Personal Computer World

US $2.50/FF 18.50/SFr 7.30/IR £1.41/BFr 99.00/
Lire 5,700/DKr 27.00/DM 9.5

December 1985 95p

Win Apple's top-line Mac

BRITAIN'S BIGGEST MICROCOMPUTER MAGAZINE



PC2 OR JUNIOR'S COMEBACK?
Exclusive benchtest of IBM's JX



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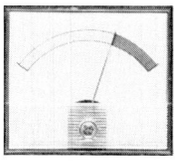
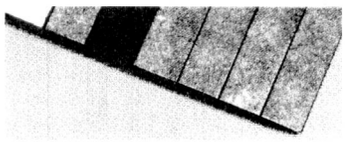
*Thankfully it's at a very low amperage so you don't feel it, except when you spark off an earth. But your computer does! O.K., it won't go bang and stop, but static causes a slow gnawing away you will only notice when — the data and memory become fuzzy, printouts aren't as accurate as they used to be, disc drives start to malfunction. These all cost you money, as they have to be rectified by re-keying, or calling an engineer.





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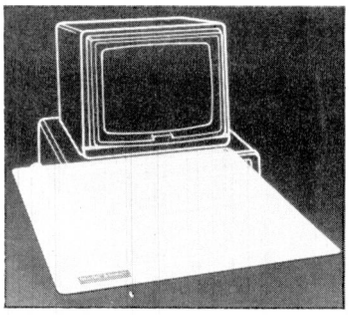

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Static Control Products by Formica Corporation

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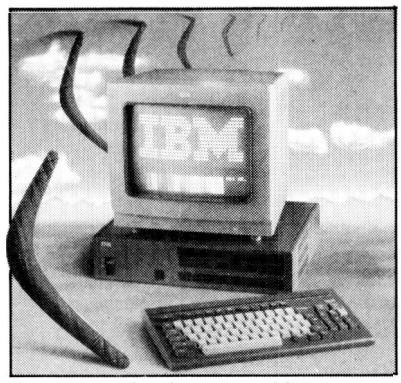

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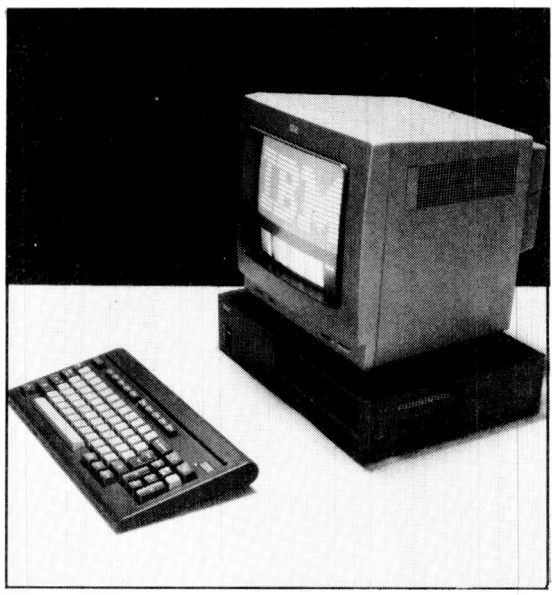

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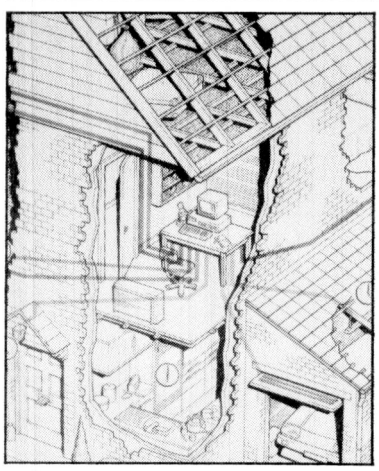

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PCW Subscription Enquiries Stuart Cruickshank **Subscription Rates** UK: £15, Overseas £40 **Subscription and back issues address** 32-34 Broadwick Street, London W1A 2HG, tel: 01-439 4242 **Advertising address** 32-34 Broadwick Street, London W1A 2HG, tel: 01-927 9016 **Editorial address** 32-34 Broadwick Street, London W1A 2HG, tel: 01-439 4242. **All departments** Telex: 23918 VNUG — No material may be reproduced in whole or in part without written consent from the copyright holders © Computing Publications Ltd 1985. Typeset by Meadway Graphics, 198 Victoria Road, Romford, Essex. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Comag Ltd., Tavistock Road, West Drayton, Middlesex, tel: (0895) 444055

THOUGHTS & CROSSES

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Commodore 64 (+ £40 FREE software)	£189
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Amstrad CPC464 (colour monitor) + £100 FREE software	£299
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Amstrad 6128 (green with disk drive)	£299
Sinclair QL	£199
Amstrad PCW 8256	£458
Commodore 128	£259

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Epson LX80	£250
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Brother HR15 (Centronics)	£375
Brother Cut-Sheet Feeder	£220
Brother Keyboard	£150
Brother 1009 (Centronics)	£189
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Juki 2200 (Typewriter Daisy Wheel Printer Centronics)	£275
Juki 6100 Tractor Feeder	£129
Juki 6100 Sheet Feeder	£220
Daisy Step 2000 (Centronics Daisy Wheel)	£250
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Mannesman Tally MT80 Plus (Centronics)	£195
Commodore MPS 801	£99
Alphacom 32 (Spectrum)	£39
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Mannesman Tally MT80	£4.30
MPS 801	£4.30
Brother HR15	£5.60
Seikosha GP80	£3.50
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Juki 6100	£5.60

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View	Acornsoft	£55.00
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Paintbox	Beebugsoft	£9.00
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Sprite Utilities	Beebugsoft	£10.80
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SPECTRUM

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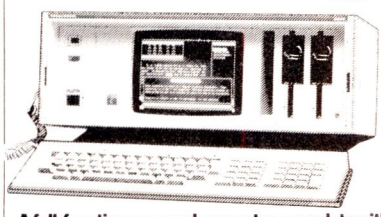

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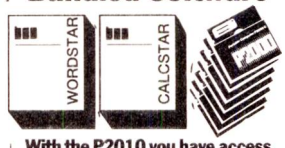

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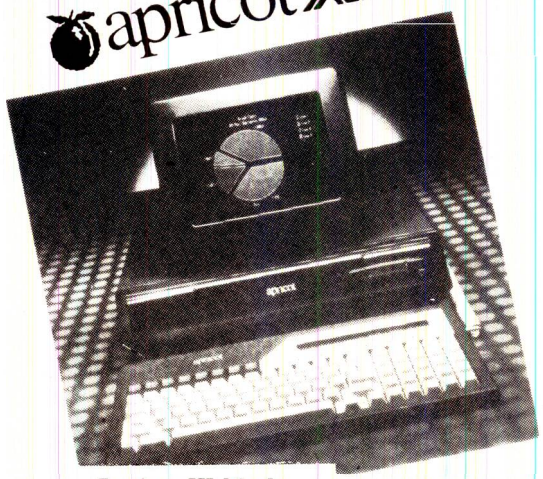

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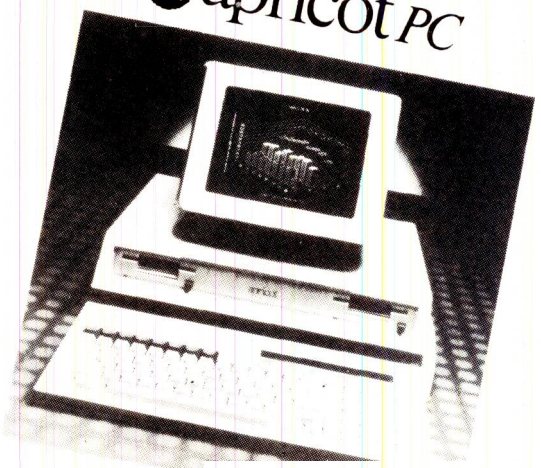

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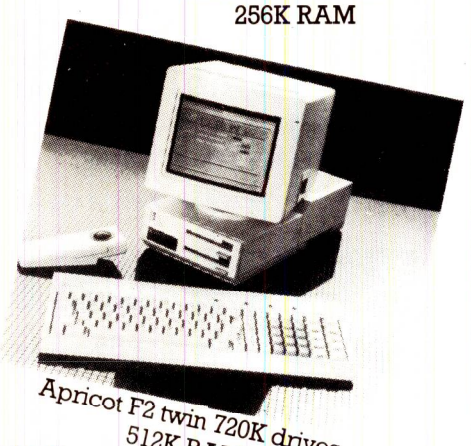

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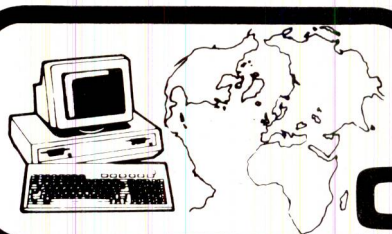

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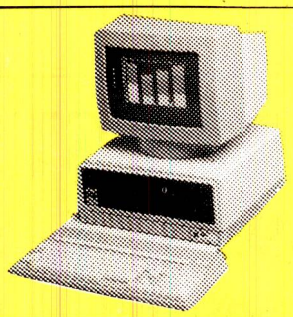

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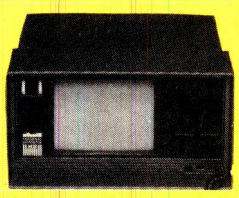

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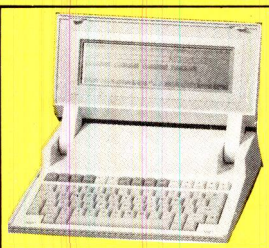

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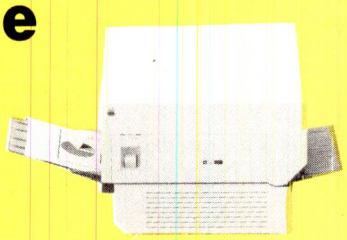

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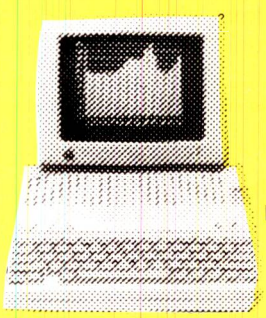

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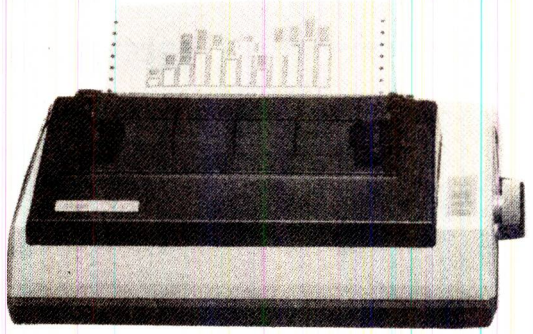

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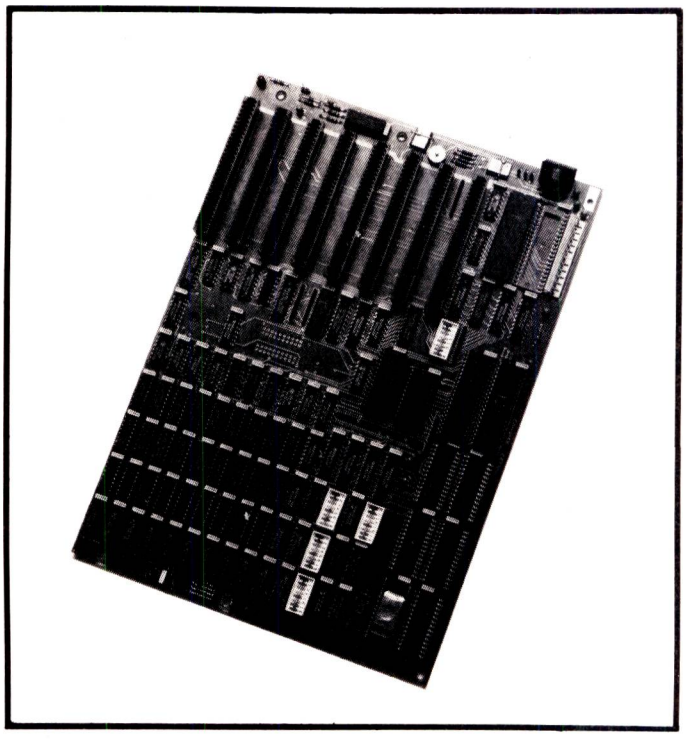

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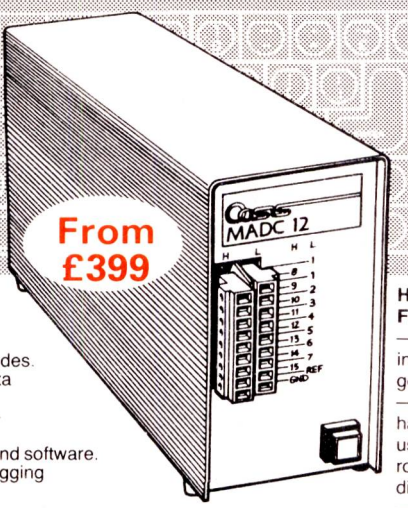

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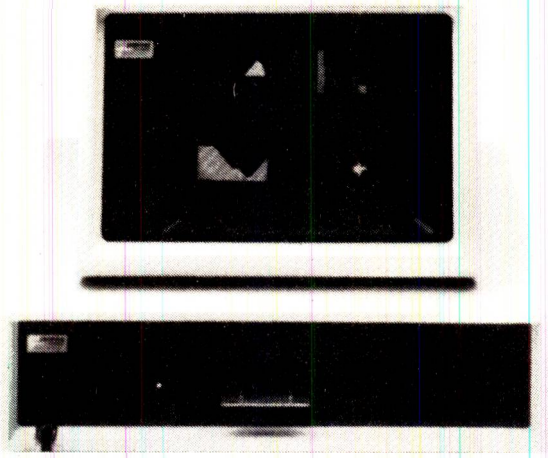

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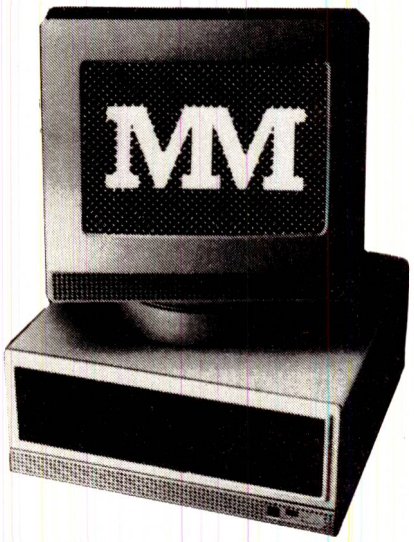

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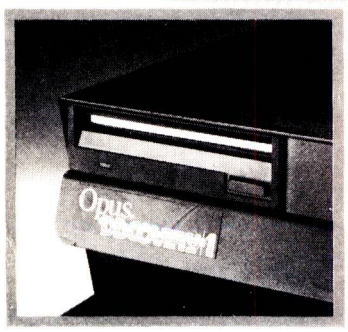
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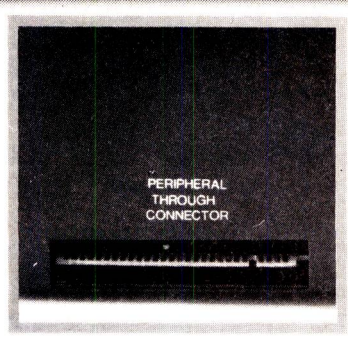
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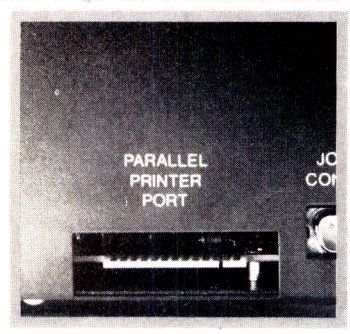
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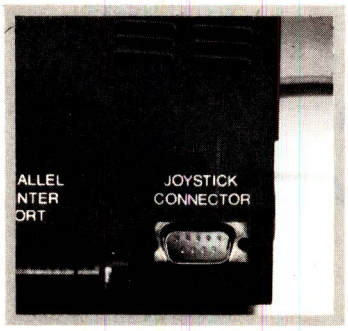



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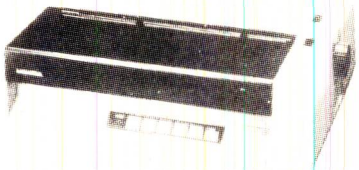

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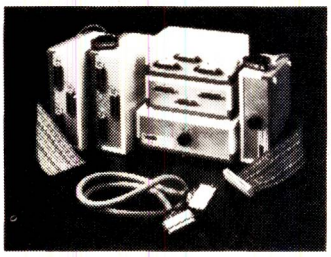

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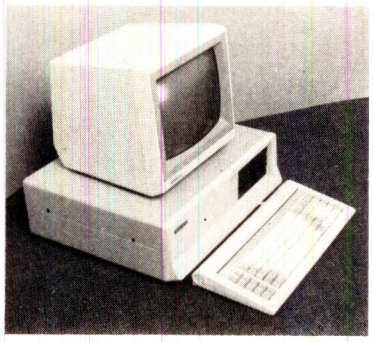

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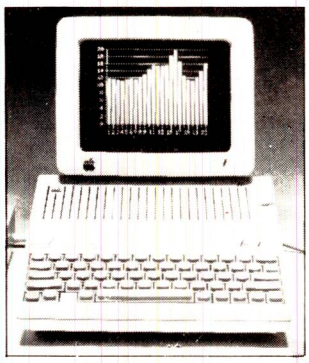

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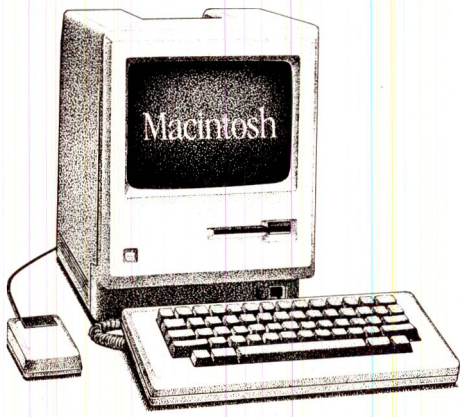

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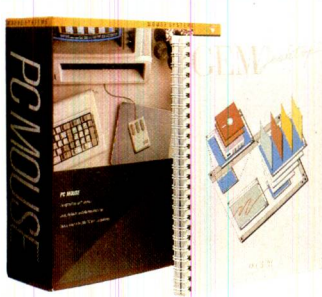

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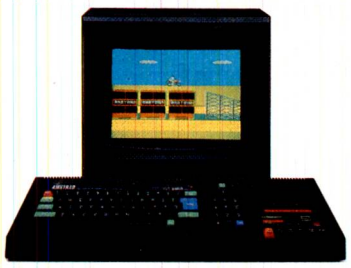



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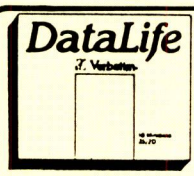

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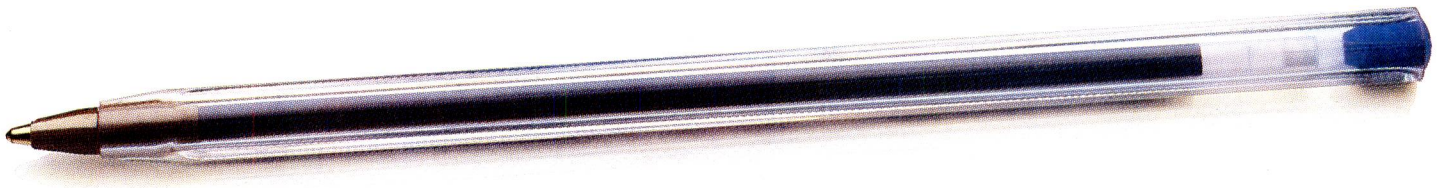

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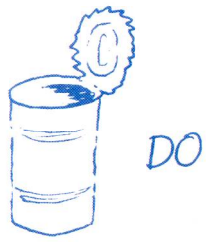

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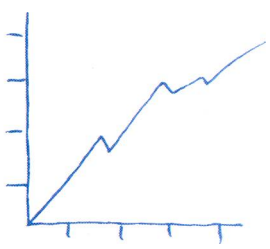

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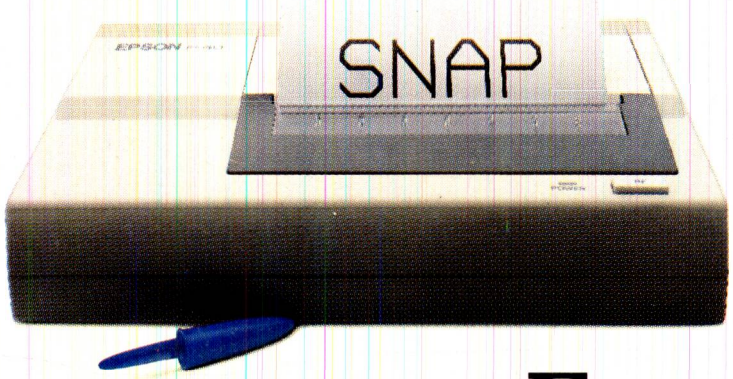

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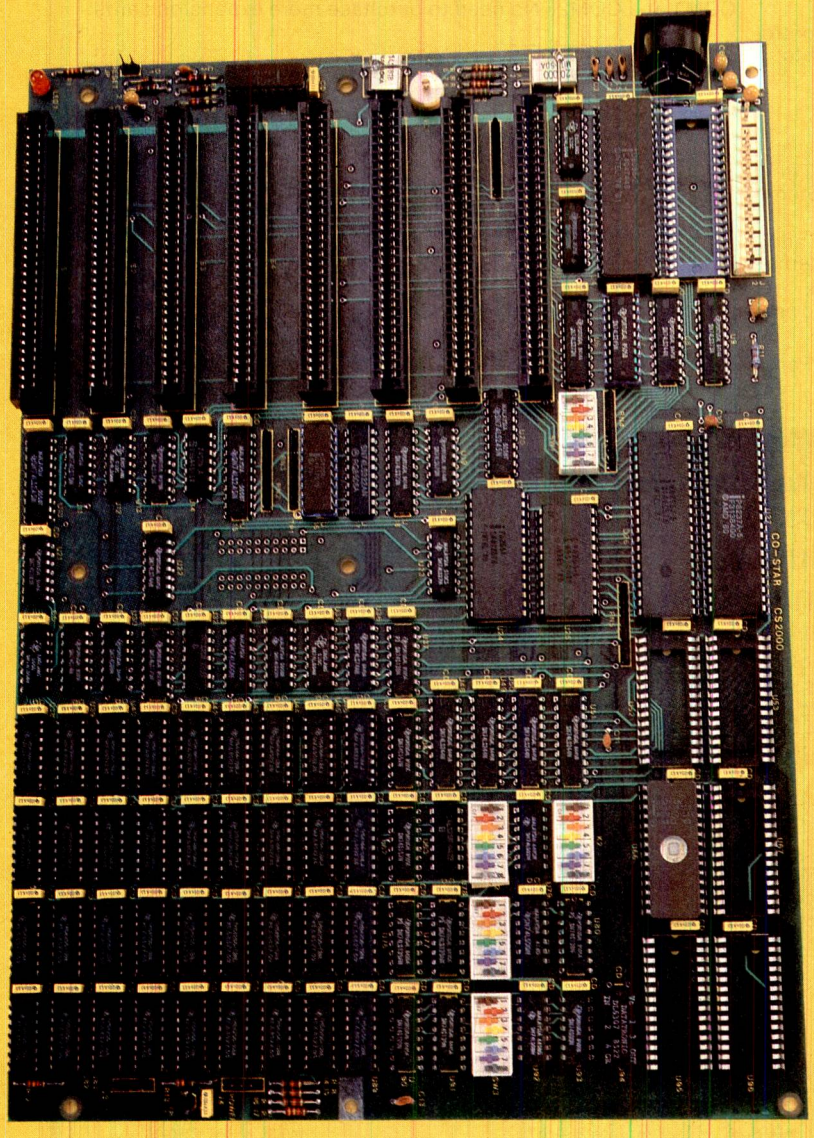

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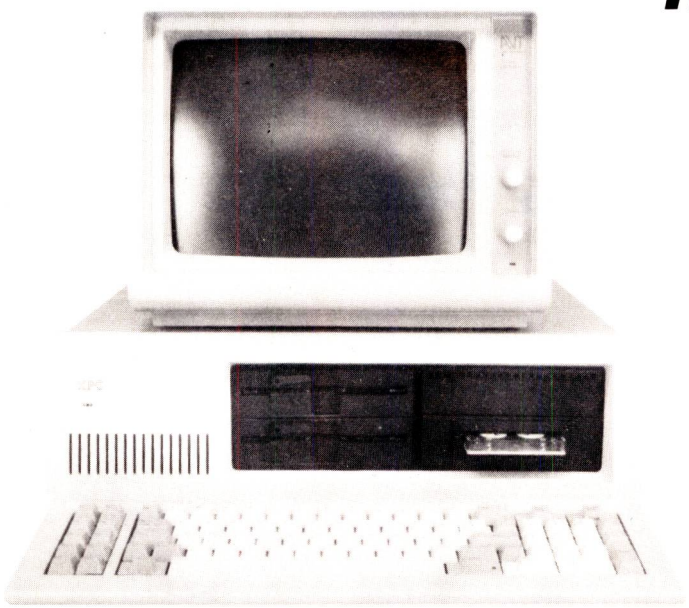

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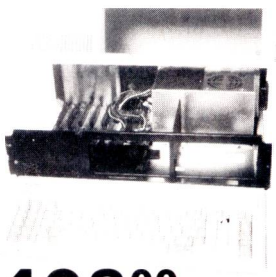

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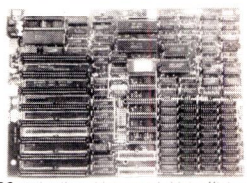

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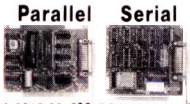

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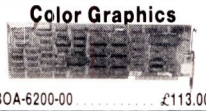

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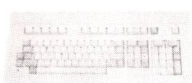

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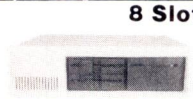

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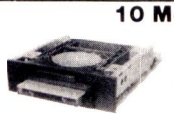

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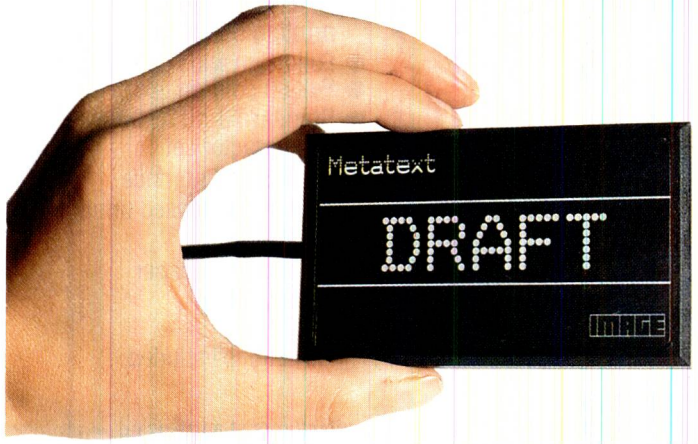

Your matrix printer is ideal for fast printing and for producing graphical output from spreadsheets etc. But matrix printer output is not usually acceptable for management reports or letters. So do you have to buy a new printer to get better print quality?



Not any more. This was printed on the same matrix printer as the text above - using Metatext. Just by turning the puck over to 'Quality', Metatext enables a standard dot matrix printer to produce daisy wheel quality output like this, without modifying the printer!

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Metatext

Metatext enhances the output of dot matrix printers into proper Courier style characters as shown, or any of five other typestyles. To select draft or quality output, you just turn over the puck which lies on the table beside the printer.
Metatext runs on the IBM PC and true compatibles, and drives most popular matrix printers that support Epson control codes, including the IBM Graphics Printer and Proprinter, and the RX, JX, LX and FX series of Epson printers.

No hardware modifications are needed to either the printer or the computer. No changes are required to user programs or to software packages for **Metatext** to function. **Metatext** is compatible with all popular software packages including WordStar, Lotus 1-2-3 and Symphony.

Metatext consists of software, which binds itself into the computer's operating system, and the puck. This plugs in between the printer cable and the parallel printer port on the computer. The puck is read by the software to determine whether to output draft or quality print. It can also be used as a simple means of switching between normal printing and the NLQ mode built into many newer matrix printers.

Metatext is available by post for £95+P&P and VAT from

Image Computer Systems Ltd.,
Ferndown Industrial Estate,
Wimborne.
Dorset BH21 7PE

Make cheque out for £110, to cover P&P and VAT, payable to Image Computer Systems Ltd.

Telephone orders accepted – using Access, Barclaycard or American Express
Ring 0202-876064.

For Dealer enquiries and multiple orders, contact

KPG Hardware House,
578/586 Chiswick High Road,
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IMAGE

IBM PC, Proprinter, WordStar, Epson, Lotus 1-2-3 and Symphony are registered trademarks.

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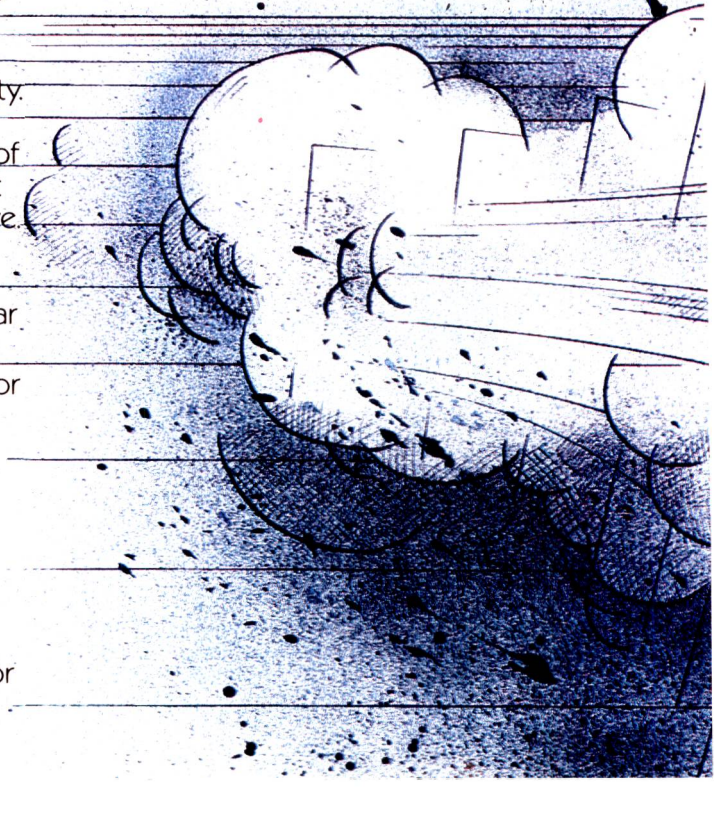

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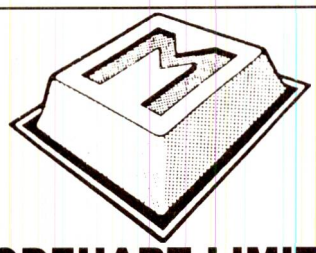

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MSP 20 (200cps 80clm NLQ)	£555.00	£444.00
MSP 25 (200cps 136clm NLQ)	£700.00	£560.00
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SR 10 (200cps 80clm NLQ)	£489.00	£366.75
SR 15 (200cps 136clm NLQ)	£589.00	£44175
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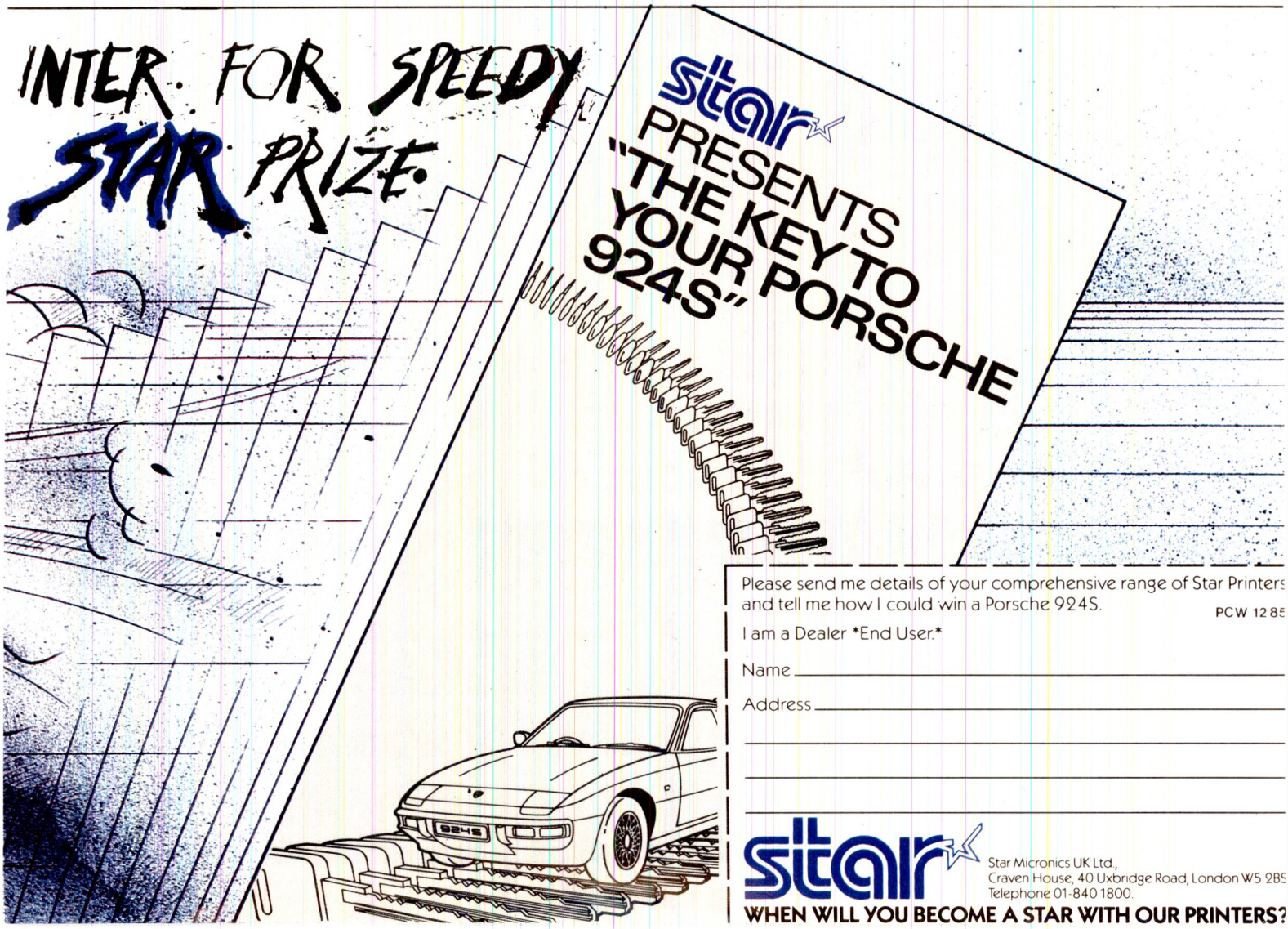

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WHEN WILL YOU BECOME A STAR WITH OUR PRINTERS?

INTEGRATION—THE FACTS

INTER-SHEET and INTER-CHART are the first of a new generation of integrated packages for the BBC Micro. They are more powerful and much easier to use than any other similar application program.

The ROM-LINK concept is unique to this range of programs; it ensures that all ROM-LINK programs are totally compatible and truly integrated.

The word 'integrated' has been much abused recently. In our eyes 'integrated' should mean that all programs in the range should share a common data format, that it should be possible to transfer data directly from one program to another (not just by saving and loading) and it should be possible to have multiple programs resident in the machine at once. The integrated programs in the ROM-LINK series are the only ones that can do this.

The ROM-LINK system allows up to 16 packages to be resident in memory at the same time. It makes no distinction between any of the packages, so that you could have up to 16 separate spreadsheets stored in memory or (more usefully) a few spreadsheets, a few graphs and a couple of documents being word processed. It is a simple matter to transfer data from any package into the one in current use, and because the packages are resident in memory, the data transfer is very fast. It is also possible to use data from other packages without actually transferring, thereby saving memory.

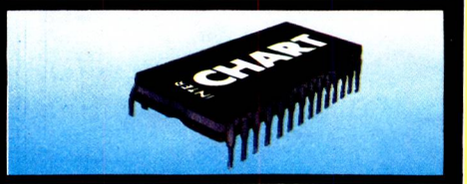
Put simply, this means that INTER-SHEET can use multiple spreadsheets and use data from one sheet in another sheet, and INTER-CHART can plot graphs using data taken directly from a spreadsheet. When INTER-WORD and INTER-BASE are available then these will be able to use data from the other packages in the same way.

FACTS INTER-CHART

The chart and graph plotting program

This general purpose graph and chart plotting program allows the user to display data in the most easily understood manner—graphically.

Two quite distinct sorts of graphs are catered for. 'Labelled' graphs that always have fixed increments on the X axis like yearly sales figures, and 'scaled' or scatter graphs. These allow both the X and Y values to be specified.



Data can be entered into the system from three distinct sources: Typing at the keyboard is the simplest method, but data can be read from ASCII files produced by WORDWISE, VIEW or a programming language such as BASIC. Because INTER-CHART is ROM-LINK compatible it can also import its data directly from other ROM-LINK packages such as INTER-SHEET.

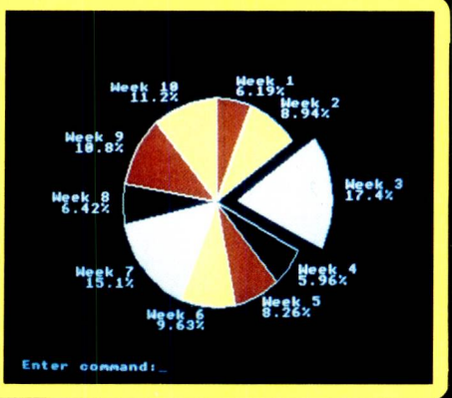
Once the data has been entered a straightforward editor allows any previous data to be altered or new values to be inserted at any position.

TEXT WITH GRAPHS: Labels are normally printed along the X-axis for lines and bars. Pie charts have their labels and values printed around the chart. These may be optionally switched off. With a pie chart the values may be replaced with a percentage figure. All graph displays can have additional labels or messages printed at any position on the screen using a powerful label editor. This allows headings to be easily added to graphs. These labels are stored with each graph when saved.

COMPATIBLE WITH: All shadow RAM boards and the 6502 2nd processor. However the ROM-LINK facilities are not available when using a 2nd proc., these include multiple INTER-CHARTS and direct data transfer from other ROM-LINK programs.

PRICE: £36.80 incl.

INTER-CHART allows up to 16 graphs to be held in memory at the same time as one 'package'. Each graph is named and, once entered, any named graph can be selected from a simple menu display.



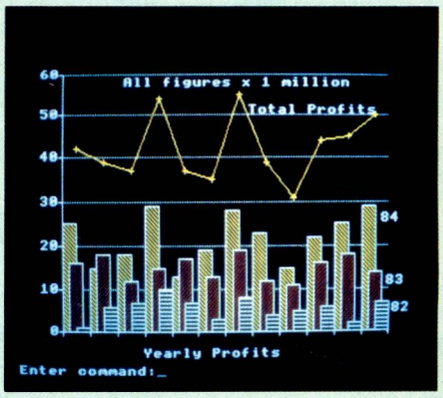
SCREEN DISPLAY: The graphs can be displayed in any of the BBC's graphics modes. The colours of the bars, lines or segments can be altered in a simple table of colours. This also allows special striped colour combinations and for bar charts a variety of cross hatching styles is available. It is also possible to use a VDU19 statement to alter the colour palette.

DISPLAY OPTIONS: Where appropriate (not pies, etc) either axis can be displayed as a log or linear scale, and there is an option to display dotted graduation lines on either axis. Pie segments and bars can be highlighted (segment 'pulled out').

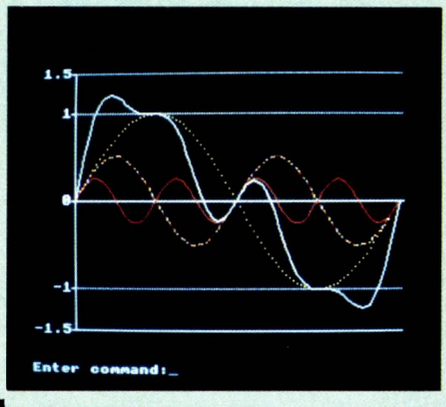
PRINTERS: INTER-CHART has a built in screen dump routine for all EPSON matrix printers and compatibles. It is possible to use other screen dump routines from within (or external to) INTER-CHART for other printers or plotters.

FILING OPERATIONS: Any named graph can be saved or loaded individually to disc or cassette, or all graphs can be saved together in one file.

GRAPH TYPES: INTER-CHART supports the three main graph types, lines, bar charts and pie charts. Scatter graphs are also catered for and can be displayed as points or lines.



SCALING: INTER-CHART automatically scales the graph display to cover the full range of values entered. INTER-CHART can cope with numbers in the range 2E-39 to 2E+38. It is possible however to force the scale independently on the X and Y axis to show any specified range, including the option for log scales on either or both axes.



