinburgh.** Laskys, 4 St James Centre. Tel: 031-556 1864.
**Glasgow.** Boots, 200 Sauchiehall Street. Tel: 041-332 1925.
**Glasgow.** Boots, Union Street and Argyle Street. Tel: 041-248 7387.

### SHROPSHIRE

**Telford.** Telford Electronics, 38 Mall 4. Tel: 0952 504911.

### STAFFORDSHIRE

**Newcastle-under-Lyme.** Computer Cabin, 24 The Parade, Silverdale. Tel: 0782 636911.
**Stafford.** Computerama, 59 Foregate Street. Tel: 0785 41899.
**Stoke-on-Trent.** Computerama 11 Market Square Arcade, Hanley. Tel: 0782 268524.

### SUFFOLK

**Bury St Edmunds.** Boots, 11-13 Cornhill. Tel: 0284 701516.
**Ipswich.** Brainwave Micros, 24 Crown Street. Tel: 047 350965.

### SURREY

**Croydon.** Laskys 77-81 North End. Tel: 01-681 8443.
**Croydon.** The Vision Store, 96-98 North End. Tel: 01-681 7539.
**South Croydon.** Concise Computer Consultants, 1 Carlton Road. Tel: 01-681 6842.
**Epsom.** The Micro Workshop, 12 Station Approach. Tel: 0372 721533.
**Guildford.** Walters Computers, Army & Navy, 105-111 High Street. Tel: 0483 68171.
**Haslemere.** Haslemere Computers, 17 Lower Street. Tel: 0428 54428.
**Wallington.** Surrey Micro Systems, 53 Woodcote Road. Tel: 01-647 5636.
**Woking.** Harpers, 71-73 Commercial Way. Tel: 0486 225657.

### SUSSEX

**Bexhill-on-Sea.** Computerware, 22 St Leonards Road. Tel: 0424 223340.
**Brighton.** Boots, 129 North Street. Tel: 0273 27088.
**Brighton.** Gamer, 71 East Street. Tel: 0273 728681.
**Brighton.** Laskys, 151-152 Western Road. Tel: 0273 725625.
**Crawley.** Gatwick Computers, 62 The Boulevard. Tel: 0293 37842.
**Crawley.** Laskys, 6-8 Queensway. Tel: 0293 544622.

### TYNE & WEAR

**Newcastle-upon-Tyne.** Bainbridge, Eldon Square. Tel: 0632 325000.
**Newcastle-upon-Tyne.** Boots, Eldon Square. Tel: 0632 329844.
**Newcastle-upon-Tyne.** Laskys, 6 Northumberland Street. Tel: 0632 617224.
**Newcastle-upon-Tyne.** RE Computing, 12 Jesmond Road. Tel: 0632 815580.

### WALES

**Aberdare.** Inkey Computer Services, 70 Mill Street, The Square, Trecynon. Tel: 0685 881828.
**Aberystwyth.** Aberdata at Galloways, 23 Pier Street. Tel: 0970 615522.
**Cardiff.** Boots, 26 Queens Street & 105 Frederick Street. Tel: 0222 31291.
**Cardiff.** P & P Computers, 41 The Hayes. Tel: 0222 26666.
**Swansea.** Boots, 17 St Marys Arcade, The Quadrant Shopping Centre. Tel: 0792 43461.

### WARWICKSHIRE

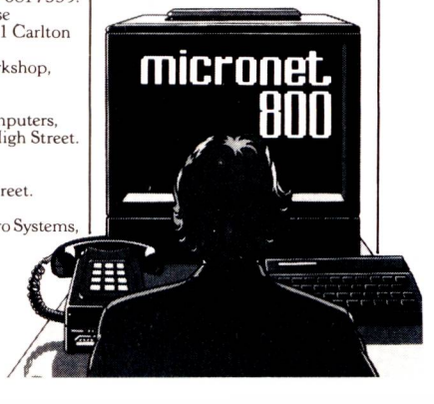
**Coventry.** Coventry Micro Centre, 33 Far Gosford Street. Tel: 0203 58942.
**Coventry.** JBC Micro Services, 200 Earlsdon Avenue, North Earlsdon. Tel: 0203 73813.
**Coventry.** Laskys, Lower Precinct. Tel: 0203 27712.
**Leamington Spa.** IC Computers, 43 Russell Street. Tel: 0926 36244.
**Leamington Spa.** Leamington Hobby Centre, 121 Regent Street. Tel: 0926 29211.
**Nuneaton.** Micro City, 1a Queens Road. Tel: 0203 382049.
**Rugby.** OEM Computer Systems, 9-11 Regent Street. Tel: 0788 70522.

### WEST MIDLANDS

**Birmingham.** Boots, City Centre House, 16-17 New Street. Tel: 021-643 7582.
**Birmingham.** Laskys, 19-21 Corporation Street. Tel: 021-632 6303.
**Dudley.** Central Computers, 35 Churchill Precinct. Tel: 0384 238169.
**Stourbridge.** Walters Computer Systems, 12 Hagley Road. Tel: 0384 370811.
**Walsall.** New Horizon, 1 Goodall Street. Tel: 0922 24821.
**West Bromwich.** D S Peakman, 7 Queens Square. Tel: 021-525 7910.
**Wolverhampton.** Laskys, 2 Wulfrun Square. Tel: 0902 714568.

### YORKSHIRE

**Bradford.** Boots, 11 Darley Street. Tel: 0274 390891.
**Leeds.** Boots, 19 Albion Arcade, Bond Street Centre. Tel: 0532 33551.
**Sheffield.** Cole Brothers, Barkers Pool. Tel: 0742 78511.
**Sheffield.** Laskys, 58 Leopold Street. Tel: 0742 750971.
**York.** York Computer Centre, 7 Stonegate Arcade. Tel: 0904 641862.



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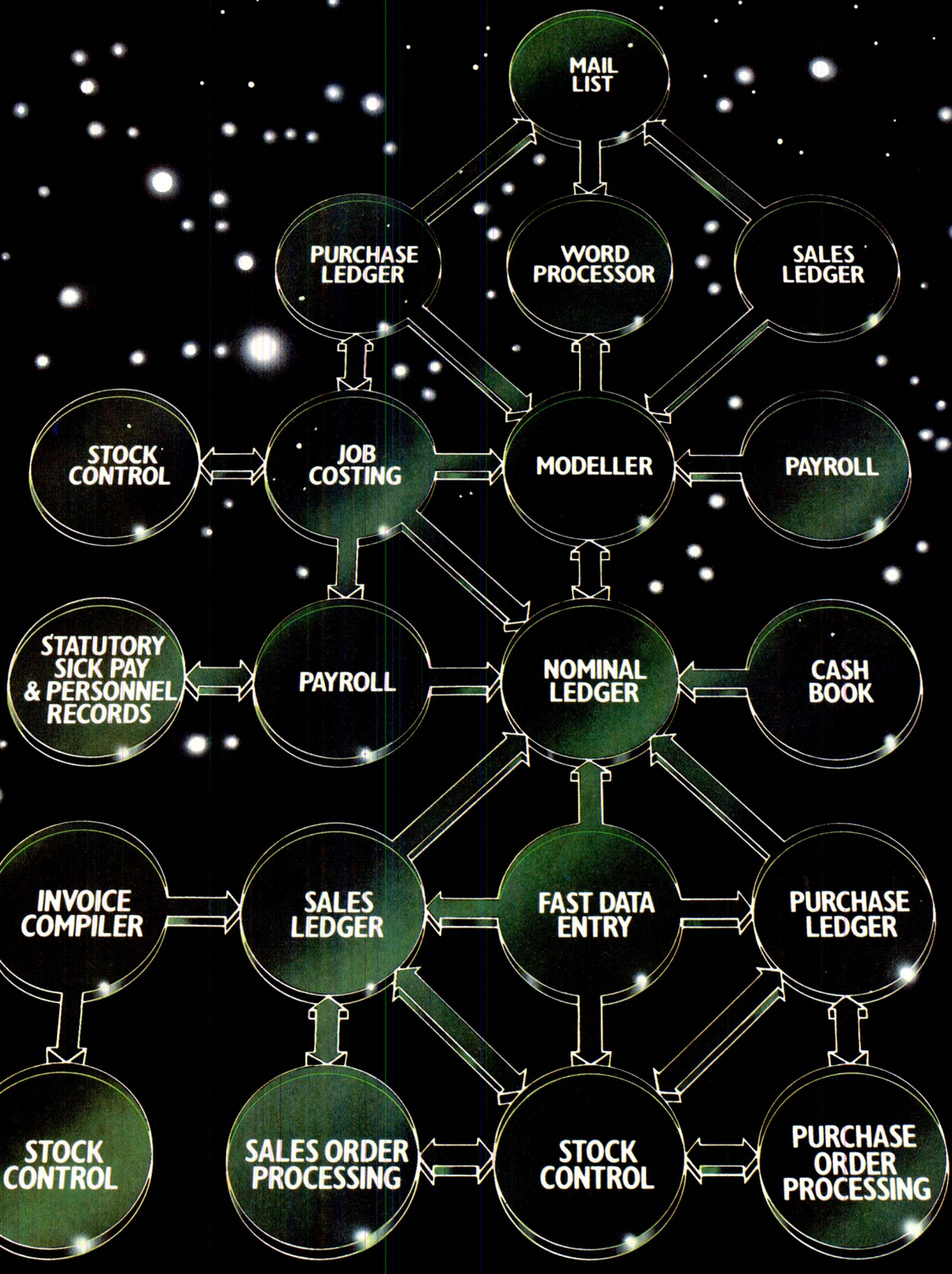


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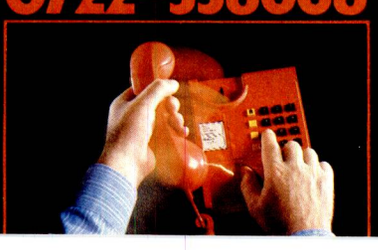



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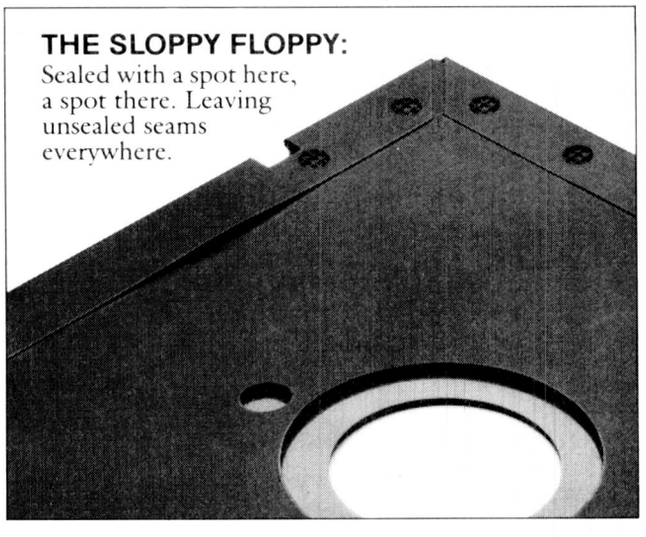

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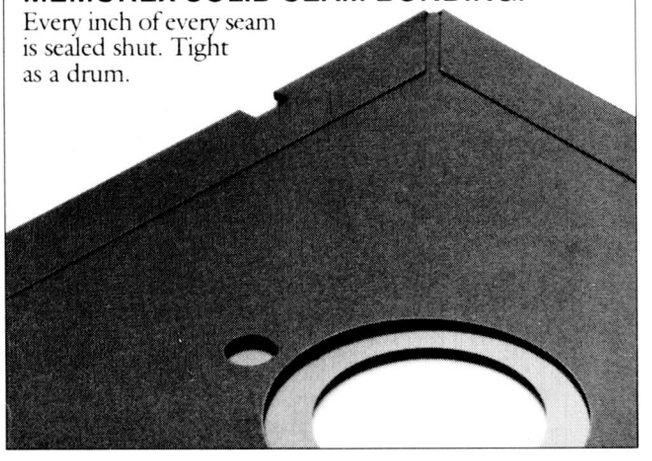

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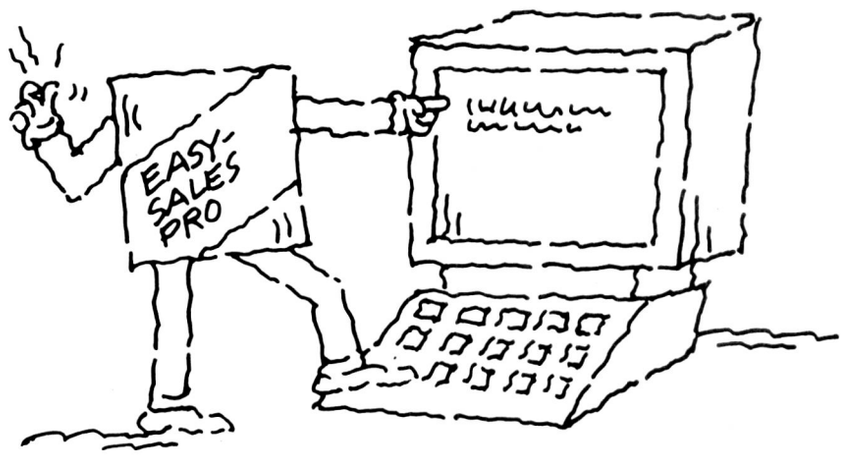


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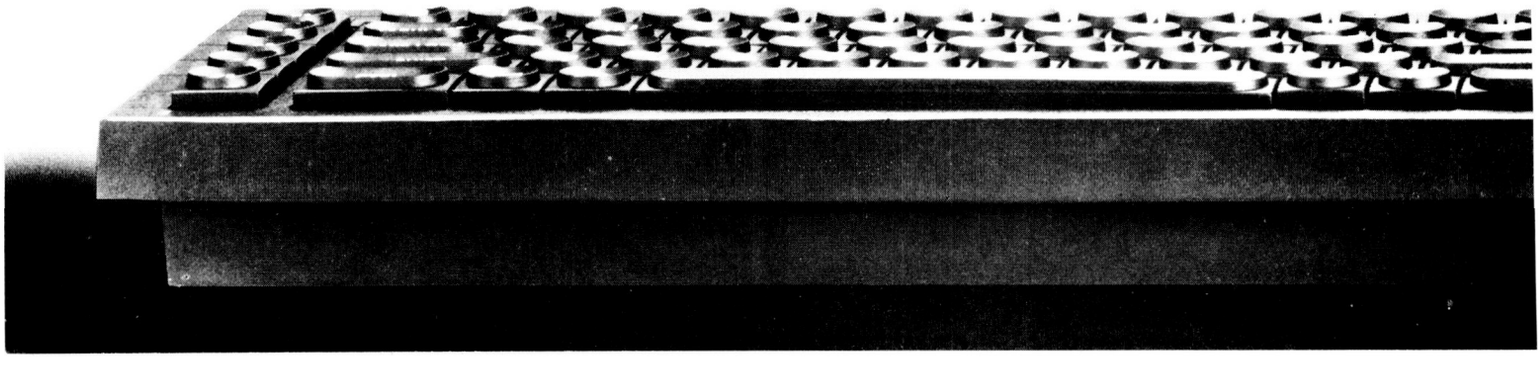