FUTURE RELEASES

Both INTER-SHEET and INTER-CHART are available now. INTER-BASE and INTER-WORD are under development at the moment, and are likely to be released in early 1986. Both are fully ROM-LINK compatible so that they will be totally integrated with the others in the range.

INTER-WORD is an 80 and 105 column word processor (not 40 columns). This will be a 'WYSIWYG' word processor showing the page on screen exactly as it would appear on the page, including page breaks, headings/footings and centered lines, justification, margins, etc. It will also handle 'continuous' documents on disc up to the capacity of your filing system.

Like all of our products this will be smooth and very fast in operation, and of course very easy to use. Editing operations will be similar to WORDWISE but this is not totally WORDWISE compatible. There will be an exchange arrangement available to WORDWISE owners—more details available nearer the release date.

AVAILABILITY: Winter 85/86
PRICE: Approx. £49.00 + VAT

INTER-BASE will simply be the most powerful database available. This will operate with all disc filing systems and have a very large data handling capacity. It will contain a powerful BASIC-like programming language with full string and mathematical operations.

This will work at 2 levels, a simple user interface will allow card-index like operations but, via the programming language, the system can be easily tailored to the individual needs. Up to 250 fields per record, each field up to 32K long. This would enable the user to store complete documents in the database. Variable length fields and records.

AVAILABILITY: Early 1986
PRICE: Approx. £59.00 + VAT

INTER-SHEET

The electronic spreadsheet program

FACTS

FILING OPERATIONS: Load and Save entire sheet. Save specified part of sheet. Load part of sheet to any sheet position. Spool sheet to file. Save all ROM-LINK packages. Load all ROM-LINK packages.

IMPORT/EXPORT: Export any part of sheet for use in word processors. Import sheets created on word processors. Import data directly from other ROM-LINK packages.

PRINTING: Print all or specified part of worksheet. Print with or without sheet borders. Print with or without held lines (windowing). Sheets titles can be printed and control codes can be sent to the printer. Print all formulae. The pound sign code can be altered to a sequence of codes for different printers.

AUTO-STEP: Whenever an entry has been made the cursor can automatically move one box up, down, right or left.

CELL DISPLAY: Any box (cell) can be displayed left or right justified. Labels can also be centered. Numbers may be displayed in three formats, exponent, fixed or general format. The number of digits is controllable from 0 to 10.

LOCKING: Any box, row or column or all boxes can be locked to prevent accidental alteration.

LABELS: Formulae can refer to other boxes in the normal way (e.g. A1 or G5) but can also refer to boxes in a much more meaningful way via labels (e.g. JAN SALES), the box referred to is at the intersection of the column and row of the specified labels. Labels are not restricted to being placed on the borders of the sheet only.

REPLICATION: Any box or area can be copied to any other box or area on the sheet, giving total flexibility. The replication is very fast—see comparisons. Single key operations for inserting or deleting a row or column. Formulae can automatically be altered, if desired, relative to their new position.

OPTIONS: A variety of spreadsheet defaults can be altered, such as the default box justification, number format, sheet area. Screen colours are easily alterable.

WINDOWING: A unique system that allows any row or column (or multiple rows and columns) of the sheet to appear at a fixed position on screen, still allowing the sheet to scroll underneath. Far easier to use and more flexible than other windowing systems.

The first published review of INTER-SHEET says:

"... It offers higher capacities than any previous Beeb spreadsheet, but it runs significantly faster than Lotus 1-2-3 and Symphony on the IBM-PC,"

"INTER-SHEET is quicker, has more features and is cheaper than either of its competitors. If the remainder of the "Inter-" series are as good as this Acornsoft and the rest better look to their laurels. Software of such quality can only make the Beeb even more attractive as a business machine."

Gordon Taylor—A&B Computing Sept. 85

PRESS

COMPATIBLE WITH: Shadow RAM boards such as the Aries B20 and Watford electronics 32K RAM board. Because the ROM-LINK system needs to switch ROMs INTER-SHEET is not compatible with the 2nd processor, although a HI version of INTER-SHEET will be available for the 6502 2nd processor (No ROM-LINK facilities and no 105 screen mode). INTER-SHEET is supplied in 2 ROMs, but if you only have 1 socket then only the ROM-LINK facilities are lost (multiple spreadsheets etc).

For the BBC MICRO
Available from all good software dealers or directly from ourselves

INTER-SHEET and the rest of the ROM-LINK series belong to the 2nd generation of application programs for the BBC Micro. They are larger, more powerful and easier to use than any previous products of this sort.

ROM-LINK



INTER-SHEET offers many quite unique features.

1. The fastest spreadsheet—see comparison box
2. The largest capacity—see comparison box
3. 40, 80 and special 105 column screen mode
4. Multiple spreadsheets in memory at once
5. Data transfer between sheets in memory
6. Data transfer to and from word processors such as WORDWISE and VIEW
7. Menu operation and fully prompting commands
8. Complete documentation. 2 manuals, an introduction and a reference, are supplied along with a quick reference card.
9. Will integrate directly with INTER-CHART and other ROM-LINK compatible products.

PRICE: £56.35 incl.

Computer Concepts

Gaddesden Place, Hemel Hempstead, Herts HP2 6EX (0442) 63933

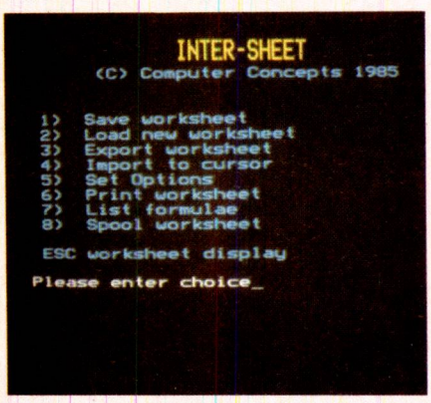
Some further facts about INTER-SHEET:

CURSOR MOVEMENT: WORDWISE-like cursor movement allowing the user to move left or right one box, one screenful or to the extremes of the used sheet area. A further command allows immediate movement to any specified box.

SCREEN DISPLAY: Single key switch for 40, 80 and a special 105 column screen mode. This allows much more of the spreadsheet to be visible on screen at once. The 105 column mode requires no special monitors—if you can read the 80 column mode then the 105 will work perfectly well.

SHEET SIZE: 64 columns by 255 rows. Each box can hold up to 80 characters. Column widths are variable up to 31 characters wide. There is no gap between boxes so labels can continue across boxes.

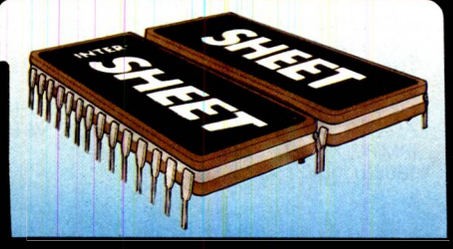
MATHS: A full range of maths functions is included. There are also additional special spreadsheet functions such as AVERAGE, COUNT, IF . . ., LOOKUP, MAX, MIN, SUM, BOX and SQRS (sum of the squares). Numbers can range from 2E-39 to 2E+38 and can be printed to 10 significant figures.



ROM BASED SOFTWARE FOR THE BBC MICRO

Spreadsheet comparisons

Times in seconds	VIEW-SHEET	ULTRA-CALC 2	INTER-SHEET
Replicate SIN(PI) into boxes A1 to Z50	66	65	7
Recalculate the above	28	33	5
Number of bytes free with above sheet	4664	1415	8400
Price (Exclusive of VAT)	£52.00	£69.13	£49.00



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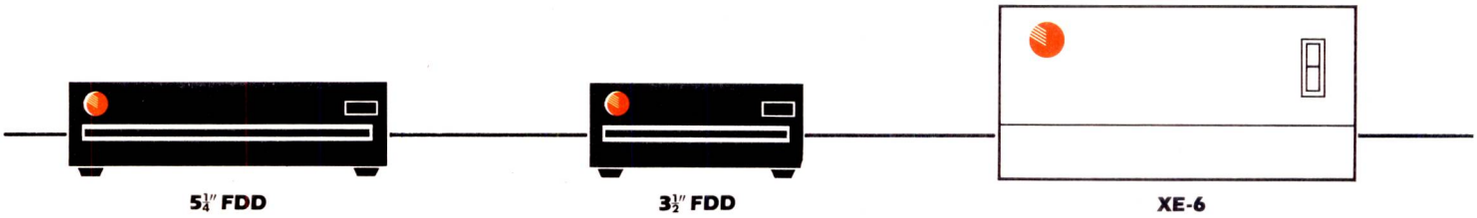

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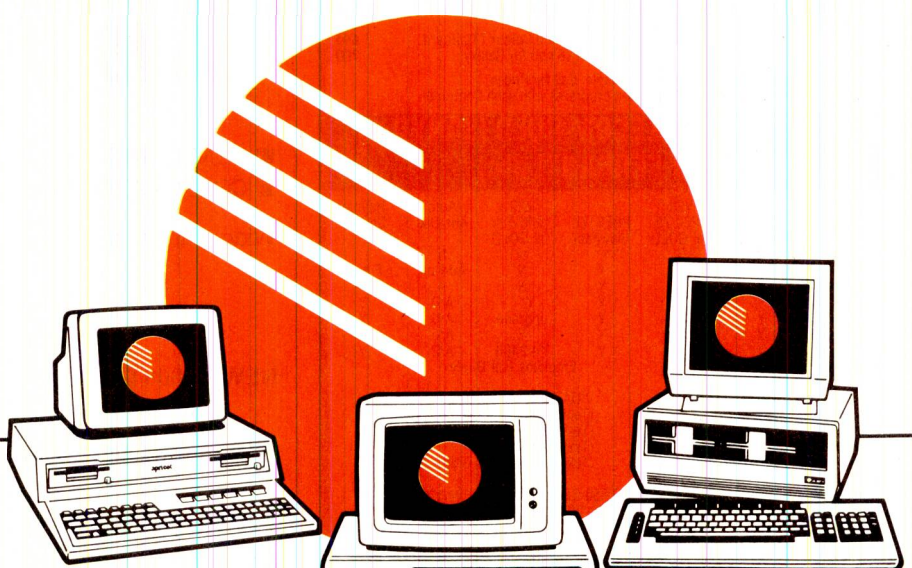

COMPATABILITY TABLE

For order purposes, please refer to the table.
N.B. Please note the following suffixes.

SUFFIX	HOST SYSTEM
A	APRICOT™ (RANGE)
S	SIRIUS/VICTOR 9000

APRICOT™ F1/F2/PC/Xi/F10

XF400A 5¼" FDD	£495
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XE-6	£245

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IBM/Lotus Video Board (MS-DOS 2.11 and GW-BASIC)	145	Graphic Specials:	
Memory Upgrades 64k (128-192k)	28	Grafiti:Freeze Frame:Joysick)	85
128k (128-256k)	45	Picasso:Freeze Frame:Joystick)	118
Standard Disk Drive Upgrades		BASIC Manual	27
2×360k	195	Joystick (2 Button) with ext cable	25
2×800k	235	Picasso	70
Teac Disk Drive Upgrades		Master Graph	55
2×360k	280	DC - 10	25
2×800k	316	Checkmate (Chess Program)	35
Disk upgrade software	39	Screen Dump (Freeze Frame)	32
MS-DOS 2.11	39	Grafiti	32
Games/Business	Send for list	Desmet 'C' Compiler and 8086 Assem	155
Serial Interface (RS232)	49	Desmet 'C' Symbolic Debugger	55
Clock/Calendar Card	59	Cornerman (SANYO's Sidekick)	38
Superzap (disk editor/inspector)	35	Emperor (War Game)	25
M-Disk (Ram disk program)	25	Mi-Term (Communications Prog)	65
Mi-Key (Keyboard re-definer)	25		

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Turbo Pascal (vers 3)	55	Special — Turbo Pascal/Toolbox/Tutor	120
Turbo Toolbox (Isam, Quicksort etc)	49	Turbo Pascal (v3 With 8087 Support)	89
Turbo Tutor	29	Special — Turbo (8087)/Toolbox/Tutor	154
Graphics Toolbox (IBM compats only)	45	Sidekick (Unprotected Version)	70

Olivetti, IBM PC/XT, Sanyo 885 Ferranti etc — Computers/Add Ons/Upgrades/Software

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SANYO 885 (IBM Compatible)	1199	DATAMASTER — database program	495
(The above include MS-DOS 2.11 BASIC, Wordstar 2000, 256k RAM 2×360k Drives, Parallel) as above 1×360k, 1×10mb	1749	OMNIS 3 (MS-DOS Hosted)	395
		Flight Simulator	55
OLIVETTI M24 Desk Top (with 2×360k drives, 640k RAM HiRes Mono Mon. Keyboard Serial/ Parallel/Graphics MS-DOS 2.11)	1649	Concurrent PC-DOS 4.1	195
		Concurrent PC-DOS (Prog Pack)	150
		GEM Desktop (IBM only)	40
As above with 1×360k Drive and 1×20mb Hard Disk	2399	GEM Draw & Desktop (IBM only)	105
		GEM Write/Paint & Desktop (IBM only)	105
M21 Portable	Call	GEM Prog Toolkit	360
Colour Monitor (M24 only)	add 299	Microsoft Windows (taking orders)	Call
HARD DISK and CONTROLLER		Microsoft Quick GW-Basic Compiler	Call
10mb Internal	555	MenuEase (PC DOS Menu System)	38
20mb Internal	655	MenuGen (Single User)	40
MEMORY UPGRADES 64k RAM	31	MenuGen (Multi User)	100
128k RAM	49	LOTUS 1-2-3 (New Version)	299
(Olivetti only) 512k RAM	99	LOTUS 1-2-3 Report Writer	96
CO-PROCESSORS		Wordstar Easy	Call
8087 (5 mhz) Maths Co-Processor	175	Norton Utilities Ver 3.0	69
8087 (8 mhz) Maths Co-Processor	255	Keyworks (Keyboard redefiner)	62
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NCS RAM/Multifunction Card (With 384k RAM:Ser:Par:Clock:Games Ram Disk/Spooler software etc)	229	Mouse Systems Mouse with PC Paint	175
		M'soft Mouse (Bus or Ser) w S'ware	165
		Mono Hercules Compat Board + Par	Call
AST Six Pack Plus Multifunction (With 384k RAM:Ser:Par:Clock: AST Software and Sidekick)	325	Cherry Graphics Tablet (CalComp/Sumnar etc compat)	499
		Two Button Joystick	25
AST Six Pack (as above with OK)	255	smARTWORK (PCB Design Package)	895
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Nightingale	95	Y	Y	Y	N	Add-on	Future
Digisolve CC2123	140	Y	Y	Y	N	A	Y
Digisolve CC2123AD	178	Y	Y	Y	Y**	A/D	Y
WS3000 v21/v23	285	Y	Y	Y	upgrade	A/D	Y
WS3000 v22	475	Y	Y	Y	Y	A/D	Y
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Mi Term	65	SANYO 550	(Text only)
Chit Chat	129	*SANYO 550/IBM etc	(Text and Viewdata Graphics)
Cable (Modem/Comp)	14		

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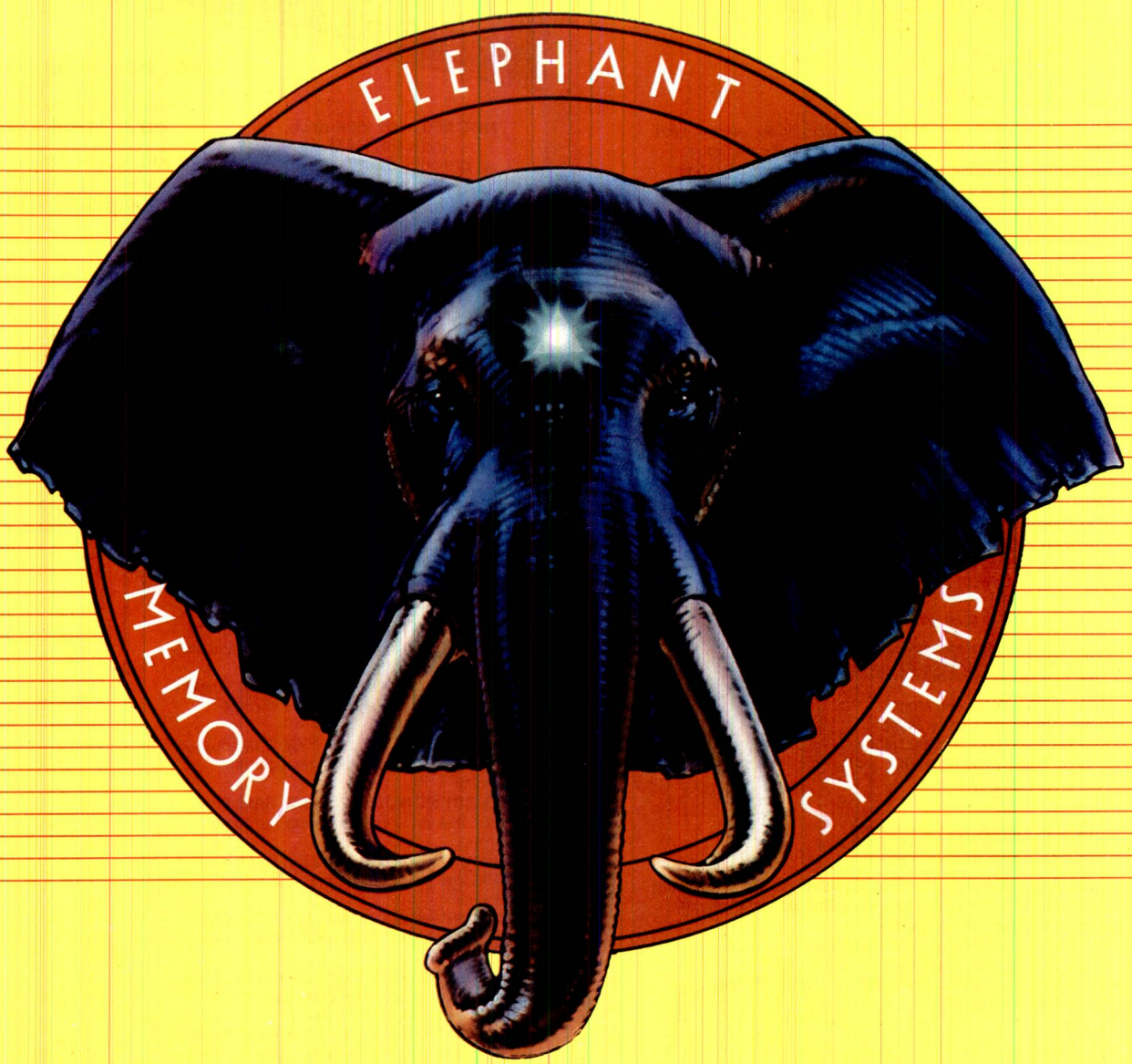



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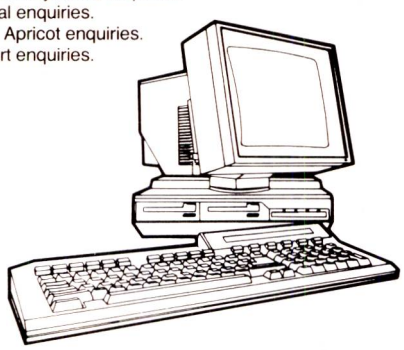

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JUKI 6100: Multistrike	4	5
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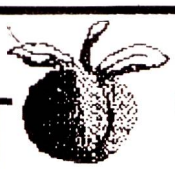

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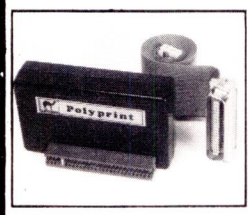

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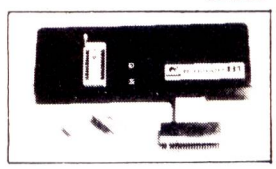

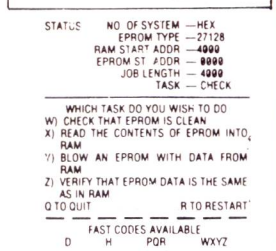

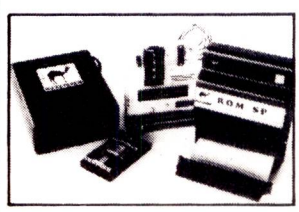

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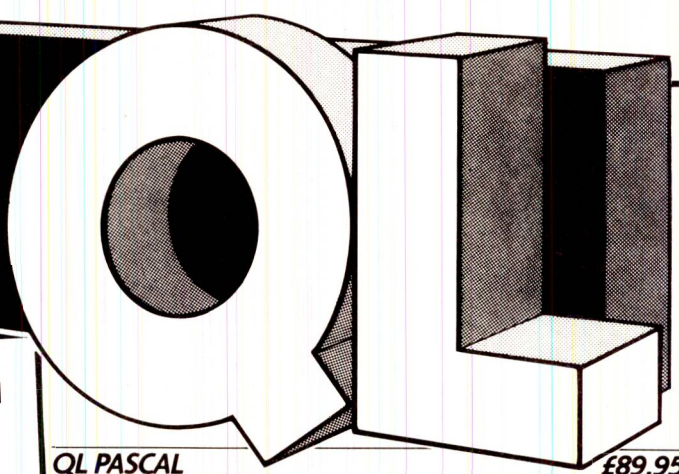

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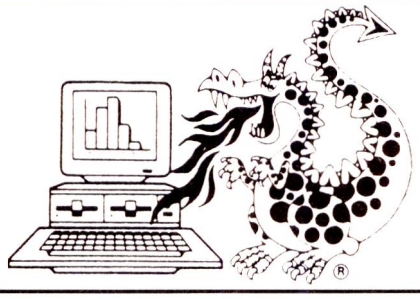

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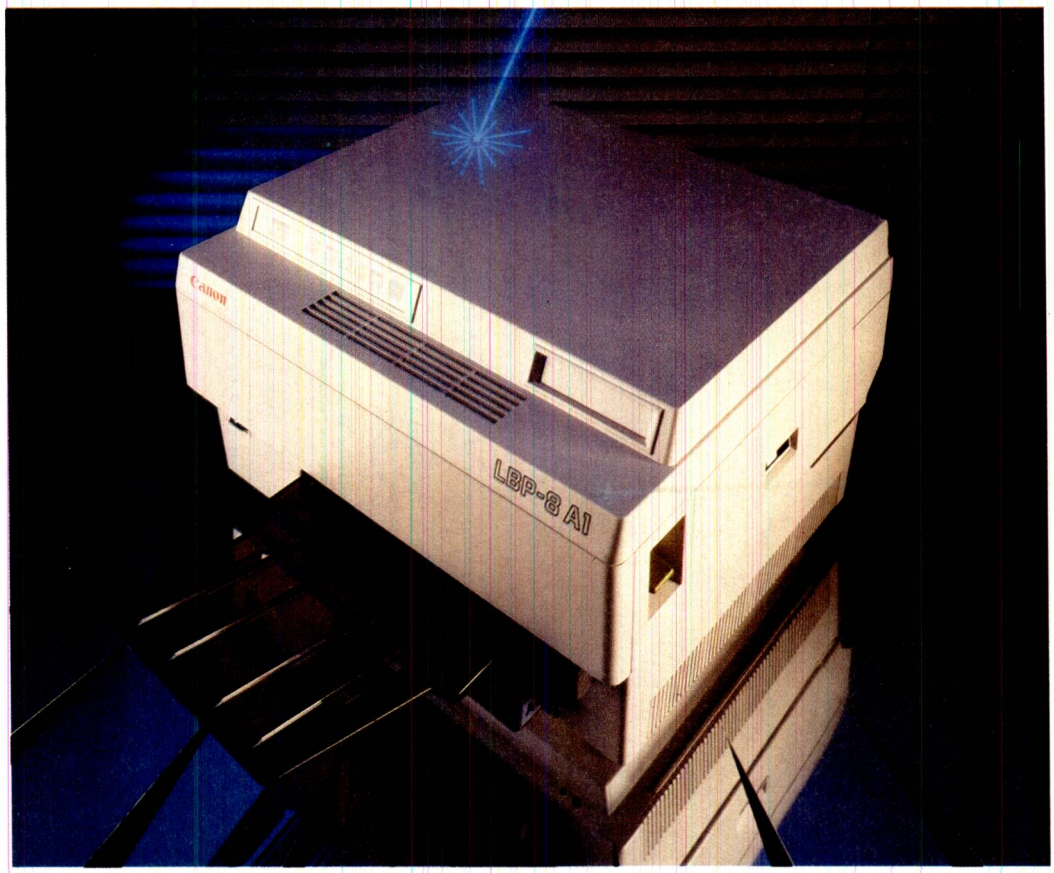

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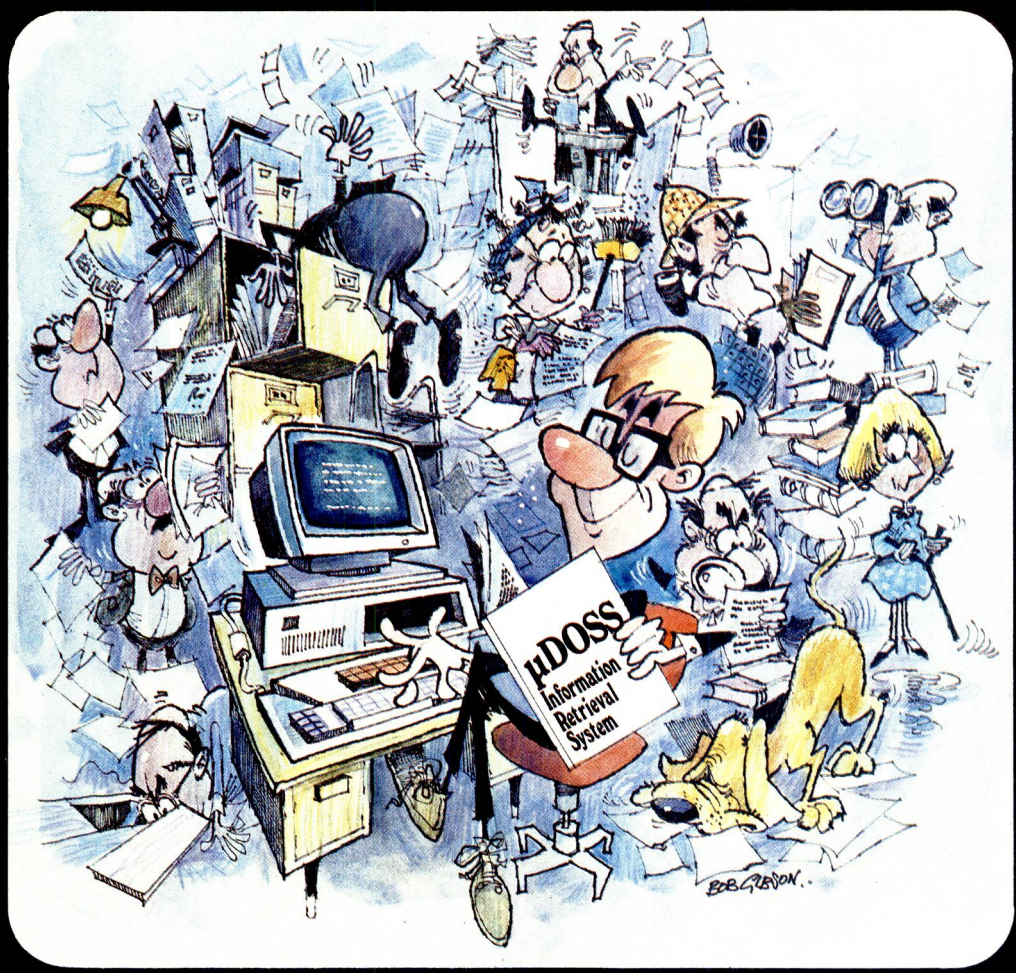

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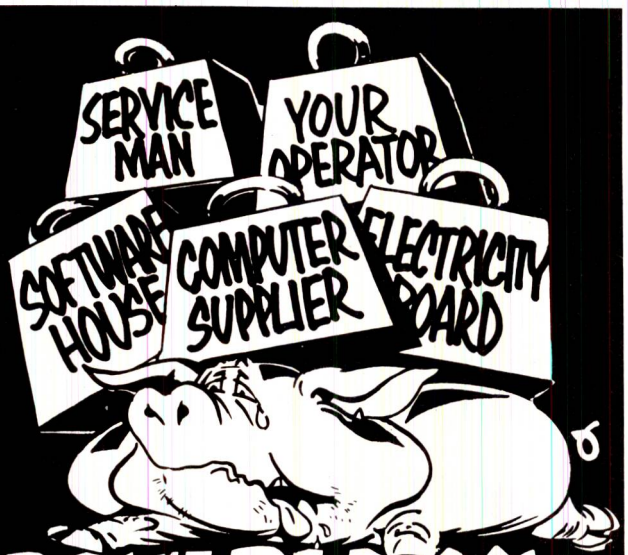

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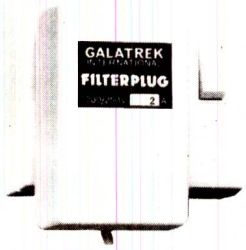

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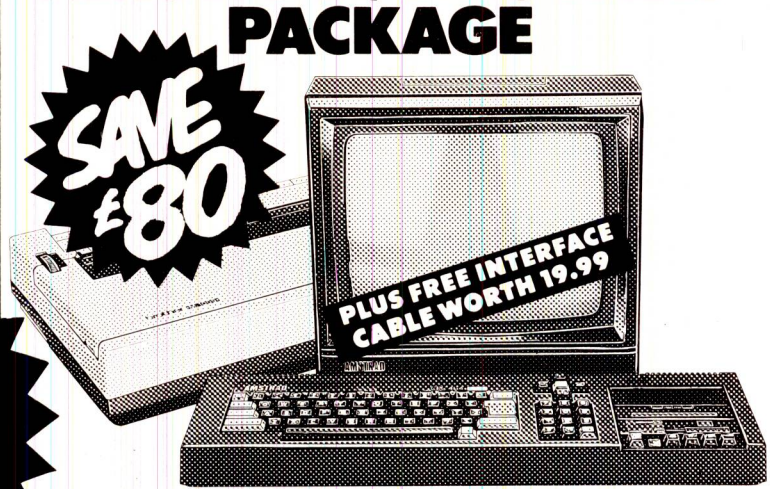

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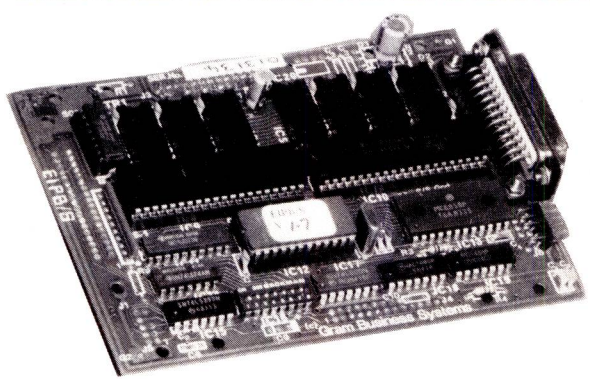

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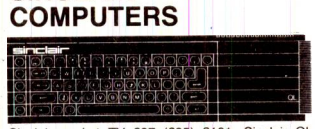
SINCLAIR COMPUTERS



Sinclair pocket TV £97 (£95) £101. Sinclair QL Computer £194 (£196) £229. QL Floppy disc interface £107 (£103) £109. 3.5" disc drive to suit this interface £177 (£176) £196. Sinclair Spectrum Plus Computer 48k £123 (£127) £147. Spectrum Plus + cassette + 4 games + joystick with interface £139 (£139) £169. Original 48K Sinclair Spectrum £89 (£95) £116. Kit to upgrade the Spectrum to Spectrum Plus £30 (£30) £40. Microdrive £49 (£50) £60. RS232 interface 1 £49 (£50) £60. Special offer:— Microdrive + Interface 1 + 4 cartridges £97 (£99) £107. Blank microdrive cartridges £2.50 (£3) £4. Spectrum floppy disc interface (See Cumana disc section for suitable disc drives) £107 (£99) £109. Interface 2 £20.45 (£20) £24. 32K memory upgrade kit for 16K Spectrum (issue 2 and 3 only) £31 (£28) £30. Spectrum Centronics printer interface £46 (£42) £47. ZX printer has been replaced by the Alphacom 32 £61 (£59) £72. ZX81 computer £29 (£29) £39.

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Commodore 128 £269 (£249) £279. Commodore C16 starter pack £74 (£77) £107. Commodore 64 £161 (£159) £189. Commodore 64 + recorder + software £187 (£213) £243. Convertor to allow most ordinary mono cassette recorders to be used with the Vic 20 and the Commodore 64 £9.78 (£9) £11. Commodore cassette recorder £43 (£44) £50. Centronics printer interface for Vic 20 and the Commodore 64 £45 (£41) £46. Disc drive £191 (£186) £217. MPS801 Printer £118 (£121) £151.

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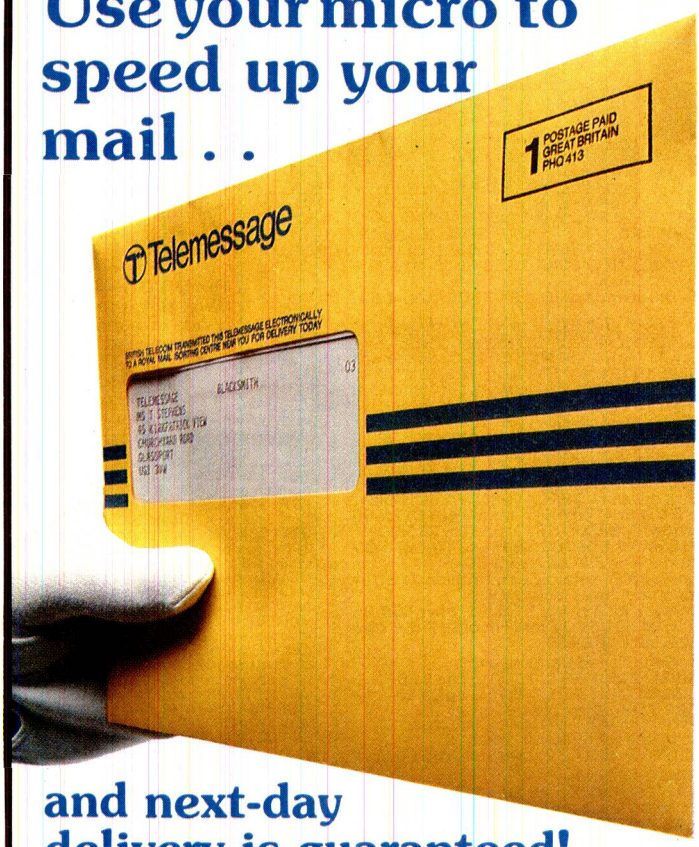

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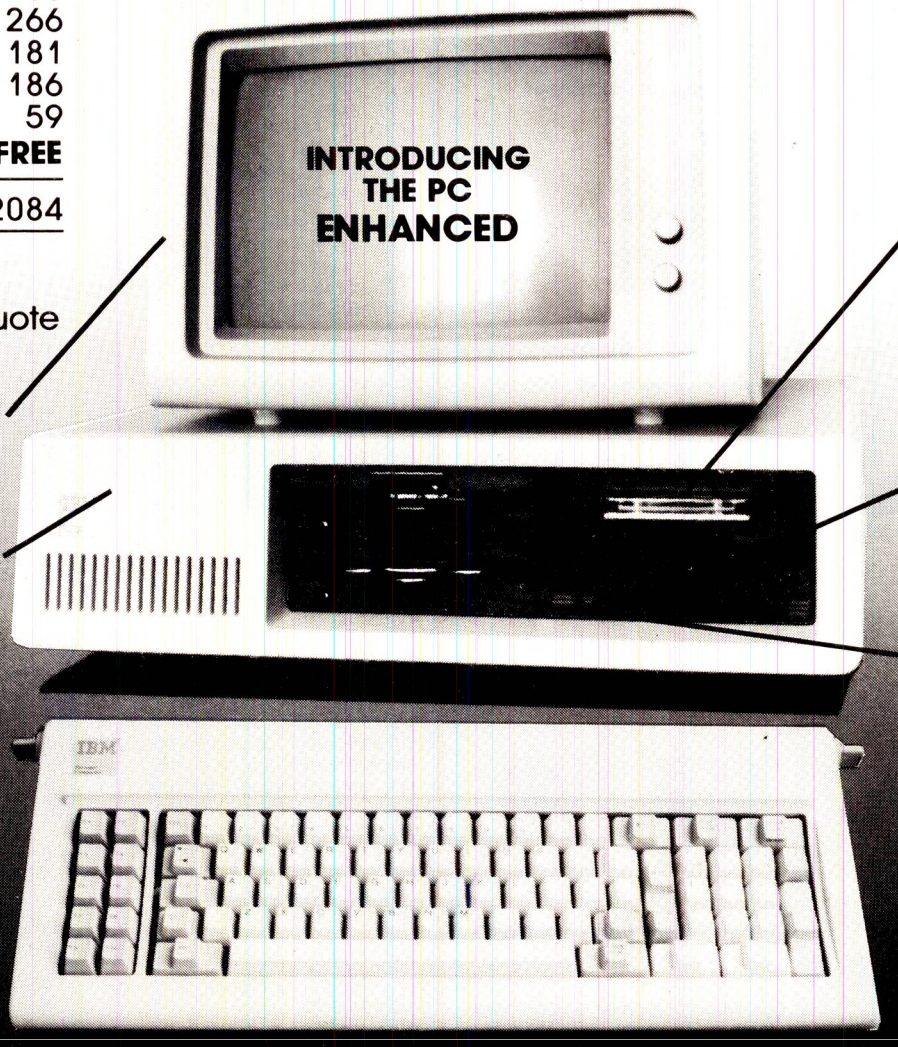

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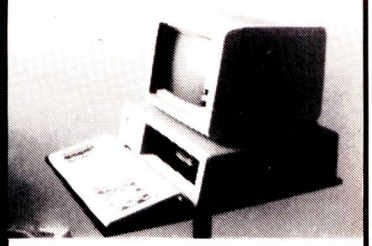

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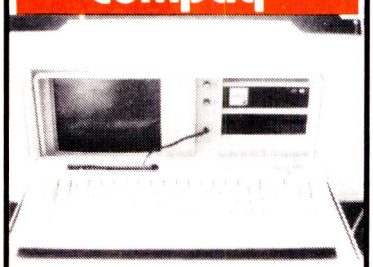

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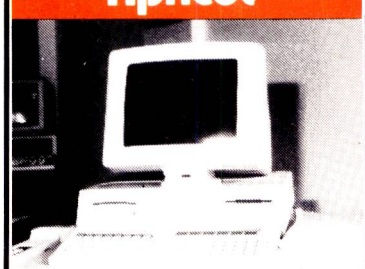
See the IBM software list for selection. Full range carried in all stores. Call for advice if you are unsure if a package will run. **ASK ABOUT OUR SUMMER COMPAQ SPECIAL.**

Apricot



APRICOT, probably the most handsome of desktops, these models though not IBM compatable have a complete range of popular software. They use the new 3.5" drives and come with wordprocessing, database and spread sheet software. You can select either nine or twelve inch monitors, and if your application is not strictly business then the F1 range is ideal for personal productivity. **Price includes ACT Sketch, ACT Paint.**

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- F1 ..... **£775**

For small businesses or owner managed firms.

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See the software list for standard packages but be sure to confirm availability before deciding.

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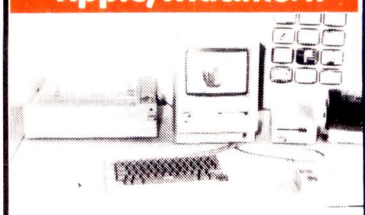

APPLE MACINTOSH, one of the most talked about personal computers of our time.* It's graphics style operating system and mouse enable virtual foolproof operation if you are new to the computing world. The excellent graphics packages available with the MAC are not only reasonably priced but extremely powerful, adding a whole new dimension to the meaning of Personal Productivity limited only by the imagination of its user. With the advent of JAZZ the MAC now has real business applications. A software list is itemised below as the MAC only runs software written especially for it.

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- MACINTOSH 512K: **Includes FREE Imagewriter** **£1995**
- ADDITIONAL DRIVE **£349**
- IMAGEWRITER PRINTER **£385**
- DAISYWHEEL PRINTER **£1332**
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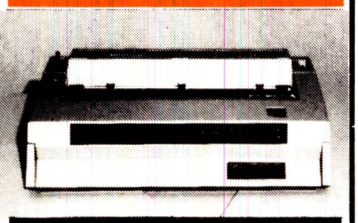
Printers



IBM PRINTERS:

IBM also produce a complete range of printers. Each unit is 100 % compatable with the IBM PC family and is the logical choice for serious computer users. The Quietwriter gives excellent quality print and is strongly recommended for WP use, whereas the Proprinter dot matrix not only provides NLQ but has high speed for draft purposes along with some nice user features, call and book a demonstration.

- GRAPHICS PRINTER **£333**
- PRO PRINTER/ **INTRO OFFER ONLY** **£450**
- QUIETWRITER **£1295**
- WHEELWRITER **£999**

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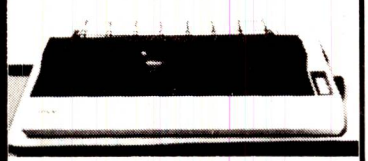

Current market leaders in dot matrix printers, especially the new JX80 colour printer and the HI80 A4 plotter. The LQ1500 offers high speed WP output, with optional Feeder.