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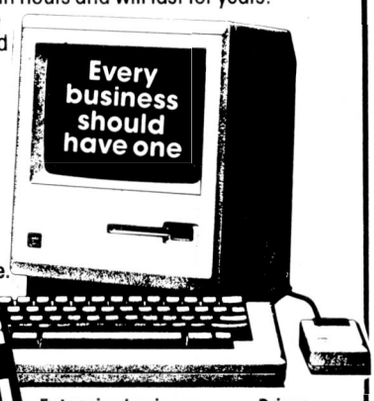


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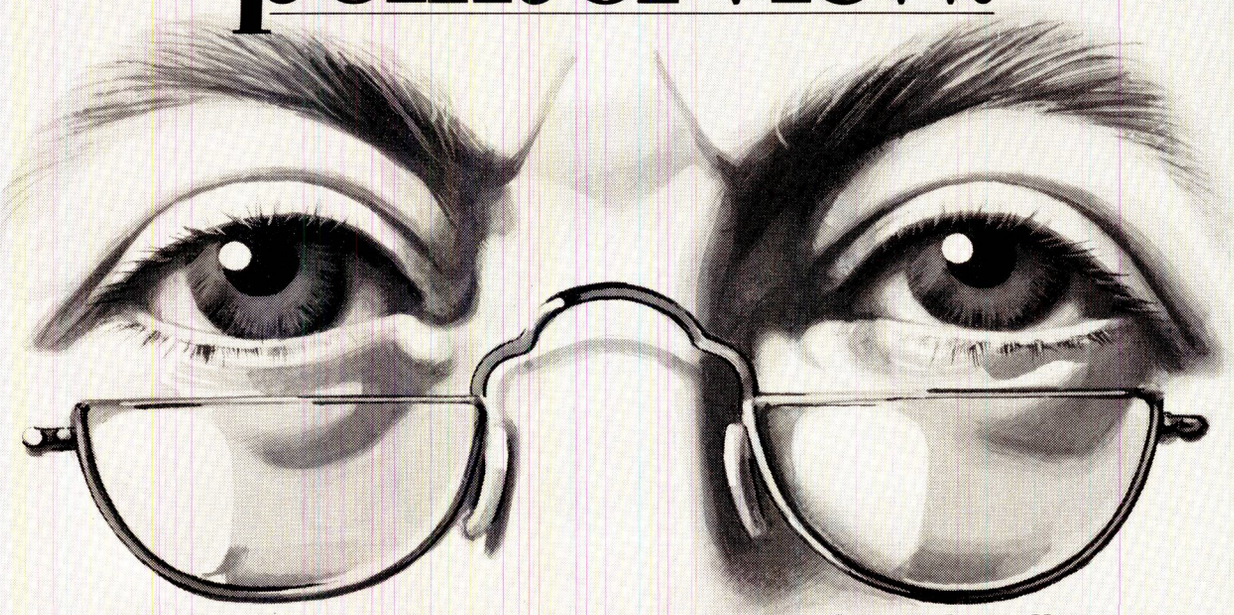

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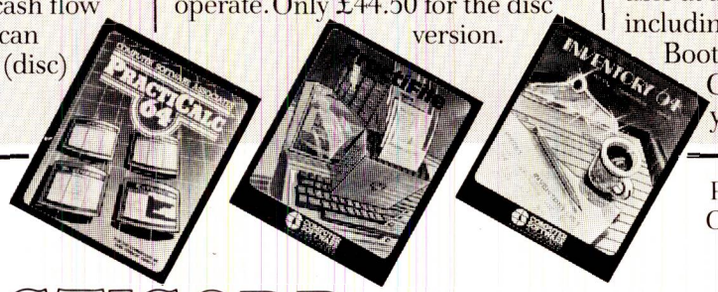


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# BRITISH MICRO COMPUTING AWARDS



# 1985

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Here's your chance to contribute to the most important event of the microcomputing calendar – The British Microcomputing Awards 1985.
Recognised as the Oscars of the industry, the awards are organised by VNU – publisher of Micro Decision, Personal Computer News, Personal Computer World, Commodore and Sinclair Answers, Personal Computer Games and What Micro? – The Sunday Times and Thames Television's 'Database', which will televise the event.

The BMA 1985 is looking for technological excellence and value for money. Who do you think deserves to win these highest of accolades? Fill in the nomination form and let us know. Your nominations will be carefully considered by a team of experts from this magazine who will then forward a shortlist to two independent panels of judges.

The winners of the eleven categories will be announced at the Awards Ceremony next June and they will each receive the unique BMA trophy. The ceremony will also make a series of special commendations for computer projects of social importance. There will be a major presentation to Concerned Micros in Education and Training (COMET), the charity established by the BMA 1984, to aid disabled young people.

Complete the nomination form opposite and you could join the top names of the industry at the prestigious Awards Ceremony in London next June

The judges will be looking for a number of important qualities in all the products nominated. These include value for money, ease of use, flexibility and innovation. Colour, sound and speed, as well as software support will be other key considerations in judging the hardware, and use of the machine in the software categories. The judges will also be looking at the consumer support service offered. There are however, certain specific requirements:

**1. Business Microcomputer & Business Microcomputer of the Year.** The machine must cost less than MRP £5000 including operating systems, CPU, keyboard, disks and monitor. It must be disk based, come with at least a 90-day guarantee and have a wide range of business software.

**2. Business Software & Business Software of the Year.** Software should be disk based with a MRP of less than £1000 per package or module.

**3. Home Microcomputer & Home Microcomputer of the Year.** The machine must not cost more than MRP £500

**4. Home Software & Home Software of the Year.** Software must not cost more than MRP £50.

**RULES 1.** Categories 1-5. Manufacturers may nominate their own products which need not have been made in Britain but all products must have been available for purchase from retail outlets in the UK by January 31st 1985.

**2.** Categories 6-9,ii. Manufacturers may nominate their own products which need not have been made in Britain, but all products must have been available for purchase from retail outlets in the UK between 1st November 1983 and January 31st 1985.

**3.** Employees of VNU Business Publications BV, The Organisers, The Sponsors or any individuals associated with the British Microcomputer Awards are not eligible to place a nomination with the exception of the six VNU title judging panels which may each nominate up to six entries.

**4.** The decision of the judges is final and no correspondence will be entered into.

**5.** All nominations must be received by noon February 15th 1985.

Enter your nomination for each category and explain, in not more than 30 words, the reasons for your choice, using another sheet of paper if necessary. You should consider carefully the guidelines given for each category.

**Category 1:** Business Microcomputer_____

**Category 2:** Business Software_____

**Category 3:** Home Microcomputer_____

**Category 4:** Home Software_____

**Category 5:** Educational Software_____

**Category 6:** Game of the Year_____

**Category 7:** Peripheral of the Year_____

**Category 8:** **(i)** Home Software of the Year_____

**(ii)** Business Software of the Year_____

**Category 9:** **(i)** Home Microcomputer of the Year

**(ii)** Business Microcomputer of the Year_____

**Name**_____

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MICRO BRITISH COMPUTING AWARDS 1985

Send your nominations to:
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Nomination forms must reach the Awards Office by noon, Friday 15th February 1985. Nominations cannot be accepted after this date.

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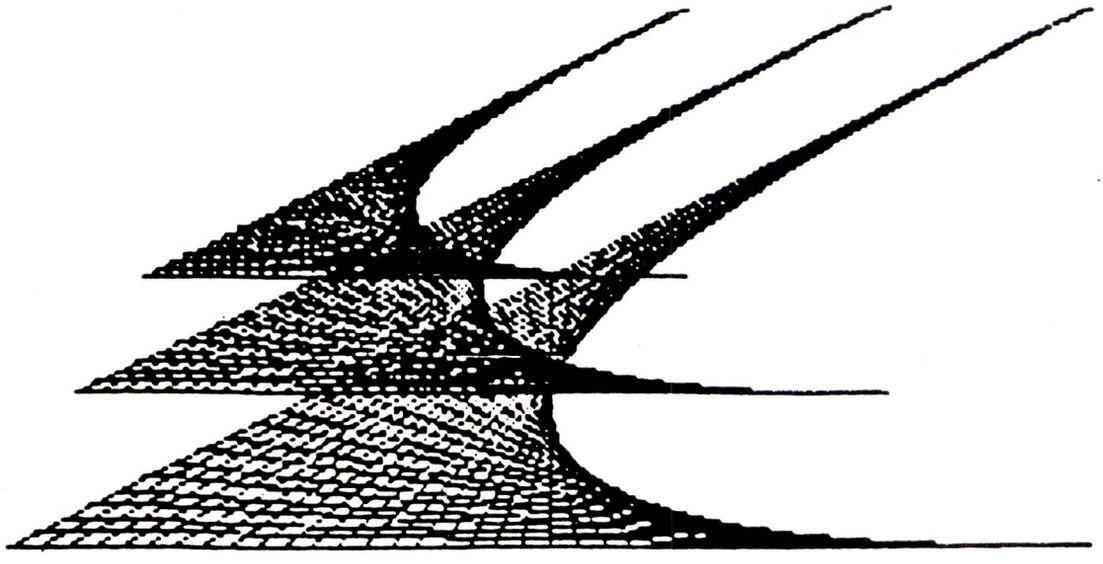

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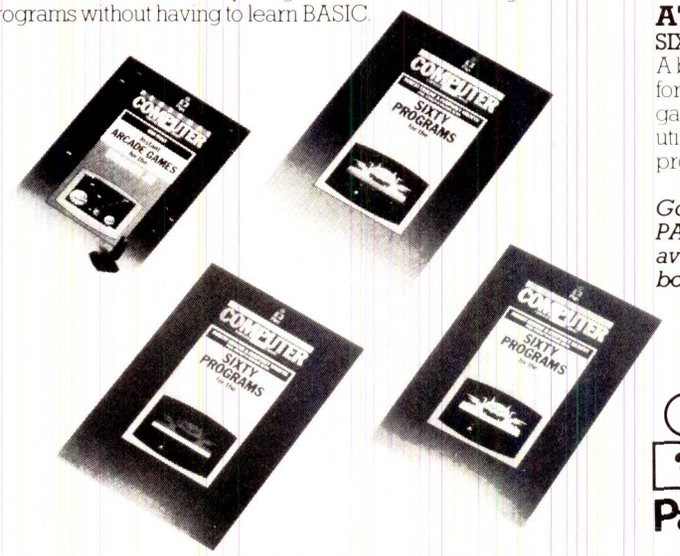


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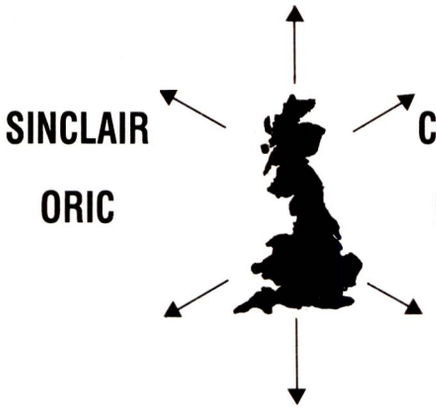


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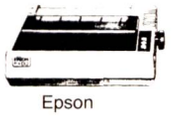

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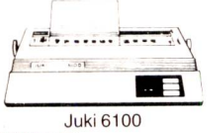

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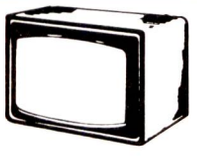

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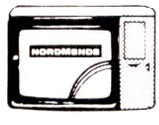


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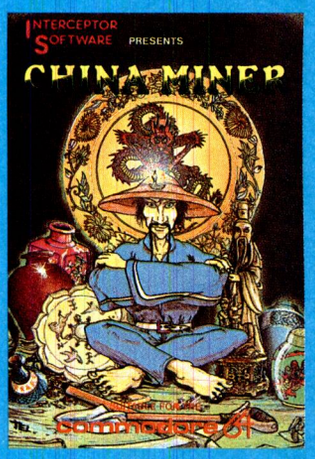


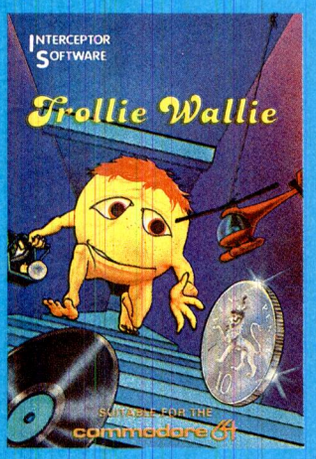


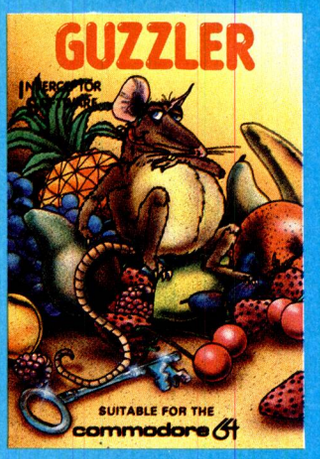


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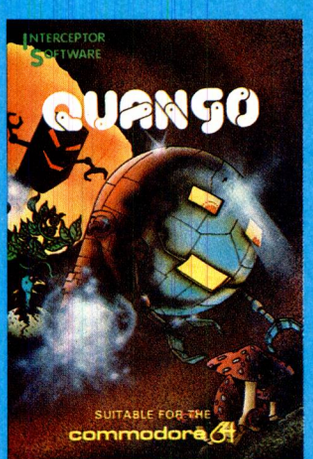


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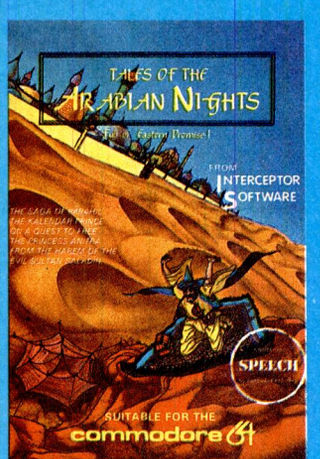


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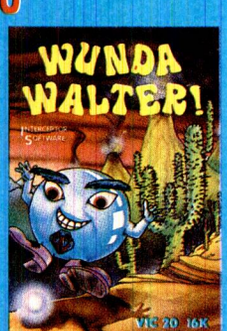


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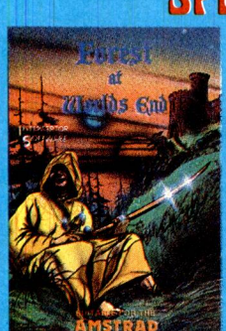


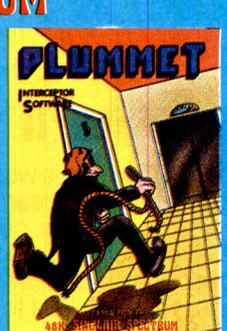


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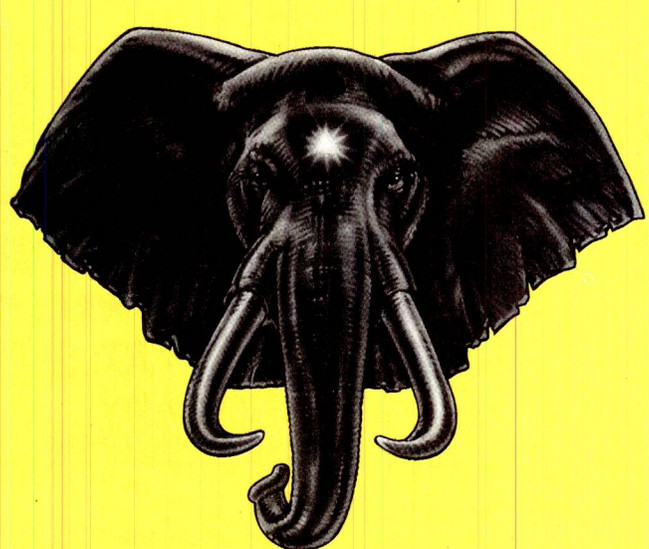

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Dear Microfans,
We have used MSX since its release in Japan last year. You will have read the articles in MSX USER about us going to Japan to meet the inventor of MSX and see the MSX manufacturers. We are acknowledged as experts in Japanese computers by TOSHIBA, SANYO, MITSUBISHI, AND SHARP who all buy KNIGHTS programs. We are also enthusiasts and will always help you — no other firm can match us for service or value for money.