- FX100+ **£495**
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- A3 FLATBED 6 PEN 7475..... **1750**
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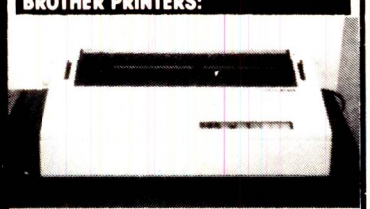

Microware are Master Dealers for Brother and offer top quality service on their range. Brother offer the highest quality medium speed daisywheel printers together with a complete range of accessories. Ask to see the superb quality of the new 2024 NLQ dot matrix.

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- HR25 DAISYWHEEL **£699**
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The new printers from Japan, JUKI offer an exceptional range of high quality, low cost daisywheel printers.

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- 2200+KEYBOARD 12 CPS..... **£245**

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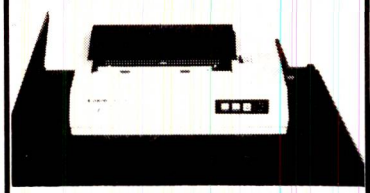

Value for money dot matrix NLQ printers. Feature a reverse feed tractor for labels and forms.

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- PRINTER WHEELS ..... **Call**

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The reason you are buying your computer is to use the software, so make sure you have seen all the options before you buy. Microware have specialist programmers in house who can modify standard packages, write complete applications to your specifications and provide as much training as you feel you need. We also offer a TRY BEFORE YOU BUY option and complete packages written especially for certain industries and trades where the standard package just will not do. Call us today and let us analyse your needs and offer a quote for the system that is right for your business.

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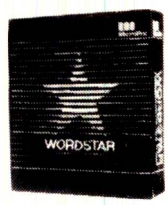

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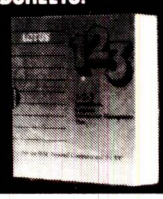

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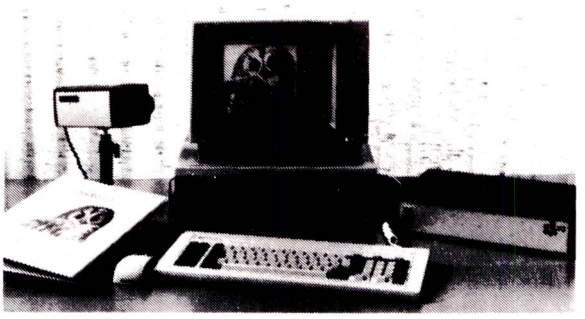
MicroSight



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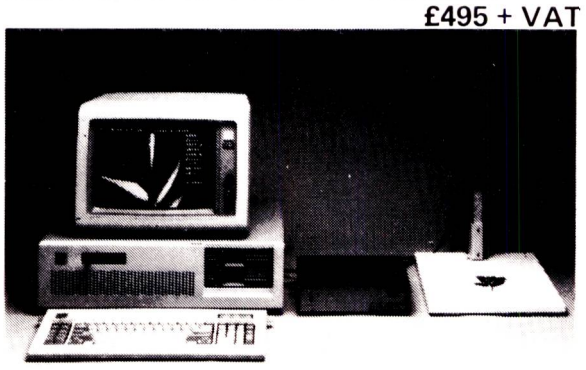

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"The sampling of voice cannot be any better quality, without additional hardware to govern hi-quality output. As a piece of program development, hardware, computer/human interface, up-to-date games design hardware, it is an essential buy for 1985. No 64 should be without one." . . . . . **YOUR COMMODORE**

"The whole system seems very well put together and functioned with no problems at all. Voice Master has impressive potential; for control of electrical equipment, security, word games and so on. The potential of the device is only limited by your imagination. An amazing device." . . . . . **COMMODORE HORIZONS**

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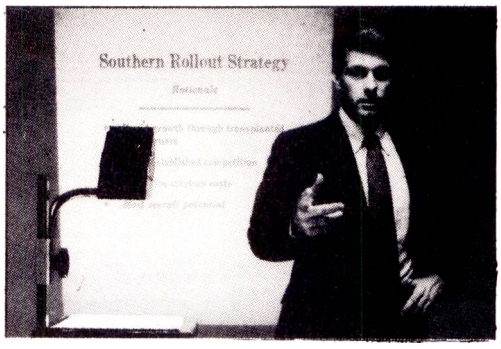

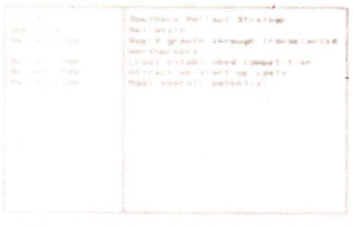

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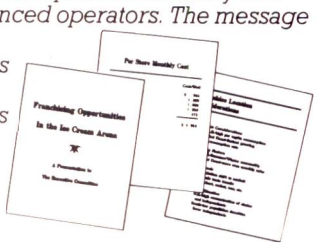

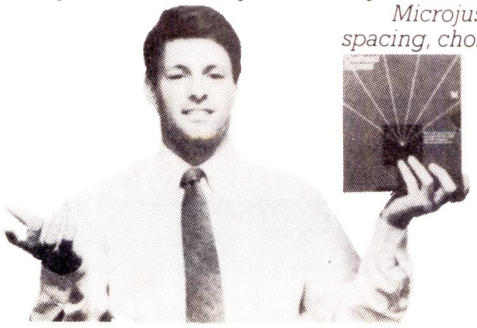

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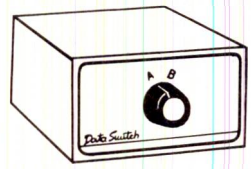

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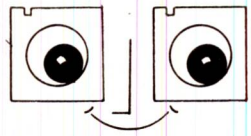

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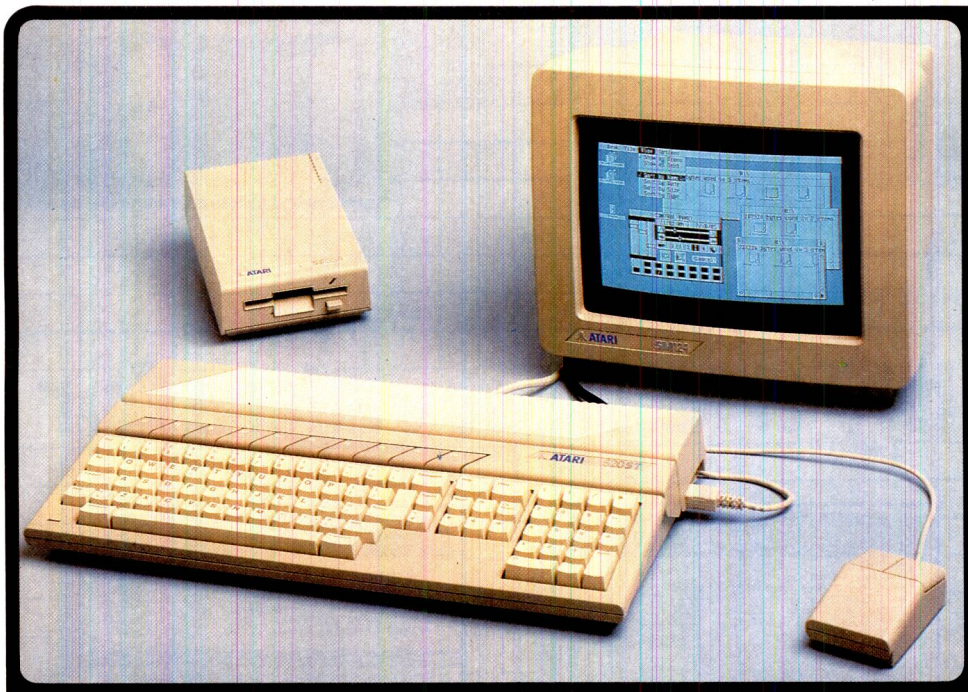

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POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

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

USER FRIENDLY GEM OPERATING SYSTEM

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

FREE SOFTWARE AND FUTURE EXPANSION

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

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

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

£749

ATARI 520ST SPECIFICATION

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

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

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

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

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

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

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

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

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

COMMUNICATIONS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT52 Terminal Emulation Software
Maximum Baud Rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 2 button mouse)
MIDI interface for external music synthesizers

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

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

VARIOUS
Dimensions: 470mmx240mmx60mm
Replaceable external power supplies
Expansion: 3½" floppy disk drives 500K/1,000K (two drives can be connected)
3½" 15Mb hard disk
CD (compact laser disc)
Dot matrix & d/wheel prntrs (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

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

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

MACINTOSH v F1e v 520ST

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

	APPLE MACINTOSH	APRICOT F1e	ATARI 520ST
FEATURES OF BASIC SYSTEM			
Price Includes B/W Monitor	YES	NO - extra £200	**YES**
Keyboard size mm (LxDxH)	330x147x50	450x167x28	**470x240x60**
Keyboard size ins (LxDxH)	13x5¾x2	17½x6½x1	**18½x9½x2½**
3½" D/Drive (Unformatted)	500K	500K	**500K**
3½" D/Drive (Formatted)	399K	315K	**349K**
WIMP (Window, Icon, Mouse ...)	Apple	ACT - Activity	**GEM**
Real-time Clock	YES	YES	**YES**
Polyphonic Sound Generator	YES	NO	**YES**
RS232 Serial Port	YES	YES	**YES**
Centronics Parallel Printer Port	NO	YES	**YES**
Dedicated Floppy Disk Controller	NO	YES	**YES**
Hard Disk DMA Interface	NO	YES	**YES**
Full stroke keyboard	YES	YES	**YES**
Number of keys on keyboard	59	92	**95**
Numeric Keypad	NO	YES (16 Keys)	**YES (18 keys)**
Cursor Control Keypad	NO	YES	**YES**
Function keys	NO	10	**10**
16-bit processor	68000	Intel 8086	**68000**
Processor running speed	8MHz	4.77MHz	**8MHz**
RAM size	512K	256K	**512K**
Number of graphics modes	1	4	**3**
Number of colours	Monochrome	16	**512**
Max Screen Resolution (pixels)	512 x 342	640 x 256	**640 x 400**
Mouse included	Single Button	NO - extra £95	**Two Button**
Replaceable External Power Pack	NO	NO	**YES**
Cartridge Socket	NO	NO	**YES**
Joystick Ports	NO	NO	**YES (two)**
MIDI Synthesiser Interface	NO	NO	**YES**
Monitor Size	9"	9" - extra £200	**12"**
RGB Video Output	NO	YES	**YES**
System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive			
Price of basic system (exc VAT)	£2595+VAT	£595+VAT	**£652+VAT**
+ Mouse	Included	£95+VAT	**Included**
+ Monochrome Monitor	Included	£200+VAT	**Included**
+ Expansion to 512K RAM	Included	£295+VAT	**Included**
Price of complete system (exc VAT)	£2595+VAT	£1185+VAT	**£652+VAT**
PRICE rounded down including VAT	**£2,984**	**£1,362**	**£749**

PRESS COMMENT

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

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

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

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

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

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

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

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

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

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

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

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

SILICA SHOP

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To: Silica Shop Ltd, Dept PCW12/85, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

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ON THE NEW ATARI 520ST COMPUTER

Mr/Mrs/Ms: Initials: Surname:

Address:

Postcode:

Do you already own a computer
If so, which one do you own?

DIGI

DIGITASK Business Systems Ltd,
Unit M, Charlwoods Business Centre,
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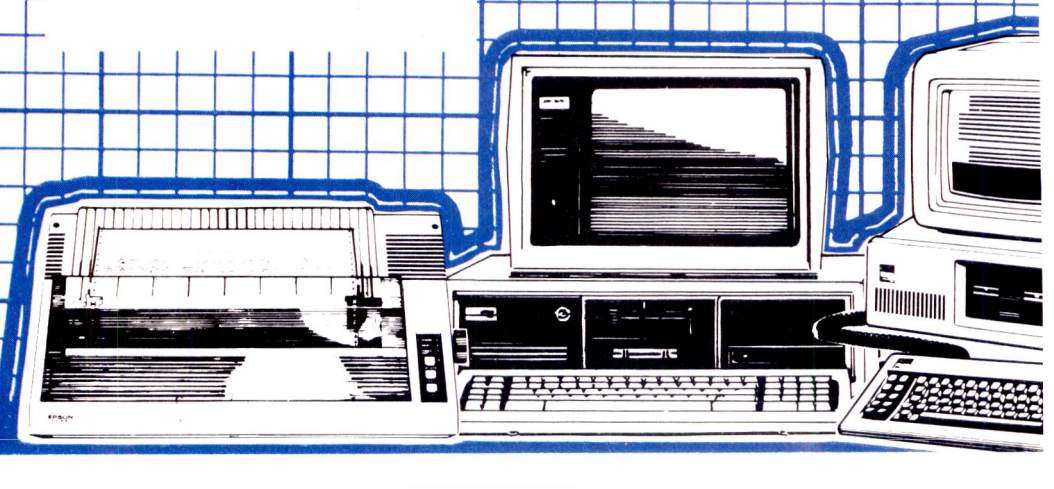

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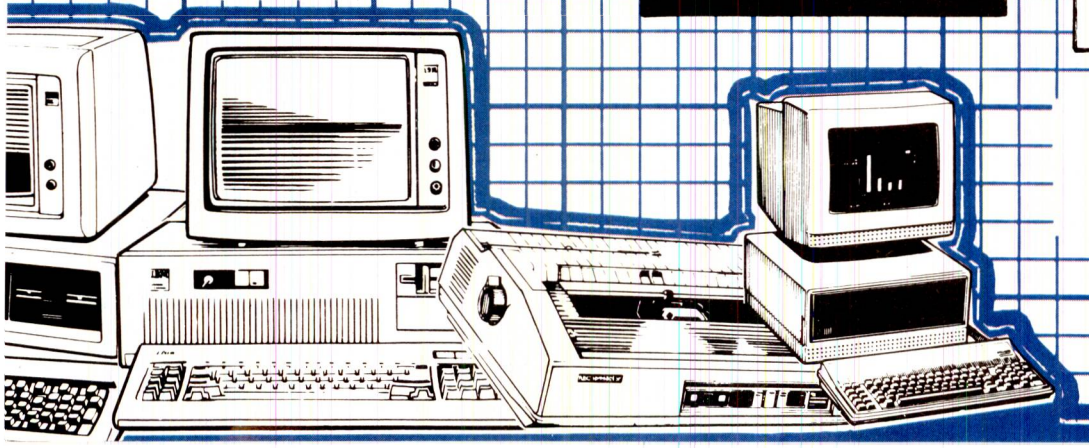

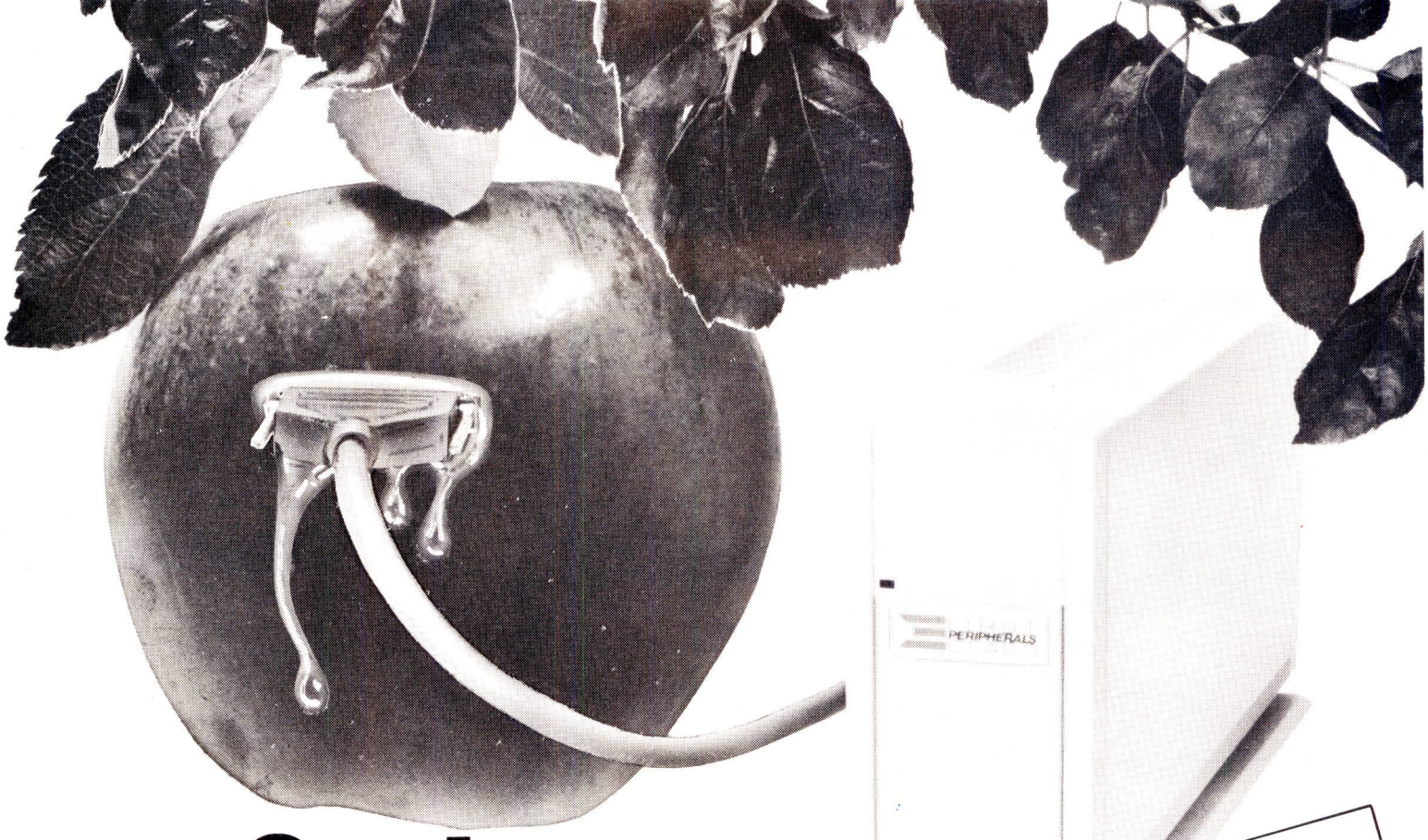

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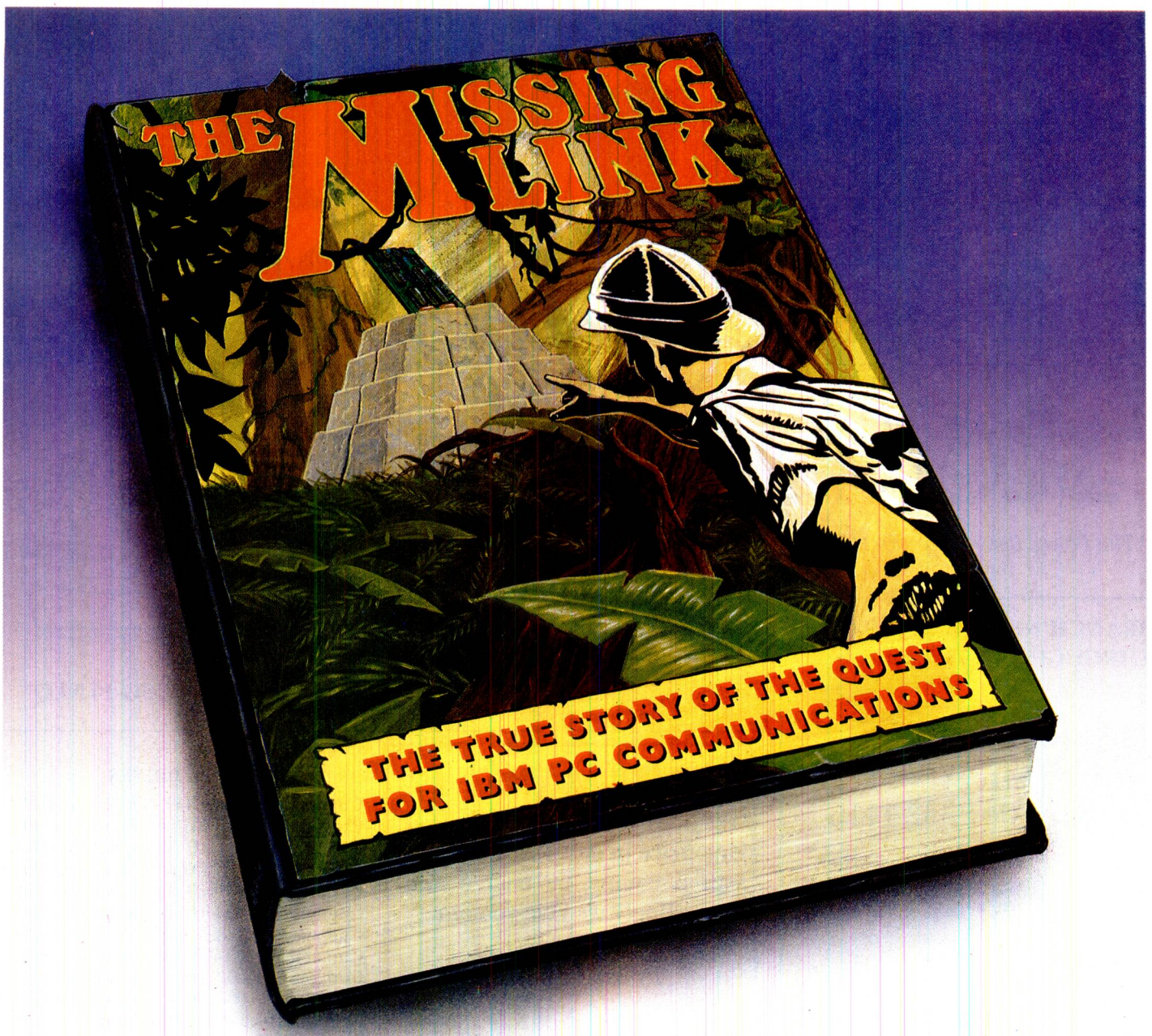

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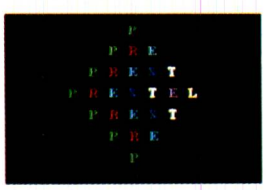

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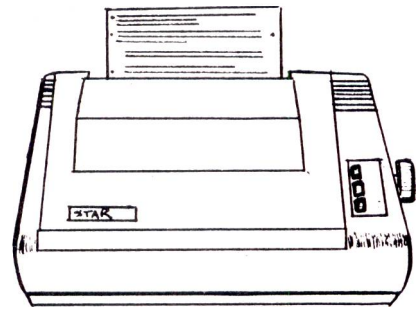

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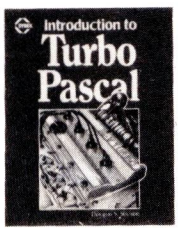

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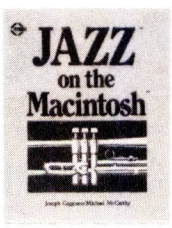

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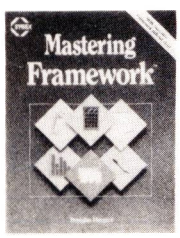

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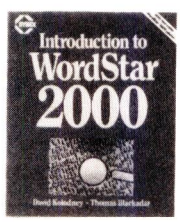

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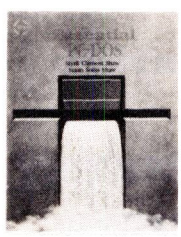

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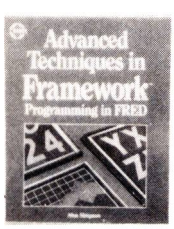

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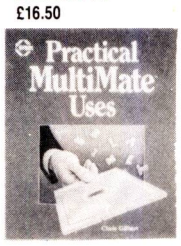

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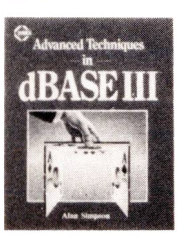

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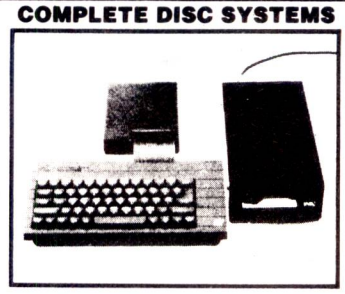

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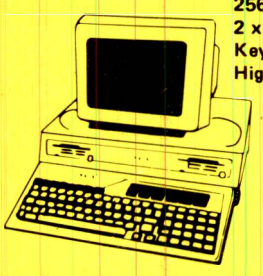

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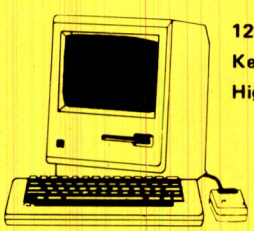

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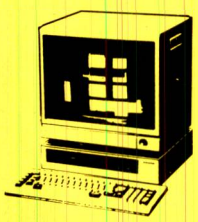

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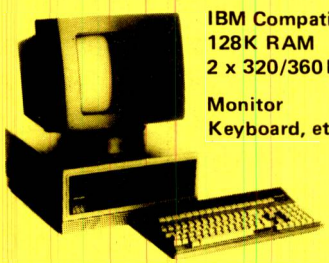

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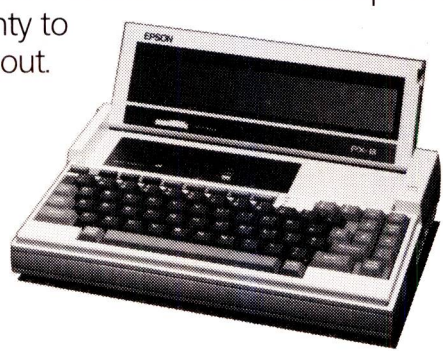
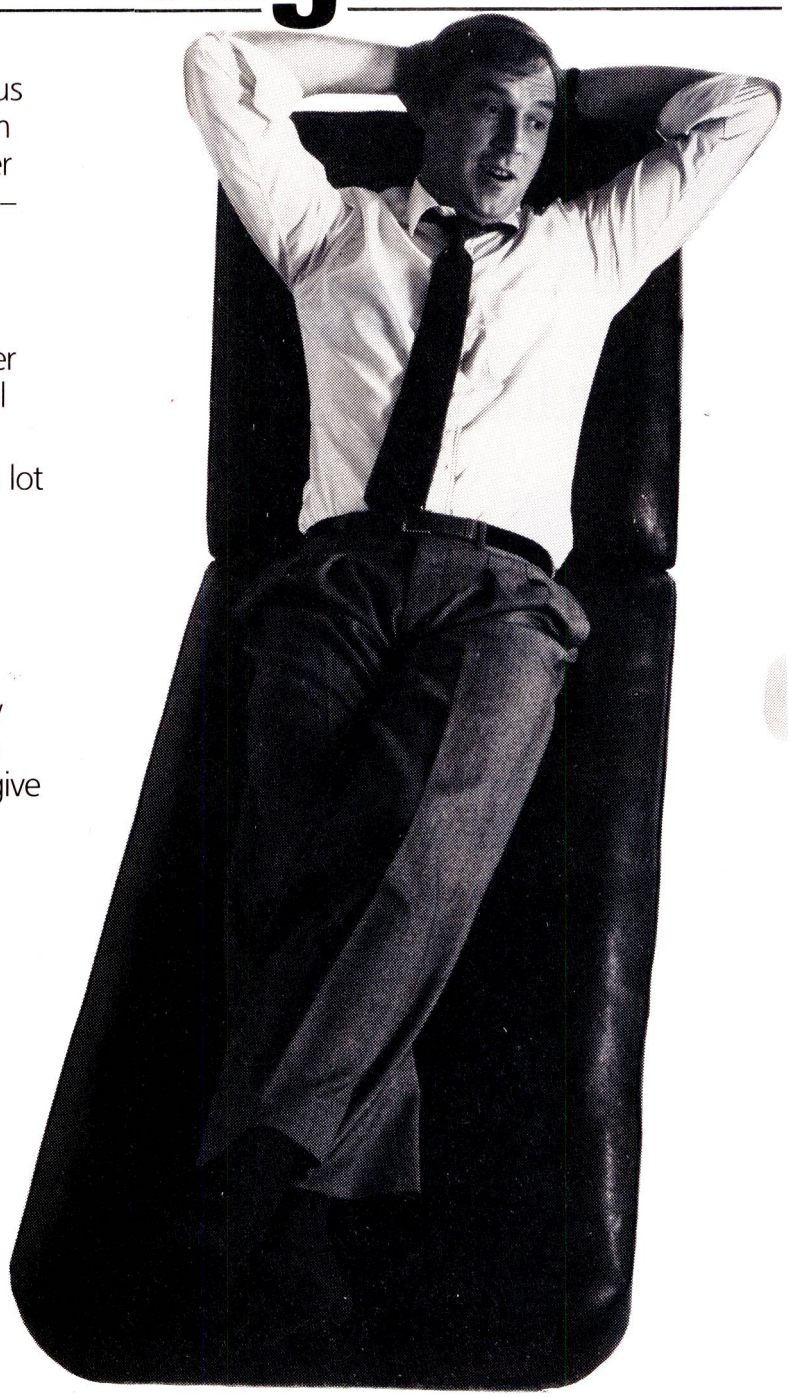
With our technical background, we're well placed to run a critical eye over competitors' developments, so you can be sure that whatever we stock has carved its way through our natural prejudice by sheer excellence.

Where customers are concerned, we do a lot of listening ourselves – before and after a sale. That's another factor that sets us apart as computer retailers, and makes our customer service an impressive talking-point.

Recently, we've put new developments in portable computers through our normal, deeply unfair tests, but even we have to admit that the capabilities of little machines like Epson's PX-8 give us plenty to talk about.





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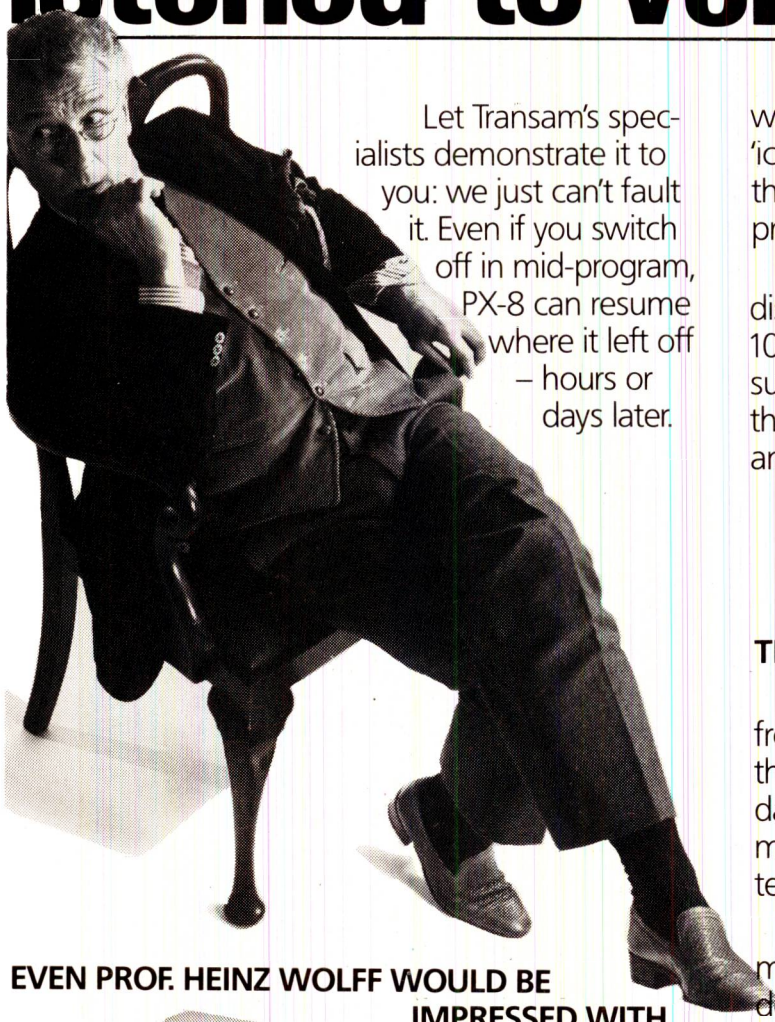
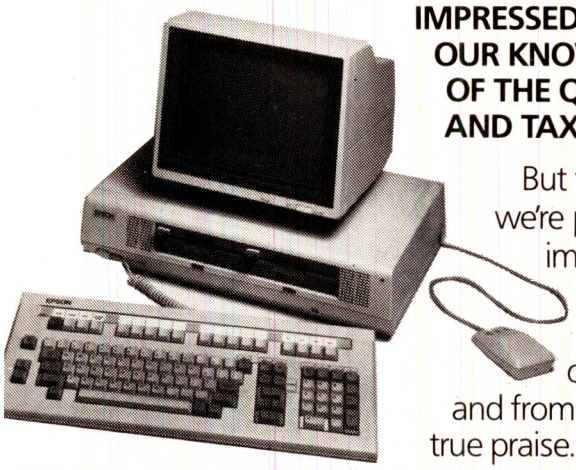


Let Transam's specialists demonstrate it to you: we just can't fault it. Even if you switch off in mid-program, PX-8 can resume where it left off – hours or days later.

EVEN PROF. HEINZ WOLFF WOULD BE IMPRESSED WITH OUR KNOWLEDGE OF THE QX-16 AND TAXI.



But then we're pretty impressed with the system ourselves, and from us, that's true praise. Epson QX-16 is a powerful, 16-bit business micro with new 'Taxi' software – so easy to use almost anyone can start right away. Taxi guides you through your choice of business applications – spreadsheets, word processing, graphics, whatever – with little 'icon' pictures on the screen. Just point and click the 'mouse' controller to select, retrieve, alter or print stored information.

Add to this the QX-16's high-capacity, twin disk drives, its large, expandable memory, massive 10Mb hard-disk option, big choice of printers, and surprisingly low price, and you'll understand why the Professor gets so carried away. Visit Transam and see QX-16 in action.



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M1 is the perfect complement to an office-on-the-move (with an Epson PX-8, for example), but it's equally valuable in your office with the QX-16 as a high-quality modem for normal data communications.

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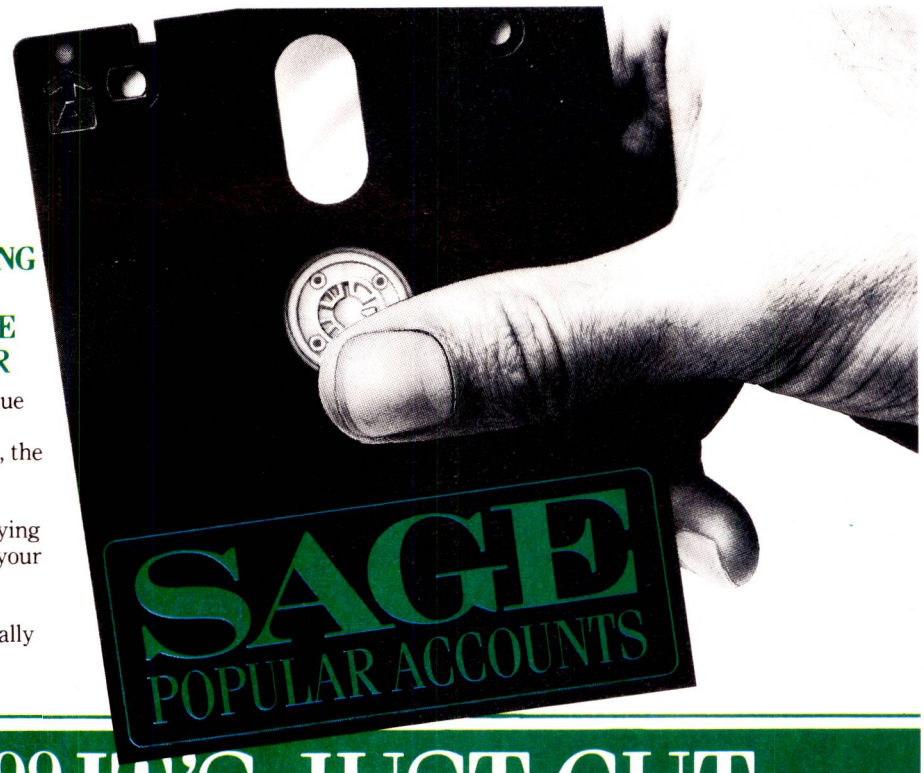

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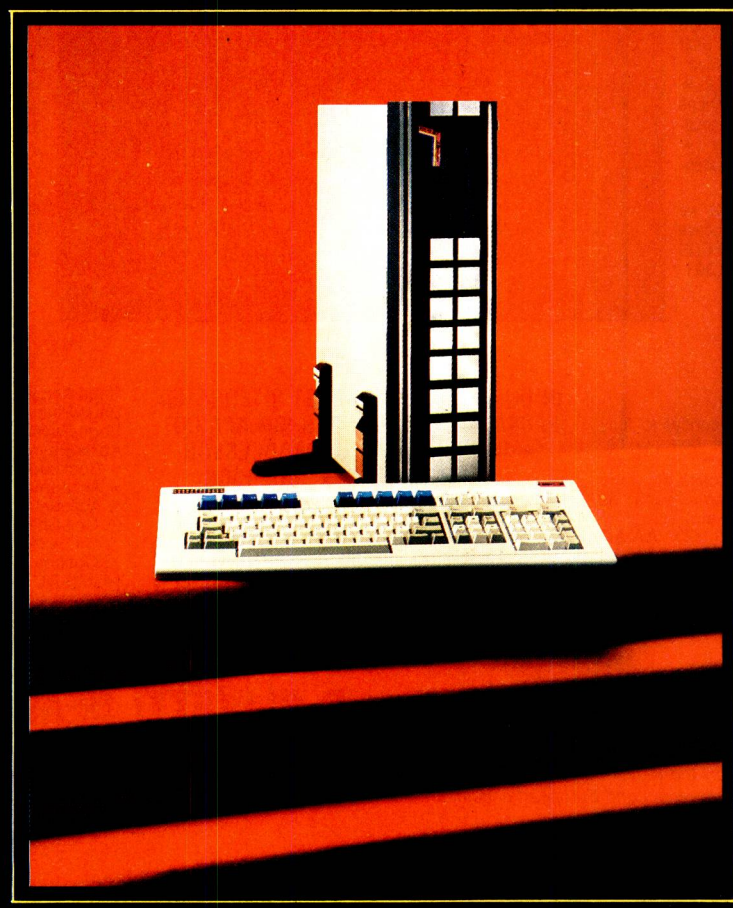

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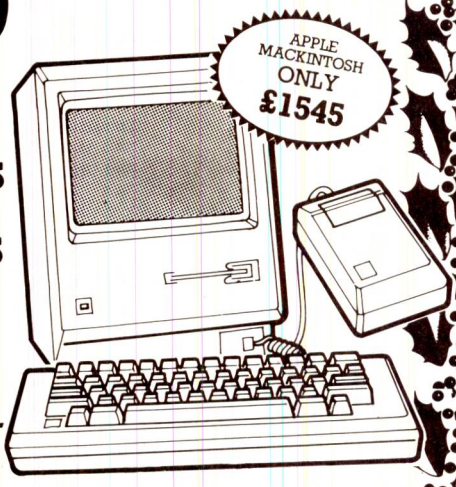

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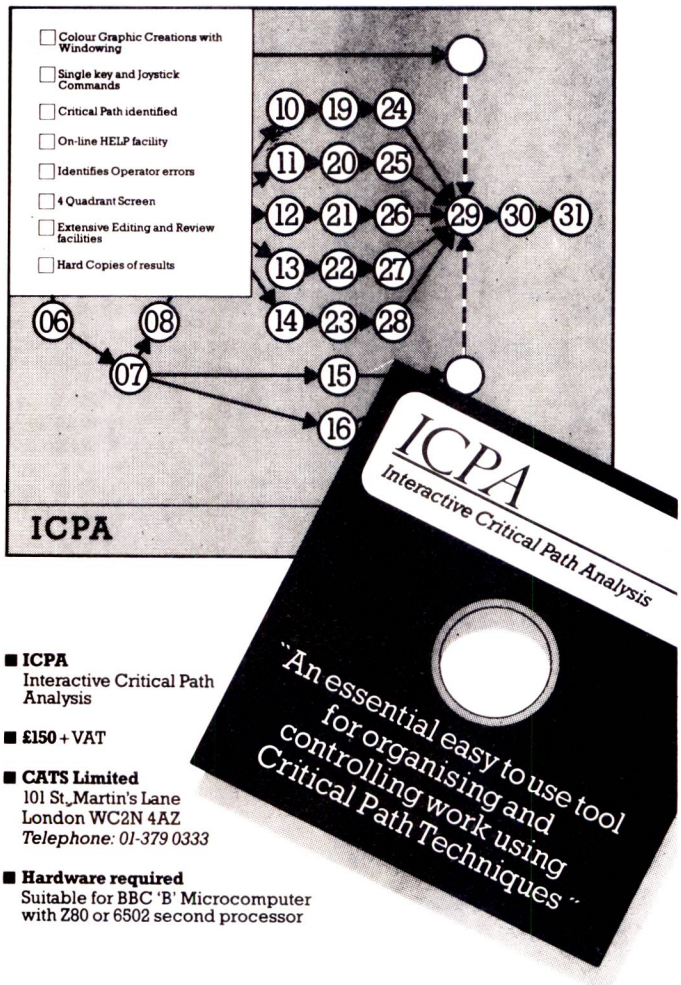

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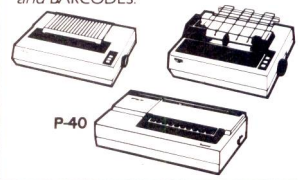

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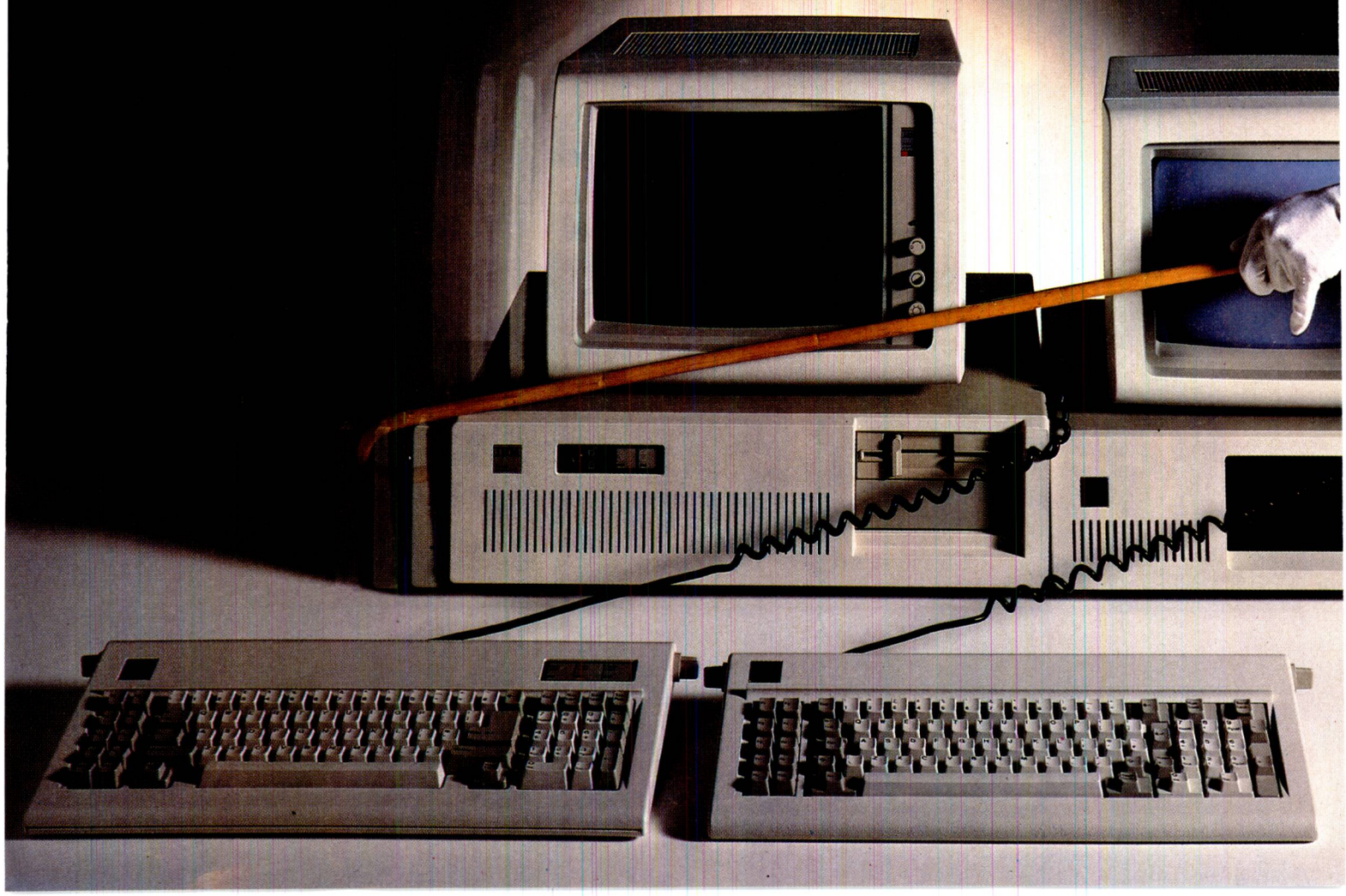

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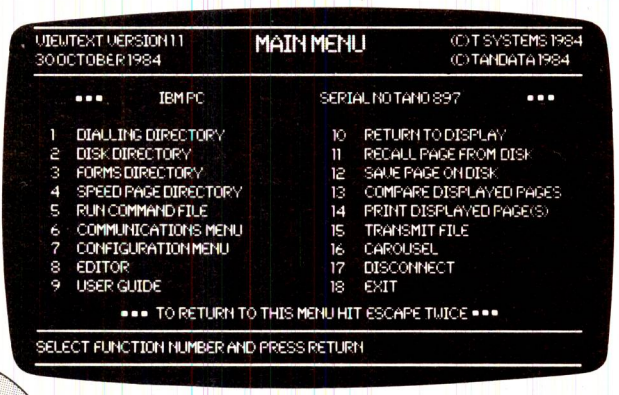

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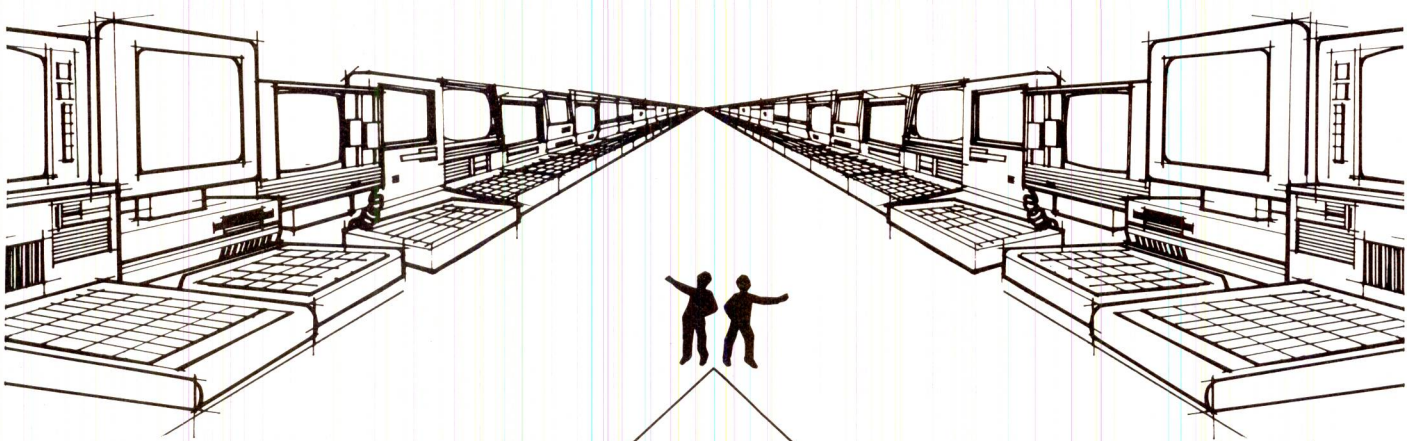

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Guy Kewney reveals the story behind the launch of the IBM JX, and gives a foretaste of what you can expect from the new Apricot Xen, in the pick of the industry's news and views.

IBM JX – not the PC Two

If you were wondering who it was who announced IBM's JX to the West, I can tell you: it was Apricot.

The reason is simple enough. Apricot was preparing the spotlight for its Xen micro, but it was in a fair bit of financial bother, and it desperately needed to get the Xen off to a very good start.

The Apricots share one important feature with the IBM JX micro: a Sony-style 3.5in disk.

The Xen micro, like the IBM PC/AT, and the Compaq Deskpro 286, and the Hewlett-Packard Vectra, and other machines from Zenith, Kaypro, and the like, use the next chip in the Intel 8086 family — the 80286.

Unlike all those, however, this machine replaces the original Apricot models. It's meant to be the main Apricot machine, the Apricot Xi becoming a 'transportable' version. If this machine is to succeed, it must sell not just thousands, but tens of thousands. On this machine, if it is to succeed, must run all the important IBM programs.

This makes the Sony drive important. In the States, it is one of those things one 'just knows' — that you can't use Sony-style 3.5in disks, not on a truly popular micro. Why? IBM doesn't, that's why.

The IBM JX, however, uses Sony-style 3.5in disks.

Before we look in detail at the Xen, let's try to work out what this IBM machine actually is, and what's going to happen to it.

Anyone who starts predicting what IBM will do is certain of only one thing — error, so the following prediction will certainly contain at least one error.

The IBM JX was designed solely for the Japanese market (fact, information from IBM when it was launched). Now, it has been released outside Japan, even though IBM had said it would not be (not a prediction, but another fact).

But the JX is not the PC Two, and the reason (I believe) it has emerged from Japan is simple enough: it is being dropped from production and will be replaced.

Now that is a prediction, and it may turn out to be wrong. If it is right, then a lot of software producers will be wrong, because they, like Apricot, suspect that the JX is PC Two. They are going to take a lot more seriously the idea of publishing their programs on 3.5in diskettes.

The reason I'm fairly sure the JX isn't the PC Two is not the obvious reason — IBM says it isn't — but the more cogent one: it isn't even as nice as the PC, which IBM has stopped building.

What IBM makes these days, unlikely though it may seem, is the PC/XT, not the PC. You can tell the difference when you turn one on: the PC just loads DOS after some system checks, but the XT counts the memory chips working inside it, and tells you how many there are. Should you install memory in an XT, you will find you don't have to play games with little circuit board switches which tell the system how much memory there is.

The JX is a range of micros, starting from ultra-cheap (by IBM standards) and going up to ridiculously pricey (even by IBM standards). The advantage of the JX is that you can buy a £450 home system, and then add bits and pieces until you have the biggest JX. Then you can spend more and upgrade it to PC level, and these days, even add a hard disk.

As a marketing concept for the next IBM family, it's an interesting experiment. But its disadvantage is that it was never intended to be a PC clone, and it takes an inordinate amount of money to add boards to it, before it will become one.

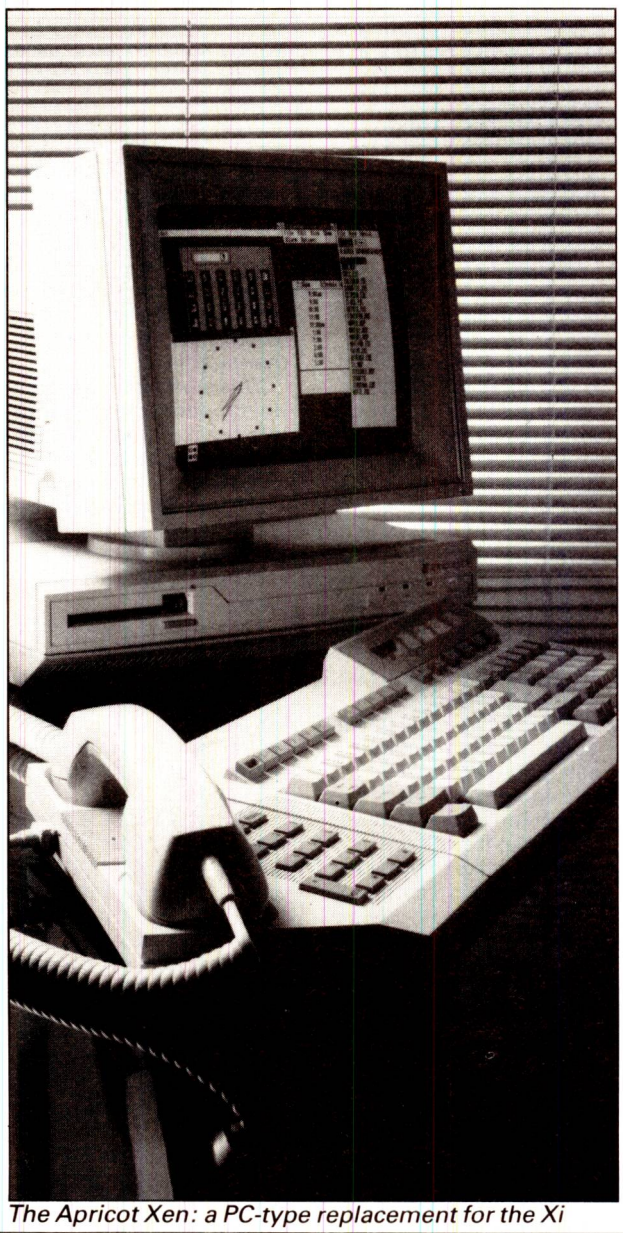
PC Two, of course, doesn't exist (IBM says). However, of the several machines which IBM could choose to launch as the PC Two (by another name, of course) the most likely design is one based on the 80186, or possibly the 80286, running a great deal faster than the PC/XT. And very strong rumours from inside IBM suggest that the 3.5in drive is (at the very least) an option on that system. Which is, of course, why so many people think the JX is PC Two . . .

The Apricot Xen in brief

The new Apricot is both a fast PC-type machine (a replacement for the current Apricot Xi) and a cheap multi-user Xenix machine. It is aiming to compete with both the Apple Macintosh and the IBM family: the windows and icons are provided by Microsoft Windows, while the speed is provided by the Intel 80286 chip.

The version of Xenix which Apricot will supply is brand new — it's Microsoft's Xenix 286, which is the same as the official Unix version V from Bell. That's not just Microsoft's claim, but Bell's, as AT&T has tested Xenix V and it meets the new standard.

The speed of the Xen is increased (by comparison with the IBM AT) by two things. Firstly, the clock speed is faster, by about 30 per cent; and secondly, there are no



The Apricot Xen: a PC-type replacement for the Xi

wait states for the processor.

A chip like the 80286 gets much of its speed by grabbing more than one instruction at a time from the program. If it has four instructions (call them add, subtract, multiply and divide) to perform, it can prepare the subtract data while the addition is still going on, and can start multiplying before the addition is quite finished. It should be doing the first part of the division while it puts the addition results out to dry, with subtraction now nearing completion.

The 80286 can have as many as four instructions in this pipeline at once, if the memory and other circuits work fast enough.

On the AT, however, they don't, so one instruction in three is a dud — a 'wait' instruction.

Apricot claims to have tested the speed against the IBM AT by running standard programs, and says that the Xen is 60 per cent faster.

As to what you get in a Xen box, the quickest way to summarise it is to run down the price list.

The basic system box with two disks and 512k of RAM costs £2095. To make it work, you still need a monitor and video card. The same box but with a big 20Mbyte hard disk instead of one floppy disk costs £1000 more, at £3095.

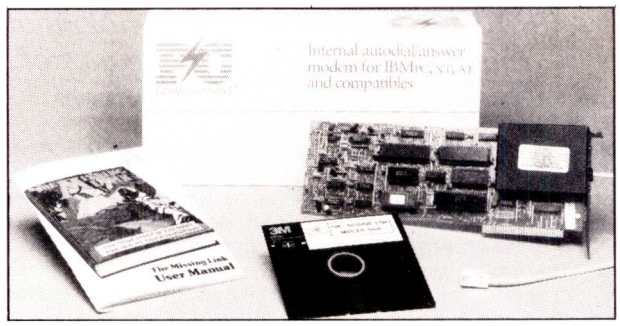
To see what you're doing, you start at £250 for a green mono screen, a price which includes the mono adaptor card (in case you want to use your own monitor), the card costing £145 on its own. A far nicer Macintosh-like white screen costs £400. That makes a twin-floppy, white-screen system cost just under £2500.

The Xen system offers pretty good colour: you can get colour screen (mid-resolution, 640 by 200 pixels) for £500. A high-res colour screen gives 640 by 350 pixels, and costs £700.

The screen prices include the cost of extra colour circuitry to make them work: a medium-res card comes at £200, a high-res card costs £300.

That isn't bargain basement, but it isn't too bad a price. And what you have to pay on the screen prices, you get back on the disks, which go in the main system box.

The box doesn't contain a power supply — that goes on the floor, so it has room for three disk units. They could be three floppies, two floppies and one hard drive, or one floppy and two hard drives — you can make your choice in the store.



When PC Communications first announced its Missing Link internal modem, I'm afraid I carped. 'Who in their right mind would launch a non-Hayes standard modem for the IBM PC?' I grumbled.

The company apparently agreed; or at least, in part it agreed, because there is now a little £20 program to add to your Missing Link to make it work with Lotus Symphony, which normally expects a Hayes or Popcom modem (or an Apricot modem, on an Apricot).

The modem is apparently a big seller, which mystifies me. I would have thought that £500 for a V21/23 standard modem, without 1200/1200 V22 capabilities, was a ridiculous price.

Details on (0438) 310145.

The nice thing, however, is that a 20Mbyte hard drive costs £1000, so a 40Mbyte hard disk system would start at £4500 for a white-screen mono, Macintosh-like box.

When you get to the add-ons, the price list looks very interesting indeed. The bit I like best is the phone management unit.

This starts with a Dacom-built modem, which plugs into the main box. With it, you get a nice matching Xen-style phone, which sits next to the keyboard. Software will allow you to use that modem's phone dialler for your own voice calls, as well as modem links.

You can ask your computer to 'dial Charlie' and it will find his phone number, dial it, and put you through. Or you can tell it to log onto Telecom Gold, and it will automatically go through the password routine for you.

All that for £400 isn't a bad deal. It should be £200, of course, but we're talking about business customers here, and they'll probably compare costs with the ICL One Per Desk, and be pleased. The only thing the OPD can do that this can't is act as an answerphone.

More important than the phone unit, however, is the add-on IBM bus and the add-on IBM disk.

The diskette is a 5.25in floppy. At press time, I couldn't establish whether the system could turn it into drive a: by using the Assign command and run software off it, but it can get IBM data off IBM standard disks. That costs £300. The disk controller circuitry is already in the Xen.

The expansion box uses AT slots, and that should let you plug in any standard IBM peripheral board — two of them, to be exact. This two-slot box costs £200.

Free with the machine is a bag full of applets (little applications): notepad, phone list, and so on, supplied as part of Windows. Windows is included, and with it, two applications — Windows Write and Windows Paint.

The Xen can control four remote terminals by plugging in a four-port RS232 card. It can take four such cards, giving it a theoretical 16-user terminal control ability. Ha! Under Xenix, do not be silly enough to try. Possibly six, possibly four users working hard, will be the real limit. If you really want 16 users, make sure that you never have more than three of them touching the keyboards at a time.

Of course, these terminals could be Apricot F1E micros at £600. As they are Apricots, you could also connect them into the Xen as part of MS Networks.

Unfortunately, that can't be done through the same wires. You have to have separate network and multi-user Xenix wiring systems.

That's the price list. The reality of the machine will have to wait until we've got one in our hands and have tested it. At press time there weren't any available, so all the details here are on trust.

The plot thickens

The coincidence of having Apricot announce the Xen at the same time that Microsoft announces a new version of Unix (Xenix System V) to run on it, is too much for me.

Long have I argued that Xenix cannot be a sensible solution until someone overcomes the simple problem of providing 10Mbytes of free hard disk.

Unix needs 10Mbytes of hard disk. Most low-cost systems have 10Mbytes. Most systems with more are fearsomely expensive, and no-one would buy one just to run Unix.

But with Xen, you get 20Mbytes for £1000. At that price, Xenix (as an optional extra) becomes something you don't mind accepting with the package, especially free.

And then, one day, someone offers you a Unix package and you think:'Hm. I've got a little machine, which I use for 1-2-3, which that will run on. I'll give it a try, perhaps.'

The coincidence is obviously a plot to make me look silly. Microsoft and Apricot are out to get me for laughing at their failure to give me a copy of Windows.

I did say I'd tell you when I had a copy of Windows that worked, didn't I, but I still haven't. 'ILLEGAL INTERRUPT', it says.

Microsoft is on (0734) 500741, for what good it may do you.

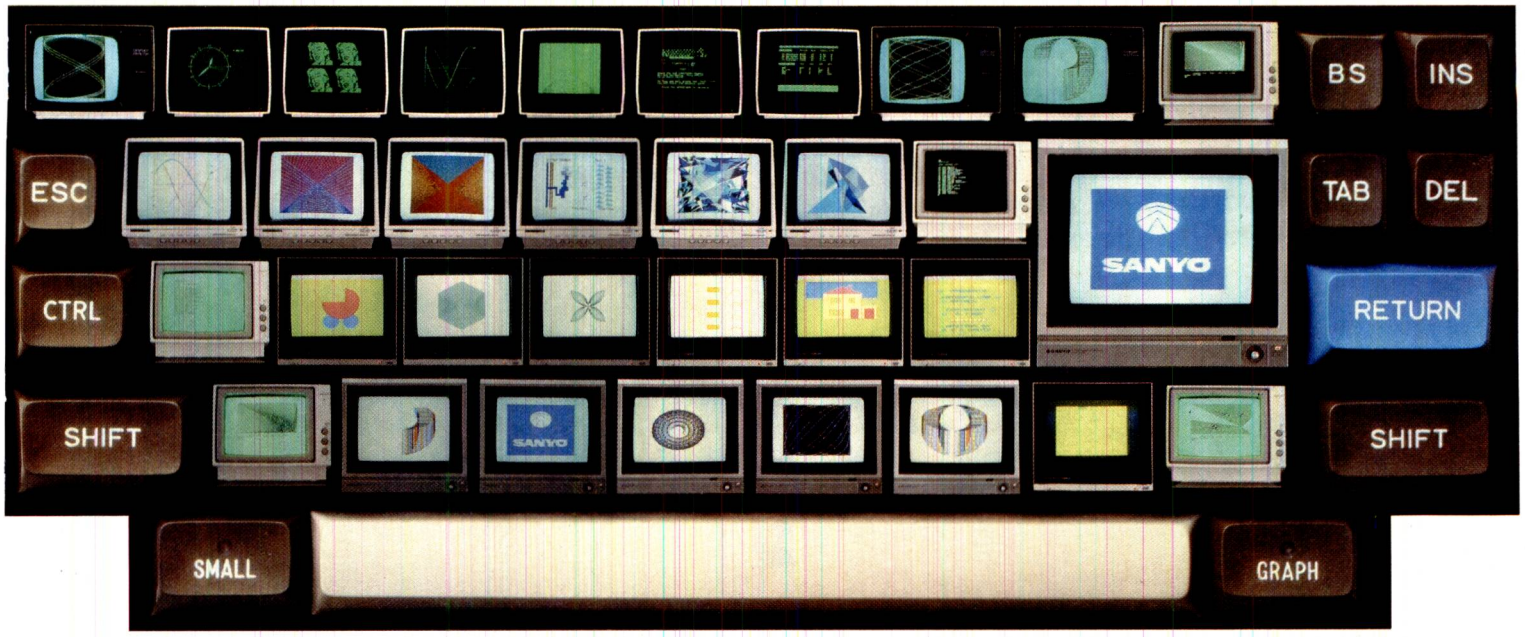
Above Board

The news that Microsoft has decided to support the Above Board comes as a surprise only to those who don't know about Microsoft's determination to make Xenix a success.

A question: what can Xenix do that PC-DOS cannot?

An answer: it can address 16Mbytes of memory.

Let's start by saying that the IBM PC (or any computer using the 8086 chip) has not one, but three memories. We may, in this way, be able to explain the daft situation into which Intel, Lotus and now Microsoft have placed the PC family with the Above Board



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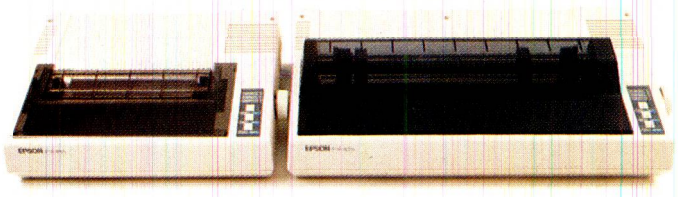

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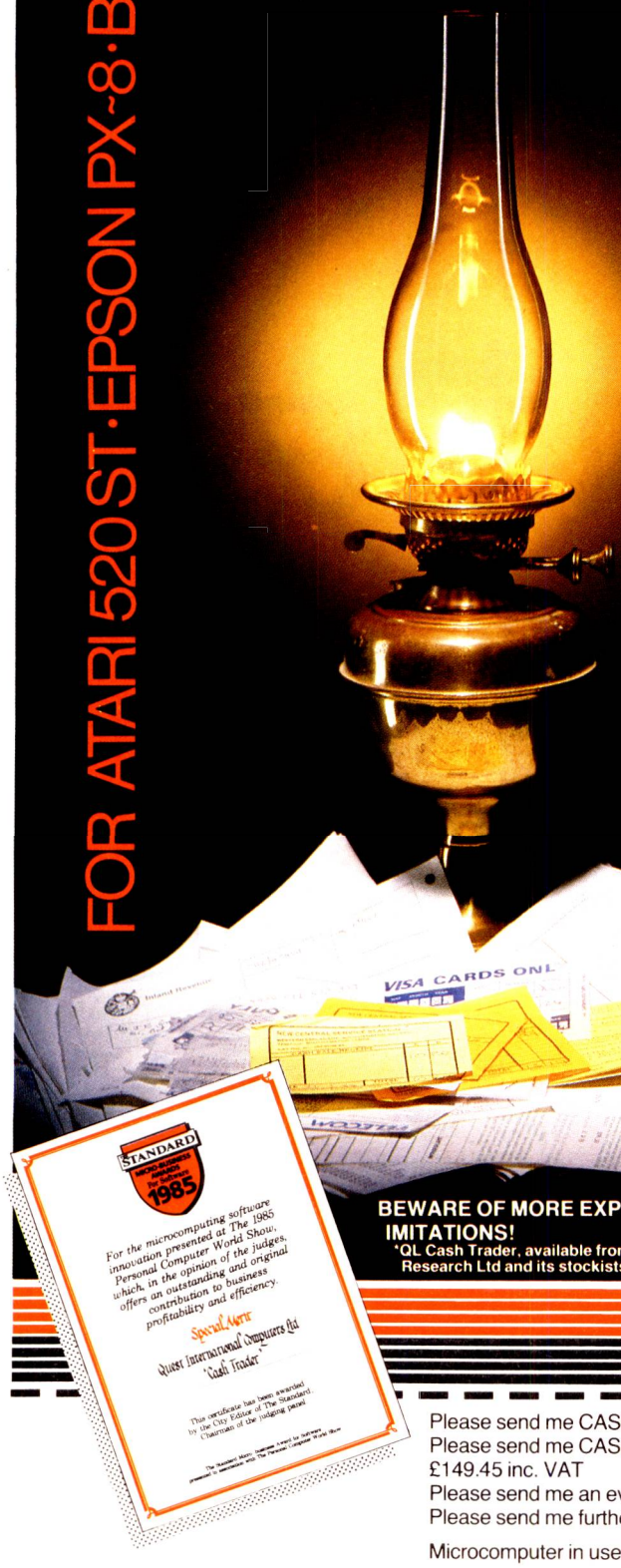

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memory expansion.

The chip has 64k of memory for programs. It can have another 64k for data, and a third 64k for a stack. These three areas of memory can be anywhere in memory, but only in 1Mbyte.

Anything more, and the chip becomes confused and starts counting from zero again. The rules are simple: you can't put a program into data segments unless the program and data segments are in the same 64k. Neither can you put the stack into a data segment. At any one moment, your computer can refer to 64k of memory only, and you can only plug a megabyte into the chip.

These days, a megabyte is barely enough for most users, but on the IBM PC, they can't even get that much because IBM stole 360k's worth when it wired up the board. 640k is the maximum on an IBM PC. On the PC/AT, however, the 80286 chip can go much further. It can, if you nudge it, suddenly count as far as 16Mbytes, in what Intel calls Protected Virtual Address Mode.

Ah, but the PC/AT doesn't know it can do this! It only knows what PC-DOS tells it, and PC-DOS works on the 8088, not the 80286. Under PC-DOS, the 80286 pretends it is just a fast 8088.

But take the AT, or another 80286 machine like the Apricot Xen, and load Xenix, and suddenly, you can plug in all 16Mbytes. Xenix 286 understands Protected Virtual Address Mode.

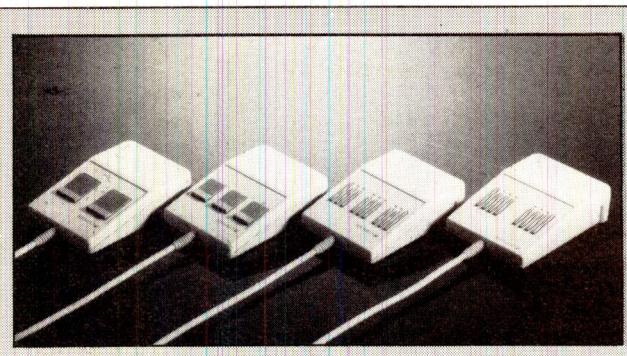
Users of Lotus 1-2-3 have long complained that there just isn't room in memory for all the numbers spread around their spreadsheets, and they need more than 640k.

So Lotus and Intel have cooked up a little extra memory card. It plugs into the IBM bus and contains quite a lot of memory, above and beyond the PC's 640k.

Get the right version of Lotus, and it will tweak a little register on the Above Board when it runs out of memory, and presto! — more space for your spreadsheet.

But not, I'm afraid, for your program. Nor, I'm afraid, for the stack. And not more than 64k at a time, either, because the register on the Above Board can't cope with more than four bits of 16k each. They have to be contiguous, too.

The new Rampage board from AST imitates the Lotus Above Board, but it goes further, giving four registers, not just one.



Some people might sell a software package for £165 and throw in a mouse, free. Not Logitech: it plans to sell a mouse for £165 and throw in the software, free.

The software is a text and graphics editor called TAG, together with two utility programs to make the mouse work.

Details from Logitech in the quite unconvincingly-named Swiss town of 1143 Apples VD, and I suggest you try the phone: 44-21 774 545.

It can pretend to be a simple 64k window inside the extra memory, or it can pretend to be four separate windows. And its windows can be data, or program, or stack, or anything.

New software like Ashton Tate's Framework II can use the Above Board and the Rampage, as it can look into more than 640k.

On the PC/AT, it can still only look at more than 640k through the Above Board or the Rampage, and it can still only look at an extra 64k at a time. It can only use the extra memory for data — not for stack, or a program.

The Above Board improves on the basic PC in the same way that an outboard motor can improve a basic rowing boat. An outboard motor, that is, attached to a separate coracle, too small for a pilot to sit in, and controlled by a pair of fishing rods held by the rower in the rowing boat.

On the AT, using the same Above Board is as silly as taking the coracle and its two fishing lines, and using it to drive, not a rowing boat, but a powerful ocean cruiser with two onboard engines.

Until Microsoft rewrites PC-DOS to use Protected Virtual Address Mode, that's the only way to drive your ocean cruiser — without Xenix.

Anyone who didn't know better would imagine that Microsoft was trying to make Xenix look good.



'Jobson! What do you make of this?'

Amstrad communications

Two useful programs for Amstrad PCW 8256 users: a word processor that is a WordStar clone, but at a sensible price, is NewWord. It's available through Newstar, and details are available on (0277) 823308.

The communications program (including its own text editor) which I mentioned a month ago, Comm, has unhelpfully changed owners while we were printing the magazine.

Andrew Margolis has now abandoned the dying Lion Microsystems, which did (after all) go under in the wake of the Lion House collapse, and is selling Comm on his own.

He was going to call his new company AM and Co — not, as you might think, Andrew Margolis and Company, but (he lied) Answering Machines and Computers.

Now he's calling it Margolis and Co. Contact him at 105 Foundling Court, Brunswick Centre, Marchmont Street, London WC1N 1AN. Tel: (01) 278 3032.

Expansion solution

Owners of Amstrad PCW 8256 machines have one thing in common: they can't get enough disks.

Here is a suggestion for dealing with part of the problem — expand the memory.

If you look inside an Amstrad PCW 8256, you will void your guarantee, but you will also see a strange thing. You'll see a row of empty chip sockets on the board.

These sockets are for memory. Officially, they don't exist, but the machine can be persuaded to look at them with a very small wire added to the circuit board, and they cost less than £1 each to fill with chips.

At the moment, I don't have details of the wiring change. When I get it, I'll print it, or perhaps TJ will in his Workshop.

The effect, however, is to give an extra 256k of memory, and that can be used as RAM disk space.

Real disks, come Christmas, will be the type of things that you'll happily swap your entire collection of hen's teeth for.

Due to the world's conviction that the Sony-style 3.5in diskette is 'the one', several manufacturers have

been reluctant to make 3in diskettes in real quantity. 'Amstrad,' said one Japanese supplier, 'is just one swallow.'

Current production of the CPC 6128 and the PCW 8256 looks like putting 100,000 3in disk drives onto the market per *month*. After Christmas, this may drop off, or it may go up. My money is on the 'go up' theory. Some swallow, you might reply.

Apart from the Hitachi disks, from the makers of the drive, Maxell has begun to make disks. Its production line has coughed once or twice, and by October, perhaps 200,000 disks had been produced.

Well, each owner wants between 10 and 20 disks, straight away.

Software suppliers sell their programs on disks: they buy in bulk, in advance. To put a new title onto the Amstrad disk machines, the duplication firm involved will have to acquire something like 50,000, just to get first stocks into shops. If the program sells well . . .

So, by Christmas, we'll have close to half a million people, all wanting around 20 disks, and a couple of dozen software people, all wanting 50,000 (or more) per title. And the Japanese manufacturers are saying 'just one swallow'.

True, upgrading your system to 512k isn't going to cut your need for disks in half, but it might reduce it.

The question of why those eight empty places are there on the board is an interesting one, by the way.

The best information I have suggests that the machine was originally going to be the PCW 8128, with 16 chips, 64kbits per chip. Then the 256kbit chips became cheap, so things were changed. The extra sockets were ignored.

Don't mess about with the board if you don't understand soldering, memory address decoding, and circuit boards. Wait for a full explanation.

Sinking Portable?

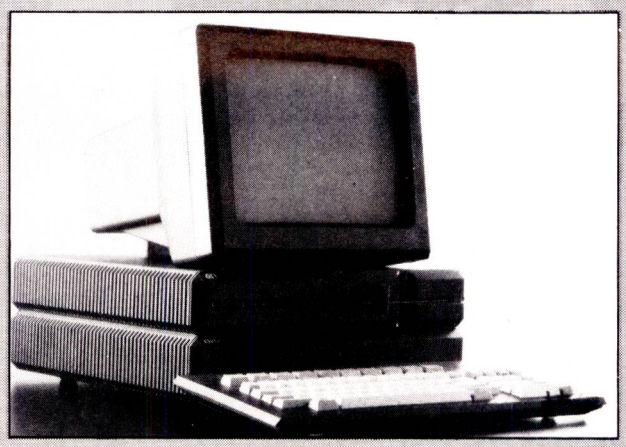
The reduction of the IBM 'Compaq lookalike', the Portable, by 41 per cent, plus the announcement of a cheap £150 colour monitor, means we can now buy an IBM portable PC for under £1500 with twin disks.

Only one retailer of the many I spoke to about this, believed that IBM means this as a way to dominate a market where it is a leading contender.

Everyone else insists that the Portable isn't sufficiently IBM-compatible to sell well, doesn't sell well, and never will, and the new price is just a way of dumping the goods.

IBM doesn't support this viewpoint. I don't suggest you should read anything into this, except that IBM doesn't support this viewpoint. On the other hand, I do support it.

I also expect to see the original PC dumped before Christmas, on similar price levels, or even better. This is just my own opinion, backed up by most of the financial analysts I've spoken to or read reports from.



Will the French go-faster Fox (Goupil) IBM lookalike, the G4, which runs four times the speed of the average PC, be a leading contender in the UK market?

No. Why not?

Because the company has not mentioned, once, in any of its publicity, what the price is.

Rule One for micro sellers: if you're selling only to the 'price-no-object' buyer, you will sell very few micros.

Rule One for micro buyers: if they don't tell you the price, you can't afford it.

From acorns to pear trees

I never heard a serious complaint about the BBC Micro, apart from the amount of memory, that couldn't also be said about the Apple II, and yet the consensus of the world is that the Apple II is good for another couple of years, but the BBC Micro is finished.

The fact that the BBC Micro didn't get more memory but the Apple II did, is crucial, of course.

Now, too late, perhaps, everyone is rushing in to expand the Beeb as well, including Solidisk, with enormous disks at incredible prices; plus new arrivals Oak and Pear Tree, with business systems built around the basic BBC board.

You haven't heard of Pear Tree before. It is buying BBC B boards and putting them into a box, with screen and remote (infra-red) keyboard, for just under £1200, including a lot of software and two disks.

The software I make no claims for: the man who wrote it is Pear Tree founder Vartan Mundigian, and he says it is 'professional' software — sales ledger, purchase ledger, stock control, and so on.

It is worth £1200, so the machine is free. 'It's all integrated and on a single disk, and it took me a year and a half to write,' he told me, and working software has indeed been written by one man in 18 months, but that proves nothing about its quality, and I'll wait for qualified accounting minds to give their opinion.

The reason for the infra-red no-cable connection is simple. The BBC Micro talks to its keyboard via a 17-way cable, and no-one would really say thanks for a long 17-wire cable connecting keyboard and computer. Also, it enabled engineer John Lowe (who doesn't play darts) to use an IBM-style keyboard, and translate all the keys.

Pear Tree reckons it can produce 60 to 70 systems a week, and that the main attraction will be the fact that any businessman who gets one will be able to ask his kids for help, because they'll know about the machine from school.

Phone him on (0480) 811573.

The sincerest form of flattery

When GEM first appeared, I saw it on the Acorn Business Computer (RIP) at the *PCW* Show last year. Acorn said it was a proprietary desk-top idiom, and everyone else said it looked incredibly like the Macintosh.

Apple agreed. Apple didn't take Digital Research to court for writing GEM, but the out-of-court agreement which they both signed did involve two things. Firstly, DR paid Apple a sum of money; and secondly, DR went away and re-wrote GEM, GEM Write and GEM Paint, so that they looked different from Macintosh.

In exchange, DR will be doing some work for Apple.

New in the jungle

We seem to be stuck with the fact that dBaseIII is now one of the inhabitants of the computer jungle — a programming language.

This fact is announced by the launch of Nantucket Software in Nantucket, and XAT in Britain, selling the Nantucket-produced dBaseIII compiler, Clipper.

Clipper, says Andre Jay, founder of XAT (ex A-T, he and his colleagues used to work for Ashton-Tate) can speed up dBaseIII programs between two and 20 times.

It produces native machine code for the PC.

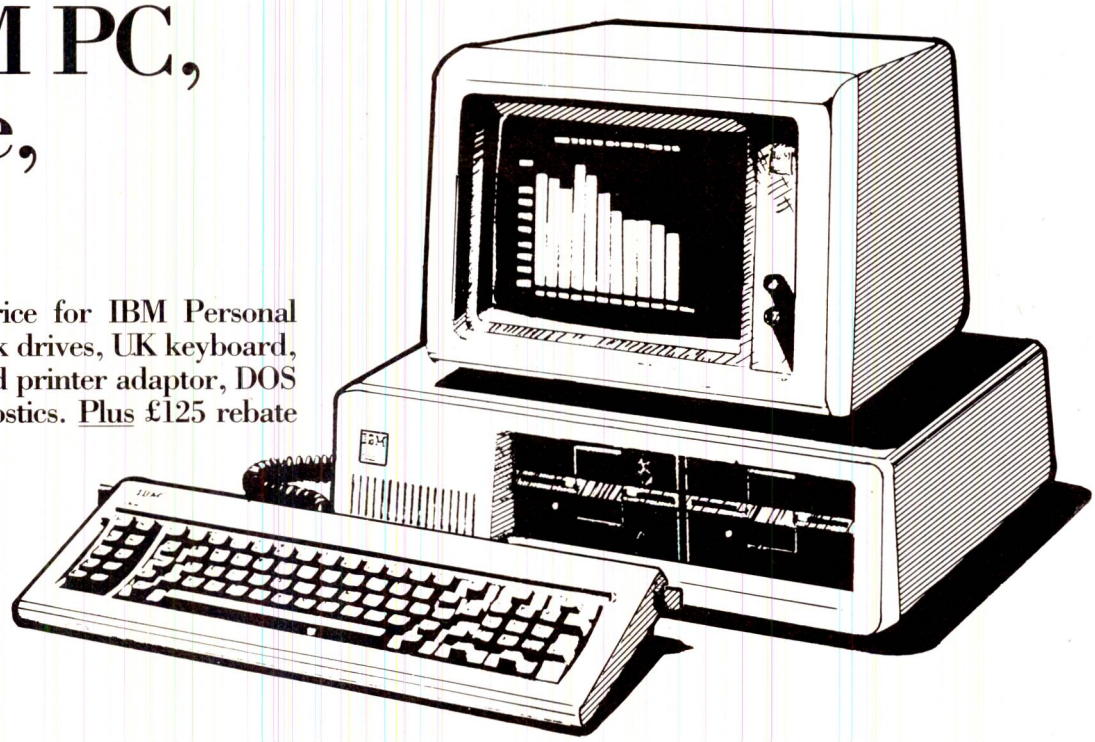
'There may be better programming languages, better "databases", and better solutions,' he admitted, 'but dBase is something which thousands of companies now have thousands of routines for. They work, nobody is going to re-write them, and they'll be very pleased to speed them up.'

Too cheap to be true?

In a world where Apricot will probably be accused of

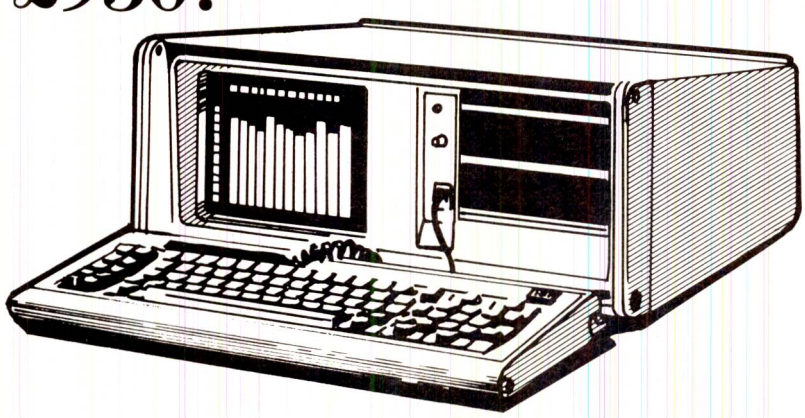
The IBM PC, complete, £1500!