We have special deals on Sharp — where else can you get a fast, reliable, 76K colour computer with a proper keyboard for £129. We have now released a FORTRAN compiler tape for the MZ700 series — the cost is £25 and that includes 10 FORTRAN programs. FORTRAN commands include Colour, Box, Fill, Sound, Joy etc.

Ring or write and we will rush you full details of our unbeatable deals. If you are really desperate ring us with your Access or Visa number as we can usually deliver anywhere in the U.K. within 24 hours. We have sold thousands of Japanese products Worldwide in the last 10 years and have never charged for a single repair. We guarantee to beat any competitors price on the spot. For personal service ring and ask for Graham or Neil.

happy computing, Graham Knight and Neil Hunter

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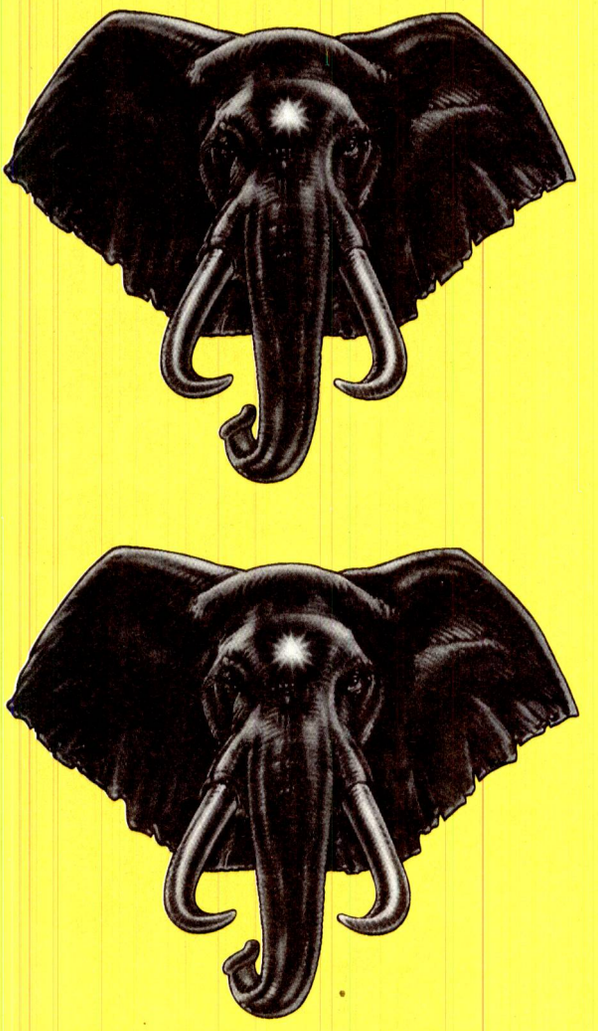

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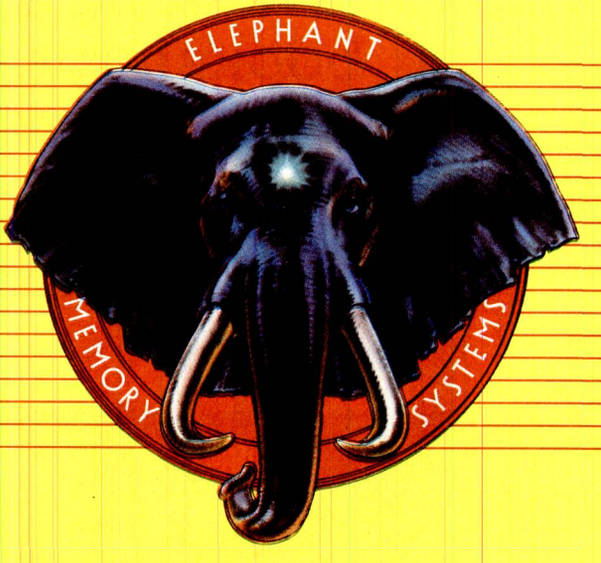

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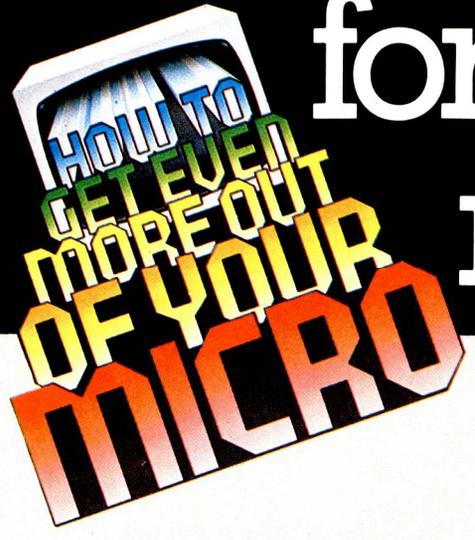
# Computer books with pages of possibilities for your micro.

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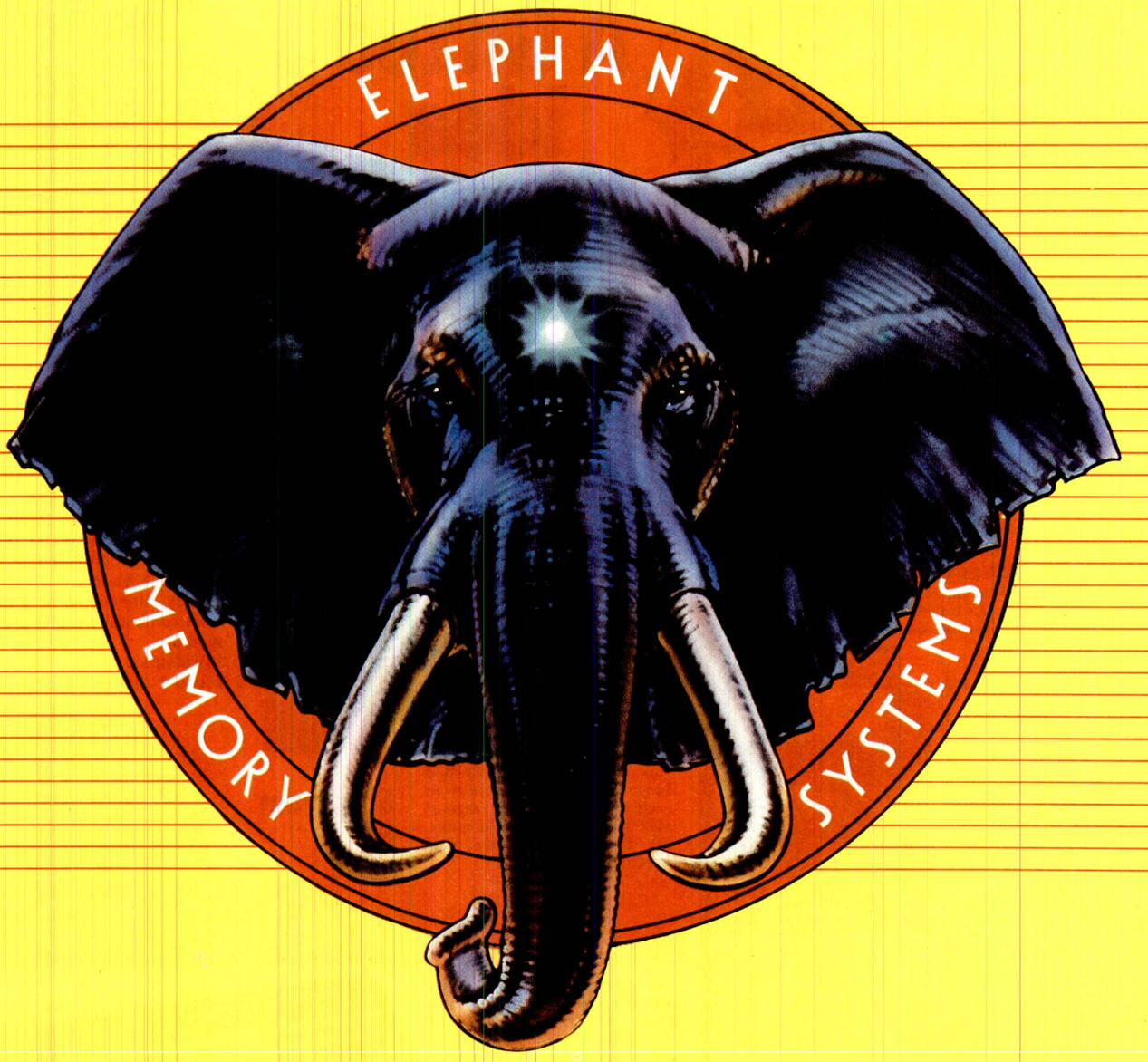


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**Spectrum's own magazine for home and small business computers**

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It's packed with illustrations and descriptions of just about everything you're likely to need in home micro hardware, add-ons and accessories. Plus there's information on current software, and hints and tips from experts about home computing.

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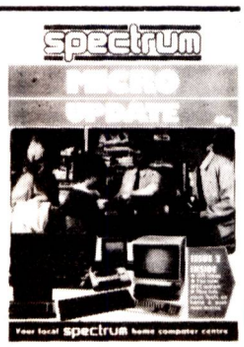


## New Products

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| BBC Emulator for CBM 64 | £13.95 |
| Timex Spectrum Keyboard | £14.95 |
| Omega Data Recorder | £24.95 |
| Commodore 1531 Data Recorder | £44.99 |
| Entrepo Quick Data Drive for CBM 64 | £79.95 |
| Koala Pad for CBM 64 | £79.95 |
| Datafax Disk Interface | £79.95 |
| Psion Organiser | £99.95 |
| Rotronics Wafadrive | £129.95 |
| ZX Spectrum Plus | £179.95 |
| Goldsatr MSX | £239.99 |
| Canon V20 MSX | £279.95 |
| Sanyo MPC 100 MSX | £299.95 |
| Commodore Plus 4 | £299.99 |

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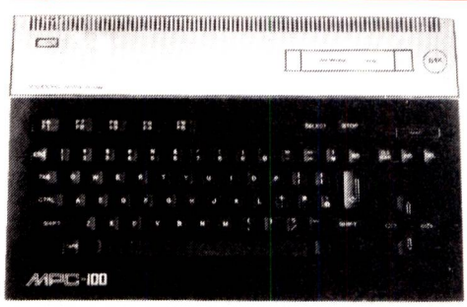
## Sanyo MPC 100 MSX




- Central processing Z80A
- Language MSX-Basic (built-in)
- 32KB MSX - Basic ROM 16KB user RAM (28,815 programmable when using MSX basic)
- 73 Key, alphanumeric, graphics & code combinations giving 256 symbols
- 16 colours
- Sound 3 channels, 8 octaves

This smart, superbly finished Sanyo PMC100 MSX micro is an exciting addition to the range of MSX computers available today. Ask to see it at your local Spectrum dealer NOW!

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An excellent 64K RAM MSX micro with 32K of ROM and a 16K Video RAM. All the benefits of standardised MSX software, 8-octave sound and super colour graphics!

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"Without doubt the best value MSX Machine"

# GOLDSTAR MSX




## "This is the one"

## "It's unlikely that you'll find a better MSX bargain"

## "I could imagine choosing this as my MSX machine"

(MSX user Dec '84)

## "At less than £240 the Goldstar is a positive bargain"

(What MSX Nov/Dec '84)

Yes—the exciting new world of MSX computing is now here, with the superb new Goldstar MSX micro! And just look at the rave reviews it's received from the press.

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. Its sixteen vivid colours and eight octaves of sound make it a great games player's micro, and there's a powerful Z-80A processor to take on a world of home or 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 Spectrum dealer NOW!

- General purpose MSX micro
- Powerful 64K user RAM
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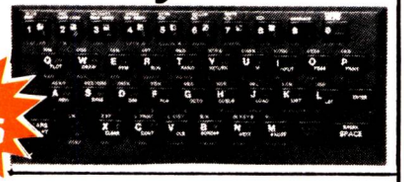

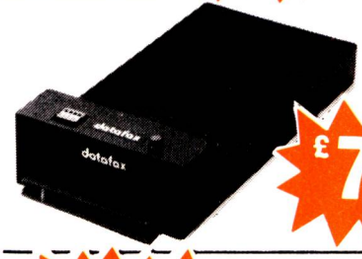

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**£79.95**

## Datafax Disk Interface

**For ZX Spectrum**
**ZX Spectrum Plus**

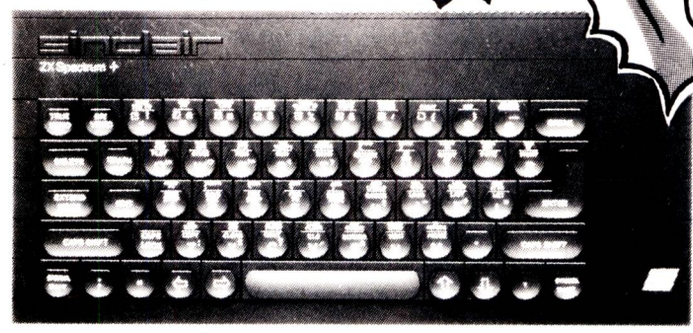
Disk interface allows you to run 3"/3½" or 5¼" Disk Drives with your ZX Spectrum or ZX Spectrum Plus. Ask to see it at your local Spectrum Dealer NOW.

**£99.95**

## Sinclair Expansion Pack

Increase the power of your Sinclair 16K Spectrum dramatically—with this neat expansion pack. Boosts the RAM capacity to a powerful 48K to run the top games software.

## The very latest



# 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**

## Rotronics Wafadrive



At last a versatile, flexible twin data drive for the ZX Spectrum! The Wafadarive features twin 128K drives that take the compact wafers (choose from 16K, 64 K 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 a top data intergrity. And it's incredible value-for-money!

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# Commodore 16
## Package offer





### Including Commodore 1531 Cassette Recorder

Introducing the new Commodore 16 - the advanced micro that's designed with the beginner in mind. This brand new micro features a powerful 16K RAM, a full professional keyboard, superb graphics with 121 colours, plus terrific built-in sounds. In its 32K ROM is a new BASIC 3.5 with over 75 commands including graphics plotting and editing. There's a unique HELP key that highlights errors when you're learning to program. It's a tremendous new micro and the Spectrum package includes a Commodore Model 1531 Cassette Data Recorder too. See it at your local Spectrum dealer now!

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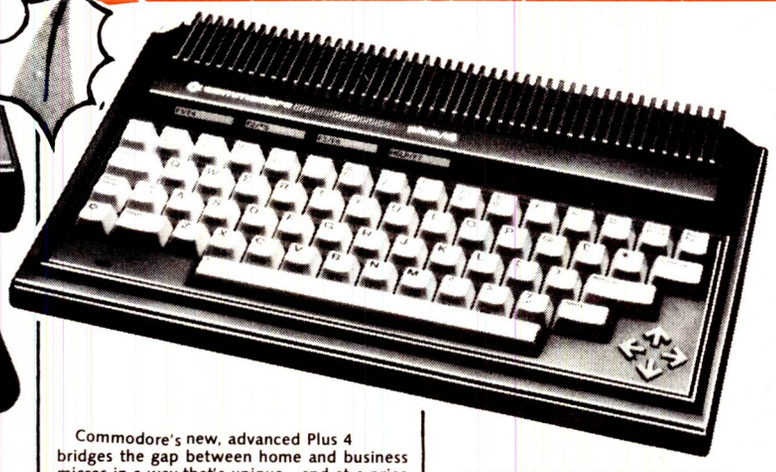
# Commodore Plus/4



Commodore's new, advanced Plus 4 bridges the gap between home and business micros in a way that's unique - and at a price that's unbelievable!

The Plus/4 features, beside its powerful 64K of RAM memory, has a host of features to make computing easier.

For starters there are four popular software packages built-in Word Processing, Spreadsheet, Database and a Business Graphics program. That's all small businesses needs - in a budget-priced micro!

Besides that, there's a HELP key that highlights errors in program lines, plus built-in graphics, advanced BASIC 3.5 with over 75 commands, separate cursor controls, a full 32K ROM and 4 programmable function keys.

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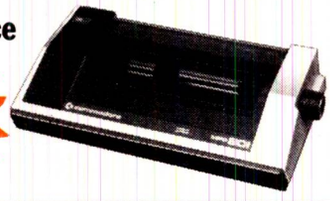

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## Commodore 16/Plus 4 Joystick Converter

NOW you can use Britain's best-selling QUICKSHOT II JOYSTICK with your Commodore 16 or Plus 4!

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## Koala Touch Pad for CBM64

Lets you control your computer without using keyboard commands, by simply moving your finger across the touch-sensitive surface.

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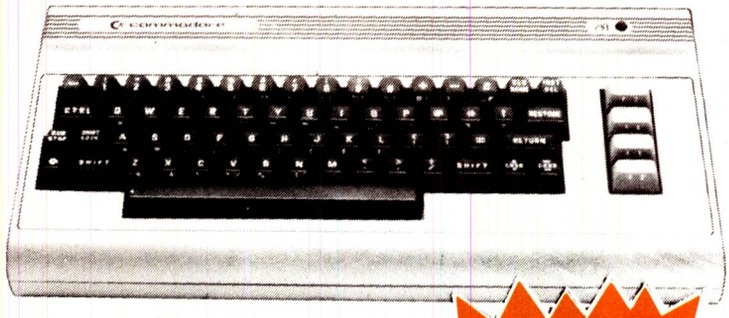
# Commodore 64
## Package offer



**Including:**

- Commodore 64
- A Joystick
- C2N Cassette Recorder
- 4 Cassette Games

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## Plus 4 Data Recorder Adapter

Allows you to use the Shado Commodore compatible recorder with the plus 4

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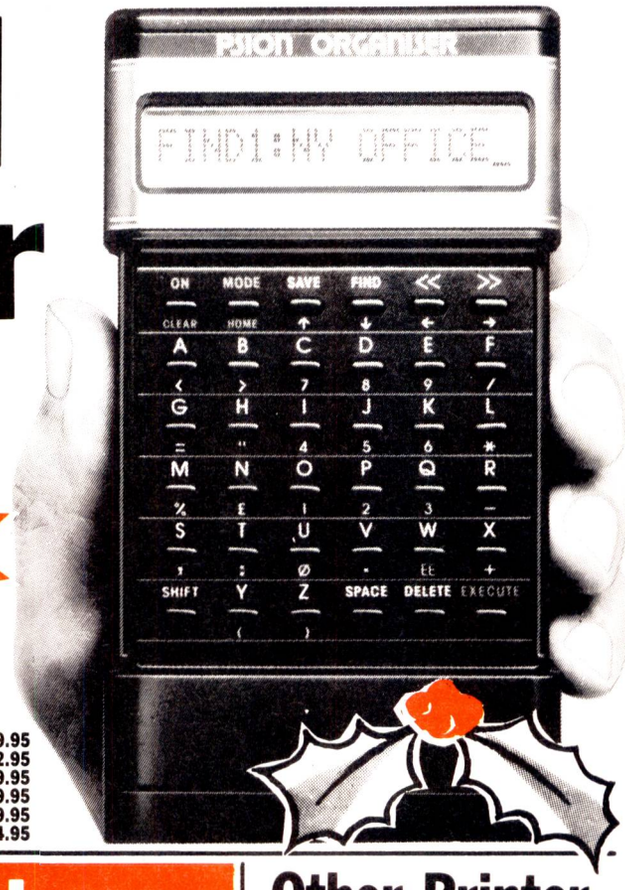
# PSION Organiser

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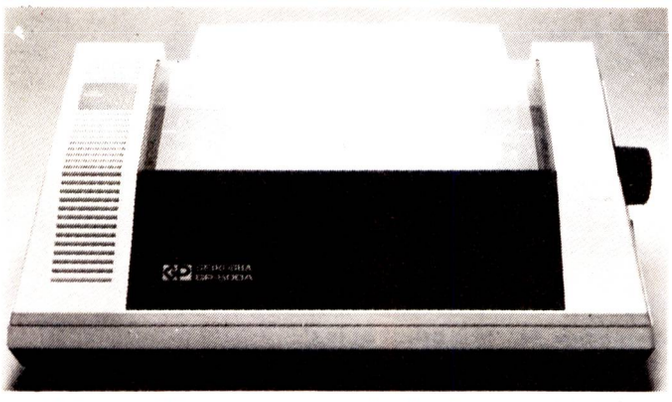

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- 8 European country character sets.
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- Automatic Printing. When the text exceeds the maximum line length no data is lost due to overflow.
- Self-test printing is available.
- Centronics parallel interface.
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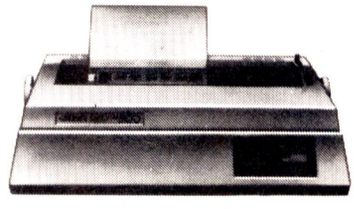

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These stylish new personal computers are among the best of the new generation of business micros. Powerful and versatile, the F-1 features a standard 256K OF RAM (expandable to 768K), with a 16-bit 8086 CPU running MS-DOS and Concurrent CP/M. That's 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!

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Excluding VAT. Monitor extra.



## 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.**

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## 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.

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Chesterfield **Computer Centre**
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St Austell **A B & C Computers**
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## Computer Dealers

Or prospective dealers. If you'd like to know more about becoming a SPECTRUM APPOINTED DEALER, please write to: BOB CLEAVER, Spectrum Group PLC, Hunting Gate, Hitchin, Herts. SG4 0TJ; Tel (0462) 37171

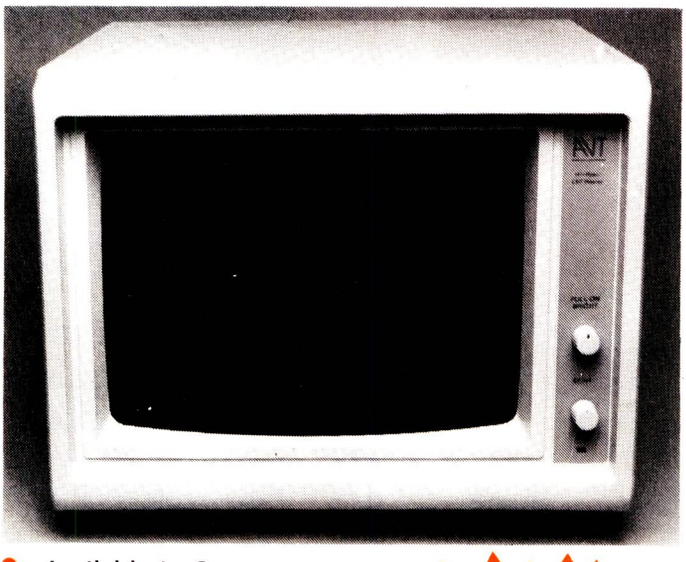
## More from Spectrum...

# spectrum

Incredible value for money

# AVT Monitors

## DM-216G or DM-216/0



- Available in Green or Orange
- Glare or Non-Glare screens
- For office micros, or Personal Computers

SPECTRUM PRICE £99.95

# Brother HR-5 Printer



A great printer at a top-value price from Spectrum. Here's what you get:

- Letter-quality daisy-wheel printing
- Between 13 and 18cps
- Bi-directional printing
- Tractor-fed paper or single sheets
- Super low price!

SPECTRUM PRICE £159.95

# Brother EP-44

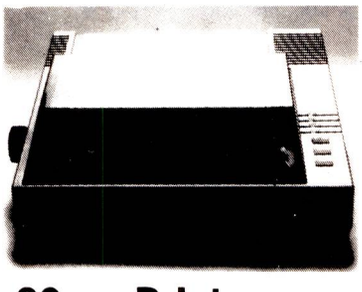


'Transforming Office Machines', runs Brother's slogan – with these super-compact battery powered typewriters, it's easy to see why!

- Top quality thermal head
- 4K of text memorise (3 A4 pages)
- Centering if required
- 15-digit LCD display for pre print corrections
- Line-by-line edit facility

SPECTRUM PRICE £249.95

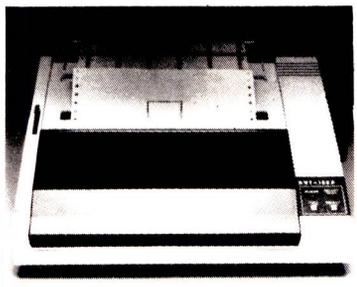
# AVT Printer Bargains



## 80cps Printer

● 228 ASCII characters ● 640 dots/line p/sec ● Centronics Parallel ● Opt. RS232C Serial ● Sprocket & Friction feed ● Semi-graphics ● Normal & italic fonts

SPECTRUM PRICE £199.95



## 100cps Printer

● Letter Quality dot matrix ● 80/132 cols ● Serial & Parallel ● Tractor & Friction feed ● Graphics

SPECTRUM PRICE £249.95

NEW!

# Music Maker

## For Commodore 64

A superb new music system for the Commodore 64 micro, with everything that's needed for high qualiy music making. The package price includes Software (on either Disk or Cassette), a 24-key piano-style keyboard which fits over the computer keyboard, and a songbook containing 28 popular songs. Music Maker is versatile, but simple to use it suits both beginners and experienced musicians. There are 8 voices to simulate instruments (including piano, guitar and synthesiser); all the sound parameters can be varied, to create any sound within the 64's capabilities. Different menu-selected modes include one which creates rhythms, from waltzes to disco, and pre-programmed bass patterns that you can create around the tune. The Music Maker is an incredible addition to the Commodore 64 superb music for everyone!

£29.95

**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

# MASSIVE SAVINGS
## ON THESE TOP SELLING MICROS



# BBC Model B
## With Speech Synthesiser fitted

The BBC MODEL B probably the most flexible personal microcomputer available today. Using powerful BBC BASIC, the BBC B is widely accepted as providing the educational standard for computer learning.

The Model B features a variety interface ports allowing easy connection of both standard peripherals (like disk drives and printers) and second processors or other devices to give you access to Teletext or Prestel services.

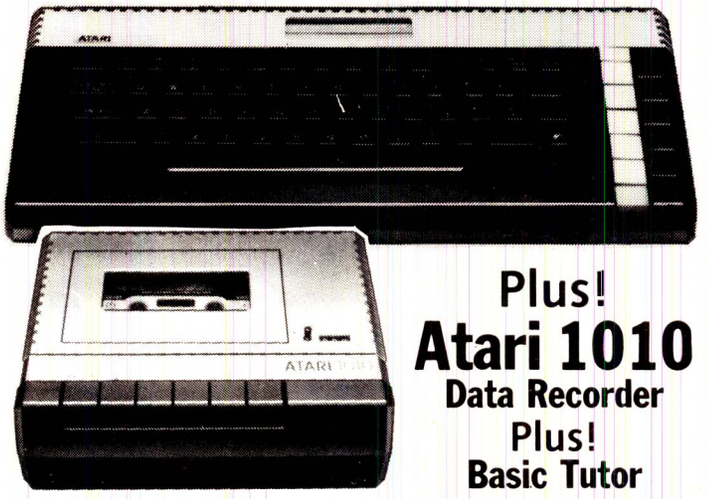
**SAVE £55**

Total Normal Price £454

**SENSATIONAL PRICE**

**£399**

# Atari 800XL



Plus!
**Atari 1010**
**Data Recorder**
Plus!
**Basic Tutor**

**SAVE £39.97**

This powerful and versatile home computer packs the punch of a full 64K of user RAM memory, to make the most of exciting games and educational software. Among its up-to-date features are a high quality full-stroke keyboard, three-and-a-half octaves of sound synthesis and a superb dscreen display capability that includes 11 Graphic Display modes and a palette of 256 colours—128 of which can be displayed together at any one time. Ask your local Spectrum dealer to show you the amazing Atari today!