Save £582 on usual price for IBM Personal Computer, two 360k disk drives, UK keyboard, monochrome display and printer adaptor, DOS 2.1, manuals and diagnostics. Plus £125 rebate on Proprinter.



IBM Portable PC, complete, £950!

IBM Portable Personal Computer 256k, complete with two 360k disk drives, UK keyboard, amber monitor, graphics display adaptor, DOS 2.1, manuals and diagnostics. Plus £125 rebate on IBM Proprinter. Limited offer.



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IBM PC/AT 256k Mono (3641.00)	**2990.00**
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IBM Authorised Dealer

under-pricing the hard 20Mbyte disks on its Xen, Solidisk can expect to be accused of undermining the stability of people's livelihoods with its 10Mbyte drive for the BBC Micro. And why not? Technical boss Tony Lee reckons he's making a loss on the drives, too.

The Solidisk price for 10Mbytes is £400. That includes everything.

As if that weren't enough to get collars heated, Solidisk can be expected to announce a memory expansion system offering 256k (expandable to 4Mbytes) of extra RAM. That will start at £175.

The company also plans to launch Interword, Computer Concept's new word processor, with it, soon after Christmas, plus a megabyte floppy disk, for £250.

Disks first, and the £400 bombshell. For that price, what you don't get is a system compatible with other BBC systems. But you get everything else: you get the Advanced disk filing system ADFS ('it's compatible with Acorn's ADFS') plus DFS 2.1 chips, plus a SASI interface board which plugs inside the BBC Micro.

If you have an old Beeb, release three or earlier, you may have to spend a bit more on a separate power supply. That costs an extra £60, and is worth it if you plan to use a floppy disk with the system.

For those who want an Acorn-compatible system, the Solidisk recommendation is that you spend approximately £55 extra and buy its floppy disk controller, which will enable you to load and run 'around 80 per cent or more' of Acorn software. Known non-runners include Hobbit, early versions of Elite and Revs, and Gemini DDD Calc.

How compatible the Solidisk SWR256 memory expansion system will be, remains to be seen. The company's technicians assure me that it switches from bank to bank of memory 'in the same way as the BBC B+ does', but there's more to compatibility than that, and there's more to the SWR than compatibility.

It will include a programmable memory management unit, with a ROM register, shadow register, access register, and size register.

The ROM register duplicates the one on the BBC B+ board. The shadow register is 'similar' to the Plus implementation.



This may look like Lotus 1-2-3, but it isn't. It's Lotus 1-2-3 Version 2, which allows bigger spreadsheets, will use an 8087 maths chip if you plug one into the system, and will use the Above Board. If you already bought Release 1A after the 24 April announcement of Version 2 (this one), then Version 2 will cost you £25.

But the size register is new, and it specifies how big 'shadow screen' memory is. Normally 16k, it can be expanded considerably, and BBC freaks will probably disappear into it with shrieks of delight for several weeks before a general verdict is available.

With the hard disk, by the way, you get quite a bit of Solidisk software, including a database manager, which is also supplied free on Solidisk floppy disks (another low-price tale, there) plus a word processor. That isn't the InterWord package, but another. And the database package isn't as good as the forthcoming package from Computer Concepts, which will be bundled in by January, apparently.

I don't expect Solidisk to let me try out the system, as Tony Lee was not very pleased with my 'aggressive attitude' towards Acorn.

He told me: 'The trouble with this disk is that we've only managed to sell 50 in two months, because nobody's going to buy a BBC Micro. They're all trying to buy Ataris, there's no software for a big disk on the Beeb.' He then went on to point out what a damaging effect my 'aggressive' writing about Acorn had on his business.

Solidisk is contactable on (0702) 354674.

The grass is greener . . .

Tim Keen used to be a leading light of the Computer Retailers' Association. Last month he wrote to me, saying that computer retailers were 'an inconvenient interface that pushes up the price.'

He's selling PC add-ons to special customers, he says, who don't need dealers.

Tim Keen's new company is PCDIRECT, and it makes hard disks, tape back-up, colour graphics, memory, and similar add-ons for the PC/XT and even XT-compatible machines.

His XT-compatible, with 256k and a 10Mbyte Winchester, costs £1333. His 25Mbyte disk plus tape back-up costs £2222.

The new venture means that Keen has failed to find happiness at either Ashley Ward's Intelligence UK, or at Nine Tiles, the networking pioneers of Cambridge. That's so far this year, and the speed of movement appears to have left Keen in a sombre mood. I heard him talking to a colleague in bleak tones about 'this better work, I don't know what comes next'.

Ashley Ward, by the way, has fared no better. Despite great hopes of his PC add-on business, Intelligence Research and its Hyperram, and so on, failed to survive a stupid venture into Seiko micros.

I don't know how many 'multi-user PC equivalents' Ward bought from Seiko, but I have never seen one with a working operating system. Neither, it seems, has anyone else, as left-over Seiko stock appears to have been instrumental in the crash.

I suspect that an IBM clamp-down on grey exports of PCs through Intelligence to the Far East, was another major cause.

Keen, by the way, sells PCDIRECT on (02814) 2417.

Start again

Delighted with his new Prestel-based Telex system, a friend reports that it works! 'You can phone and phone and phone, and they take no notice, but send a telex, and they reply at once.'

His joy was a little confined, however. From the large corporation came the following answerphone message.

'We've been trying to reply to your Telex, but your Telex machine keeps giving us the OUT OF PAPER code. Was it important?'

Oops, Prestel; you didn't think you could run a paperless office, did you? Back to the drawing board . . .

Modem round-up

It's still possible to make a lot of money out of a few chips by building them into a modem — providing it runs



'Its first word!'

The Commodore 128. When you look at the facts they do seem to weigh rather heavily in our favour.

When you add it up, the Commodore 128 is really three computers in one.

It can run 64K, 128K and CP/M software. Giving it the largest range of computer software in the world. Making it as efficient in business as it is entertaining at home.

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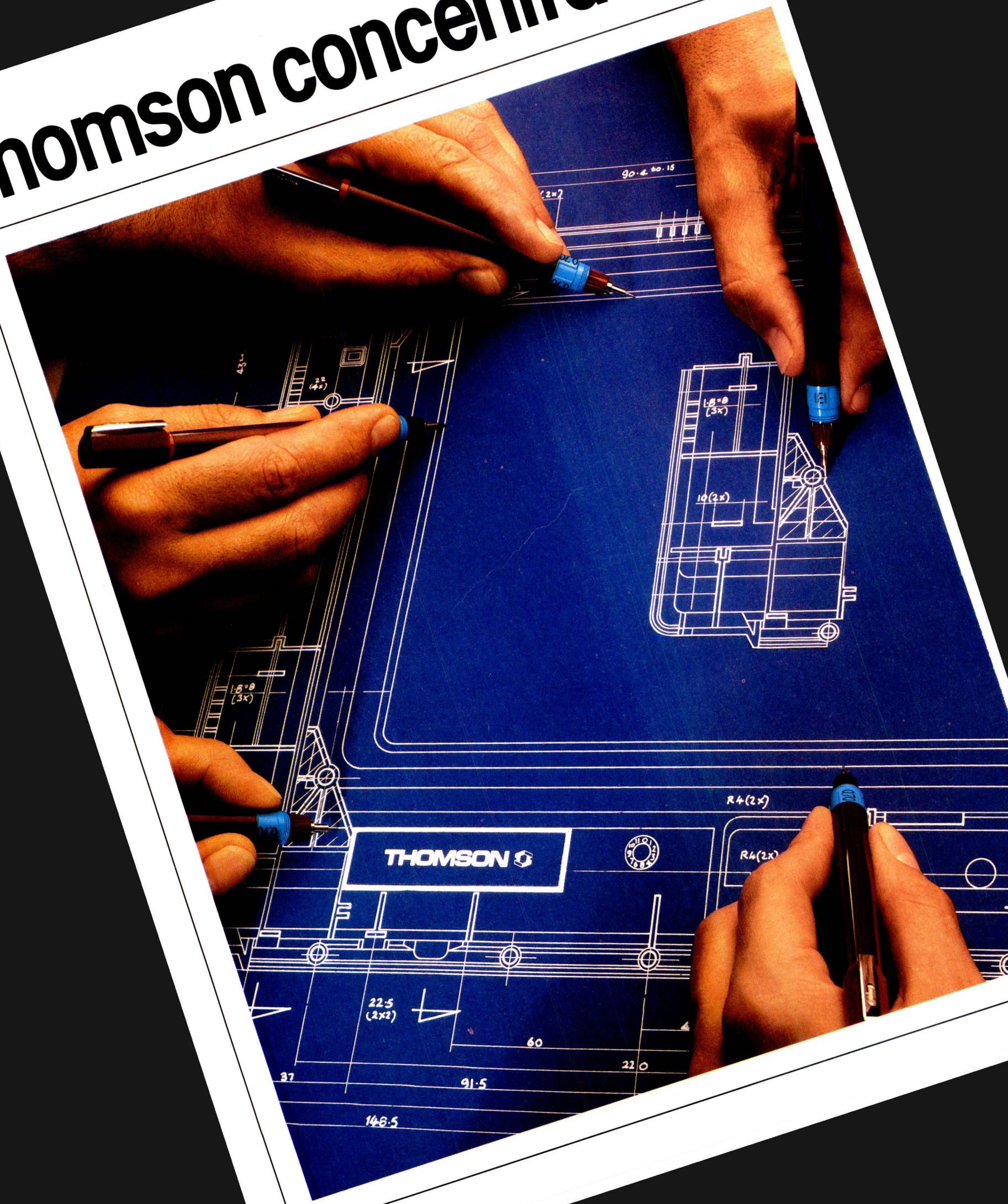
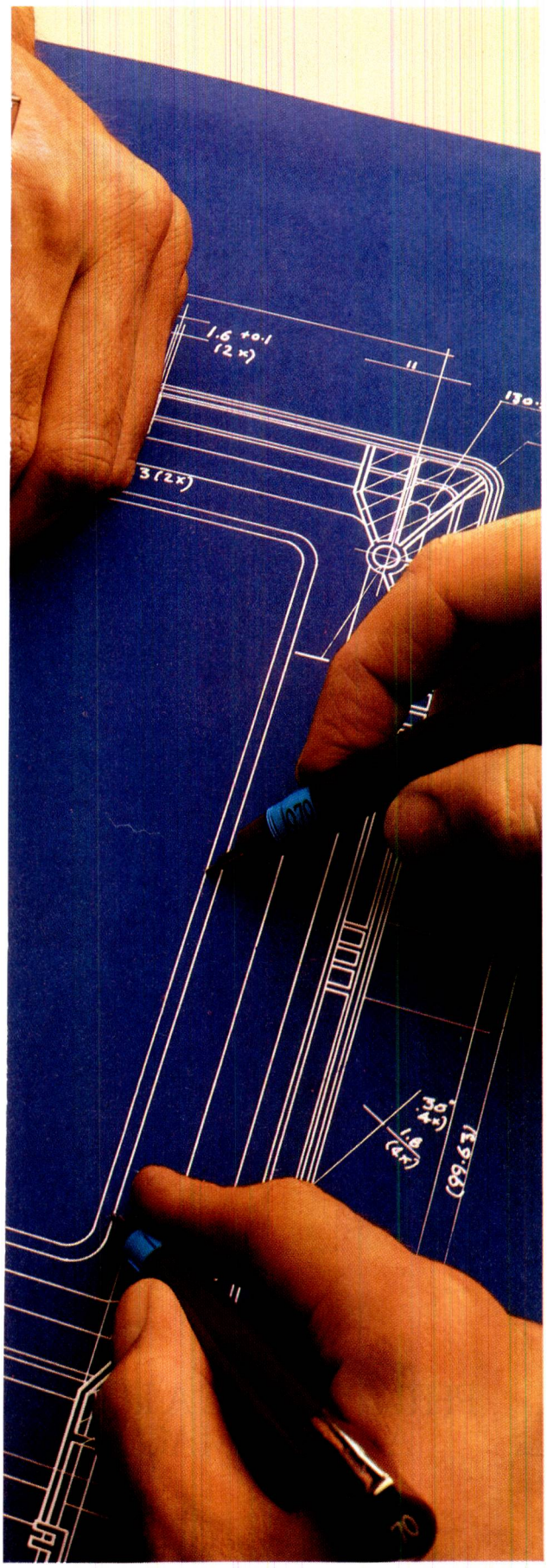


the business of monitors.



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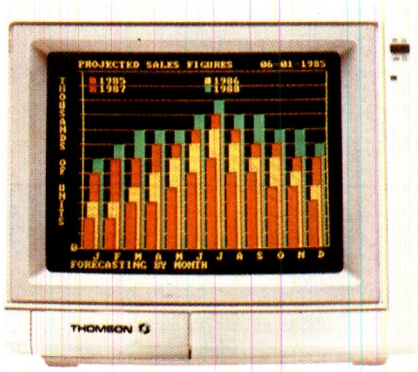

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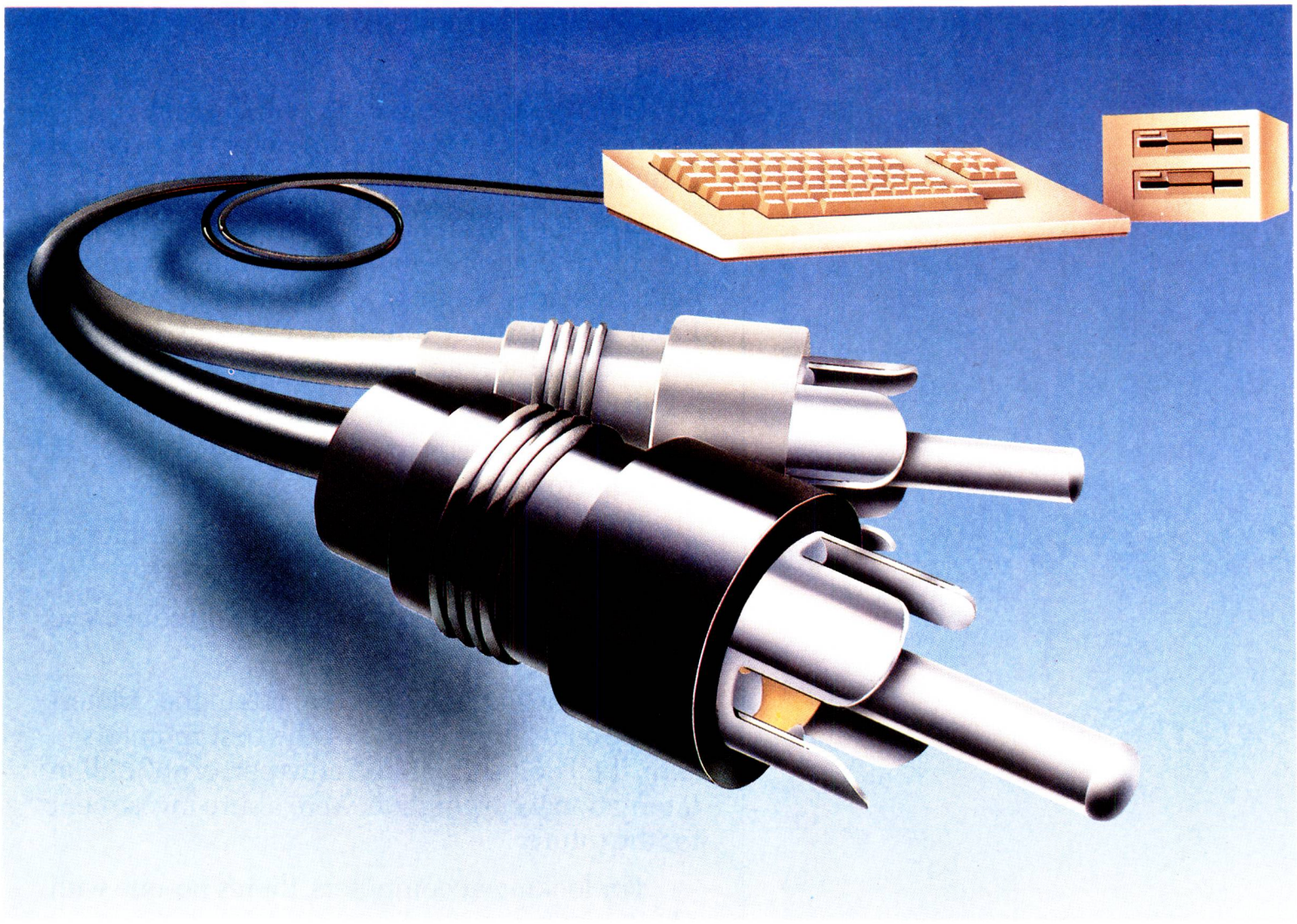

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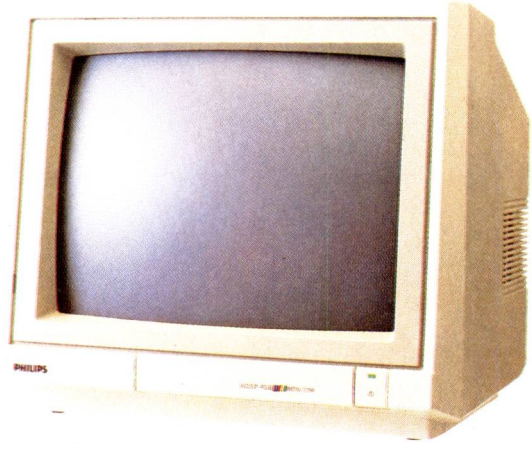

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fast. However, the arrival of a new Tandata modem, the Tm 602, shows that this is starting to change.

Three new modems have now hit the market, running at 2400 bits per second, and they all cost around £700.

From Network Products, the Datalink 224 costs £695, and will work with any software that expects a Hayes-compatible modem.

This one is 300, 1200 and 2400 bits per second, full duplex. Unusually, it can work synchronously as well as asynchronously.

I don't know much software that can handle this.

From the now-respectable Miracle Technology comes a rather more versatile box, the WS3000. This one can be upgraded to include the V22 standard (2400 and 1200 bits per second), but starts out with the old favourites, V21/23 (which is the 300 baud and 1200/75 Prestel standard) included. This one, too, uses Hayes Smartmodem dialling and phone-answering protocols, so will work with things like Crosstalk, Symphony and Spotlighting.

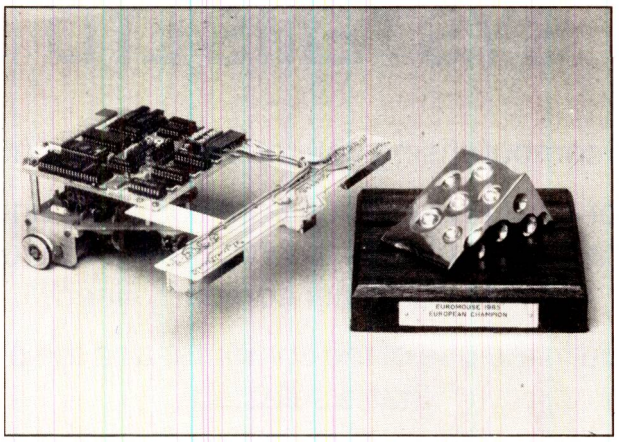
From Tandata, a similarly all-inclusive box, but at a rather different price. This costs £465. Like the WS3000, it will handle V21 (300 bits per second duplex) and V23 (Prestel), as well as V22 (1200 bits per second). The difference, of course, is that it won't work at 2400 bits per second.

For the next year, however, that won't matter much, as there isn't a lot you can do with a 2400 bits per second modem, except find someone else with one and swap data. But at 2400 bits per second, you can play clever tricks — tricks like Tymnet's X.PC protocol, which lets you connect, simultaneously, to more than one database.

The drawback of the Tandata modem is that it doesn't obey Hayes commands.

This could be a serious mistake, except that putting in Hayes protocols won't affect the price much since Hayes itself, the US's most successful micro modem maker, is about to launch itself onto the UK market. I gather that its Smartmodem has just gained BABT approval.

Tandata is on (06845) 68421. The Miracle Technology modem is the most versatile of the three, and the company is on (0473) 50304.



The fastest robot mouse in Europe, the winner of the European Micromouse contest, was judged to be David Woodfield's Blitzer, which found the centre 'blind' in 66 seconds. When it had mapped the maze, it took 27 seconds.

David Woodfield works for Intelligent Software, the chess championship software company, so the win is a plug for its programming talents, on (01) 636 7016. Tell you what, though: I bet the designer of the brass cheese prize doesn't know that mice, being totally vegetarian, can only eat cheese when starving, and usually die of the intestinal complications that result.

Imagine this

There are those who still don't believe it, but Atari ST micros are, at last, available.

The proof of this is the complaints that are starting to come in, suggesting that the machine doesn't work properly. Well, what did you expect? New machines never do.

Software, however, is another matter, and the piece which is amusing me most is probably the least important — it's a game.

Bratacus, from the people who used to run Imagine, looks very much like a Megagame.

A Megagame is a game designed by Imagine for the Commodore 64 and the Spectrum, back in the days when Imagine was *the* games company.

When the company went bust, some of the directors set up in business and sold the Megagame to Sinclair, to put on the QL. Work proceeded, but so far, no game has been seen. Apparently, money did change hands, but I can't discover how much.

Bratacus on the Atari ST has some very QL-like colours. The graphics are squeezed up like a Cinemascope movie on TV, the way QL graphics might well look on a narrower, more conventional 80-column screen.

The writers don't deny that they wrote it on a QL, but they do deny that it's the Megagame.

So far, I haven't spoken to a single Atari owner who believes them.

Here's MUD in your eye

Multi-user Dungeon, the ultimate adventure game, is about to appear on Prestel, through Micronet, news which the average MUD user and the informed Prestel user alike will greet with disbelief.

'It can't be done,' they will say, 'because MUD scrolls, and Prestel gives pages.'

When you have filled up your MUD screen with cries of 'Avaunt, wizard!' and 'Pick up wand' or even 'Hi, Gzartlingrol! What's in room 29?', the whole screen moves up one line. The top line vanishes. The new line is written in the new blank space at the bottom.

When you reach the bottom of a Prestel screen, the Prestel computer informs your micro that that's that, and instructs it to delete the whole screen. Then it starts again from the top.

You obviously can't delete the whole screen and then re-print it, missing the top line and putting the cursor on the bottom line. Well, you can, but by the time you've done it, everyone else on MUD has watched the witch fall down, down, down and turn into a drroytlp with yellow wings, while Gzartlingrol has responded to your cheery request for information with a megazap which turns your wand into an adder. Huh.

Well, it's going to happen, for all that, and you have Mike Brown to thank, at Micronet. Actually, his solution might even be an improvement on scrolling.

'I've established a protocol; with a window 19 lines deep for information coming from the host, and a smaller window of a couple of lines at the bottom of the screen, for your instructions,' he says.

The result will be that your own instructions will not form an alphabet soup with the description of the witch who turned into a rytl while you were typing 'drop'. When you get to the bottom of the 19-line news window, it will change colour into something restful like dark blue on light blue, and the cursor will jump to the top of that window. You will be able to see quite clearly what's new, and what happened a minute ago.

The result is that the information coming from the MUD computer will be slowed down from 1200 bits per second to 600 bits per second, because quite a lot of information will be invisible instructions to the cursor — 'Move to the bottom window, set colour to blue', and 'Move to top window, move down three lines, and carry on from column 25', and so on.

Frankly, 1200 bits per second is faster than I can read, and 600 bits per second might be just about right.

Micronet is quite impressed with Mike's cleverness, but even more impressed with the new Chatline service.

Chatline used to let you have a chat with other users, with a mere 20-minute delay between 'Hi, this is Scrottyuin, is Uvluinop online today?' and 'No'.

Now, Micronet says (or at least, as from November) it has installed Chatline on a new mainframe, giving instant response. There are now 10 separate Chatline sections, four of which are open to anyone on Prestel, Micronet or not. It says it hopes one will be 'adult', by which, I suppose, it means schoolboy smut, with incredibly detailed jokes about what Jet Set Willy did with the Manic Miner. Ho hum. Well, that's freedom of speech, and well worth fighting for.

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That'll do nicely

The C language for CP/M users (people like owners of the Amstrad PCW) normally is unobtainable, or expensive.

At £40 for the HiSoft C++ compiler however, I'll overlook most objections.

According to HiSoft, there are no objections possible, as it follows the Kernighan and Ritchie standard 'very closely' (ouch!) and, even better, includes special functions which allow a programmer to access CP/M BDOS and BIOS directly.

Apparently it will even work on CP/M imitations such as Torch's CPN.

And it includes a screen editor, ED80, which is said to be WordStar-compatible and very closely integrated with the compiler. For example, when the compiler hits an error, it dumps you back into your C program at the point where it found the error, and when you've finished, it jumps back to the compiler again.

Details on (0582) 696421.

How wrong can you be?

'Product never installed.'

That's the message that greeted me after I tried to 'uninstall' Spotlight from my hard disk.

You might justifiably wonder why I was doing this. The answer is that it had suddenly ceased to work.

The software was lying, of course. I had 'installed' it, not just once, but twice. It wouldn't work, and all the data I'd laboriously entered into it was unavailable to me.

I wouldn't revive my own private hell in the backwoods of copy protection, except for the fact that Lotus, which now owns Spotlight, has just relaunched it. It's cheaper.

Credit to Lotus: it quickly sent me another copy, and the original floppy disk allowed me to run the program from drive A:, even if it wouldn't admit that I had a hard disk on the Olivetti M24. Eventually, I managed to re-write the data files into another directory and get at them again.

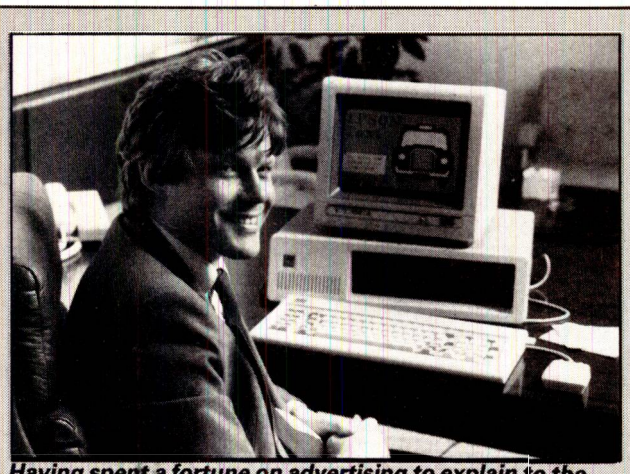
I never found out what caused the problem. It may happen again at any time.

When is the software industry going to realise that copy protection like this is as endearing as those parish priests who preach 20-minute sermons on the evils of not attending church services — to the people who are there!

I've paid for the wretched program (I may wish I hadn't, but I have) and why should I have to suffer because someone else might steal it? The heck with it, and I'm getting a copy of Sidekick, non-protected version, as soon as possible. Who needs this hassle? What this is all about, is copy protection.

I hope that you will take warning from my experience and refuse to buy 'protected' software.

Spotlight is a 'pop-up' package on the IBM and similar micros. When it was launched, I greeted it with quite a lot of enthusiasm. 'It sounds,' I think I recall saying, 'like what I've been looking for for some time.'



Having spent a fortune on advertising to explain to the world that you have to have an Epson PC because it runs Taxi ('all the advantages of the Macintosh and the IBM PC, without the drawbacks'), Epson has now spoiled the whole game by putting Taxi onto the IBM PC.

Taxi is a window-icon mouse pointer feature for PCs, but to load it you have to buy a board and plug it in. The advantage of this is that it doesn't use any of that precious 640k of IBM memory. The cost is £199.

The smiling academic sitting in front of the taxi-ridden PC is the author, Dr Alastair Mackintosh.

He apparently designed this 'graphic interface system' from his office inside Epson UK.

Sensibly, Epson is publicising its virtues by comparison with Digital Research's GEM, rather than against Microsoft Windows.

No, I still don't have a working sample of Windows, but I still feel that it must work, and that it will probably win.

The advantage of Taxi over GEM is clear. Apart from the fact that GEM takes 128k of user memory, it doesn't actually change the programs you run — run WordStar under GEM, and it remains WordStar. But under Taxi, says Epson, you can put Taxi information files (not drivers, I note) into the system with the applications, and it will give you icons and things inside WordStar.

I haven't tested this claim yet, by the way.

First – at a price

Trust Digital Equipment: first out with a nice, useful standard for using compact disks for data storage, the world's second-largest computer company has spoiled the porridge by pricing it at $2300.

DEC has found 11 companies, starting with the big names like Lotus, 3M and Tecmar, which will support its CD ROM standard, and it has also found five databases to sell on compact disk, which are attachable to its Rainbow personal computer.

And then it asks this kind of money!

When is compatible not compatible?

Full marks to Hewlett-Packard for getting away with an 'IBM AT-compatible' machine that doesn't have a hard disk.

Half of the attraction of the AT is, of course, the 80286 chip inside it. This is fast. The other half is the provision of a 30Mbyte hard disk.

The Hewlett-Packard Vectra comes with one floppy disk of 360k for £2415, and goes up to a maximum of a 1.2Mbyte floppy. The diskettes, by the way, are not 3.5in Sony diskettes, but good old-fashioned 5.25in bendies.

The company rather unnecessarily adds that this machine 'will not replace the HP 150'. I'll say not.

Come on, HP. What about a hard disk controller, at the very least, so that people can plug in standard hard disk subsystems? **END**



'I've been replaced by a floppy disk!'

YANKEE DOODLES



Another American soap opera emerges as Steve Jobs organises his post-Apple business. David Ahl delivers the news from the States.

Much-improved Framework

Framework II from Ashton-Tate has been significantly improved over the original product. Three major changes have been made in the area of memory management. Firstly, Framework II has an optional virtual memory driver. This feature allows a hard disk to serve as an extension of RAM, permitting the creation of virtually unlimited-size files. Secondly, it supports the Intel/Microsoft expanded memory specification, which means it can directly address up to 8Mbytes of RAM. And thirdly, the package uses a 'sparse matrix' technique for compressing spreadsheet files into less space.

In the area of communications, Framework II has completely integrated commands instead of the external Mycroft Labs MITE program that was provided with the original Framework.

Utility programs were offered with the original Framework for importing Lotus, DIF and WordStar files. Framework II is considerably more versatile, particularly with respect to converting ASCII text into numeric data that can be used by the spreadsheet module.

In exporting files, the original Framework could write only ASCII text files and dBase comma-delimited files. Framework II can produce files in IBM DisplayWrite, WordStar, and MultiMate formats also.

The word processing module now contains an 80,000 word spelling checker, offers discretionary hyphenation and non-breaking space characters, and displays pagination on demand.

Two interactive tutorials — beginners' and advanced — are now included with the program. The package comes on eight disks and requires 384k of memory. All modules installed on a hard disk will occupy about 1Mbyte. Framework II sells for $695.

Q&A, naturally

Symantec's new file manager, Q&A, has two user interfaces — one like the pfs: range and one like natural language. The natural language interface, called the Intelligent Assistant, lets the user ask complicated queries of the database in English sentences. Moreover, the user can expand or modify an enquiry without having to start all over again.

Q&A appears to be an innovative and well thought-out product. Its ability to use existing pfs: files is a big plus. The company is composed of seasoned professionals, and although retailers are not exactly looking for more software to put on their shelves, Q&A ought to have a better than even chance of making it big.

Just the job?

The headlines read like a high-tech soap opera.

3 June 1985: Apple Reduces Jobs' Duties in Overhaul Designed to Trim Costs, Bolster Stability

2 Aug: Apple Chairman Jobs Is Selling Eighth of Stake in Computer Firm

17 Sep: Apple's Jobs Plans New Computer Firm, Hires Five from Concern He Co-Founded

19 Sep: Apple Mulls Position After Jobs Quits

20 Sep: Jobs' Team Building a Lisa-like Micro

25 Sep: Jobs Asserts Apple Abandoned Efforts to Settle Dispute Over His New Venture

Underlying the news stories is the notion that Steve Jobs is an American business hero of the order of Thomas Edison, John D Rockefeller and Lee Iacocca — an inventive genius, a master marketeer, a charismatic manager, and an astute financier — all rolled into one. Whatever he touches will turn to gold — Apple seems to think so (now that he has been forced out) and news reporters seem to think so (it's nice to have heroes).

Frankly, I think the jury (the market) is out and will be out for some time to come, but that doesn't stop us from looking back and I do not see Jobs' name in lights. Let's look at the myth versus the reality.

Jobs the inventor: Steve Wozniak invented the Apple II, the longest-lived design in personal computers; Jobs had nothing to do with it. Jobs influenced the design of the Lisa/Mac; 'influenced' does not equal 'designed'.

Jobs the marketeer: the real management direction for Apple in its staggering growth period was provided by AC 'Mike' Markkula and Mike Scott, not Jobs. Years later, Jobs brought in John Sculley in recognition that Apple needed leadership in marketing.

Jobs the manager: 'Morale hit a new low during the company's annual meeting, when Macintosh division employees got front row seats to hear the zealous Mr Jobs describe new Macintosh products. The Apple II division watched via closed-circuit television from a nearby auditorium.' — *The Wall Street Journal*. Typical of Jobs.

Can Jobs' new Lisa for the education market make it? Sure! Colleges would love a cheap Vax or high capability Mac, but for Jobs' company to be a success a great many pieces will have to fall into place. Some of them will *because of* Jobs, but more will have to in *spite of* Jobs.

Random bits

As expected, IBM has formally announced that it will merge the sales forces that sell to large and small customers. The reorganisation will be along geographical lines: 12 regional sales offices will be eliminated ... Cash-strapped retailers say that IBM's pre-Christmas rebates of six to eight per cent on XT and AT models are not sufficient to increase already bulging inventories. The wholesale price of the PCjr has also been reduced by another $174, which means that the street price should be in the $300-400 range — quite a bargain if the computer meets your needs ... Distribution of the English-language version of the IBM JX (similar to the PCjr) is being expanded throughout the Far East. The machine is made by Matsushita (Panasonic) and sports a 3½in disk drive. No plans for the US or Europe yet ... Checkmate Technology of Tempe, Arizona has introduced a MultiRam CX card for the Apple II which contains a 16-bit 65C816 CPU and additional memory (up to 640k). A companion operating system, MAX-OS, from Micro Magic has multi-tasking and multi-user capabilities that allow creation of a Unix-like environment. The card with software costs $329 ... Citizen has introduced a 35cps daisywheel printer with an 8k buffer that is compatible with the Diablo 630, NEC 3550, and Qume Sprint 11. The price is just £599 ... Lotus admitted in September that Symphony 1.1, which it began to ship last July, has a serious defect that can cause users to lose significant amounts of data. About 25,000 copies of version 1.1 have been delivered to customers ... Having failed to win a significant market share with its QX line of computers, Epson has announced a me-too line of IBM PC-compatible machines ... Sperry Corp has expanded its PC-compatible line with a Mitsubishi-made Intel 80286-based machine to compete with the PC/AT. . . Mindset Computer Corp, maker of a machine that opened to rave reviews last fall, has filed for protection under Chapter 11 ... Rising from the dust is Franklin Computer Corp, with new financing and a new Apple-compatible computer, the Ace 2000 ... To help alleviate cash flow problems at Morrow Computer, Zenith has agreed to finance some of Morrow's inventory used in the manufacture of the Zenith Z-171 portable computer purchased from Morrow

..Ever wonder what became of all those ex-Atari executives? Five of them, including former president Don Kingsborough, are selling high-tech animated story-telling toys such as Teddy Ruxpin, a bear who blinks and moves his nose and mouth realistically as he tells stories or sings. END

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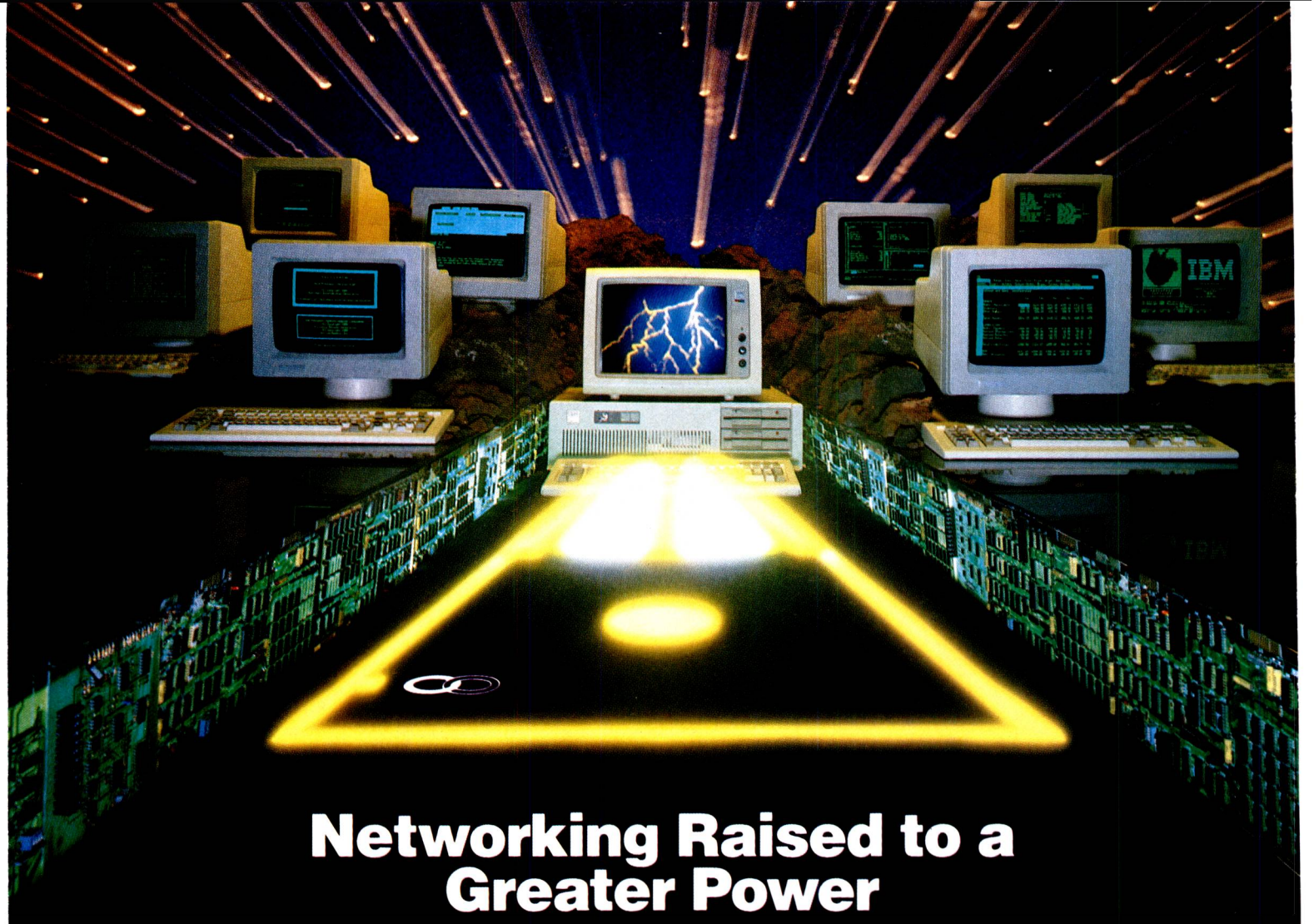

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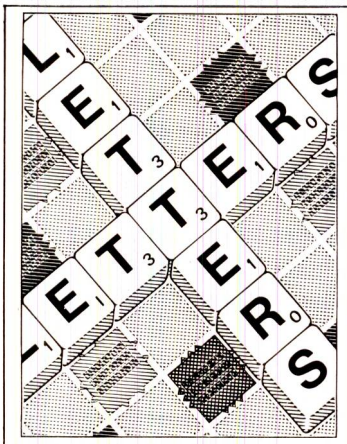
LETTERS



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Anything's possible . . .

In your feature 'New Life' (*PCW*, October) Geoff Simons draws some comparisons between the structural organisation of living things and computer systems. While this is to some extent semantic, there would seem to be no insurmountable obstacles in the way of its conclusion that an extension of existing electronics and programming will eventually enable the manufacture of a machine which is alive in the same sense that an animal is alive.

Such a machine, like any physical life, would necessarily be deterministic — in simple terms it would do what it was programmed to do, which, in the absence of malfunction or built-in randomising components and in full knowledge of all inputs, would be entirely explicable by its initial design. Similarly for animals and humans, although the full mechanism (in particular that of the brain) is not understood, the state of its physical constituents at any instant must be determined by their state an instant before through the action of intermediary forces.

However, this in no way explains our experience of life at its highest levels. We consider ourselves to be in control in a literally supernatural non-deterministic way (see *The Abolition of Man* by CS Lewis for some insights into the validity of this attitude). Here science has nothing to say, as inherently it deals with the natural. The presence of a supernatural component in human beings is of great relevance to the understanding of artificial intelligence in its broadest and highest definition, as it must set the limits on the extent to which machines can be designed to do what we do.

It will be of considerable interest to discover in the coming decades just where these limits lie.