Normally £209.97

**SENSATIONAL PRICE**

**£169.99**

# Acorn Electron
## Plus 5 Software Cassettes



The Electron gives high quality graphics output to either colour TV or monitor. Sound can be generated through the internal loudspeaker. The Electron comes complete with a free introductory cassette, containing 19 free programmes & two manuals—the User Guide and 'Start Programming With The Electron'.

**£199**

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

# Computer Dealers

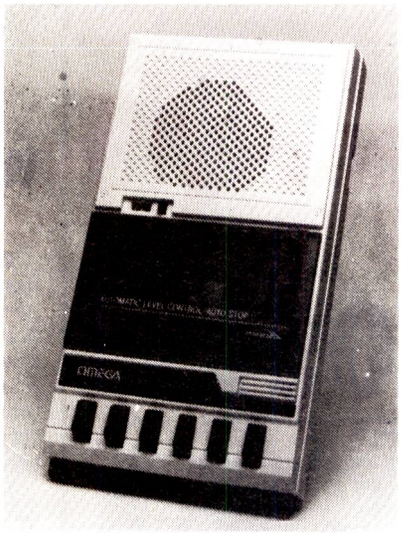
Or prospective dealers. If you'd like to know more about becoming a SPECTRUM APPOINTED DEALER, please write to: BOB CLEAVER, Spectrum Group PLC, Hunting Gate, Hitchin, Herts. SG4 0TJ; Tel (0462) 37171

# More from Spectrum...

# spectrum

## Micro Dealers UK's Top 50
### Britain's No.1 Software Chart

| Program | Supplier | Machine | Price |
|---|---|---|---|
| Underwurlde | Ultimate | Spectrum | £9.95 |
| Tir Na No | Gargoyle Games | Spectrum | £9.99 |
| Eureka | Domark | CBM 64 | £14.95 |
| Eureka | Domark | Spectrum | £14.95 |
| Fort Apocalypse | Synsoft/US Gold | CBM 64 | £9.95 |
| Daley Thompson's Decathlon | Ocean | Spectrum | £6.90 |
| Raid Over Moscow | Access/US Gold | CBM 64 | £9.99 |
| Knight Lore | Ultimate | Spectrum | £9.95 |
| Psi-Warrior | Beyond | CBM 64 | £9.95 |
| Backpackers Guide | Fantasy | Spectrum | £7.50 |
| Travels with Trashman | New Generation | Spectrum | £9.95 |
| Bruce Lee | Datasoft/US Gold | CBM 64 | £9.95 |
| Jasper | Micromega | Spectrum | £8.95 |
| Eddie Kid Jump Challenge | Martech | Spectrum | £6.95 |
| Combat Lynx | Durell | Spectrum | £8.95 |
| Cyclone | Vortex | Spectrum | £6.95 |
| Jinn Genie | Micromega | CBM 64 | £8.95 |
| Pyjamarama | Micro Gen | Spectrum | £6.95 |
| Suicide Express | Gremlin | CBM 64 | £7.95 |
| Elite | Acornsoft | BBC | £14.95 |
| Select 1 | Computer Records | Spectrum | £12.49 |
| Fighter Pilot | Digital | CBM 64 | £9.95 |
| Select 1 | Computer Records | CBM 64 | £12.49 |
| Steve Davis Snooker | CDS | Spectrum | £6.95 |
| Cliffhanger | New Generation | CBM 64 | £7.95 |
| Havoc | Dynavision | Spectrum | £7.95 |
| Jet Set Willy | Software Projects | CBM 64 | £7.95 |
| Aztec (Hunt for the Sun God) | Hill MacGibbon | Spectrum | £7.95 |
| King Arthur's Quest | Hill MacGibbon | Spectrum | £7.95 |
| Skool Daze | Microsphere | Spectrum | £6.95 |
| Sherlock | Melbourne House | CBM 64 | £14.95 |
| Valkyrie 17 | Ram Jam | Spectrum | £9.95 |
| Braxx Bluff | Micromega | Spectrum | £6.95 |
| Zaxxon | Synsoft/US Gold | CBM 64 | £9.95 |
| Boulder Dash | State Soft | CBM 64 | £8.95 |
| D-Day | Games Workshop | Spectrum | £7.95 |
| Avalon | Hewson | Spectrum | £7.95 |
| Tower of Despair | Games Workshop | Spectrum | £7.95 |
| Battlecars | Games Workshop | Spectrum | £7.95 |
| Kosmic Kanga | Micromania | CBM 64 | £6.95 |
| Manic Miner | Software Projects | Amstrad | £8.95 |
| Xavior | PSS | Spectrum | £7.95 |
| Beachead | Access/US Gold | Spectrum | £7.95 |
| Beam Rider | Activision | Spectrum | £7.99 |
| Dues ex Machina | Automata | Spectrum | £15.00 |
| Manic Miner | Software Projects | BBC | £7.95 |
| 3D Grand Prix | Software Invasion | BBC | £9.95 |
| Kentilla | Micromega | Spectrum | £6.95 |
| Dark Star | Design Design | Spectrum | £7.50 |
| Summer Games | Quicksilva | CBM 64 | £14.95 |



## Omega Compucorder

- Battery/Mains Operation
- Built-in condensor microphone
- Automatic level control
- 3-digit Tape Counter
- DIN Socket

GREAT VALUE AT ONLY £24.95

## BBC Emulator

NEW

This superb unit enables you to process your BBC projects on your Commodore 64 at home. All you do is type programs in BBC BASIC and the Emulator allows your Commodore 64 to 'imitate' the BBC.

Spectrum Price £13.95

## Quickshot II Joystick

Helicopter-style grip with the Fire button on top. Features suction feet for stability and Auto Fire mode. Compatible with most micros.



£11.95

## Super Value Shado Add-Ons

### Shado BBC Compatible Data Recorder

Also suitable for 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 Compatable 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

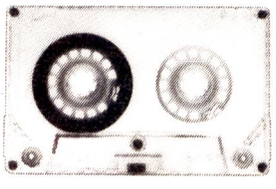
### Shado Joysticks for the BBC



Designed as direct replacements for the Acorn originals, these superfast joysticks (connected to the Analogue port) feature much improved hand action with sprung response. left & right are identified by the colour of the fire buttons.

Spectrum Price Per Pair £16.95 per pair

### Blank Data Cassettes



C12 Standard Data Cassette..... 50p
C15 Standard Data Cassette..... 58p
C12 Reel to Reel..... 75p

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

for up to date news, information & offers from SPECTRUM - see PRESTEL page 600181 for details

# There's a Spectrum near you...

## AVON

**ATH** Software Plus, 12 York St
el: (0225) 61676
**/ESTON-S-MARE** K & K Computers,
2 Alfred St Tel: (0934)419324

## BEDFORDSHIRE

**IUNSTABLE** Dormans 7-11 Broad Walk
el: (0582) 65515
**EIGHTON BUZZARD** The Computer Ctr
t Milton Keynes Music, 17 Bridge St.
el: (0525)376622
**UTON** Terry-More, 49 George St.
el: (0582) 23391/2

## BERKSHIRE

**IRACKNELL** Computer Centre, 44 The
Broadway. Tel: (0344) 427317
**NEW! WINDSOR Gadgets 30 Peascod**
**itr., Tel: (07535) 67211**
**ILOUGH** MU Games and Computers 245
High St. Tel: (0753) 21594

## BUCKINGHAMSHIRE

**ILETCHLEY** Rams Computer Centre,
117 Queensway. Tel: (0908) 647744
**CHESHAM** Reed Photography & Comp-
uters, 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** Logic Sales, 6 Midgate
Tel: (0733) 49696
**PETERBOROUGH** Ptrbrgh Communications,
91 Midland Rd. Tel: (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** Wilding 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 38B 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**
**NEW! CHELMSFORD Way-in Cptrs. 7**
**Village Square Chelmer Village Tel:**
**(0245) 467858**
**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
**NEW! ROMFORD 92 Market Place Tel:**
**(0708) 41719**
**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** RC 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
**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
**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
**NEW! LIVERPOOL Home & Business**
**Cptrs 31 Bold St. Tel: (051) 708 0428**
**LIVERPOOL** Beaver Radio, 20-22 White-
chapel. 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

**NEW! PINNER P&H Micro & Photo Ltd**
**91 Field End Rd., Eastcote Tel: (01) 868**
**6830/6860**
**UXBRIDGE** J K L Computers, 7 Windsor St.
Tel: (0895) 51815

## NORFOLK

**FAKENHAM** Fastview, 12 Norwich Rd.
Tel: (0328) 51319
**KING'S LYNN** Computer Plus, 40 Conduit St,
Tel: (0553) 4550
**NORWICH** Norwich Camera Centre 20
White Lion Str. Tel: (0603) 612537
**NEW! NORWICH Brainwave 11A Cas-**
**tle Meadow Tel: (0603) 663796**
**THETFORD** C B & Micros, 21 Guidhall St.
Tel: (0842) 61645

## NORTHAMPTONSHIRE

**NORTHAMPTON** Dormans, 22 Princes Walk
Grosvenor Centre. Tel: (0604) 37031

## NOTTINGHAMSHIRE

**NOTTINGHAM** Jacobs Cptrs, 13 Middlegate
Newark. Tel: (0636) 72594
**NEW! NOTTINGHAM Amplitone Ltd., 3**
**Mansfield Road. Tel: (0602) 418191**
**WORKSOP** Computagrafix, 132 Bridge St.
Tel: (0909) 472248

## NORTHERN IRELAND

**BELFAST** Arthur Hobson Ltd., 37 Great Vic-
toria St. Tel: (0232) 246336
**PORTSDOWN** Pedlows, 16 Market St.,
Craigavon Co. Armagh. Tel: (0762) 332265
**LONDONDERRY** Foyle Computer Systems,
3 Bishop St. Tel: (0504) 268337
**NEWRY** Newry Computer Centre. 34
Monaghan St. Tel: (0693) 66545

## NORTHUMBERLAND

**MORPETH** Telerents 31 Newgate St. Tel:
(0665) 513 537

## OXFORDSHIRE

**ABINGDON** Ivor Fields Computers, 21 Stert
St. Tel: (0235) 21207
**BANBURY** Computer Plus, 2 Church Lane.
Tel: (0295) 55890
**OXFORD** Ivor Fields, 7 St Ebbes St.
Tel: (0865) 247082

## SCOTLAND

**NEW! ABERDEEN Dee Micro 278**
**George Street Tel: (0224) 644350**
**ABERDEEN** North East Computers, 1-3 Ellis
St., Peterhead. Tel: (0779) 79900
**AYR** Vennals, 6A New Bridge St.
Tel: (0292) 264124
**DUMFRIES** Vennals, 71 English St.
Tel: (0387) 54547
**NEW! DUNDEE Micromania 60 Gray**
**St., Boughty Ferry Tel: (0382) 77130**
**EDINBURGH** The Silicon Centre,
6-7 Antigua St. Tel: (031) 557 4546
**HAMILTON** Tom Dickson Computers, 8-12
Cadzow St. Tel: (0698) 283193

## SHROPSHIRE

**NEW! BRIDGNORTH Jentech Services**
**Ltd., Smithfield Ctr Whitburn St. Tel:**
**(07462) 61458**
**SHREWSBURY** Computerama,
13 Castlegate. Tel: (0743) 60528
**TELFORD** Cptr Village, 4 Hazeldine House
Telford Town Centre. Tel: (0952) 506771

## SOMERSET

**TAUNTON** Grays, 1 St James St.
Tel: (0823) 72986

## STAFFORDSHIRE

**STAFFORD** Computerama, 59 Forgate St.
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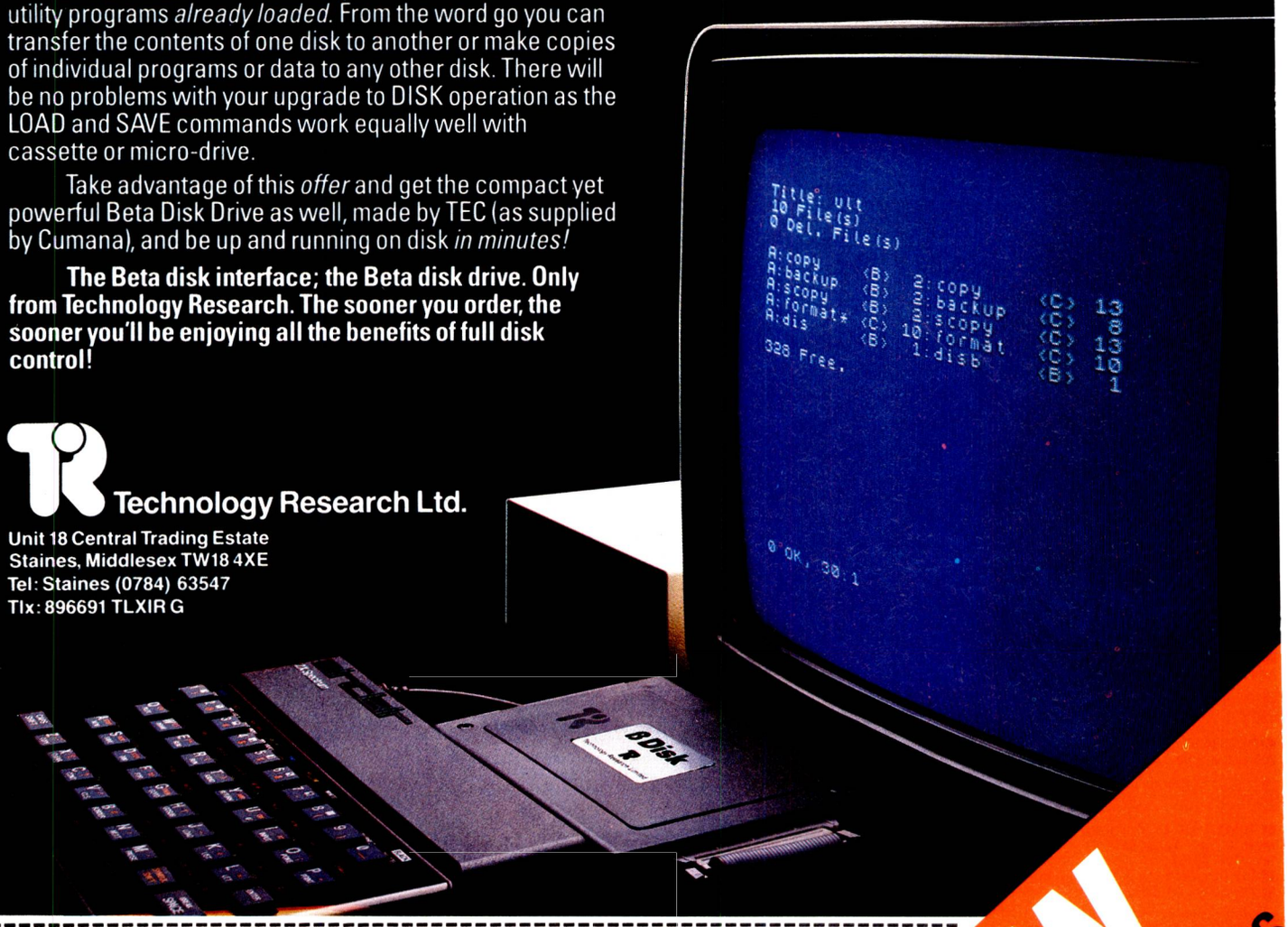


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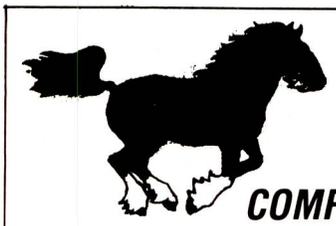

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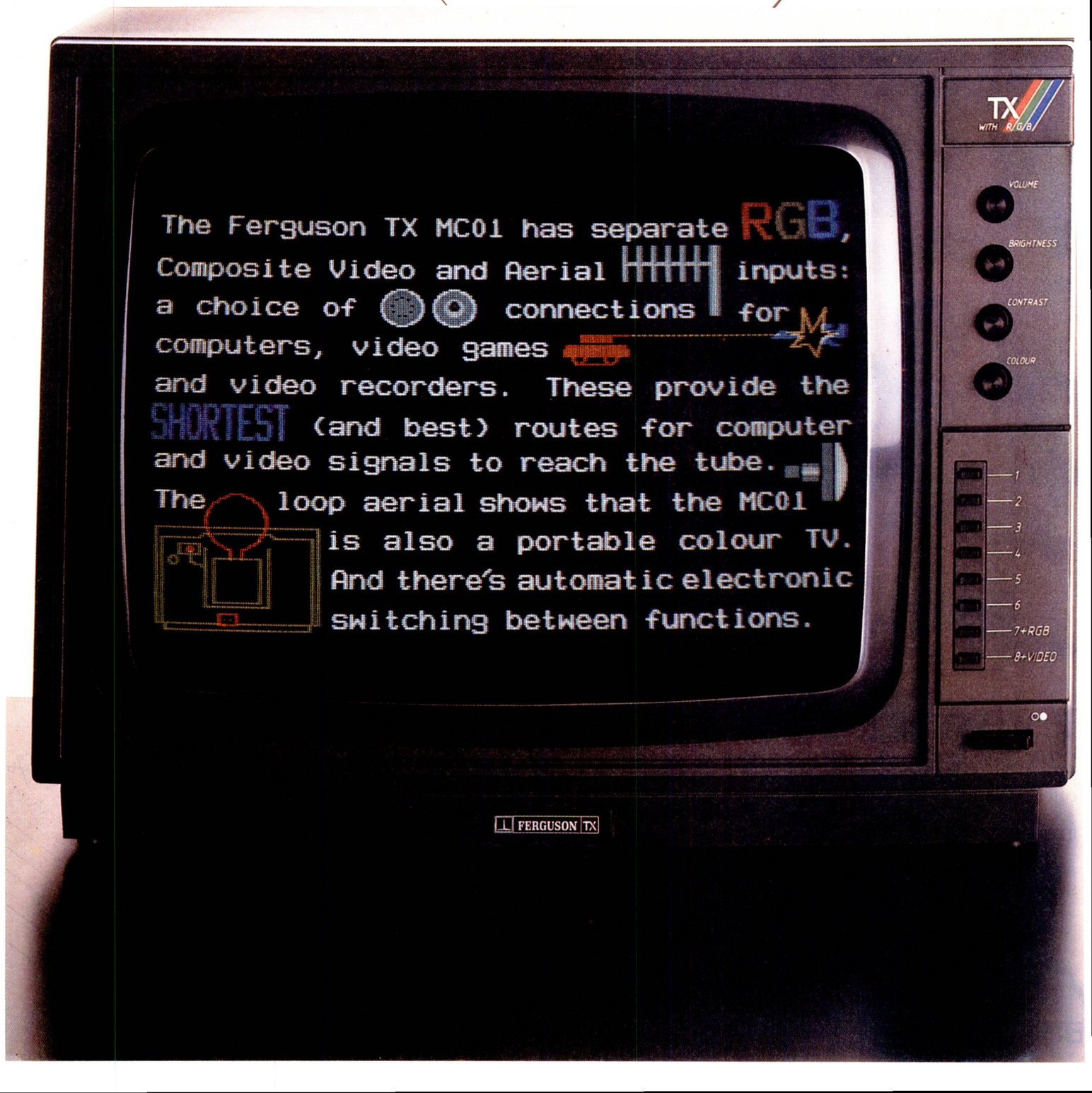

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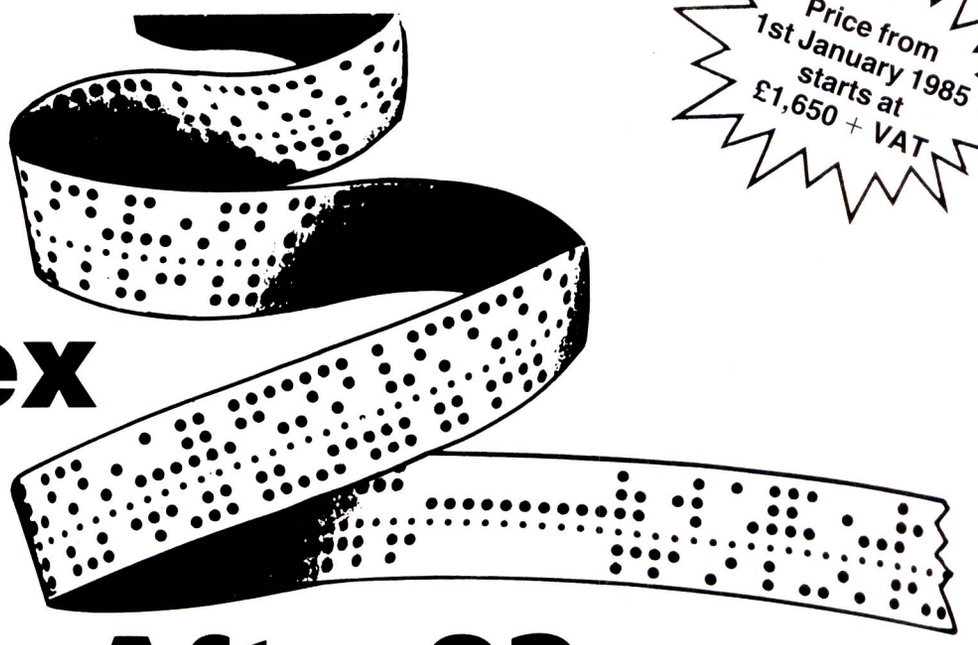

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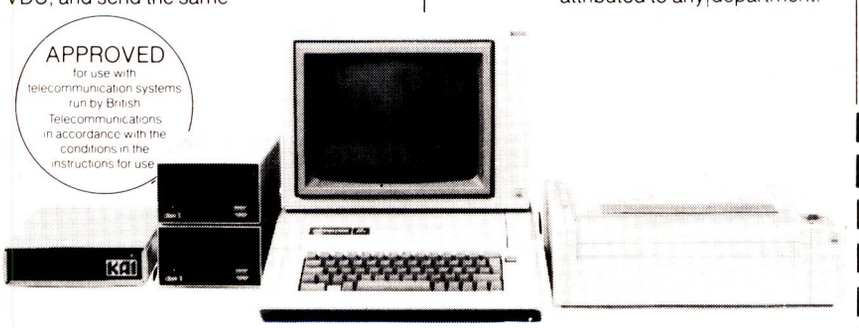


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TELEVIDEO 8 or 16 bit, 80Mb, 2 to 32 users ..... £POA

### HOBBY MICROCOMPUTERS
SINCLAIR QL ..... £339
COMMODORE 64/SX64 ..... £179/£650
BBC MODEL B/wDFS ..... £339/£399
SPECTRUM 48k/plus ..... £119/£165
COMMODORE 16 Start Pack ..... £120
COMMODORE Plus 4 ..... £239
ELECTRON Starter Pack ..... £199
ATARI 800XL ..... £139

### PRINTERS
#### DOT MATRIX
Citizen 160cps/40cps NLQ ..... £399
Smith Corona F-80/D100 ..... £175/£250
Smith Corona 200/300 NLQ ..... £395/£479
Canon PW1080A/1156A (NLQ) ..... £295/£435
Canon PJ1080A (Ink Jet) ..... £389
Kaga Taxan KP810/910 (NLQ) ..... £289/£399
Dataproducts 8050/8070 ..... £POA
Brother EP44 KSR ..... £195
Brother HR5 ..... £129
Panasonic KX-1091 120cps/LQ ..... £295
EPSON P40/P80 ..... £95/£150
EPSON JX80 Colour ..... £499
EPSON RX80FT+ ..... £239
EPSON FX80 ..... £359
EPSON RX100FT/FX100FT ..... £359/£459
EPSON LQ1500 ..... £895
Fujitsu P1340/1351 (24 pin) ..... £CALL
Shinwa CTI-CP80 ..... £179
NEC Pinwriter w/Interface ..... £895
Prism 132S (Colour) ..... £999
Microprism FT (LQ) ..... £299
Mannesmann Tally MT80 ..... £185
Mannesmann Tally MT160 ..... £385
Mannesmann Tally MT180 ..... £579
Seikosha GP700A (Colour) ..... £349
Seikosha GP250X ..... £199
Seikosha GP550A ..... £219
Seikosha GP100A ..... £149
NEC PINWRITER ..... £599
TEC 1550 (Serial) ..... £489
Microline 82A/92P ..... £239/£399
Microline 83P/93P ..... £468/£499
Microline 84P ..... £659
Microline 2410P ..... £1590
STAR Gemini 10X/15X ..... £219/£299
STAR Delta 10X/15X ..... £335/£429
STAR Radix 10X/15X ..... £470/£595
Toshiba 2100H (LQ) ..... £1349
TEXAS INSTRUMENTS 810/LQ ..... £995
TEXAS INSTRUMENTS 855/LQ ..... £695
Anadex DP9725 (240cps) ..... £1195
Anadex WP6000 (330cps) ..... £1795
Anadex DP6500 (500cps) ..... £1990
DRE-Newbury DRI 8925 240cps ..... £1445
Newbury Data 8931 240cps + LQ ..... £1750
Newbury Data 8950 480 cps ..... £1990
Hermes 612B ..... £1690
Anadex DP9500 (180cps) ..... £850
Anadex DP9620 (240cps) ..... £985
Philips Mullard GP300 ..... from £1900
Siemens PT88 & PT89 (Ink Jet) ..... £399
Diablo 150C Colour Ink Jet ..... £890

### MONITOR
#### MONOCHROME
Roland MB121 Green/Amber ..... £120
Sanyo DM8112 CX (18mhz) ..... £89
Philips 12" (Green) ..... £79
Kaga 126 (Green) ..... £98/£110
BMC 12" Green ..... £79
BMC 12" High Res ..... £99
Zenith 12" Green/Amber ..... £95
YANJEN (Green/Amber/tilt,Sw) ..... £95
Swivel & Tilt Monitor Stand ..... £28

#### COLOUR
Roland CC-141 14" (640×200) ..... £395
Kaga K12R1 ..... £199
Kaga K12R1X RGB/PAL ..... £249
Sinclair Vision QL ..... £235
Novex 14" RGB ..... £239
Luxor 14" (Super Res, 800 dot) ..... £495
Dyneer 14CMI 640×200 ..... £399
Dyneer 14CHI 720×350 ..... £575
Sanyo CD3117M (620 DOT) ..... £295
Sanyo CD3115H (720 DOT) ..... £399
Fidelity CM14 12mhz, RGB & COMP ..... £185
Microvitec monitors ..... £POA
Princeton RGB Hi-Res ..... £427

### TERMINALS
Qume QVT 102 ..... £495
Qume QVT 108 ..... £649
Qume QVT 211GX (Tektronics) ..... £856
Qume QVT 103 (DEC VT100) ..... £795
Kokusai KDS (TV1925, WS) ..... £449
Televideo 924/925/950 ..... Best Price
ZENTEC (Various Emulations) ..... £495
Hazeltine Esprit ..... £449
Hazeltine Esprit II ..... £455
Hazeltine Esprit III (TVI950) ..... £825
Tatung VT4200 ..... £499
Wyse WY50 ..... £545
Wyse WY75 ..... £699

### PLOTTERS & DIGITISERS
HP 7470/7475 ..... £795/1290
WATANABE MP1000 ..... £699
WATANABE WX4636 ..... £2165
MT PIXY PLOTTER (with SF) ..... £495
ACT WRITER 80/81 ..... £528/£695
EPSON H180/Expansion RAM ..... £365/£75
GOULD BRYANS DP7 ..... £1255
HOUSTON DMP40 (2 Pen) ..... £699
ROWLAND DXY800 (8 Pen/A3) ..... £495
ROWLAND DXY880 (8 Pen/A3) ..... £650
STROBE 8 Pen drum plotter ..... £655