Dr P Beardwood, Imperial College of Science and Technology, London SW7

. . . well, almost

I read Geoff Simons' article 'New Life' in the October issue of *PCW* with some amusement. His statement that '. . . the whole of the plant kingdom is unable to reproduce without assistance from other species (namely birds and insects)' I found a little surprising.

It is good to see that the conifers, ferns, mosses and algae hold his views in a healthy disrespect. They colonised the dry land many millions of years before there were any insects or birds to assist them in propagating themselves. I can only assume that they were unusually long-lived, and very celibate.

As to how water plants must breed, I find it hard to believe that diving birds and water beetles are entirely responsible. Then there are species such as the dandelion, which have turned their nose up at sexual reproduction of any kind. . .

Enough: the man clearly doesn't suffer from hay fever. Other than this slight lapse of common sense on his part, I found the article thought-provoking, if a little bizarre. For those of a cynical disposition, I would strongly recommend an article in *A Random Walk in Science* written from the point of view of a bunch of robots exploring the earth. They conclude that cars are the principal lifeforms, but note that they seem to be infested with small, bipedal parasites.

Stephen Burt, Cambridge

Seduction

Geoff Simons ('New life', *PCW*, October) wrote an excellent and thought-provoking article. However, much of the plant kingdom can reproduce asexually without outside interference.

The electronic equivalent may be 'induction', perhaps what is really 'computer seduction'.

PM Lewis, FRCS, MRCOG, Consultant Gynaecologist, Stoke Mandeville Hospital, Aylesbury

Fuzzy cats

Oh dear, Commander Howard Oakley ('Letters', *PCW*, October) has trotted out the old Cat Paradox to 'prove' the existence of fuzzy logic.

This supposed paradox is more a proof of a lack of practical logical thinking. Imagine I am presented with a sealed black box and am told that a cat is inside with a radioactive electrocution device attached. I have to assume that I am blindfolded and am wearing ear muffs, as the cat, if alive, would be frantic by now.

To me, logically, there is no cat. The box is sealed, and by definition, the presence of the cat, let alone its state, is unknowable and logically not describable. What I can work out logically from information received, is the future probability of the cat being alive in one minute's time when the box is opened and the cat exists for me for the first time: that is, 0.5 ×61/60 or 50.833 per cent.

WD Brinicombe, London W5

Sharp users get together

Very few people know we exist and even fewer know how to contact us. 'We', being the Sharp Users' Club, have recently re-organised and have a new committee with a strong editorial team, all of whom are enthusiastic volunteers. Presently we have over 900 members, and there is a section of the club devoted to each of the Sharp computers as well as special interest sections. Our records holder has a database of users' interests so that people can be put in touch with each other for problem-solving, sharing ideas, and so on.

We also run a free library of users' programs; members can contribute to the library or request tapes, reviews of which are given in the magazines we publish at approximately three-month intervals.

Membership costs a mere £41, or £61 for overseas members. Our membership secretary is Larry Galliford, 24 Whurley Way, Spencers Estate, Maidenhead, Berks SL6 7SS.

As we are a non-profit making club, we only have the members' interests at heart. Our magazine (Volume 5, Number 1) is due to be released very soon and has a lot to offer.

T Cowell, Bedford

A drive for all reasons

With 5¼in mini-floppy disks, 3½in and 3in micro-floppy disks and a variety of formats on each, I wonder if the market isn't ready for a disk drive unit with three different disk slots. It would need the necessary hardware / firmware / software to read and write differing formats, and a programmable interface to enable connection to a wide variety of computers and operating systems.

It isn't likely that this could be produced yet at a price that most of us could afford, but I think the need may well exist commercially. My employers have on-site IBM format 5¼in, BBC B Acorn DJS format 5¼in, and Hewlett-Packard 5¼in and 3½in, at least; there may be others. At present no-one wants to read one system's disks on another's, but this may be as much because it is currently not possible as that there is no requirement.

Dennis Powell, Saffron Walden, Essex

Buy British — if you dare

At the end of last year, I was looking for a computer which would mainly be used for word processing (I had a

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doctoral thesis to write). I narrowed the choice down to two machines — the Apple IIc and the Apricot F1. In the end, I managed to convince myself that the F1 was more my cup of tea for all kinds of technical and professional reasons. At heart, I knew that the main motive was simple patriotism — a sentiment which I now realise is inappropriate to the market-place.

The first sign that all was not well occurred when I tried to copy the software from the mother disks. Nothing doing. I had to have the software changed, which set me back a week or so in my work schedule. However, everything from then on seemed to work quite sweetly, so I consoled myself with the old saw about babies and new teeth.

Some months later I crossed the English Channel, taking my F1 with me, and I now teach in a French university. (Some of my students are studying information science, and will soon be in a position to influence purchasing decisions about computer equipment.) One morning, as I was saving a lesson plan, the disk machine packed up. I phoned French Apricot, naïvely thinking that it would honour the guarantee. Not a bit of it — if the machine had been sold in England, then it had to be repaired in England.

I contacted my dealer. It seemed, both to him and to me, that the simplest thing would be for ACT to instruct French Apricot to look after my machine, and for ACT to pick up the tab. ACT didn't want to know. Apparently, it is no longer interested in the F1, because 'the market has collapsed.' My dealer is no longer interested in selling Apricots. I'm no longer interested in buying them — not just because they haven't backed me up as they should, but because I now don't think that they will be around much longer.

Why not? The reasons for British lack of competitivity in this field are complex. Nevertheless, I think that my little tale does illustrate one major cause — the lack of any structures which would be capable of forging the kind of home market that Apple and Commodore, to say nothing of IBM, can base themselves on. Look at a map. Trace out the distance between New York and Los Angeles. The person who buys a Macintosh in the one can have his warranty honoured in the other. Now trace a line between London and Paris. As your pencil crosses the Channel, the lead breaks.

The lack of a Europe-wide policy has other effects — without a strong home market, British innovators are reduced to running as fast as they can simply to stay in the same place. A product is thrust out onto the streets without having been fully tested. Firms sell techno-flash, rather than reliability. Models are abandoned before users have really had time to get used to them. Finances are overstretched and companies collapse. None of this is solely the fault of the companies concerned; the reasons are structural and cultural. But if we had the political will to turn the EEC into something more than a beanfeast for the farmer, we might manage to support a thriving, truly innovative, European computer industry.

It's probably already too late for the Acorns, the Sinclairs and even the Apricots, but perhaps we can do something in time for a second generation of European innovators. Until we do, the golden rule for the computer buyer seems to be 'Buy American'. I'm only sorry that I was foolish enough not to follow it.

CT Mason, St Germain-en-Laye, France

Watch out! — there's a bug about

I was amused to see Lawrence Williams' letter about his problems with the Apricot Portable in the October issue, after experiencing similar difficulties with the Apricot F1. As I was already using an Apricot Xi for academic work — word processing and data management — and my wife had rapidly become enthusiastic about word processing for her own work, the F1 was the obvious choice for a second machine; its disk drive compatibility with the Xi makes it easy to use the machines interchangeably, and is an excellent feature within the Apricot range. The fact that I could no more get Sketch and Diary to run than Mr Williams could didn't worry me much, since like him I saw little practical application for these programs, and merely tried them out of curiosity. Are there thousands of other Portable and F1 owners who know something we don't, or have they all given up too, blaming their own stupidity rather than the system?

The inadequate provision and instructions for copying files are a much more serious problem; there is an MS-DOS bug here, which I have only sorted out with help from my dealer. The F1 manual suggests that there is a utility under FILES on the Activity disk, but in practice this icon only provides a disk directory. As even on the Xi it's easier and quicker to use MS-DOS, it seems straightforward enough to abandon Activity and follow the relevant page in the manual. Typing in COPY FILE1/S as instructed generates an error message, telling you that a file cannot be copied to itself. A printing error in the manual here; leave an extra space, type COPY FILE 1 /S, and a copy is actually made from one disk to another (with two switches of disks).

Don't be fooled, however, for all is yet far from well, and you must not be lulled into thinking that back-up files are accumulating happily on the second disk. My machine at least is adding insult to injury by baptising them all FREDFRED, so that each new one erases its predecessor (I note that FRED is one of the example names used for files in the MS-DOS manual). The system is defaulting to FREDFRED (or sometimes the name of the last file, with identical results). My dealer's answer, which has worked so far, is to specify the destination; COPY FILE1 FILE1 /S should do the trick.

This is by no means the only area in which the F1 manual is defective, but it is a particularly serious one.

Beware also the Diskcopy utility under the DISK icon, which you may be tempted to use in despair for back-up purposes; while it does work (albeit slowly and laboriously), it can only be used with an empty disk. The manual does not give a specific warning, as it should, that any files on the destination disk will be lost in the copying process.

As the identical bug was present on my dealer's Activity disks, I concluded that it must be common to early F1 models, and presumably Portables too, yet mine was apparently the first complaint. I'm left wondering whether the world is full of users who can't be bothered to make back-ups on single disk machines, or who think they have done so and are in for a shock when they need to use them.

Despite these problems, I'd still recommend the F1 as an excellent little workhorse, and very good value for money. It would be better still if ACT rethought the manuals; our life has been much easier because we have the far superior documentation supplied with the Xi to fall back on.

Robin Briggs, Oxford

. . . and so on

Many people think they have an intuitive understanding of the concept of infinity. They might like to solve this little conundrum:

A Take an infinite series of numbers:
2,4,6,8,10,12, and so on.
This is obviously a series of all the even numbers, and its sum is obviously infinite.

B Take another series:
1,3,5,7,9,11,13,15, and so on
This is obviously a series of all the odd numbers, and its sum is also infinite.

C Now put the two together, and derive the difference:
2,4,6,8,10, and so on
1,3,5,7,9, and so on
1,1,1,1,1, and so on
It is obvious that the further you extend these series, the greater becomes the sum of the differences; in fact, this tends to infinity. Therefore, obviously, the sum of all the even numbers is infinitely greater than the sum of all the odd numbers.

D Now let's add zero to the even numbers (zero is conventionally assumed to be even):
0,2,4,6,8,10, and so on
1,3,5,7,9,11, and so on
−1,−1,−1,−1,−1,−1, and so on
It is obvious that the further you extend this series, the greater becomes the sum of the differences; in fact, it tends towards minus infinity. Therefore, obviously the sum of all the even numbers is infinitely less than the sum of all the odd numbers. This is a remarkable result, from just adding zero.
Which is right? C or D?

Colin Walls, Bristol END



Above board

Martin Banks examines the tricky area of copyright on CP/M-based applications software when the author of the piece no longer exists.

Several years ago, I wrote in this august journal about CP/M. Remember CP/M? The operating system that everyone says is now dead and gone: long live MS-DOS!

I wrote at the time that it probably wouldn't go away that easily, and that it would constitute a goodly slice of the operating system market for some time to come.

There were those who gently denigrated the idea, so I have watched with interest over the last few months as CP/M has 'surfaced' again as a front-line operating system. This is through the emergence of machines like the new Amstrad and Commodore systems, as well as some earlier attempts such as that from Triumph Adler (whose machines are now resurfacing at Matmos). CP/M not only lives, it is regaining much of its importance.

The reappearance of CP/M on the front line has suddenly posed an interesting problem. That problem is the legal one of copyright.

CP/M was the leading general-purpose operating system for the first batch of 8-bit personal computers. Apple and Commodore had their own systems, and these proved good spawning grounds for a great deal of applications software. It was for CP/M, however, that the majority of applications software appeared, and the reasons for this are well charted. The system ran on a wide range of computers which gave the software authors, as long as they wrote to the CP/M standards, the chance to sell their products across that whole range of machines, rather than risking the selection of just one machine type.

Several companies, such as Ashton-Tate and Micropro, became extremely successful on the back of that possibility, but there were many other companies and individuals who also tried this market with markedly less merit. For every software company that has made a profitable business from CP/M-based sales, there are probably hundreds which have failed. The number must rise to thousands if the individuals who aspired to but failed to make company status, are included.

In general, these companies and individuals failed for the most obvious of reasons: their products were hopelessly bad. Sometimes the execution of the coding was brilliant, but it was applied to the wrong idea. Sometimes, however, the idea was good, but the product failed due to the company or individual lacking the skills required to make the product survive in a cut-throat business. It is an unfortunate but unavoidable fact that, regardless of the excellence of an idea or product, it is management skills which eventually prescribe its success or failure.

Consequently, the world is left with a whole bunch of CP/M-oriented applications software of varying quality from authors who have long since gone out of business. This would have remained a quaint, historical observation had it not been for the re-emergence of the operating system on such new machines as the Amstrad.

'For every software company that has made a profitable business from CP/M-based sales, there are probably hundreds which have failed. The number must rise to thousands . . .'

This system comes with some applications already pre-configured, and it's quite possible that the majority of purchasers will be satisfied with that supply. It is part of the nature of the system, however, that downloading applications software from one CP/M machine to another, regardless of the differences that may exist between them, is not all that difficult. It has to be considered likely, therefore, that people are going to do it.

To some extent it is encouraged, as there is already a lot of CP/M applications software in the public domain. This is freely available to anyone with an RS232 cable and a package such as BSTAM to control the data transfer.

The aspect that has struck me, and to which the legal question is applied, is not this freely available software, neither is it those users who copy the occasional application from a trusted friend.

The question that interests me specifically is those applications written by companies which have now gone out of business. As I have stated, some are good packages and could find a ready market among the new breed of CP/M users. Therefore, what is to stop a dealer who has a copy of such an application from selling it? We are all aware that, should the same thing be attempted with an application written by one of the big names, the full weight of the law — and the legal profession — would immediately be down on the culprit. But what of the company which has gone out of business?

As one software retailer put it to me recently: 'Well, you just take a calculated gamble on two things: one, you hope that they don't find out; and two, that even if they do, they won't have the resources to take you to court.'

It is not my intention to accuse the software distribution and retail industry of being full of sharks and charlatans, but even they are not going to turn down the chance of a really significant margin on a sale. If they have a copy of a program that will work on one of these new CP/M machines and the authors are now defunct, there is going to be a strong temptation to try to sell a few copies, isn't there?

If the only costs to be considered are those of a new blank disk, the photocopying of the manual (if it still exists) and the time taken to do the deed, the profits can be quite high. Only a few copies need be sold to make healthy additions to the bank balance, even if the price is just a few pounds.

And royalties to the authors? Ah well, if they don't find out and can't afford to sue anyway, who's to care? And the users who have bought these products? There could be lots of new CP/M users with a legal problem, technically speaking. END

Photograph by Philip Habib

IBM JX

The release of the JX in Australia signals IBM's intention to re-enter the home and education market. But just how confident is Big Blue that the JX will succeed where the PCjr failed? Ron Dunn investigates.



The demise of IBM's PCjr after a short life and a lengthy illness fuelled speculation about the company's low-end product line in the US. There was talk of a lap-held, a cheaper and smaller PC2, and even of an IBM MSX machine.

Meanwhile, IBM has quietly launched a new entry-level PC — so far only in the Australian market — by adapting its Japanese-sourced JX to the English-speaking micro world. It seems that the company is aiming at homes and schools with the JX, although commentators have stated that a company as 'heartless' as IBM could not exist in a market where Apple and Commodore dominate.

Well, they were wrong. IBM has released what the PCjr should have been. The JX (and don't ask me what JX stands for — my guess is Japanese X-pertise) is a well-designed and packaged computer that is suited to home, school and business use.

The JX originated as IBM Japan's entry-level system. The Japanese version of the computer has not been an enormous success in that market, dominated as it is by entrenched Japanese companies selling computers that are often specific to Japanese conditions.

The dual English/Kanji features of the Japanese JX have been removed from the new machine, which means a new keyboard and processor architecture. The original 'extended' keyboard, with both English and Japanese character keytops, is available as an option, however. The power supply and the attachment of the power cord have also been changed, for less obvious reasons.

The history of the JX's entry in Australia is tied up with educational contracts and requirements.

Early this year, IBM imported a small number of JXs for evaluation, and submission in tender to the Victorian Education Department. Although the company denied all knowledge of the machine in Australia (as is IBM's policy in these circumstances with all computers), the JX was shown to a few local non-IBM employees in an attempt to assess its software compatibility and likely market acceptance.

As the Education Department tender progressed, discussion of the computer grew more open. It wasn't until recently, however, that plans for the general release of the computer were discussed in public — the JX, originally proposed as an educational computer only, was officially released for general dealer sales on 16 September.

'IBM has released what the PCjr should have been. The JX (and don't ask me what JX stands for — my guess is Japanese X-pertise) is a well-designed and packaged computer that is suited to home, school and business use.'

This is a strategic product for IBM in the small systems market. Having been burned once with the PCjr, IBM executives will not be keen to experience another loss of face. This is definitely a computer to watch.

Hardware

The basic JX computer is a conventional three-box design, consisting of system unit, screen and keyboard. In its base configuration, the computer provides 64k of RAM, two cartridge slots (more on these later), a 30cm colour display, and a compact keyboard.

Options for the computer are an extended 98-key keyboard, 3½in and 5¼in disk drives, joysticks, cassette, light-pen memory expansion to 512k, asynchronous communications and additional expansion slots.

The system keyboards are low-profile and of light construction, but have a good, positive feel. Having been spoiled by the standard IBM PC layout, however, I found the more conventional Selectric layout of the JX a little clumsy to use — my fingers kept tripping over the back-slash key on their way to the right-hand shift key.

The compact keyboard has 10 function keys arranged in two groups of five across the top of the keyboard, along with another key marked FN. This acts in conjunction with other keys to provide extended cursor management. The cursor keys are logically grouped and clearly marked, and apart from the problem with shift keys, I found the keyboard a joy to use. A feature sure to please many critics of earlier PC keyboards is the incorporation of an enlarged Enter key. The Caps Lock key, however, still provides no indication of state, having neither a locked-down position nor an LED indicator light.

The extended keyboard is almost identical to the compact model, but provides a dedicated numeric keypad to the right of the keyboard. This provides the digits 0 to 9, as well as basic mathematical signs, a comma, and its own Enter key.

The keyboards are unusual in providing both infra-red or cabled operation. The infra-red worked well in an office environment, with a distance from the screen of about 10 feet. Missed keystrokes — and your aim really has to be bad — will cause a soft beep to sound. Where another infra-red device is operating in the vicinity it is advisable to



The JX's keyboard is of a light construction but has a positive feel, and provides infra-red or cabled operation.

use the cable, consisting of 0.63m of coiled flex. This can be plugged in at any time, with no effect on any program that's running.

The system unit I tested was equipped with two 3½in disk drives. These seem to break with market tradition by only offering 360k capacity, whereas most other vendors stretch the disk capacity to 720k at least. This was a disappointment. Many small businesses, to whom this computer is ideally suited, need more than 360k of data on a mass storage device, but cannot justify a hard disk. As the disk drives are physically incompatible with existing IBM hardware, I can see no reason for having limited disk capacity to this amount. It would appear IBM agrees and has recently released a version of the JX in Japan with 720k drives — no doubt this system will be available outside Japan in the not too distant future. In the meantime, software suppliers will be forced to produce two versions of their software for 3½in disk users: one for the JX, and another for the large number of IBM PC compatible lap-held machines which have 720k drives.

The power switch for the computer is logically placed on the front-left of the system unit, and is a positive-feel toggle switch.

Underneath the disk drives are slots for two cartridges. These are completely compatible with the PCjr cartridges, providing a ready supply of software. Cartridges load virtually instantly, and leave all user memory free for data. This will be a boon to users of cartridge programs such as Lotus 1-2-3. For a start, programs load immediately from cartridge; and, secondly, programs like 1-2-3 need to store all user data in memory at one time, so programs on cartridges not requiring any RAM for themselves, leave memory free for user data. From the software suppliers' side, also, cartridges are difficult to copy. Each cartridge has the capacity for up to 160k of ROM.

Inside, the computer is vastly different from the rest of the IBM PC family. The expansion slots are limited and not compatible with IBM PC slots, and expansion cards are much smaller. The system is based on an 8088 processor operating at a standard 4.77MHz, but no space is provided for an 8087 maths co-processor. The back of the main unit has connections for the following devices: parallel printer, RGB colour display, keyboard, two joysticks, external speaker, cassette recorder and light-pen.

'The expansion unit contains the ability to install a 5¼in disk drive for data interchange with the rest of the IBM PC family, as well as another four expansion cards.'

The disk models have a disk card capable of driving three disks. Three dedicated expansion slots are available within the computer, of which two are used in expanding user memory: one takes a 64k card, and the other either a 128k, 256k or 384k card, giving a total of 512k maximum RAM including the standard 64k on the motherboard. The additional slot may be used for the installation of an RS232 serial card. If the cluster adaptor card is installed, the computer may only be upgraded to 128k of memory unless the expansion unit is installed, as the slot which takes the high capacity RAM card is the only one able to accept the cluster card.

The expansion unit can house a 5¼in disk drive for data interchange with the rest of the IBM PC family, as well as another four expansion cards. These are currently restricted to the cards alrady mentioned, but I would not be surprised to see a hard disk available for this unit within a short period of time. A 10Mbytes drive is already available in Japan, as are a number of 'third-party' cards for the expansion unit, which should be available early next year. The JX expansion unit will not accept standard PC expansion cards.

The colour display supplied with the system provides an 80 by 25 screen matrix, consistent with that of other PCs. The monitor has a dot pitch of 0.41mm, and is disappointingly fuzzy — those used to IBM's old colour graphics display should feel quite at home. Graphics may be displayed in four colours at 640×200 pixels, or in 16 colours at 320×200. The character set is a 7×7 font in an 8×8 box.

Also incorporated in the system is an eight-octave triple chord sound generator, connected to a speaker in the display unit. External speakers may be connected if desired.

Software

The JX uses version 2.1 of DOS, and functions exactly the same as on any other PC. When the machine is switched on, an IBM logo is displayed as system testing is performed, then DOS is loaded from disk, or Basic is brought up from ROM if no disk is detected. It's the same Basic found in the PCjr (Advanced Basic): in fact, when loaded, it displays 'The IBM PCjr BASIC'. The language is standard and does its job well, albeit a little more slowly than Basic loaded from disk.

Memory-based operations are exactly the same as for any other 8088-based



Optional device ports are included for a cassette, light-pen memory expansion and asynchronous communications

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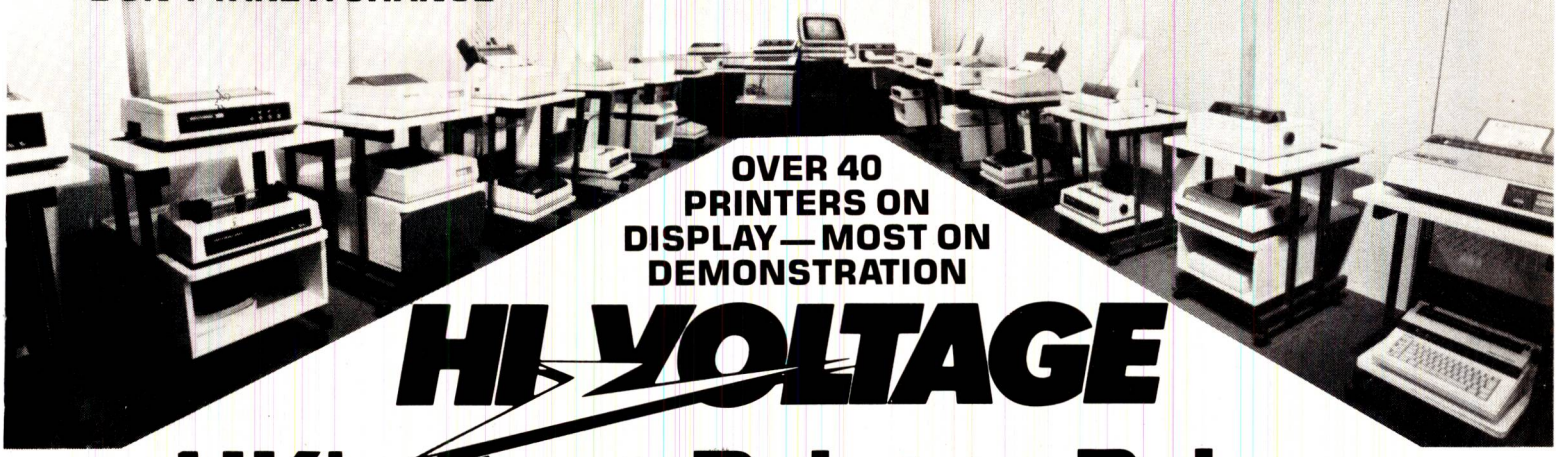

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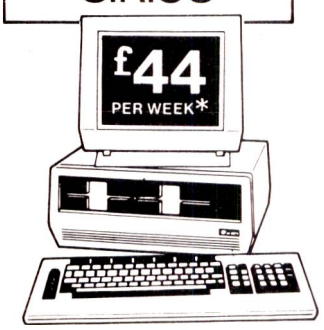

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IBM PC. The *PCW* Benchmarks ran much the same on the JX, PC, PC/XT, Portable PC and 3270-PC — not exactly the stuff riveting reviews are made of.

Disk operations were considerably slower than on other computers. The disk drives seem slow to activate, and shut down when waiting for display or printer resources in a much shorter time. This means that a directory listing, for example, will frequently pause to allow the disk drive to restart. A 5¼in disk drive, which was procured along with an expansion unit just as I concluded this test, was considerably faster, but was noisy and sounded cheap.

Software supplied with the computer for evaluation included Personal Editor, WordStar, Lotus 1-2-3, Open Access, PC Storyboard, and many other games and utilities. All ran without a problem. I also managed to convert a Turbo Pascal system to the JX and, although making use of BIOS programming, the system ran quite well. I would expect no problems with software that can live within a PC BIOS environment. A potential conflict, however, would be software using disk schemes for copy protection.

All software released for the PCjr will run on the JX, including all cartridge programs. As only the colour screen is available, programs will be expected to live in a colour-based environment.

An interesting feature provided as standard with disk-based versions of the JX is a RAM disk utility. The size of the 'electronic disk' can be user-selected from 10k up to a maximum 512k; it makes file reading and writing almost instantaneous from and to this 'drive', but care must be taken to save all wanted files to a floppy disk before powering down.

No software is bundled with the machine other than PC-DOS 2.1, two versions of Basic on disk and one in RAM, and usual DOS utilities, plus the RAM disk facility and a few Basic demonstrations.

IBM claims to already have over one hundred software titles available on its 3½in disk format, and a further 20 or so are on the way. There's no doubt that software publishers will be scrambling to convert their software to 3½in format for the JX, or to produce cartridge versions of their programs.

WordStar has already been announced for the JX; Lotus 1-2-3 as mentioned earlier, is on the way and dBaseIII is close behind.

There's no doubt that there will not be a shortage of software for this machine, despite the awkward disk format; such is the power of the name IBM. And when IBM releases the 720k drive machine worldwide (some say 'if', but I feel it inconceivable that IBM would restrict the 720k JX to Japan as it is doing now), the question of software availability will be a thing of the past.

Documentation

'Copious' is the word that springs to mind when asked to describe the accompanying literature. Manuals supplied were titled *Guide to Operations, Technical Reference Manual, JX PC-DOS 2.1 Technical Reference, JX PC-DOS Quick Guide, JX PC-DOS User's Guide, JX PC-DOS Reference* and *Basic*. With the exception of some mediocre proofing *('The next time you start from this DOS diskette the expanded JX memory will be available . . .')* the manuals were well-produced.

My only criticism is that there are too many manuals. It's difficult to know where to start with so many reference, user, technical (and multiples of these) manuals. This is not a serious problem, though; no doubt familiarity would help.

Prices

The JX has been released in three basic configurations. Each includes a colour monitor, a parallel printer port, cassette, audio, light-pen and joystick interfaces as common items.

The base model of the system provides 64k of RAM and no disk drives. This configuration will sell for $2115 in Australia (around £1000).

The intermediate configuration (JX2) increases memory capacity to 128k, and adds one disk drive. This model sells for $2861.

The high-end configuration sells for $3365 and provides two disk drives, with increased memory capacity to 256k.

Additional memory from the basic 64k is priced at: 64k $172, 128k $345, 256k $419 and 384k $558 (the latter two boards come with a battery-backed clock/timer). The expansion unit retails for $268; four expansion slots cost an additional $167; and the 5¼in drive sells for $596. The RS232 board, including a cable, retails for $166.

Conclusion

Aside from some initial disappointment with disk capacity and screen resolution, I found this an excellent computer.

In fact, the JX is so good I am considering buying one to network into my existing set-up as an additional development computer. It provides an affordable entry into the world of IBM computing, with the ability to grow with a user's own development.

Although prices may be a little high for some home purchasers, the days of a $99 toy being sold as a home computer should come to an end— to get quality, you must pay. And quality is what this computer is all about.

The home user will find it well supported, and with a wealth of available software. Business users will find it suited to small business management and accounting operation, with the ability to grow if required. Large corporations will use the JX with success as an executive familiarisation tool, or as a stand-alone departmental workhorse. In short, it is a widely useful computer. **END**

Technical specifications

Processor:	**Intel 8088 operating at 4.77MHz**
ROM:	**1 megabit**
RAM:	**64k – 512k**
Mass storage:	**Cassette, ROM cartridges 3½in disk, 5¼in disk**
Keyboards:	**Two types**
I/O:	**Serial-parallel, cassette, light-pen, video, audio**
DOS:	**PC-DOS version 2.10**
Bundled software:	**None**

In perspective

The launch of the JX outside Japan could mark IBM's re-entry into the market it abandoned when the PCjr met an unlamented end. Although the machine has so far emerged only in Australia, and IBM is typically tight-lipped about any future plans for spreading distribution further afield, the JX is significant. It is the first 'English-speaking' IBM PC to use 3½in floppy drives, ahead of the much-rumoured Clamshell lap-held and the much-delayed PC2, and seems to have avoided the PCjr's big problems: low memory capacity, rubber keyboard, lack of PC software compatibility and markedly unaggressive price until stock-clearing set in. Although tentative, the quiet launch of the JX outside its native land shows that IBM has not completely abandoned the home and education market. Perhaps Apple and Commodore do not have that market completely stitched up *just* yet.

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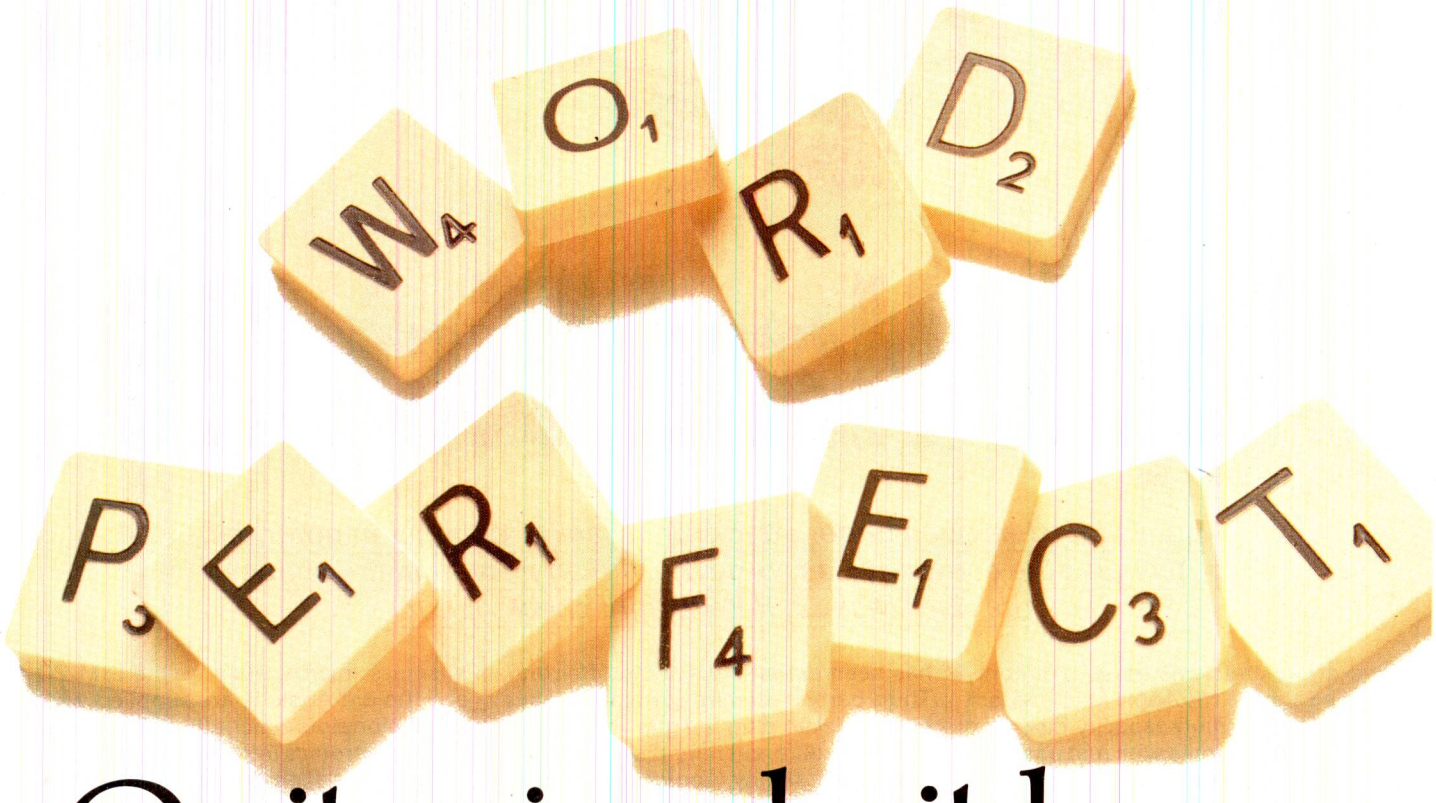

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Apple Hard Disk 20

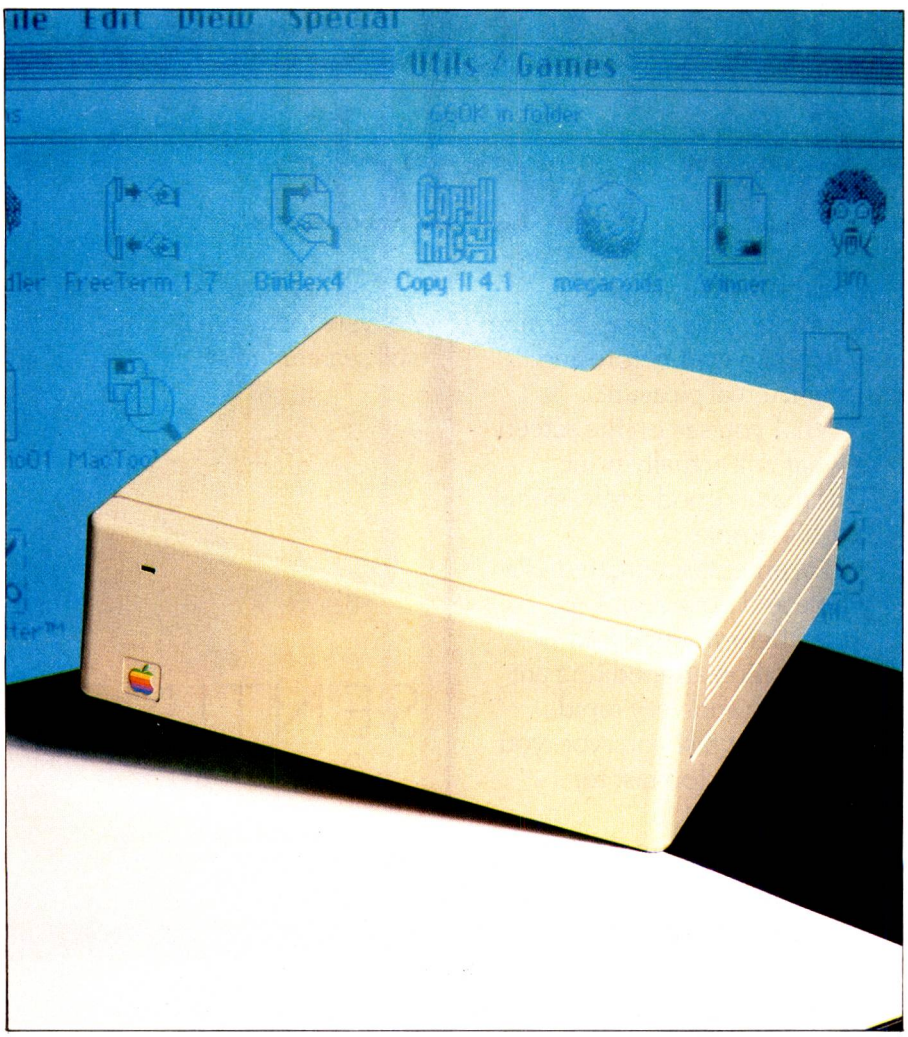
Apple's Mac has been under attack for its lack of expansion potential, but, finally, the company has come up with an answer in the shape of the Hard Disk 20. Peter Bright checks it out.

One of the criticisms most commonly levelled against the Apple Mac is its lack of high-speed, high-capacity disk storage. The Mac comes with just one 400k floppy disk drive, and to make the machine usable an optional external floppy drive is needed. Even with the twin drives, the Mac soon runs out of storage space if you are using complex applications such as Jazz and Helix.

The obvious answer to the lack of disk space is to add a hard disk, but Apple has been extremely slow to offer one. Third-party hardware companies have been quick to plug the gap with a wide variety of different hard disk configurations. Now, finally, Apple has launched its own 20Mbyte hard disk to be known as the Hard Disk 20.

Hardware

One of the main problems of adding hardware to the Mac is that it is a 'closed architecture' machine. Most popular business micros, such as the IBM PC and the old Apple II, are supplied with expansion slots which allow you to plug extra electronics into the main PCB.



The advantage of this approach is that it makes it very easy to add hard disks, graphics cards, modems and the like to the basic system. The disadvantage is that in order to fit the cards, the user needs to have some degree of skill or send the machine back to his dealer.

The philosophy of the Mac is that it should be used by naive users. It was reasoned that since users never take the back off their televisions, it shouldn't be necessary to open the Mac. Therefore, not only does the Mac not have any expansion slots, but removing the back cover actually invalidates the warranty.

The lack of expansion potential has meant that different hard disk manufacturers have adopted different ways of adding their products to the Mac. The vast majority of external hard disks either plug into the printer port or the modem port on the back of the machine; the main disadvantage of this approach being that the data transfer rate, although fast, is not up to usual hard disk speeds. Besides taking up one of the scarce ports, an external hard disk adds an extra box to the Mac which you have to put somewhere. Some live under the Mac, some by its side, and some at a distance from the machine.

Only the General Computer HyperDrive is actually designed to be contained within the Mac's casing. This is mounted on the main chassis inside the Mac, and is also unique in that instead of connecting to an external port, the HyperDrive has its own controller PCB which clips directly onto the back of the Mac's main Motorola 68000 processor. This gives it direct access to the processor and overcomes the data transfer speed problems of external hard disks.

There have been persistent rumours that Apple will market the HyperDrive as its own product, but for the moment

at least the company has decided to go with a more conservative external hard disk in the shape of the Hard Disk 20.

The Hard Disk 20 comes in a three-inch-high box which is designed to sit underneath the Mac. The US-built review unit was pre-production, as witnessed by the fact that the disk access LED on the front panel didn't work and the Apple badge had fallen off; the casing plastics didn't match those on the Mac, so I assume they were pre-production as well.

Although mounting the hard disk underneath the Mac may look neat, it also raises the Mac screen by three inches which I found hard to work with. Also, to my mind, the Mac looked slightly precarious perched on top of the hard disk. I was much happier with the unit living on the desk to the right of the Mac. I would have been even happier to have it on the left, but the connection lead isn't long enough.

The Hard Disk 20 connects to the Mac via the floppy disk port rather than the modem port. The advantage of this is that the data transfer rate is higher than the modem port, and you don't run into trouble with programs such as MacTerminal which look for the modem port when they start up.

An additional advantage of the Hard Disk 20 is that a floppy disk port extension is provided, so that you can daisy-chain an external floppy disk drive or another Hard Disk 20 onto the back of the unit.

As well as containing a 20Mbyte 3.5in hard disk, the Hard Disk 20 box also contains a power supply unit, a fan, and controller circuitry. The combined noise of the fan and the hard disk can be intrusive in quiet offices, but are no worse than other systems I've used. The main hassle is having to plug in and switch on the Hard Disk 20 separately from the Mac.

System software

As if having to cope with the problems of physically attaching a hard disk to the Mac weren't enough, hard disk suppliers also have to face the problems posed by the design of the Macintosh system software.

The system software functions on the Mac are provided by two programs: the 'System' and the 'Finder'. The System contains operating system resources which are used by applications programs, and the Finder looks after disk files and windows, icons, menus and 'dialogs' which make up the Mac screen. Neither of these were designed to handle the problems that hard disks can present.

Most of the problems revolve around the fact that you can store a lot of files on a hard disk. The original Mac Finder was designed for floppy disks, which meant that there was an inbuilt low physical limit to the number of files that could be stored on a disk. Early versions of the Finder (1.1 and 1.1g) couldn't handle more than 128 files on one disk, and got very slow when the limit was approached. The latest version (4.1) of the Finder isn't limited to 128 files per disk and is faster at handling large numbers of files, but it still isn't ideal for hard disk use.

The main problem is that every time you want to load a file into an applications program using the 'Open...' command and every time you 'Quit' from a program, the Finder looks for details about every single file on the disk before proceeding. This is OK when you are using a floppy disk with only a few files on it, but with a hard disk you can have thousands of files so you might end up waiting a very long time for the Finder to do its thing.

'. . . it is nice to see Apple doing the job properly rather than opting for the easy way out . . .'