### SOFTWARE
LOTUS 1-2-3/SYMPHONY (IBM, DEC, WANG) ..... £279/£479
OPEN ACCESS (IBM/Apricot) ..... £350
FRAMEWORK/FRIDAY ..... £390/£175
DBASE II/III ..... £275/£355
EXCHANGE (4 Int. Package) ..... £395
CARD, BDX-PLUS ..... £139/£295
NEWS AGENTS SYSTEM ..... £500
VOLKSWRITER DELUXE ..... £195
INTEGRATED TRAVEL AGENTS SYSTEM ..... £750
PFS: REPORT/FILE/WRITE/GRAPH ..... £350
FILE TRANSFER IBM/APRICOT/SIRIUS ..... £95
AUTOCAD (2 Dim CAD Package) ..... £650
DOODLE (CAD Package for IBM/Apricot) ..... £695
CADPLAN (CAD with Autodimensioning) ..... £1500
SMARTWORK (Circuit-Board-Design) ..... £895
SAGE ACC/EXECUTIVE ..... £295/£590
PULSAR/PEACHTREE/PEGASUS ..... from £150
MICROSOFT PROJECT ..... £375
PERTMASTER/MILESTONE ..... £650/£295
HARWARD PROJECT MANAGER ..... £379
OMNIS I/II/III ..... £156/£299/£399
EVERYMAN/KNOWLEDGEMAN ..... £379/£395
CONCURRENT CPM86 with windows ..... £175
WORDSTAR PROFESSIONAL ..... £250
MULTI TOOL WORD w/MOUSE ..... £275
ULTIMATE ..... £250
FILEVISION (Mac) MACCASH/MACLEDGER ..... £159/£295
MANAGEMENT/SALES EDGE (Mac) ..... each £190
SUPERWRITER V1.10 ..... £150
SUPERCALC 2/3 ..... £195/£235
MULTIPLAN ..... £150
DELTA/RETRIEVE II ..... £CALL/£350
MICROMODELLER ..... £395
COPY II PLUS (IB/Apple) ..... £39
THINK TANK/TK! SOLVER ..... £125/£190
JANE (Apple)/SPOTLIGHT (IBM/MAC) ..... £179/£195
SARGON II/III ..... £22/£29
MILLIONAIRE (Stock market simulation) ..... £39
PROLEY (IBM)/FROGGER/PINBALL ..... £95/£25/£29
SPOTLIGHT ..... £99
MANAGEMENT TRAINING SERIES ..... £350
BACKGAMMON/CHECKERS/CHESS/ODIN ..... each £39
FLIGHT SIMULATOR ..... £39
TURBO PASCAL/With 8087 Support ..... £49/£85
If you can find the software/printer/monitor that you are looking for call us for the best price and details

### COMMUNICATION HARDWARE
TELECOM GOLD/EASYLINK/ONE TO ONE ..... £POA
ACOUSTICE COUPLER (Epson/TWL) ..... £160
BUZZBOX MODEM/Auto Answer ..... £90/£139
MINOR MIRACLES 300/1200 ..... £170
MASTER SYSTEMS V2123/2123AD ..... £169/£250
DACOM AA/AD/EC MODEM ..... £479
BRAID telex system ..... £POA
COMMUNIQUE (Sirius/Apricot) ..... £350

### ADD-ONS
ROLAND Synthesizers (JUNO-106/JX-3P) ..... £POA
Musical Instrument Digital Interfaces ..... £POA
CUMANA DISKS for BBC at best prices ..... £RING
AST SIX PLUS PACK IBM ..... £239
MULTIFUNCTION BOARD IBM (Smorgasboard) ..... £245
KOLAPAD TOUCH TABLET (Ap/IBM) ..... £75
Each 64k RAM for IBM or Comp ..... £76
MEGA PLUS II 64k, Ser, Clk, (IBM) ..... £285
IBM JOYSTICK/TRACKBALL ..... £45/£39
APPLE/IBM/C64/ATARI JOYSTICK ..... £39
AST/MPC-QUOD Cards for IBM PC/XT ..... £POA
MOUSE (IBM/Apricot S or P) ..... £125
HERCULES GRF. CARD ..... £290
PLUS-5 Ext. 10Mb HD for IBM, Epson etc. ..... £1125
POWER BANK (For power cuts) ..... £590

### DAISYWHEEL PRINTERS
Brother HR1/HR15 ..... £290/£349
Brother HR25/35 ..... £595/£799
Juki 6100/6300 ..... £299/£675
QUEN-DATA ..... £279
Daisystep 2000 ..... £269
QUME 12/20 20cps ..... £476
QUME 9/45-55 ..... £1595/£2150
QUME 11/40-55 ..... £1195/£1379
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NEC 2010 (S or P) ..... £659
NEC 2050 (for IBM) ..... £699
DIABLO 620 RO ..... £695
DIABLO 630 API ..... £1299
Ricoh 1300 ..... £795
Ricoh 1600 ..... £1375
Ricoh 2600RP ..... £1750
TEC F10-40 ..... £995/£1250
TEC F10-50 ..... £1250
Smith Corona TP1/L100 ..... £189/£249
Silver Reed EXP (12cps) ..... £295
BROTHER EM101 KSR ..... £799

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Rutishauser Electro Mechanical ..... £479
Tractor Feeds ..... £159
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Computer Paper 11×14 (2000) ..... £20
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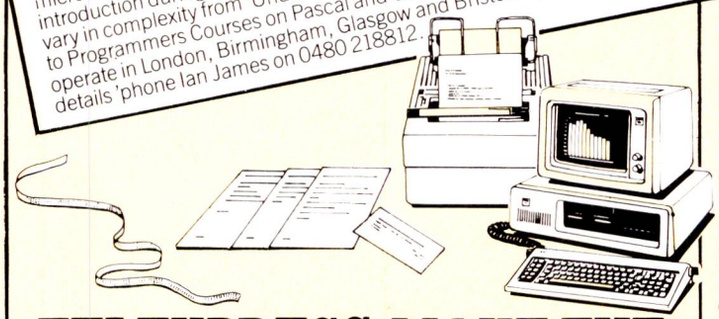
# BYTE SHOP News

## 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, Glasgow and Bristol. If you would like details 'phone Ian James on 0480 218812.



## TELEXPRESS MAKE THE TRAFFIC RUN SMOOTHLY

Telexpress are a Rochdale-based bureau who generate a considerable amount of telex traffic. In order to improve the speed and efficiency of their service, Telexpress took a list of their requirements along to Byte Shop Manchester. Following consultations they acquired an IBM PC running Data Master software package. This provides them with full details of every telex sent covering client, number of words together with an invoice total. Reporting facilities on both a daily and monthly basis show the total number of telexes sent with invoice totals and a gross profit figure. Telexpress were "very impressed" with the advice and back-up they had received from Byte Shop Manchester.

## *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: NOTTINGHAM

With their team of all talents, it's perhaps surprising that Brian Clough has not popped into Byte Shop, Nottingham to discuss a solution to Forest's goal scoring problems.

Manager David Slater's method of relaxation (?) is to renovate houses; Engineer Clive Davison is into amateur TV and can even transmit his own pictures. The Sales Executives haven't been left behind and Steve Mayes is writing a book about a Nottingham architect; Alan Smith plays hockey and both David Iliffe and Simon Gunn are keen photographers.

If you're not interested in these subjects it's a relief to know that they can all talk enthusiastically and knowledgeably about all facets of microcomputers.

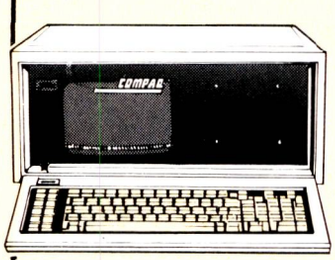
**PROGRAMMERS CORNER**
Wide selection of programming languages, plus utilities and tools from Microsoft, Digital Research, Microfocus, Xitan and Pulsar, incl. Basic, Fortran, Cobol, Pascal, Assembler, C&PL1.

**NOTTINGHAM** • SPECIAL OFFER
**IBM Portable** was 2254.00
**Symphony** was 550.00
Available together at the special package price of only **£2600.00**

## THE BYTE SHOP. THE FIR TURN TO FOR MI

# COMPAQ

### STANDARD & PLUS




Following phenomenal success in America, you can now find the portable, fully IBM PC compatibie, 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

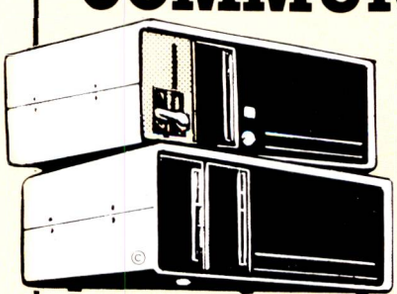
Four new PC/XT compatible models from Compaq fully complementing the now established 'Standard' and 'Plus' models. By incorporating the high-speed 8086 microprocessor, Deskpros can offer 2-3 times faster processing speeds than standard PCs while running virtually all PC/XT software without modification.



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.

### COMMUNICATOR MULTI-USER MULTI-PROCESSING SYSTEMS

**£1800 per user**
**Communicator CP520MP** including 5 display terminals, cables 6 × processors and 6 × 64Kb memory ..... **9095.00**

**£2119 per user**
**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.

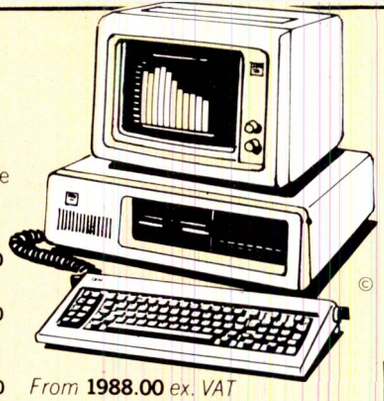
# IBM/PC

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.

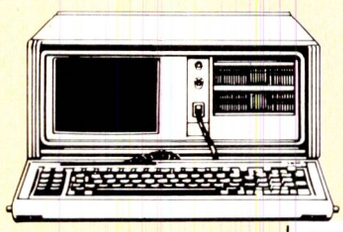
**IBM PC**; dual 320Kb disk drives; 64Kb RAM; UK keyboard and screen ..... **1988.00**

**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 × 10 Mb hard disk; 128Kb RAM; ASYNCH COMMS; DOS 2.1; UK keyboard and screen ..... **3432.00**



*From* **1988.00** *ex. VAT*



**IBM PORTABLE PC**

Offers the features of PC computing in a self-contained portable package weighing only 30lb (13.6kg). Specification includes 256Kb RAM expandable to 512Kb, dual floppy disk drives, 9" amber screen and smart system carrying bag ..... **2254.00**

**PC/XT ADD-ON'S & ADD-IN'S**

**Alloy PC-Backup** – cartridge tape unit for backing up, storing and retrieving data from hard disk ..... **1,750.00**

**Microvitec 1446** – 14" colour monitor ..... **495.00**

**Expansion Unit 1** – 10 Mb hard disk unit for PC ..... **1,954.00**

**Expansion Unit 2** – 10 Mb hard disk unit for PC/XT ..... **1,581.00**

**Tallgrass Datasave** – 5¼" hard disk mass storage unit with 12, 20 or 35 Mb capacity plus integral streamer tape cartridge backup..from **2,820.00**

**Hercules Graphics Card** – allows high resolution bit mapped graphics on monochrome display ..... **395.00**

**Orchid PC Net Starter Kit** – local area network allowing file and disk sharing plus optional electronic mail from ..... **1000.00**

**PC Net Cards** – to link additional terminals to network from ..... **460.00**

**Quadram Cards** – full range available inc. memory expansion & colour graphics from ..... **194.00**

**IBM** colour monitor plus adapter card ..... **685.00**

**IBM** printer inc. cable ..... **469.00**

**Epson FX80** printer inc. cable. **478.00**

**Brother** Letter Quality Printer.. **445.00**

**ALL PRICES EX. VAT**

## TYPICAL IBM BUSINESS SYSTEMS

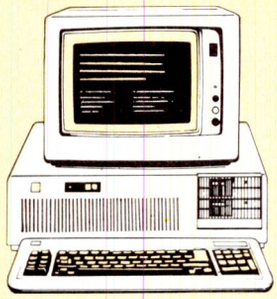
**Word Processing**
IBM PC; Multimate, letter quality printer ..... **3135.00**

**Colour Spread Sheet**
IBM PC; colour monitor; Symphony; full width dot matrix printer; 2 pen plotter ..... **4999.00**

**Information Management**
IBM PC XT; dBase II; dot matrix printer ..... **4399.00**

**Accounting System**
IBM PC XT; Sales, Purchase and Nominal Ledgers. Invoicing and Payroll; dot matrix printer..... **4999.00**
ALL PRICES EX. VAT

# SYSTEM SPOTLIGHT



## IBM PC AT

If you are doubtful whether a standard PC will have the processing speed or memory to keep up with your future developments then the AT is the obvious choice. The AT's 'formidable' spec. includes 256Kb standard RAM (512Kb enhanced version), 1.2Mb disk drive (plus 20Mb enhanced), new DOS 3.0 operating system expandability, monitor and new enhanced keyboard with 10' coiled cable, separate numeric key pad for easier and error-free data entry.

Basic ..... from **3374.00**
Enhanced ..... from **4703.00**

# ST NAME BUSINESSMEN CROCOMPUTERS.

## *At a glance Computer Checklist*

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

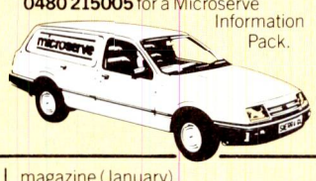
# TOP 20 SELLING SOFTWARE

1. **Lotus 1-2-3** – Remarkable integrated spreadsheet and information management package incorporating colour graphics for the IBM PC ..... **375.00**
2. **dBASE II** – Powerful database management and applications generator with optional graphics and development tools ..... **365.00**
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 Plus** – Simple to use selective data retrieval tool with extraction and sort facilities.... **330.00**
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**
16. **CBASIC** – Widely used commercial programming language for business applications development, interpreter also available ..... **125.00** (CP/M86 271.00)
17. **Delta** – Comprehensive and sophisticated database program with '3-D' file structures, links to Lotus 123, MultiPlan and WordStar ..... **495.00**
18. **BSTAM** – Communications package for sending and receiving CP/M files over telephone lines **133.00**
19. **Presentation Master** – Provides all you need to turn your PC/XT into a graphics/slide production unit **1495.00**
20. **Pascal MT+** – Comprehensive integrated language for developing production quality software..... **269.00** (CP/M86 462.00)

**ALL PRICES EX. VAT**

# microserve

An integral part of the Byte Shops, **Microserve** provides a complete range of servicing and maintenance plans nationwide for computers such as the IBM PC and Communicator plus peripherals from Epson, Anadex, Qume, Wyse and Volkercraig. **'Microsure'** – our speedy nationwide on site maintenance contract for a 'once only' annual fee. **'Microswap'** – component exchange service. **'Micromend'** – workshop repair and up grades. **'Microcall'** – on site maintenance and repair charged on a time and materials basis. **'Microtrain'** – runs product training courses for your own service engineers. Call into your local Byteshop for further details or 'phone **0480 215005** for a Microserve Information Pack.

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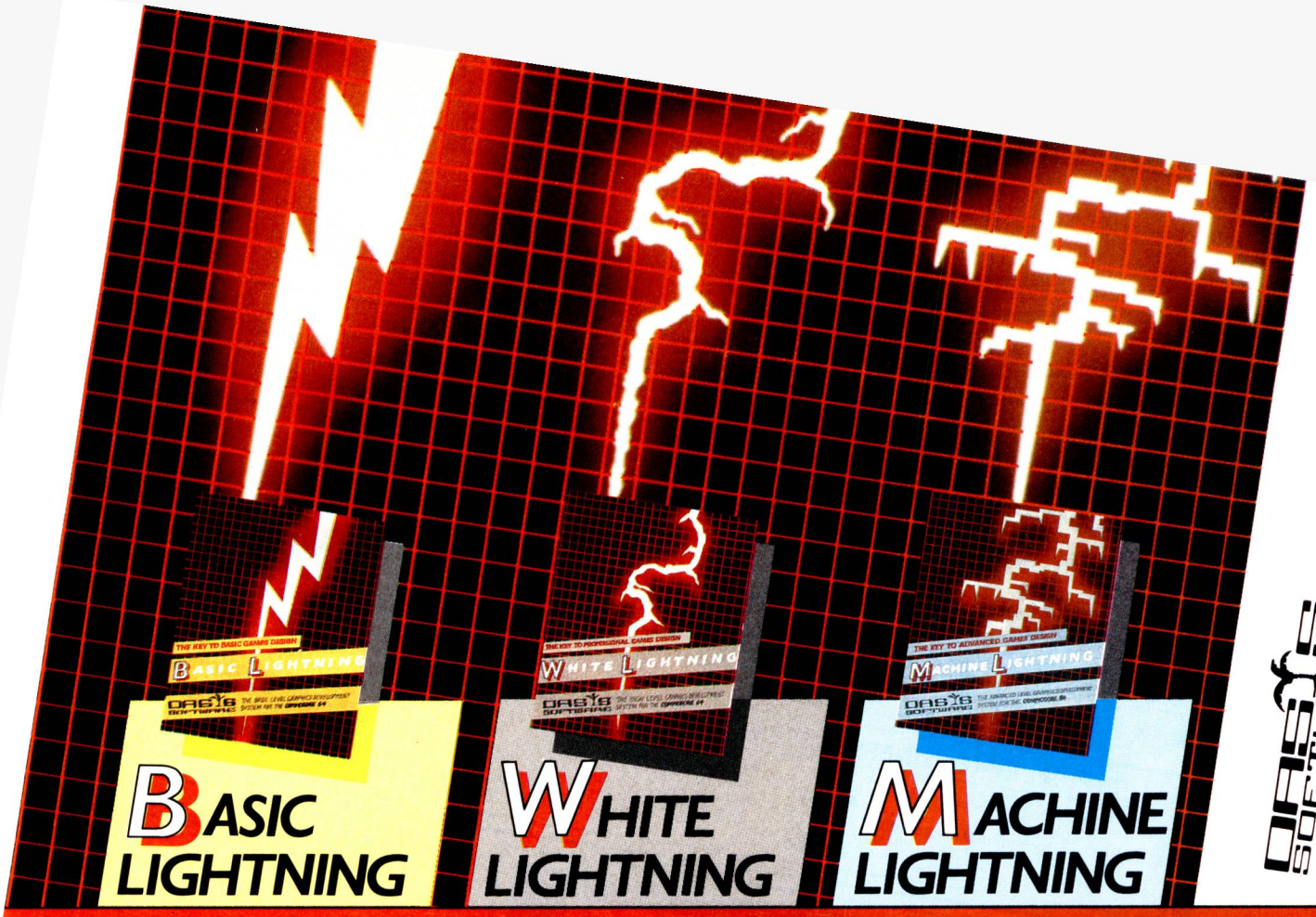


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*Totally dedicated to writing very fast, video games, BASIC Lightning is a is a fully structured extension to the Commodore BASIC which adds a staggering 200 reserved words. It allows up to five tasks to run concurrently (one in foreground and four in background). Most of the commands are dedicated to games writing and the sound and graphics commands are unparalleled. Procedures and PASCAL type structured programming commands are also a feature of BASIC Lightning.*

*As well as the Commodore's own 8 hardware sprites, BASIC Lightning has its own software sprites. Up to 255 can be defined with user selectable dimensions. These can even be several screens wide. They can be scrolled, spun, mirrored, enlarged or inverted with phenomenal speed and smoothness.*

*A Sprite Generator Program (written in BASIC Lightning) is also supplied and can be used to design, edit and store all your sprites for use in your main program.*

*White Lightning is a complete games writing package comprising a high level, Forth based, multi-tasking games writing language, the extended BASIC (see BASIC LIGHTNING) and a powerful sprite Generator Program. Programs can even be written in a combination of Forth and Commodore BASIC and the final program, which will run independently of White Lightning, can be marketed with no restrictions whatsoever.*

*The Basic Lightning part of the package can be used to experiment quickly and easily before the Forth program is developed.*

*The speed of White Lightning has to be seen to be believed and a full demo is included. As with Basic Lightning, hardware sprites are supported, together with 255 software sprites which can be scrolled, spun, reflected, enlarged or inverted.*

***MULTI-TASKING** Without doubt the most powerful feature of the Lightning series of languages is the multi-tasking facility. This allows two programs to be run concurrently and makes those smooth landscape scrolls etc. effortless.*

*The BASIC Lightning Sprite Generator Program is also included in the package.*

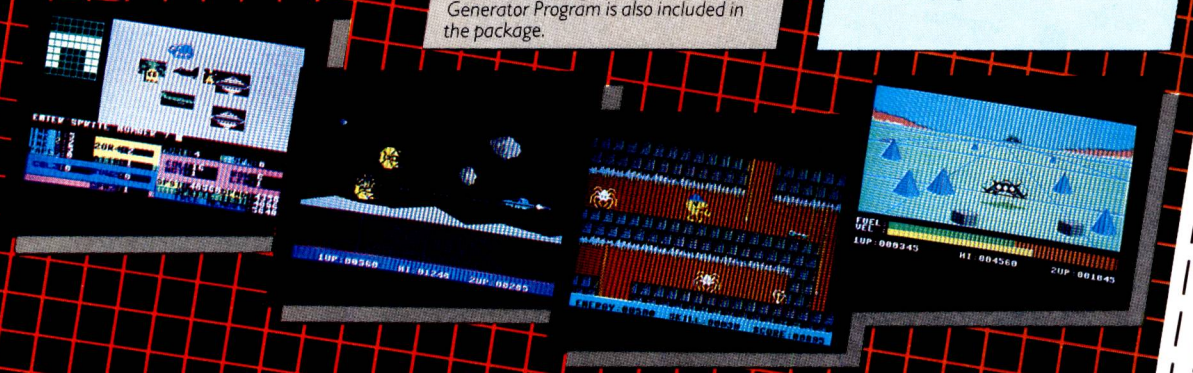
*Commodore 64 Machine Lightning is probably the most advanced games writing utility available on any micro. It comes in 4 parts:*

***MACRO ASSEMBLER/ MONITOR/DISASSEMBLER** This is probably the most comprehensive machine code development system available for the Commodore 64 with features too numerous to mention.*

***BASIC LIGHTNING** BASIC Lightning, the multi-tasking BASIC is also provided to facilitate experimentation in preparation for later assembly.*

***SPRITE GENERATOR** Used to develop all the graphics for the final game. The Sprite Generator has numerous functions including enlargement, rotation and reflection.*

***OBJECT LIBRARY** This is Machine Lightning's most powerful feature. 10k of re-entrant code with more than 130 documented entry points. These are the routines that provide all the superfast graphics routines in White and Basic Lightning. They contain virtually every routine you'll ever need to write an Arcade Game and multi-tasking in Machine Lightning is covered in the comprehensive accompanying manual.*



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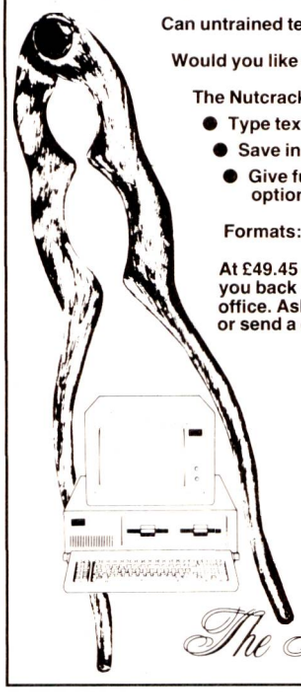

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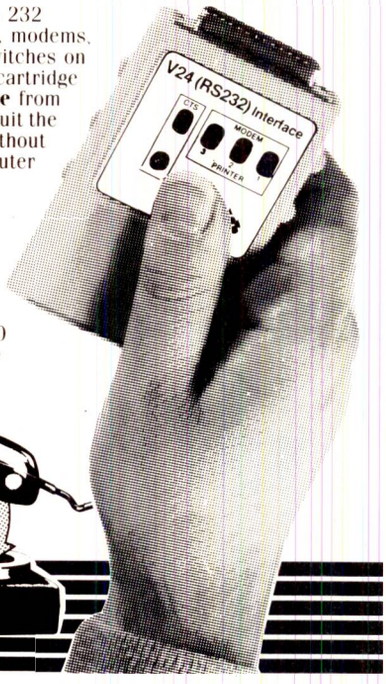






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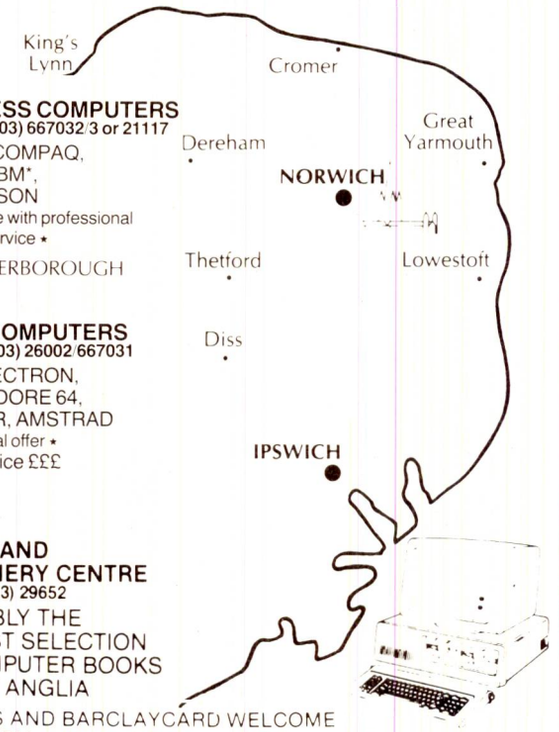


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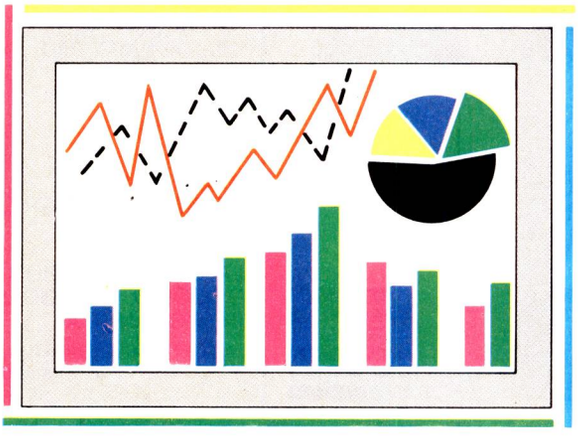

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# CHIP CHAT



***Apart from breaking into joy because the tape has finally loaded, what else might have excited the young user in the centre of this photograph? And no, we don't know why the other young lady had to put on her leotard before tackling the Spectrum.***

***Send your suggestions, on the back of a postcard, to ChipChat, PCW, 62 Oxford Street, London W1. Don't forget to give your name and address so we know where to send the £10 should you win. The closing date is 31 January.***

**The BBC sure gets around**: last November we reported on a US firm advertising the Dragon as being produced under licence from the British Broadcasting Corporation. Now a UK newspaper reports that ICL 'is concerned at getting its name better known because many people do not associate it with the BBC computer' — strange that.

**Eat your heart out, Cindy**: US software house Epyx has celebrated the 25th birthday of Barbie dolls by releasing a game based on this heroine of our times. The company president comments enthusiastically: 'Through the magic of the home computer, children can take Barbie shopping in five different stores, dress her in over 1000 combinations of outfits, and even change Barbie's hairstyle or hair colour.' Readers concerned at this stereotyping will doubtless be reassured to learn of another feature at the Barbie convention where the game was announced — a display of 'contemporary Barbies groomed for the fast-paced business world.'

**Taking stock**: Nottingham Building Society has announced the winners of the Homelink/Interactive Game competition we ran last summer. Making money through investment proved to be a rewarding theme for P L Wallinger of Winchester who took first prize, closely followed by Edinburgh's K Campbell and Grimsby's W K Turner.

**Inscrutable**: readers may recall a letter from NEC in our last issue which denied a price-cutting possibility raised in a previous news story. That letter was published about the time a price cut was announced. We understand that this particular deal will no longer be on offer by the time you read this, then again . . .

**Basic knows no borders**: Xitan doubtless deserves credit for translating XBasic into Welsh (LOAD is LLWYTH, RUN is RHEDEG, and so on). The Southampton-based company would deserve even more credit if it hadn't said that one reason Welsh was chosen was 'to get the product checked out by people in the same country.'

**Rave from the grave**: Livewire Software has revived the only game which *PCW*'s editor ever truly mastered — Space Invaders. What next from this forward-looking firm — Pong 85? Uncoordinated readers striving for success on faster games should look at a product called Slomo which will slow everything down so that you can at last rack up a high score.

**SOS**: Douglas Nunn has sent Chip Chat a plea: 'I returned to my computer one day to find the following anonymous message left for me via my newly acquired teletext system. I can see it's not a program of any sort, not even in Forth, but I can't make head nor tail of it. My last hope is to send a copy to both *Personal Computer World* and the Polish Embassy to find out if either can tell me its significance and the whereabouts of the mysterious sender. I have added my own numbers for reference.'

We can't help (nor, we suspect, can the Polish Embassy) — but we've every faith that one of our readers can. In case faith is not enough, Hewlett Packard has agreed to offer a prize of its 12C calculator to whoever can come to Douglas's aid.

Send your suggestions to reach us by 31 January — the address is as for the caption competition.

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26 OBHCH OCFBD OEBHG A COCCH FOBBA ADOEH BCOFC CAOGE
27 OEECA AOFDD AOFGD A BDOGF BAODC FOGFC FODCA OFGGG

**Another winner**: M L Awcock of Steventon, Oxon wins £10 for submitting the correct answers to the November crossword. The solutions are:

ACROSS

8 Validate 9 Edible 10 Author 11 Database 12 Blip 13 Nadir 15 Elan 16 Twenty-eight days 20 Oric 22 Alter 23 Bumf 25 User port 27 Digits 28 Pacman 29 Diskette

DOWN

1 Manual 2 Light pen 3 Warranty 4 Wend 5 Letter 6 Nibble 7 Glossary 14 Drift 17 WordStar 18 Hard disc 19 Debugged 21 Chrome 22 Acorns 24 Mutate 26 Tidy

Many thanks to all our readers for submitting their crosswords. Unfortunately our publisher won't allow us to give prizes to you all.

END

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