Without exception, third-party hard disk suppliers have attempted to get around this problem by using disk 'volumes'. Instead of presenting the hard disk to the operating system as one large disk, it is presented as a number of smaller logical disks. In effect, the Finder is tricked into thinking that it is looking at a number of different small disks instead of one large one. Because each of these different volumes is treated separately by the Finder, it will only look for files on the selected volume rather than over the whole disk. This means that the Finder has to look at fewer files and therefore works faster.

The main problem is that only a few volumes can be active at any one time so you have to 'mount' and 'dismount' volumes according to what you want to do. This means you have to exercise some care in grouping files together to ensure that when you mount a volume, all the required files are present. This tends to go against the general idea that the Mac should be easy to use.

Another problem with some third party hard disk systems is that you have to arbitrarily set the size of a volume in advance and you can't easily change its size. If, for example, you had two 800k volumes, one of which was nearly empty and one of which was full, it wouldn't be possible to give some of the spare space to the full volume. This criticism doesn't apply to all third-party hard disk systems; the HyperDrive, for example, has a dynamic disk space allocation system which means that volumes can grow as they fill up.

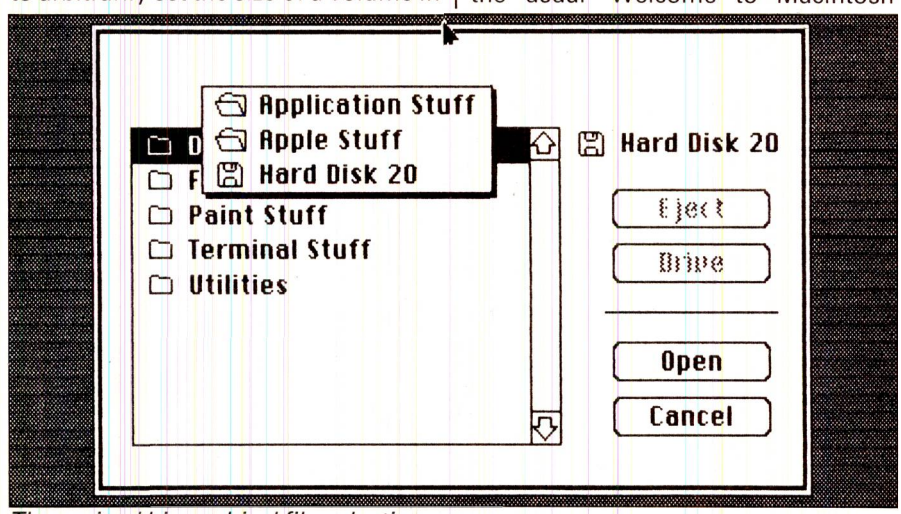
Even the best hard disk partitioning system still isn't the best way to handle hard disks on the Mac. What is really needed is a hierarchical filing system.

Most popular business micro operating systems such as PC-DOS, MS-DOS and Unix use hierarchical systems. These allow you to have different disk directories which represent different groups of files but which link together to cover the whole disk. The directories are usually linked together in an inverted tree structure. In this way, the master 'Root' directory is at the top with sub-directories, which in turn have sub-directories of their own. You can easily move from one directory to another and examine different groups of files, breaking all the files on the disk into manageable chunks while retaining the ability to move from group to group at will.

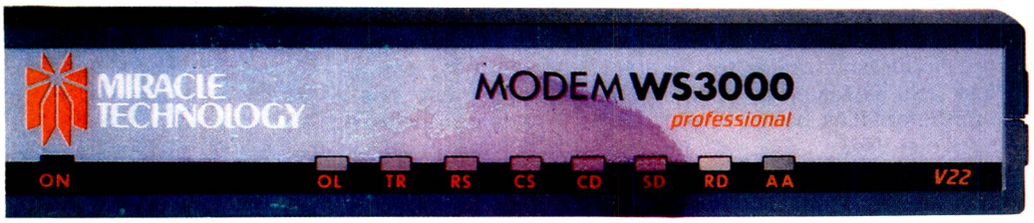
The Mac Finder looks as if it has a hierarchical filing system. When you open a disk window you can create 'Folders' and move groups of files into these folders and sub-folders. However, this system of folders has only been an illusion to avoid the screen getting cluttered with file icons. In reality, all the file information is stored in one directory. Until now . . .

Instead of following third-party manufacturers with a hard disk partitioning system, Apple has re-designed the System and Finder so that the Mac now has a hierarchical filing system.

The Hard Disk 20 is supplied with new versions of the System, Finder and a special Hard Disk 20 driver. When you initially switch on the Mac, you have to insert a start-up disk in the internal disk drive. This boots the hard disk and then ejects. When the system is booting up, the usual 'Welcome to Macintosh'



The revised hierarchical file selection menu



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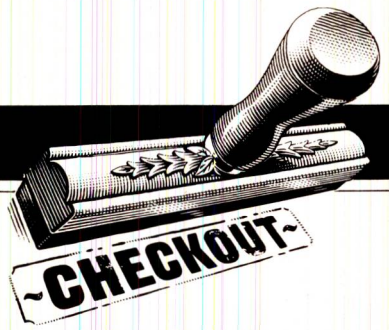


screen also displays a hard disk boot-up message. The review hard disk was supplied with very early pre-production software which displayed its version number as '0.26'. As most release versions start at '1.0', it's obvious that the software has some considerable way to go.

The review hard disk was also supplied with an pre-production updated version of the new hierarchical Finder (version 4.49). This looks just like Finder 4.1 except that it now supports miniature file icons so that you can display more files on one screen.

Using the new system, the Finder will only look at files in the currently open folder. This means that you could have 2500 files on the disk and three in the open folder, and the Finder would only look at the three in the open folder.

If you are in the Finder desk-top you move around the folders in just the same way as you do on the old Finder—just keep double-clicking folder icons until you get to the required place. The only difference is that opening folders under the old Finder was instantaneous because it already knew all about the files contained in the folders. Under the new Finder, there can be a delay while it goes off and looks for the relevant information about the folder to be opened.

Opening a file or changing a folder from within an application program is a good example of the benefits of the Apple's design philosophy, using 'Resource Files' as the building blocks for applications programs. For example, when you select 'Open...' from MacWrite to load a file, instead of displaying its own 'Open File' window and then going off and fetching the file itself, MacWrite simply calls a standard system utility which displays the standard file selection window, and wanders off to get the file on MacWrite's behalf.

When Apple wanted to allow applications programs to handle the new hierarchical file structure, all it had to do was rewrite the file selection resource, in the System, to take care of the new structure. The applications programs didn't have to be touched and were none the wiser. That's the theory anyway . . .

Now, when you select Open... or Save from an application program you are greeted by a re-designed file selection window. As well as specifying the file name, a new section has been added which displays the names of the available sub-directories and files. You can move down through the sub-directories by double-clicking the folder name. You can move back up by selecting the root directory name or by clicking the name of the parent directory.

One nice feature of the filing system is that files remember where their parents are and can call them, even if they are in a different directory. For example, if you have a MacWrite document in one directory and MacWrite itself in another, MacWrite will still load if you double-click the document icon.

Interestingly, the hierarchical system is only available on the hard disk; all floppy disks are automatically treated as one directory, even if you have folders on the floppy.

Apple says that the new Finder has been designed so that response time is maximised, even when there are several files in one folder. Obviously it pays to have comparatively few files in any one folder, but just to be difficult I wrote a little Basic program which created 500 files and put them all in one folder.

'. . . hard disk suppliers also have to face the problems posed by the design of the Mac system software.'

When I left Microsoft Basic, it took the poor old Finder no less than five minutes and 46 seconds to work out what was going on and re-build the desk-top. However, once it had done that and got its act together, it took 19 seconds to open the folder from the desk-top, and subsequent quits to the desk-top from Basic took a very respectable 35 seconds.

The Finder is obviously a lot cleverer than it used to be. For a more usual folder containing just five files, it took just over one second to open the folder from the desk-top and 17 seconds to re-build the desk-top when quitting Microsoft Basic.

In terms of general access speed, the Hard Disk 20 is roughly two and a half times faster than a floppy disk. It took 32.2 seconds to load MacWrite 4.5 from floppy disk and just 12.6 seconds to load it from the Hard Disk 20.

My only major worry with the new hierarchical filing system was that quite a few programs that I tried to run crashed under the new system. Popular programs such as Jazz, MacWrite, MacPaint, MacDraw and Factfinder all ran fine, but quite a few of my public domain utilities crashed. PageMaker would run, but wouldn't read documents created under the old system. Obviously some allowances need to be made for the review system as it had early pre-production system software.

Conclusion

In hardware terms, the Apple Hard Disk 20 isn't anything special; there are plenty of other external hard disks around which do the same job. It's the system software which makes this product different.

Hard disk based Macs really do need a hierarchical filing system, and it is nice to see Apple doing the job properly rather than opting for the easy way out and using disk volumes. My only worry is that a significant percentage of my Mac software won't run under the new filing system.

At the time of writing, Apple UK wasn't sure if this was due to bugs in the pre-release system software or because of a basic design problem. I can only hope that it was the former. **END**



'I'm sorry, Mr Finsbury, but according to our computer you're dead.'

The right to know

Although the Data Protection Act became law in 1984, which means you are now entitled to examine information held on computer about you, its enforcement is posing vast problems. Alexander Sandison examines the implications.

There can be few serious computer owners who do not use their machines to record some information, say, about living individuals — whether as names and addresses, the scores of cricket teams, or to identify the texts of letters or reports. If you keep any such records, then you come within the terms of the Data Protection Act and you need to give some thought to the obligations it imposes.

Purpose of the Act

The Act became law in 1984, with the intention of protecting private individuals from the misuse of sensitive information held in the data banks used by the police, security services, credit checking agencies and others. The intention was excellent, as are the rights the Act gives you to ask whether such organisations hold a file about you: if so, what it says, and whether or not it is accurate.

Since September 1984, an individual has the right to seek compensation through the Courts for damage or distress caused by loss or unauthorised disclosure of such information, but only if the information is stored in a computer. The Act does not apply to paper files.

To provide a means for discovering where information about you might be held, the Act set up a new quango in the form of a Data Protection Register maintained by Registrar Eric Howe. The Register is intended to contain details of where all 'personal data' is held in computers.

Individuals will be able to consult it (for a fee if the consultation is by post) to find the names and addresses of people or organisations holding personal data. They can then write to any of these who they think might have a file about them. But then they must send another fee, and evidence that they are the person to whom a file relates. The file owner then has 40 days in which to send you a copy of information held about you.

Put like that, the Register is a good idea. The only trouble is that it's going to be vast: 300,000 entries have been suggested. No individual enquirer is likely to find fewer than a hundred or so potentially relevant entries. Following them all up will be just too expensive in fees, time and effort to be of any real value. In any case the Register will be cluttered up with details of all the computer files we know about already, such as employers, banks, building societies, tax offices, and the DVLC.

However, the Act and its Registrar exist and registration started on 11 November 1985. After 11 May 1986 it will be a criminal offence, with fines of up to £1000, not to have registered if you ought to do so, or to use your data in ways not covered by the Register entry.

Data protection principles

Quite apart from the Register, the Act lays down some 'Data Protection Principles' for handling personal data. Everyone who holds confidential information about individuals, whether in computers or in any other form, is only being sensible to bear them in mind. Many will find that they suggest deficiencies in existing systems.

The principles can be summarised as:

(1) The information shall be obtained and processed fairly and lawfully.
(2) The data shall be held only for specified and lawful purposes — in other words, you should know why you want it.
(3) The data shall not be used or disclosed for any other purpose.
(4) The data shall be adequate, relevant, and not excessive for those purposes.
(5) The data shall be accurate and where necessary kept up to date.
(6) The data shall not be kept for longer than necessary.
(7) Individuals shall be entitled to be told whether any data refers to them, what it says and, where appropriate, such data shall be corrected or erased.
(8) Appropriate security measures shall be taken against unauthorised or accidental loss, alteration or disclosure of the data.

The Act restricts these sensible principles to 'personal data' about living individuals, although they are equally applicable to confidential data of any kind. But the Act applies them to all personal data, whether confidential, sensitive, or public knowledge. Furthermore, the Act ties all the 'purposes' to those mentioned in the entry in the Register. The Registrar has very limited powers to refuse registration because he does not like what you say you want to do. But he *can* refuse if he thinks you are, or are likely to be, in breach of the Data Protection Principles. In effect, therefore, the crimes of failing to comply with those principles boil down to failure to foresee everything you will want to do with your data.

Who has to register?

The Act requires everyone who 'holds' personal data in a computer to register, unless they are covered by certain exemptions set out in the Act. Such people are called 'Data Users'. The word *hold* is given a very special meaning by a series of complex and obscure definitions. Broadly speaking, you hold data and are a data user if:

(a) You are an individual or an organisation who takes the decisions on what data is held and what it is used for. But if you use spare capacity on your employer's equipment for personal purposes, you can be a 'data user' quite independently of the employer.
(b) Your records contain information about living individuals who can be identified.
(c) Your data forms part of a collection which has been, or is intended to be, *processed* by you or on your behalf on equipment operating automatically.
(d) Processing means altering, rearranging or extracting information from the data *by reference to* individuals. This means that you have the ability to process if your equipment can search a full text by personal identifiers to find data about an individual, or can select data from fields for personal identifiers. If you have either of these facilities, you will almost certainly want to use them one day and should

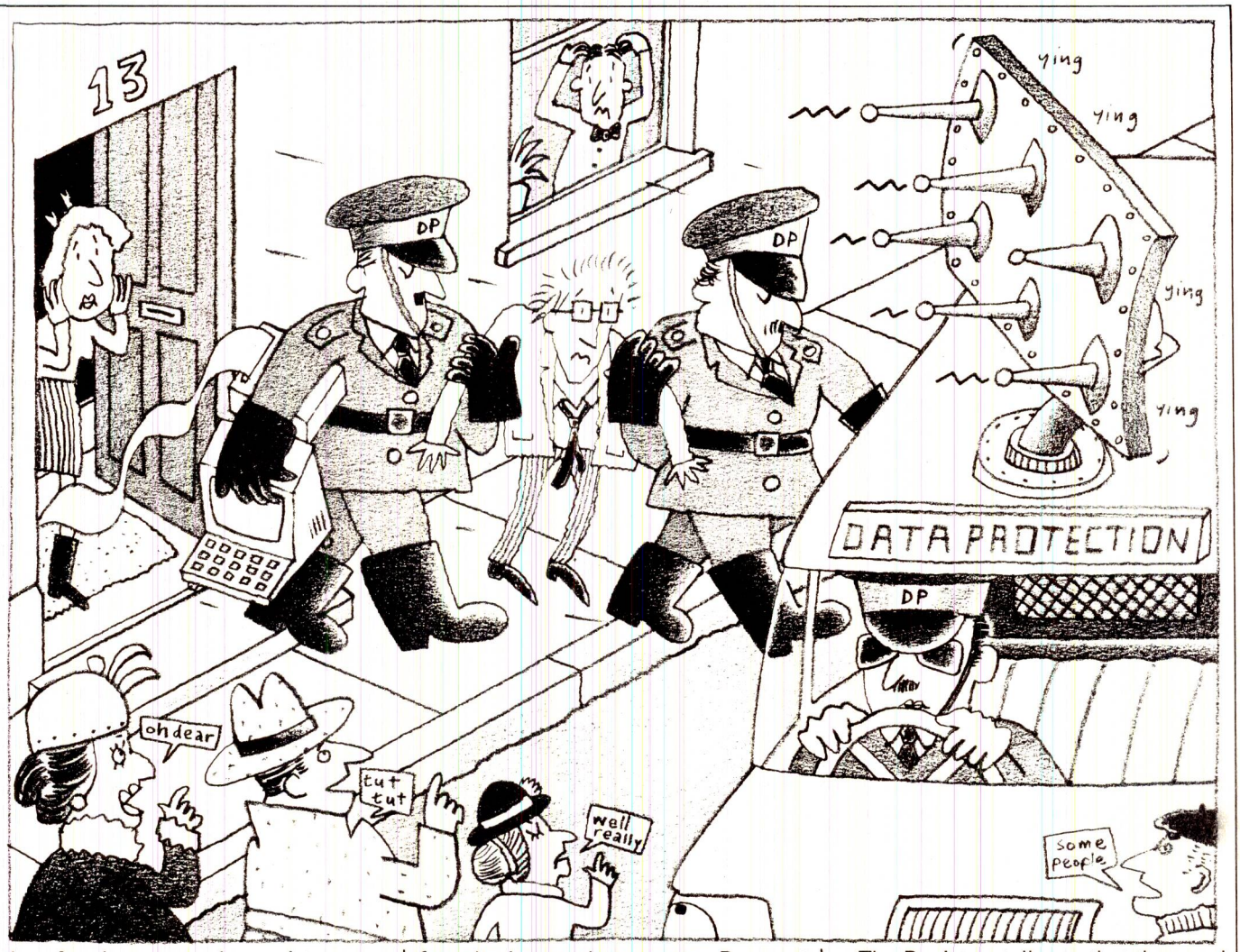


Illustration by Chris Winn

therefore be prepared to register.

Exemptions

The Act provides that certain categories of data user do not have to register. For readers of *PCW* the most important is the one relating to home computers. 'Personal data held by an individual and concerned only with the management of his personal, family or household affairs or held by him only for recreational purposes' are exempt. But there is a vague borderline between 'personal affairs' and 'business affairs' which would have to be registered. If your private activities start earning money, then they are liable to become registerable, but your private tax returns and personal finances as an employee are not.

The other exemptions are less useful. They are all qualified by an 'only if' provision which greatly reduces their intended value. There is an exemption for data held by an unincorporated club, but only if it relates to the members of the club who have been informed and not objected to the inclusion of data about them. The exemption is lost if you include ex-members or other correspondents in the mailing list.

Others are for data held 'only for' calculating pay or pensions, for keeping accounts of business activities or for distributing articles or information. If you use absence data in calculating pay you can be exempt, but not if you use it for altering a duty roster. Payment arrears data can be used for the accounts, but not as guidance for salesmen. Everyone on the distribution mailing list must have been asked, and not objected. In general, do not rely on these exemptions unless you are quite sure the 'only for' really applies to you.

There is another major exemption, intended to exclude word processing from the definition of processing which makes you a data user. The exact interpretation of the words 'only for the purpose of preparing the text of documents' is obscure. The Registrar is trying to say, for example, that extracting data from a list of names and addresses when writing a letter is exempt, but that keeping that list up to date is not. This sounds as if he is saying that preparing and storing text on disk for immediate use is not registerable, but storing it for subsequent use is. The points are subtle and difficult, but the Registrar will no doubt issue clarifying guidance in due course.

Lending your equipment

There is one blanket provision in the Act from which there are no exemptions and which has ominous implications for all computer owners. If you process personal data for someone else, or if you allow someone else to use equipment *in your possession* to do so, then you must register as a 'Computer Bureau'.

The Registrar tells me that the word 'possession' always gives rise to difficulty but that it implies actual control. You will have to register unless your equipment is removed from any possibility of your controlling it, as, for example, into another house. So beware. Make sure that anyone who borrows or uses your or your family's equipment uses it only for recreational or personal affairs or for entirely non-personal data.

Conclusion

I have tried to present the extremely complex provisions of the Act in simple terms, but simplification inevitably distorts.

If you are quite sure that you do not have to register, then you are probably safe not doing so. But if not, or if you are in any doubt at all, then write to the Registrar for a copy of his guidelines, telling him the kind of use you want to make of your data, and asking for any special guidance he may have which relates to it. The Registrar has developed standard forms of register entry for many of the major uses of personal data, and one of these may be appropriate for you. If you are still in doubt then consult a solicitor.

For further information write to: The Registrar, Eric Howe, Office of the Data Protection Registrar, Springfield House, Water Lane, Wilmslow, Cheshire SK9 5AX. END

Final version

Colin Cohen provides a cost-effective guide on turning the output from your word processor/database into polished typeset copy

If, as a user of a micro with a word processing or database program, you ever need to have the results printed — say, as a newsletter, price list, or specialised directory — you might wish it could be typeset in a 'real' typeface without having to have all the data re-keyed by an expensive typesetter. However, not all micros use the same format of floppy disk: indeed, if you know anything about disk formats this will appear a gross understatement.

Problems

Ever since IBM laid down a standard for the 8in diskette, other manufacturers have realised just what a good idea the floppy disk was. On the other hand, for a variety of commercial reasons, almost every micro manufacturer has seen fit to place the data on the disk in different ways. These variations in disk format have two different sources: the disk drive itself and the Disk Operating System (DOS) of the micro.

First of all, the drive: clearly an 8in diskette will not fit a 5.25in drive any more than one of the newer 3in-plus micro-diskettes, which also come in several shapes and sizes. And, while a double-sided floppy will fit quite neatly into a single-sided drive of the same size, you will not be able to read the second side. Then if, for example, there are only 40 'steps' available on the drive, it will not read an 80-track disk — although this problem is not totally insoluble.

From the DOS point of view there is a degree of flexibility in the number of tracks on a disk, but the real problem is the number of wedge-shaped sectors in each track and how the information is laid down within them. With the majority of disks being 'soft-sectored' — that is, controlled by the software — there is almost no limit to the number of sectors that can be laid down on a disk. Even hard-sectored disks, on which the sectors are marked out by a series of holes near the spindle, are by no means uniform. The 3in disk can be laid out to emulate the 5.25in disk, although the latter is usually completely different from the original 8in model; and then you can unplug a 5.25in drive and substitute a 3in+.

Finally, as far as the DOS is concerned, some micros, like the Victor 9000/Sirius and Apple's Macintosh, pack more information into their disks by the nightmare solution of varying the speed of the drive, dependent on the position of the track being read. The only good news in this department is that the popularity of operating systems such as CP/M and PC-DOS/MS-DOS families has introduced a degree of standardisation, so that once a specialised disk reader has cracked one format in a family the others are less difficult.

But the bad news is not over. To be able to read a disk is not only to make sense of it, but then to be able to set type from it — economically. So, before you give up the whole idea of typesetting from disk, let me say that a sound understanding of the problems involved is the best basis for making the operation a success.

For example, I have a database program that writes the data back-to-front on the disk! If I try to read the database data disk back within my word processor program, what I get is the data back-to-front on the screen, with the blank spaces in each field padded out with what look like random control codes. You don't have to be a genius to see that unless the database were huge it would not be economic, as opposed to possible, to write a conversion program to strip out the garbage. Indeed, as the whole rationale of this exercise is to save money, the cost of any extra work involved in conversion, such as laborious writing of programs and conversion tables, has to be set against the cost of re-keying at perhaps 20,000 keystrokes per hour for ordinary copy.

Other problems can come from academic word processors, which have a character set which cannot be accommodated within the normal seven-bit ASCII standard. These extra characters may well clash with the receiving system's software and cause some form of crash.

Another aspect to be considered is how to handle the codes generated by your word processor or database. The most obvious of these codes are the printer control characters to change fonts, start underlining, and control other functions.

Leaving out the specialised laser printers, the dot-matrix or daisywheel printers found in homes and offices are unlikely to have more than a handful of fonts available — each of which will only be in one size. The typesetter, on the other hand, may have as many as 1200 fonts available online, each available in a large number of point sizes. Even 'starter' systems can offer over 1000 online combinations of font and size. If you then consider that each one of the 128 or so characters in a font is of a different width, you will begin to appreciate the complexity of the problems facing typesetters.

Agreement

Typesetters and their clients naturally approach the conversion of computer files on a variety of different levels. Their approach will depend on the sophistication of their decoding equipment, their relationship with the local craft trade unions and the original typist's grasp of the problem. But on the whole the typesetters' union is not keen on this sort of thing. Some typesetters have an agreement with the National Graphical Association, but others seem to make do without.

At the lowest level, you have to find a typesetter who is both prepared and physically able to accept your data.

There are four ways in which your word processing or database can be transferred for setting. Firstly, you can send the typesetter a disk which he can read in a suitable multi-format reader. These readers are specialised devices with slots for 8in, 5.25in and 3in disks, and sometimes tape, and they cost in the region of £10,000. They are widely used both in typesetting and in the software business when programs need to be prepared for different systems — one system is said to be able to read over 60,000 disk formats! The reader will either read your disk and write a new disk in the typesetting computer's format, or read it and transfer it to the typesetter by way of a serial RS232C interface.

Alternatively, if the typesetter has the same computer as you, or a good lookalike, you can send him a disk for him to read in the usual way and transfer to his typesetter via the ubiquitous RS232C. Provided that your word processor or database saves a standard ASCII file, the typesetter should be able to extract the data without a copy of your program disk (an important consideration if the program disk is copy-protected). Otherwise you will need to use a spool facility to create

a duplicate copy of your data in ASCII.

The third method is for the typesetter to visit you with what is cumbersomely called a text retrieval terminal (TRT), colloquially a FART (Fast Accurate Retrieval Terminal) or milking machine. This is simply plugged into your micro and data is 'milked' out of it. Usually a degree of error-checking is included, and some of them can be connected to a Centronics parallel interface, rather than an RS232. This is useful if you are not sure about the use of your serial interface, since you can treat the TRT as if it were your printer. The computer should not notice the difference. Some TRTs also do a bit of code conversion during the transfer, which saves time and labour, and depending on the make the data will be written onto a C60 cassette, a mini-cassette, a tape cartridge, or a 3in or 5.25in disk. If disks are used they can be written in the typesetter's format, otherwise the data will have to be read off via the TRT's serial interface.

Finally, as far as hardware is concerned, you can use a modem. Of course, the typesetter also needs to have a similar sort of modem, and if it is not auto-answer nor permanently configured you will need an agreed logging-on procedure. (The price of modems has probably fallen faster than any other item of computer equipment, and it is quite possible to find a serviceable modem for about £100.)

It's worth pointing out that while you really do need a full duplex modem, so that the receiving system can send a stop code when it opens a new file, it does not have to be fast. For instance, you should be able to reverse the normal operating speeds of a Prestel modem so that you can send your copy at 1200 baud, and just get back the odd control code at 75 baud — much more satisfactory than the normal 300/300 baud of the bulletin board.

Options

Of course there are variants. One nice trick, if you or your typesetter subscribes to an electronic mail service, is to dump your text into a mail box for later retrieval and typesetting — you can usually leave it to the mail service to strip out control codes that the typesetter won't recognise and sort out the differences in modem speeds.

If you don't already have a micro, or need another one, you can now buy several packages which make a micro emulate a typesetting system by generating all the codes that the printing unit will need. They are all now available on MS-DOS micros, but Typecraft started life on the PET, PagePlanner on the Cifer and Typecount on the Sirius.

Normally they are sold with hardware and software bundles. If you want a lot of copies of the software to run on your own kit, some of the companies might oblige, but this often poses problems with warranties.

One other package, the APL, includes a very substantial modification of the Apple IIe built into a new box, as well as the bundled software. This gets over the problem that the menus on the other products can't totally overcome — the fact that a standard micro does not have all the special control keys that are found on a full-blown typesetting system. Having said this, they have all been very successful in the printing industry, and will help you cut costs by delivering files which are completely ready to drive a typesetter.

If you just want to send word processor files to the typesetter you have a choice of coding. You can start with no codes, not even tabs and underscores. Here, at least, the typesetter knows that apart from your text errors, the data is clean. If you have not marked them on the hard copy (you should always send a printout, even when using a modem) he will go through it marking which words are to go in italic — the printer's equivalent of underscore — and what other fonts and sizes to use. Once the typesetter has the data in his own format he will scroll through it and insert any control codes he needs to achieve these effects. Any mistakes will then be the typesetter's responsibility, but this obviously costs more.

An extension of this is for the typesetter to translate codes like your underscore and then add the rest himself, or use the so-called generic codes. These are entered by the text creator and are quite simple, such as [i] for italic and [b] for bold — similar commands can be used to build up complex pages. They can be used all by themselves, or in combination with your own control codes as long as the typesetter knows *exactly* what you have done. I use '[' and ']' as they are on the non-shift part of the keyboard, and thus easy to get at. This is a convention adopted by the coding structure known as ASPIC, but many typesetters have their own versions. Only two things are important here: the codes must be easy to remember and key, and must comprise character strings that never get used in any other way in your data, or there will be trouble. A very simple version, for very simple text, is invisible coding. This just uses a specified number of <RETURNS> for each change, but clearly the number of codes one can create in this way is limited, and it can play havoc with your own screen display.

The final choice is full coding, which involves entering letter by letter the complex codes the typesetter wants. *Not recommended.*

Warning

Remember that if you give the typesetter magnetic data, he is not responsible for proof-reading. The errors you make always look much worse typeset than in typescript, especially if you have put in an 'on' code without the following 'off' code. If you turn on a large type heading and forget to turn it off, the whole of the next section, up to the next heading, will be in the display size. This will be: unsightly, unreadable, and uneconomic — as you will have to pay the typesetter to correct and re-run it.

Finally, don't run before you can walk. If you have a typesetting requirement from disk, first of all discuss it with a typesetter and start with something simple like straightforward text rather than complex tables on forms.

For information on companies offering interfacing equipment or services, consult The Interfacing Directory *published by the Printing Industries Research Association at £30.* END



'Pardon!'



BENCHTEST

Sharp PC-7000

Sharp's reputation for building well-produced but rather quirky machines seemed to be recurring, but the PC-7000, an IBM PC compatible luggable, is definitely a step in the direction of compact engineering and speed. Peter Bright conveys his impressions.



When the Sharp PC-7000 arrived in the *PCW* office, it was greeted by almost total apathy from the staff. Badly-hidden yawns were the order of the day.

It's true things didn't look good. Sharp has always had a reputation for building technically sound but rather strange micros. The company has been quite content to go along in its own sweet way, happily ignoring 'industry standards'.

The fact that the PC-7000 is an IBM PC compatible and is said to represent a new awakening at Sharp, didn't help my colleagues' attitudes towards the little machine. We've got IBM compatibles coming out of our ears.

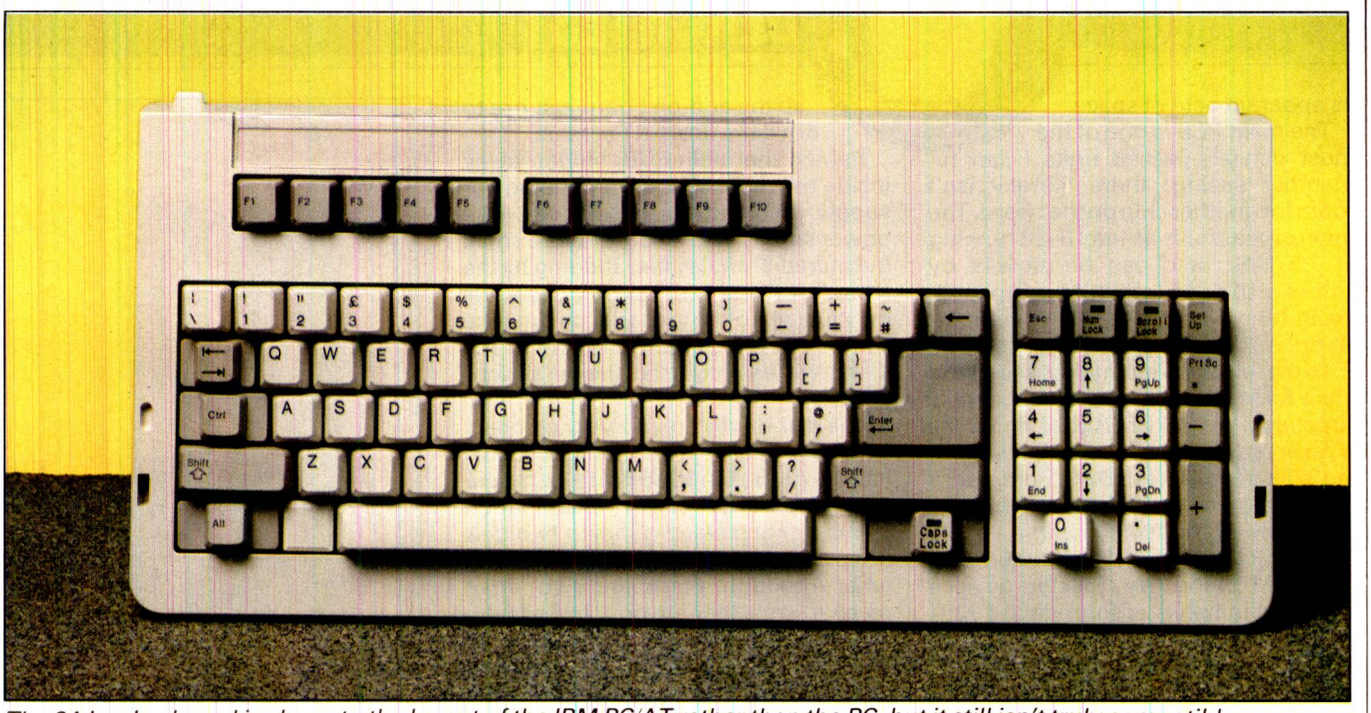
However, when I unwrapped the machine and switched it on, people became interested; it looks neat, it has the world's first backlit LCD, and it's fast.

Hardware

The PC-7000 is certainly one of the neatest IBM PC lookalike luggables I've come across so far. The system consists of three main parts: system unit, keyboard and printer (the CE-700P printer is optional). All three units are finished in cream and light grey plastic casings.

When the system is rigged for carrying, both the printer and the keyboard clip onto the main unit. This combination can then be placed in the custom-designed carrying case, or carried by the handle built into the top of the main unit.

Together, the main unit and the keyboard measure 16ins wide by 6.3ins deep by 8.5ins high, and weigh just over 18lbs. Considering what is packed inside, this is reasonable and makes the PC-7000 very easy to carry around. Adding the printer increases the depth of the system by just under 3.5ins. More significantly, it adds an extra 11.5lbs to



The 84-key keyboard is closer to the layout of the IBM PC/AT rather than the PC, but it still isn't truly compatible

the weight, making the unit considerably more difficult to carry. One nice touch is that the hinge of the built-in carrying handle can be moved to compensate for the change in the centre of gravity when the printer is clipped on.

Like most machines of this type, the keyboard clips onto the front of the main casing to protect the screen. In this case, the keyboard is held in place by a couple of lugs and two catches. When the catches are released, you can remove the keyboard and access the main workings of the unit.

Most of the system unit's front panel is occupied by the LCD. To its right is a system status display with LEDs, showing whether the power is on and which disk drive is in use, as well as a backlight message which comes on when the display times out. Under this is a thumbwheel to alter screen contrast, and a concealed lever to alter the screen tilt. Running along the base of the front panel is a recess which is designed to hold the keyboard cable when the system is in transit. This has a spring-loaded lid which swings into place whenever you remove the cable.

The front panel looks very good indeed. Everyone who saw the machine commented on how neat it is and the layout of the status lights, especially, reminded me more of a modern photocopier than a computer. The overall effect is definitely of a piece of office equipment rather than a micro.

Working around the rest of the machine, the right-hand side panel houses twin 5.25in disk drives and a Telecom-style socket for the keyboard. The left-hand side panel holds the on/off switch.

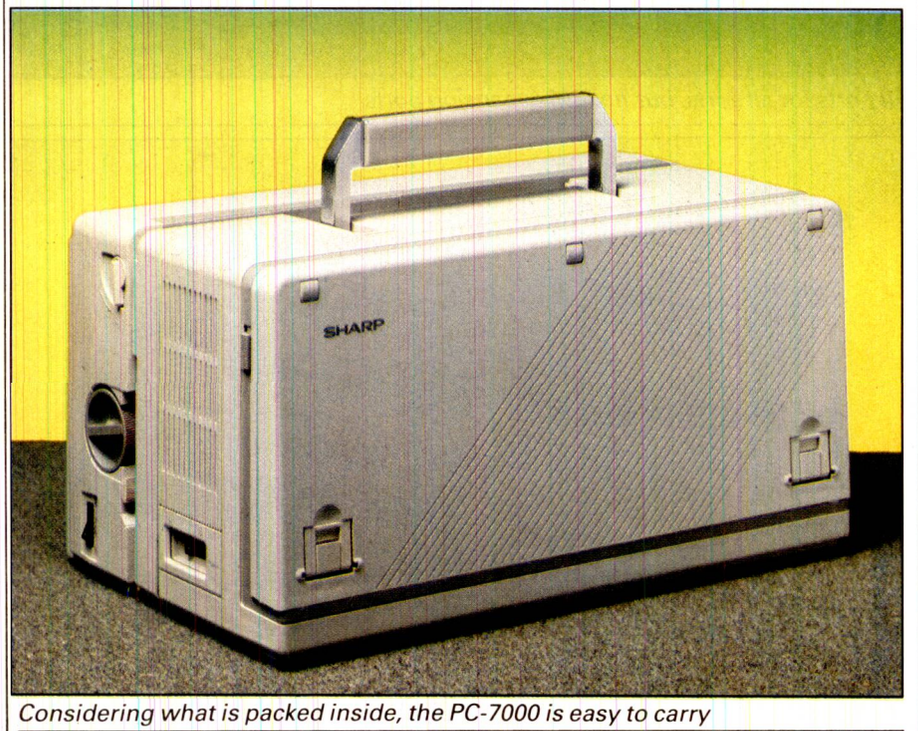
The rear panel is generally neat and uncluttered. As well as a power socket, it accommodates an RS232 serial port and an IBM-style Centronics parallel printer port. The review machine also had the optional colour monitor adaptor fitted, so the rear panel has an IBM RGB monitor socket. The remaining space on the back panel is for the telephone connections for a built-in modem, but as this unit isn't approved in the UK at the moment, it wasn't fitted.

One thing which is missing from the rear panel is any sign of IBM expansion ports. If you want to fit an IBM card, you will have to use the optional expansion box which sits under the main unit. This also holds a custom-designed 3.5in hard disk to make the PC-7000 into a PC/XT lookalike.

Unlike some luggables and most portables, getting inside the PC-7000 is straightforward. Indeed, users are encouraged to fit their own expansion units aided by comprehensive instructions in the manual.

The first step is to remove three Phillips screws on the top of the back panel: the panel then lifts up to reveal the main PCB and any extras that may have been fitted. Removing an additional three screws allows you to slide the main chassis out of the casing and get at the power supply and disk drives.

The first thing that struck me when I removed the rear cover was how superbly engineered both electronically and mechanically the PC-7000 is. The main PCB measures a miniscule seven inches by eight inches, but manages to achieve more than the IBM PC with



Considering what is packed inside, the PC-7000 is easy to carry

its apparent acre of space.

The main PCB is one of the most densely-packed units I can remember seeing; there literally isn't room for another chip on the board. The main processor is an Intel 8086 running at 7.37MHz, and can be slowed by software to 4.7MHz for IBM compatibility. Butting onto the 8086 is a socket for an optional 8087 maths co-processor.

To the left of the main processor is the main RAM. The entry-level machine is supplied with 384k of RAM, of which 64k is reserved for system use; the remaining 320k is available to DOS. Sockets are provided on the main board to take the total RAM up to 704k, giving a usable 640k which is the DOS maximum. All the RAM chips are 256kbit devices arranged in banks of four, giving 128k per set. To the right of the RAM is 16k of ROM which provides the IBM-compatible BIOS, as well as self-check and the set-up routines.

In its compact dimension, the main PCB also houses the disk controller and RS232 and Centronics drivers. Much of the space-saving is accounted for by two massive surface-soldered square-gate array chips in the top left-hand corner of the PCB.

The review machine was supplied with the optional IBM RGB colour graphics adaptor. The main LCD screen is already colour graphics compatible, so the add-on board just has to drive the IBM CRT screen.

Behind the main PCB, hidden away inside the main chassis, are the power supply unit and the disk drives. The power supply also incorporates a small but incredibly noisy fan. Judging by the sound of the fan, the power supply is only just up to the job, as each time the screen backlight was turned on or the disk drive was accessed, the fan slowed audibly.

The disk drives are of a very compact size. Externally they resemble two half-height 5.25in 360k IBM PC compatible drives, but closer examination showed that instead of being two disk drives bolted together, they are all one unit. Although there are two drive mechanisms, they are both bolted onto the one chassis and are both controlled by one controller board. This is the first time I've seen this, but it certainly makes sense in terms of space saving. (The drives, incidentally, are made by Canon.)

The main display on the PC-7000 is an 80-column by 25-line IBM colour graphics adaptor compatible LCD, mounted in the front panel of the main unit. By pressing a lever on the front panel, the display hinges forward on a smooth-running, silicon-dampened mechanism, which allows you to alter the angle of the display to suit yourself.



The one-unit disk drives

The contrast of the LCD can also be altered by turning a thumbwheel on the front panel.

The main trouble with LCD displays in the past has been that they can be very difficult to read. The main reason for this is that unlike conventional CRT devices, LCDs simply reflect light, they don't glow like a conventional screen.

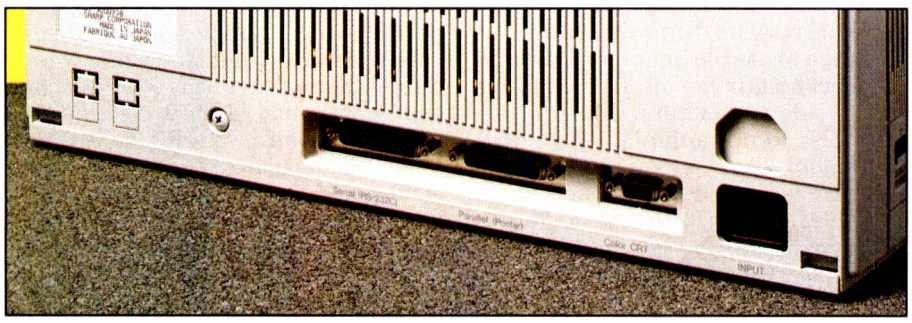
The PC-7000 is the first production machine I have seen that overcomes this problem by backlighting the display. The Sharp backlighter works by using an electro-luminescent panel which shines out through the LCD and makes the display glow. The problem with backlighters in the past has been their short life, but Sharp has made the backlight user-replaceable.

The length of time that the backlight lasts depends on how it is used. Sharp claims an average of around 3000 hours, although the manual quotes a worst-case length of around 1000 hours.

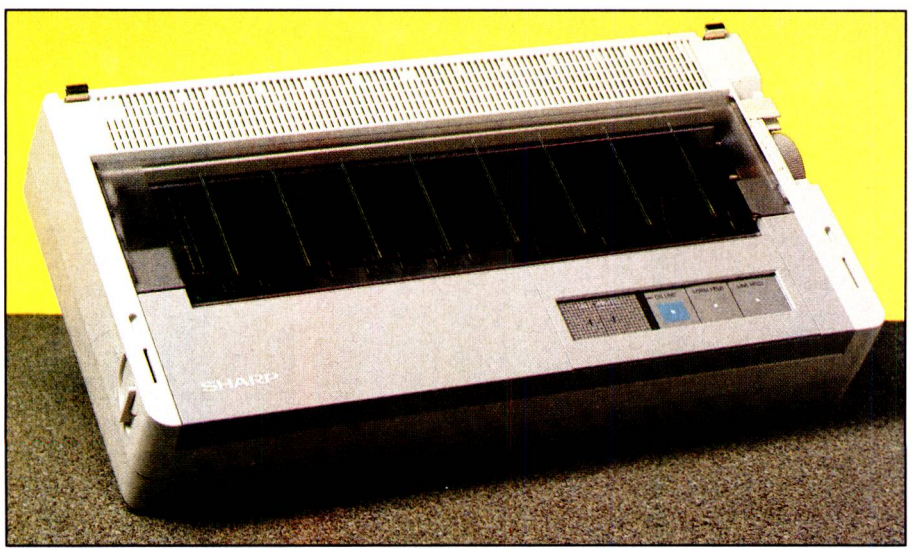
To change the backlight, you simply remove an endcap at the side of the screen, unclip the power to the backlight and slide it out. Close up it looks like a piece of pink plastic: it's the same size and width as the screen, but it's less than 1mm thick. To put in a new backlighter, you slide it in, plug in the power and replace the endcap.

One of the nice things about using backlighters is that you can change the screen colour simply by changing the backlighter. The light in the review machine was white and gave a black on white display, but if I had wanted, say, a green screen, all I had to do was slide out the white backlight and slide in a green one and — hey presto! — a green screen. Fiendishly cunning, these Japanese.

In terms of usability, I was impressed by the backlit display. It puts an end



All ports for all sorts, but no IBM expansion ports



The optional CE-700P thermal printer clips onto the back of the main unit

once and for all to the traditional LCD screen practice of trying to position the screen so that it reflects enough light for you to read. When you switch on the machine, the screen goes dark and then flicks into life, giving off a healthy glow. The brightness of the backlighter can be set under software control to either off, normal or bright.

Normal increases the life of the backlighter while bright is good for light rooms. In order to save the backlighter, it automatically switches off after a preset time. As if this wasn't obvious, a 'Screen Standby' message lights up on the front panel to tell you that the screen is off, rather than faulty. Hitting any key switches on the backlight again.

One interesting point is that when the backlight is removed, you can see all the custom screen de-code controllers lurking behind the screen. It always amazes me how much logic is needed to drive these large LCD displays.

Overall, I found the PC-7000 display to be much the most usable LCD display I have worked with. As well as being easy to read, the display is fast and is perfectly capable of running moving graphics programs such as Digital Research's GEM. The only disadvantage of the backlight is that it uses a lot of power. This means that for the moment, the backlight is not suitable for battery-powered portable machines, which is part of the reason why the PC-7000 is a mains-only machine.

The keyboard is the same width as the main unit and contains 84 keys. Considering the restricted space available, it does a good job. The keyboard is connected to the main unit via a coiled cable and a couple of Telecom/style plugs and sockets.

The base of the keyboard has two feet which can be hinged down to alter the typing angle; you can either have the keyboard down, slightly raised or fully raised. Although the rest of the machine is IBM PC compatible, the keyboard doesn't follow the PC's keyboard layout. In effect, it is closer to the IBM PC/AT layout, although it doesn't exactly match even this.

The main qwerty typing section takes up most of the space, and features large Shift keys and a truly enormous Enter key. The \ has also been moved from between the Z and Shift keys at the top of the section to the left of the 1.

To the right of the qwerty section is an IBM-style combined numeric keypad and editing keys. Most of the keys in this section serve a dual function, and these functions are selected by the Num Lock key.

Along the top of the qwerty keys are 10 programmable function keys arranged in two banks of five. On IBM keyboards these are usually to the left of the qwerty section rather than above it, but the PC-7000's keyboard isn't wide enough to accommodate this arrangement. Sharp does, however, provide a key legend strip on which you can write the key functions if you are confused by the layout.

I like the keyboard layout: it makes the best use of the limited space available while still being easy to use. The Caps Lock, Num Lock and Scroll Lock keys all have built-in green LEDs to indicate when they are engaged. The one oddity is a key marked 'Set-up', which I'll look at in the 'System software' section.

The only problem with the keyboard layout is that as it doesn't slavishly follow the IBM PC format, keyboard overlays for certain PC software packages won't fit, but this shouldn't be too much of a problem if you use the legend strip which is provided with the machine.

I wasn't all that keen on the feel of the unit. It has the cheap feel of keytronics units on other PC compatibles that I have never liked, but by the same token, I know people who really like this type of keyboard feel.

The review machine was supplied with the optional CE-700P printer, which was designed specifically for the PC-7000 and clips onto the back of the main unit. The driver software in the PC-7000 was designed to take advantage of some of the advanced printing features offered by the CE-700P.

The printer is a thermal unit rather than a conventional dot-matrix unit.

'One thing is certain — there is hardly a lack of competition for this machine.'

I've never been a fan of this type of printer. Its advantage is that it is virtually silent, but to achieve good results you have to use special thermal paper. You can use a thermal transfer ribbon, but you still have to be careful about the grade of paper you use.

Having said that in general I don't like thermal printers, I must admit that this printer is capable of very high-quality printing. It works in three modes: Draft, Near Letter Quality (NLQ) and Very Near Letter Quality (VNLQ). Only the Japanese could have thought of the last description.

In addition to the three printing modes, the CE-700P can print in two built-in fonts: Elite 12-point or Courier 10. You can add two extra fonts by plugging extra ROM packs into the printer.

Font selection and print quality selection can be done under software control from the PC-7000 using the Set-up utility, although it is sometimes necessary to set a DIP switch inside the printer to select Draft-mode printing. It also supports Epson printer control codes, so it is easy to install into applications programs which need some degree of control over the printer.

As supplied, the machine is designed to print single-sheet or roll paper only. One unusual feature is that it is capable of printing up to 10 inches wide, so you can feed paper through sideways if you need the extra width.

If you use the right paper, the CE-700P is capable of very high-quality output indeed. In its Very Near Letter Quality mode, it beats some daisywheel printers I've seen — there is no trace of the dots that make up the character. The main problem is that although print quality using thermal is very good, the paper tends to look shiny and flimsy and generally tacky; if you use better paper, you lose print quality. It's a case of swings and roundabouts.

System software

As you would expect from an IBM PC compatible machine, the PC-7000 runs MS-DOS version 2.11. What is more surprising is that a machine from one of Japan's largest electronics companies should have to to go elsewhere for its IBM-compatible ROM BIOS routines. According to the message display on start-up, the ROM routines are by Vadem Inc, late of Osborne Computers fame. It certainly is an incestuous business.

When the system boots up, it automatically takes the date and time from the internal clock. The system will happily boot from an IBM PC PC-DOS 2 disk although it won't take the system date and time, and there is a problem with the UK keyboard driver which has been specially altered by Sharp.

The problem with the driver centres around the use of the Set-up key. Whenever you press this key, a ROM-based screen is displayed which allows you to change the system settings. You can do this at any time — at the DOS A> prompt, in an applications program, even in Lotus 1-2-3. The only program in which I couldn't access the Set-up screen was in Microsoft's Flight Simulator, which isn't really surprising.

Using the Set-up menu, you can change settings for the clock, display, RS232, logical devices and printer.

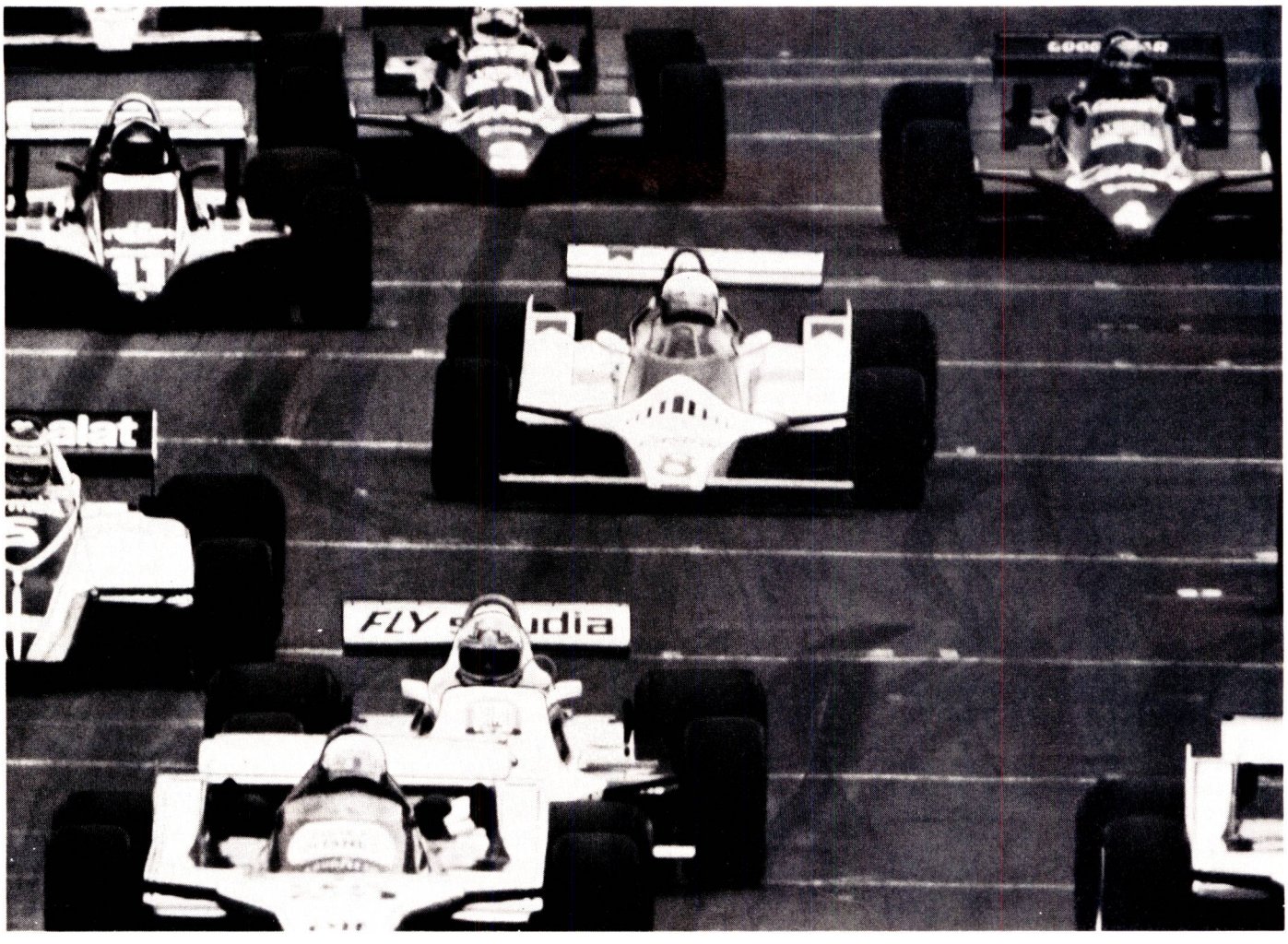
The general mode of use is to use the cursor keys to highlight the setting you wish to change, and then to use the space bar to scroll through the options. For example, if you want to change the time, you select the hour or minute and hit the space bar continually until you arrive at the required time.

Using the Set-up menu to control the display settings, you can set the

Benchmarks

BM1	1.1
BM2	3.8
BM3	7.9
BM4	8.2
BM5	9.0
BM6	15.5
BM7	24.6
BM8	26.7
Average	12.1

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January 1985 issue.



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cursor to block, underline or underbar, and set its blink time to zero, one, two, or four seconds. You can also set the speed at which characters blink.

On the display, you can set the whole screen to normal or inverse (everything is displayed white on black instead of black on white). You can set the display controller to emulate either the IBM colour graphics adaptor or the IBM monochrome adaptor.

The backlight can be set to off, in which case the display is virtually unreadable, or to dim, normal or bright. Generally, I found normal and bright the easiest to use. Backlight timeout can be set to two minutes, five minutes, 10 minutes or permanently on.

One particularly useful feature of the set-up menu is that you can set the baud rate, data bits, stop bits and parity on the RS232 serial port as you go along. The baud rate can be set at anything from 150 to 9600 baud. If you have more than one serial I/O device fitted, the two logical I/O devices COM 1 and COM 2 can also be set.

As far as printer control is concerned, you can route printer output from the machine to the RS232 printer port or the Centronics printer port. You can also use the Set-up menu to control the CE-700P printer characteristics without any involvement from the applications program you are running. For example, if you are in WordStar and want to print in Courier rather than Elite, you hit the Set-up key and select the font. You can also use Set-up in conjunction with a DIP switch in the printer to select print quality from Draft, NLQ or VNLQ.

You can use the set-up menu to set the speaker volume and the main processor speed. The 8086 in the PC-7000 usually runs at 7.37MHz, but a few IBM applications programs rely on the IBM PC's clock speed of 4.7MHz for timing purposes. If you are running such a program, you can slow the PC-7000's processor to cope.

'The only disadvantage of the compact design is that you can't fit IBM PC boards into the basic machine . . .'

Applications software

As you would expect from a modern, reputable IBM PC compatible machine, the PC-7000 runs the vast majority of popular IBM PC programs. Lotus 1-2-3, Flight Simulator and GEM all ran significantly faster than they do on the IBM PC, thanks to the PC-7000's uprated processor and faster clock speed.

The only problem with graphics-based programs is that they look distorted on the LCD screen, as 80-column by 25-line LCD screens tend to be more than twice as wide as they are high. This means that although the pixel resolution is the same as the IBM screen, graphics have a habit of looking squashed.

Documentation

The PC-7000 was supplied with three pre-release photocopied and bound manuals. The first was a general-purpose operations manual, the second an internal options manual, and the third a general-purpose MS-DOS manual.

Of the three, I found the internal options manual the most helpful as it instructed me how to take the machine apart, and had a useful technical specifications section. The operations manual also looks useful to purchasers of the PC-7000. Although my copy was a photocopy of the proof, it contained lots of useful pictures and the text was easier to understand than the usual Japanese-style English.

Prices

Pricing was not confirmed at the time of going to press, but the system as reviewed is expected to retail at under £2500.

Conclusion

It's amazing how, after some time spent in this business, first impressions count for a lot. When I first saw the machine, I liked it. It looks neat and tidy; it's small and well put together, but I still think that it looks more like a photocopier than a micro.

In terms of engineering, the Sharp is also very good. The main PCB is truly minute considering that it contains everything including the disk controller, the RS232 port and the Centronics port. The only disadvantage of the compact design is that you can't fit IBM PC boards into the basic machine — you have to buy the expansion box, but this shouldn't be a problem for most users as the parallel and serial ports, and all the memory required, are all contained on the main board.

As far as I know, the backlight LCD screen represents a production first for Sharp. It certainly works considerably better than unlit LCDs, and being able to change the colour of the display at will is fun if a little trivial.

I don't know if I would buy the printer. It's nice that it is designed to fit with the rest of the system and clips onto the main unit, and the print quality is also excellent if you use the correct paper, but I can't overcome my dislike of thermal printers — even good ones.

I liked the Sharp PC-7000 a great deal. It's faster than the IBM PC, it runs the popular PC programs, and it looked ten times better. Not bad at all. END

Technical specifications

Processor:	Intel 8086 running at 7.37MHz
ROM:	16k
RAM:	384k expandable to 704k onboard
Keyboard:	84-key IBM PC/AT style
Display:	80-column by 25-line backlit LCD
Size:	16ins (w) × 8.5ins (h) × 9.8ins (d)including printer
Weight:	29.5lbs including printer
I/O:	RS232, Centronics
DOS	MS-DOS 2.11

In perspective

One thing is certain — there is hardly a lack of competition for this machine. Most PC-compatible manufacturers have been in the luggable/desk-top market for years, and at first sight there doesn't seem to be any necessity for another contender.

This machine is important to Sharp for psychological reasons. Like Commodore and Apple, Sharp has always prided itself on going its own sweet way in terms of compatibility. This has led to a succession of machines which have been technically good, but which have been about as successful as the Jupiter Ace.

Like Commodore before it, Sharp has now decided that perhaps it would be a good idea if its machines had a decent software base available, and this in turn means that the machines have to be IBM PC compatible. But unlike Commodore, Sharp has pitched in with a well-designed, technically advanced machine that would look good on anyone's desk, and which offers a significant performance advantage over the IBM PC.

The problem remains, however, that the only companies which have fared well in the IBM-compatible market in the UK are Compaq and Olivetti. Everyone else has been doing nickle-and-dime business.

Sharp has a nice machine which deserves to succeed, but I can't help thinking that the company is labouring behind the game.

Real time

Brian Heywood takes you step-by-step through the design techniques of a real-time operating system in C, which can provide a reliable and stable environment for programming codes.

For some time, there has been an old micro lying around my house doing nothing, left over when I upgraded to my present personal computer. What could I use it for?

The obvious thing would be to use it to control something, for example the central heating, but to limit it to controlling one system was silly as I was bound to think of other ways of implementing it in the future. I decided to write a simple real-time operating system (RTOS), so that in the future it could be expanded to meet my varying requirements.

The system would be coded in C, as C was originally developed for writing the Unix operating system and would give a suitable level of control over the system while retaining a degree of portability across any future computer systems.

Real-time systems

A real-time system can be described as any program which is designed to run *continuously* for long periods of time. This is the type of program which controls anything from a washing machine to an oil refinery, from a car control system to the NASA Space Shuttle's flight computers. In short, this type of program has to operate without anyone watching it. It therefore has to be reliable, and should be maintainable: that is, it must be adaptable to changes in the hardware it controls.

A real-time operating system is a program which is an attempt to achieve the twin goals of reliability and maintainability. A real-time operating system is a program which is designed to act as an environment for the code which does the work handling whatever it is that needs to be controlled. If you separate the tasks of running the computer and that of controlling 'whatever', and then need to change the 'whatever', you can concentrate on the section of code involved with that, without being side-tracked by the more mundane problem of controlling the computer environment.

The main feature of a real-time operating system is that it doesn't determine the function of the control task(s) running under it. Further, when you have split off the function of controlling the computer environment from the application tasks you can control more than one task, allowing the program to control more than one device. However, it will probably affect the structure of the application task's code and some of its operating characteristics, such as response time. As always there is a trade-off, in this case between speed and adaptability.

Structure

Any real-time operating system can be broken down into two basic sections, comprising the scheduler and the application tasks. The scheduler is a program which executes other programs or procedures according to a simple set of rules; these rules may relate to things such as task priority, external events or timing considerations. The application tasks are the programs or procedures which the scheduler executes, and are the part of the system which do the actual work.

The scheduler is necessary to overcome the restriction that the CPU can only ever execute one piece of program code at any particular instant. With a scheduler, a computer can simulate the execution of more than one program at a time by swapping between programs. Several programs can apparently run simultaneously, the cost of this being that the programs will take longer to execute.

The application tasks are essentially the same as the equivalent programs would have been if they were operating on separate computers in a single-tasking system. The difference is that the programs must periodically release execution control to the scheduler so that it can decide which task should be running according to its set of internal rules. The frequency with which the scheduler is run will determine the response of the system to changing conditions, so if response time isn't important, each program can run through to completion before releasing control to the system.

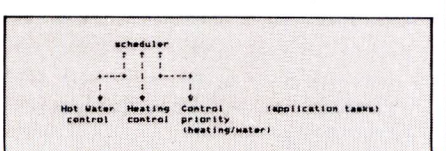


Fig 1 A simple multi-task control program (central heating)

A further constraint on the application tasks is that they shouldn't interfere with each other's memory, although the compiler will usually handle this.

Communications

One possible source of complexity in this type of system is the provision of inter-task communications. If the tasks are dependent on each other in any way, they must be provided with a means of talking to each other. There are two types of communication required between tasks, normally called 'pools' and 'channels'.

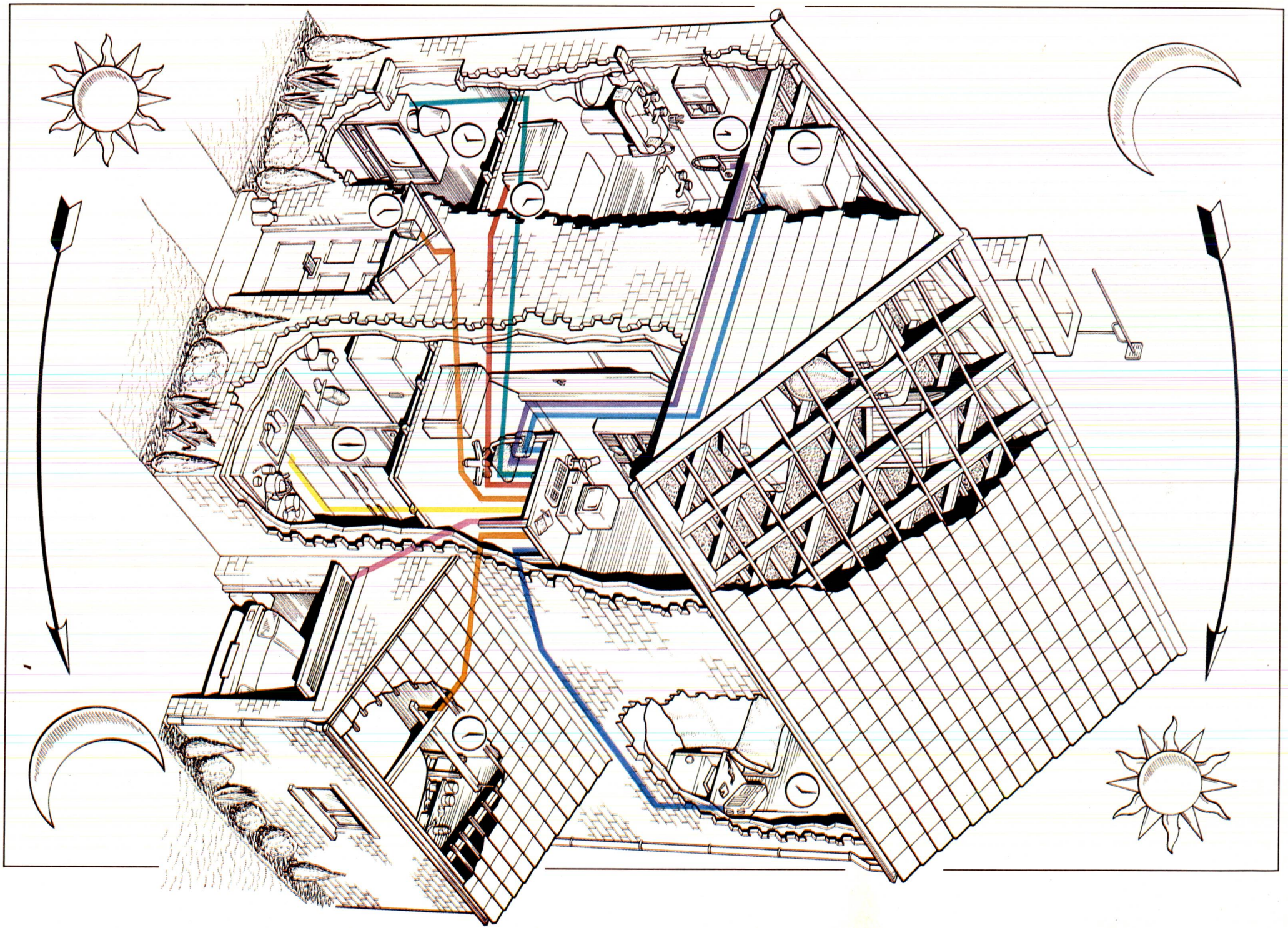
A pool is usually used for synchronisation purposes, and, as such, is implemented as a bit field or a Boolean variable. A channel is used for the transfer of data and can be a first in/first out (FIFO) buffer, a stack, or an area of RAM set aside for this purpose. For my simple system, I implemented only pools as part of the system. If I ever needed channel type communication, I could implement it outside the operating system.

Another feature usually found in real-time operating systems is the provision of some kind of clock. This is useful as it allows tasks to be run at particular time intervals or times of day. In its simplest form, this clock is implemented as a 'sleep' function. A task can put itself to sleep for a certain length of time by loading its sleep counter with a number, which is decremented each time the scheduler is run (that is, when a task has finished execution). While the count is non-zero the scheduler will ignore this task, but when the count reaches zero, the scheduler will execute the task according to its priority as before.

Error-handling

An important aspect of real-time systems is that they run continuously for long periods of time, so any faults in the software or hardware can (and probably will) accumulate. If the system is to be reliable you should provide a

Illustration by Mark Franklin



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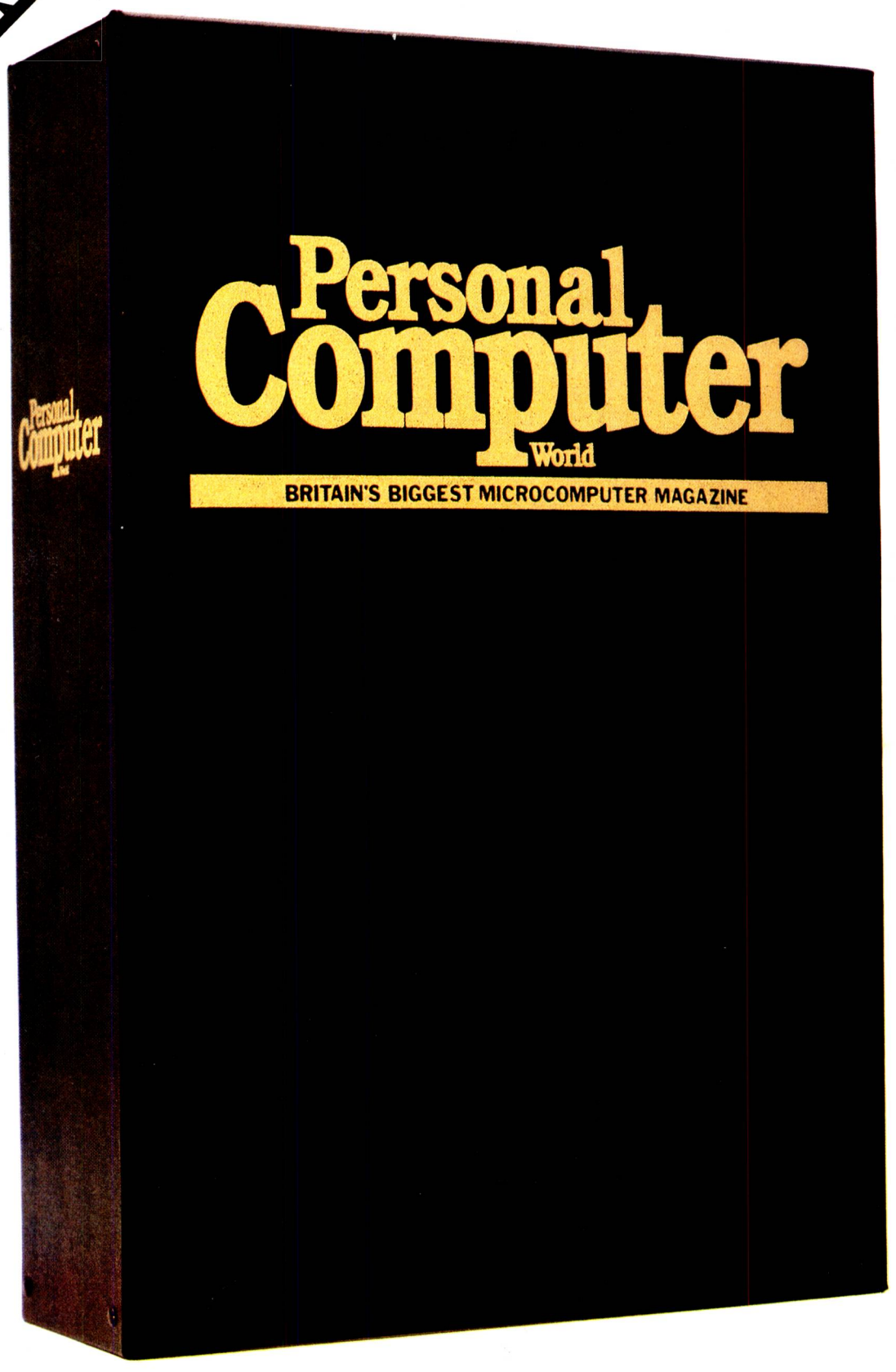

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mechanism to detect the operating software going haywire, and take appropriate measures to recover from the fault.

There are two common ways of ensuring that the system will recover from fatal errors; one which involves a piece of hardware, the other solely software. The first is called a 'watchdog timer', a monostable timer, which is connected to the computer's reset line and can be triggered by software. The scheduler must periodically restart the timer. If a task goes wrong and stops the scheduler from running, the watchdog will 'bite' or time-out, resetting the computer and restarting the operating system. Obviously the timer period needs to be longer than it takes to run the longest task, and the system needs to load automatically on a hardware reset.

The other common method is sometimes called 'sanity checking'. This involves having a task which checks certain aspects of the system for consistency, and if it finds a fault, it will cause a software reset to restart the system from scratch. Two common types of sanity checks are checking that the stack doesn't overwrite code or workspace RAM, and monitoring selected 'guard' locations in RAM to ensure that a task hasn't run amuck and altered RAM not 'belonging' to it. This method is not as effective as the hardware 'watchdog', as the monitoring software itself could go 'insane'.

Implementation

In any RTOS, the scheduler controls the various tasks by maintaining for each task a data area in which it stores various pieces of pertinent data as to the state of the task with respect to the operating system. The most important piece of information is the state of each task. The task could be running, sleeping or inactive. Other data could relate to statistics for each task, such as whether the task has been initialised, the task sleep count, how many times it has run, and also data which is used by the tasks, such as the aforementioned communication 'pool' and possibly a task state variable (Fig 2).

```
struct    task_data {
                  char state ;
                  char init ;
                  int  sleep ;
                  int  calls ;
                  char task_state ;
                  char pool[7] ;
} ;
```

Fig 2 A task control data structure in C

The core of the scheduler could be a series of IF/ELSE statements, stepping through each task_data block in turn and executing the first task it comes to with its state set to 'running'. In this scheme, the priority of each task is determined by its position among the IF statements, and when the task returns control to the scheduler the sequence starts over, ensuring that the highest-priority task is always executed.

A slightly more general way of implementing the scheduler would be to use a case construct in C to call the various tasks, making it easier to add new tasks as the need arises. Also, by splitting the scheduler into a system maintenance section and a task execution section, you can use a more complicated set of rules for determining the priority of the tasks and therefore which task will run first.

```
                /* define external data */
struct    task_data       tasks[N] ;      /* N=number of tasks */

main()          /* Yet Another Real Time Operating System */
{
                /* define local variables */
     int  run_task, status ;

     initialise_system() ;          /* set data areas etc */

                /* start of scheduler */
     while (TRUE)                   /* do forever */
     {
          update_sleep_counters() ;

                        /* find out which task is to run */
          run_task = select_run_task() ;

                        /* now execute task */
          switch( run_task ) {

               case 1 :  status = task1(run_task) ;
                         break ;

               case 2 :  status = task2(run_task) ;
                           break ;
                         :
                         :
                         :
                        etc
                         /* if no task active then do background */
          default : status = background(0) ;
                         break ;
     }
                             /* if any task returns an error
                                restart the system          */
          if( status != NO_ERROR ) reset_system() ;

     }    /* end of do forever loop */
}    /* end of main body of program */
```

Fig 3 The basic scheduler design

In Fig 3, 'update_sleep_counters()' maintains the sleep counter for each task and 'wakes up' any tasks that have timed out; 'select_run_task()' contains the set of rules which determines which task is going to run; and 'task1(), task2()' and so on, are the application tasks. To add another task, increase N by 1, insert another case statement, and recompile and link the system.

Each task has the basic structure as shown in Fig 4. The initialisation section is only executed once, and is used to set up any hardware and/or data areas. The

```
task( index )        /* Application task frame */

int          index ;        /* task number for data reference */

{            /* initialise task */

     if ( task[index].init == TRUE )
     {
          -- code  to initialise data/hardware for this task --

          task[index].init = FALSE ;     /* reset init flag */
     }

          /* ---- main body of task ---- */

     -- the code of the application task --

     return( NO_ERROR ) ;          /* we could return an error
                                      condition here if something
                                      goes seriously wrong      */

}            /* end of the application task code */
```

Fig 4 An application task structure

main body of the task consists of the code needed to perform the function required by the application task.

The task execution code in this case just steps through each task data area and finds the first task with its state variable set to RUN. The individual task's priorities are determined by the position of their call in the main case statement, making it very simple to change a task's priority by moving it about within the case statement. This of course means that the priority of each task is fixed when you create the system (that is, compile the code), but you could easily make the priority dynamic by allocating one of the pool variables to 'task priority' and have 'select_run_task()' check this variable when it selects the next task.

```
int    select_run_task()       /* select the next task to run */
{
       int     rtask, i ;

       rtask = 0 ;
                               /* N is the number of tasks in system */
       for ( i=1 ; i<=N ; i++ )
            if( task[i].state==RUN && rtask==0 ) rtask=i ;

       return(rtask) ;

}      /* end of select_task */
```

Fig 5 The scheduler structure

The sleep feature is implemented by 'update_sleep_counters()' which decrements any of the tasks which have non-zero 'sleep' counters, and sets any tasks in the SLEEP state with zero in their sleep counters to the RUN state. If the system had a built-in clock you could measure absolute time to update the sleep counters, but in this case you just decrement the sleep counters each time the scheduler is called.

```
update_sleep_counters()          /* maintains the sleep counter
                                                for each task */
{
       int     i ;

       for ( i=0 ; i<=TASKS ; i++ ) {
            if (task[i].asleep != 0) task[i].asleep-- ;
            else if (task[i].state == ASLEEP) task[i].state=RUN ;
       }
}      /* end of update_sleep */
```

Fig 6 Sleep counter code

To simplify the process of the task going to sleep, the code in the 'goto_sleep()' loads the appropriate sleep counter with the desired sleep period. An advantage of making this a function is that in the future, you could easily install a new version of 'goto_sleep()', secure in the knowledge that all cases had been accounted for (that is, rather than going through all the application tasks and altering each one in turn).

```
goto_sleep( index, time )        /* goto sleep for specified time
                                          (measured in clock ticks) */
int     index ;
int     time ;
{
       task[index].state = ASLEEP ;
       task[index].asleep= time ;

       return(NO_ERROR) ;
}      /* end of goto sleep */
```

Fig 7 A simple sleep function

The error-recovery function is covered by 'reset_system()' and is so dependent on the system in which it's running that I haven't included any code. This function should reload the system from permanent storage (for example, disk) otherwise you can jump to the load address for the operating system.

Conclusion

I have presented here a brief description of real-time operating systems, with some generic C code, as an example of one particular implementation of such a system. The basic concepts can be (and have been) implemented in many different languages and computer systems, and there is no reason why anyone can't take advantage of the techniques. **END**

Side by side

In contrast to the standard Von Neumann architecture (sequential — one function performed very quickly), parallel architectures have been developed which do lots of things at once. Is parallelism the ideal, or are computers most efficient when concentrating on one task? Richard Forsyth examines the question.

As well as being the 40th anniversary of the atomic bomb, 1985 marks 40 years of another revolutionary technological innovation – the Von Neumann computer. The logical design of the computers we all use today is attributed to John Von Neumann, a Hungarian mathematician who emigrated to the US and, incidentally, made a significant contribution to the atom bomb project.

John Von Neumann has a lot to answer for, although – as far as computers are concerned – a number of other scientists in the US and the UK had dreamed up the same idea at around the same time. This central notion is the concept of the stored program. Presper Eckert, Hermann Goldstine and John Mauchly in the US, and Tom Kilburn, Alan Turing and Maurice Wilkes in the UK, all realised that the key to unlocking the computing power of the electron was in having a machine that stored its own instructions.

Still, history gives the credit, or the blame, to John Von Neumann. But whereas the fission bomb had spawned a far more devastating big brother, the fusion weapon, within 10 years, the basic design of the digital computer has remained unaltered.

Of course there has been progress – fantastic progress, some might say – in fabrication techniques, miniaturisation, speed, value for money and almost every other parameter you care to measure; but the fundamental design has stayed the same. This is curious because, as we shall see, people have been saying that the Von Neumann computer was obsolete since the day it appeared. One of those people was John Von Neumann.

Before I deal with this 40-year-old chorus of criticism, I had better define the terms and state briefly the essential characteristics of the 'classic' Von Neumann machine.

Characteristics

In conventional computers, the program is held in store. The basic design consists of five components – an input unit, an output unit, a storage unit, an arithmetic/logical unit (ALU) and a control unit. This is sketched in Fig 1.

The workings of the machine are governed by what is known as the 'fetch/execute' cycle, which is as follows:

1) Read the next instruction from the memory location given by the program counter (PC) into the central processing unit (CPU).
2) Transfer the op-code of the instruction to the control unit.
3) Decode the instruction and send signals accordingly to the ALU.
4) Put the address of the next instruction into the PC (usually by incrementing it).

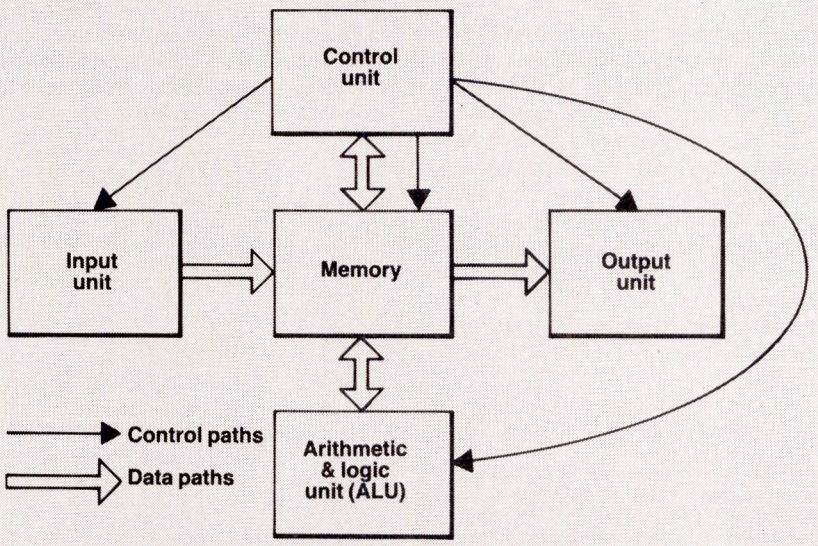
This cycle may initiate another cycle if the instruction involves data in memory (as most do). In such cases, additional steps will be interleaved into the basic loop:

3a) Fetch the data from memory.
3b) Store the results in memory.

The point to note is that there is a single processor which works in strict sequence. Consequently, the languages we use to write programs for such computers require us to specify the precise order in which operations are to be carried out, even when this is logically unnecessary.

Parallelism

That is the essence of the computing engines we have come to know and love over the last four decades. It is a design which, in its various guises, has proved capable of guiding spacecraft to Saturn and beyond, of paying your salary cheque (or unemployment Giro) on the appointed date, of leading you through the Troll-infested forests of



In the traditional Von Neumann computer, all units are under the control of a single control unit. Operations are carried out in sequence and the bottleneck is the CPU.

Machines that depart from this pattern are collectively termed 'Non-Von Neumann computers' (Non-Von for short). There are many kinds of Non-Von machine, differing in a variety of ways from Von Neumann's scheme.

Fig 1 Von Neumann computer diagram

Middle Earth, and much else besides.

In view of the computer's astonishing versatility, why has a chorus of voices been raised since its advent protesting that it is manifestly, obviously and inescapably the wrong way to process information? The answer, in a word, is parallelism: like a recent US President, today's computers cannot walk and chew gum at the same time (so to speak).

They can give the impression of doing several things at once, by timesharing; but timesharing is a kind of conjuring trick (like the Western banking system). If all depositors want their money at the same time, there is an embarrassing and costly hiatus called a 'crash'. Likewise, anyone who has used a large timesharing installation knows from bitter experience that when everyone wants processing power at the same time, there is an embarrassing and costly event called a 'thrash'. (There may be a crash as well.) This is why personal micros have proliferated in such abundance.

As I have mentioned, the drawbacks of the conventional design have not gone unremarked. John Von Neumann himself, just before his death from cancer in 1957, compared the computer with the brain. He made a telling point in favour of the latter as it employs millions of processing elements simultaneously:

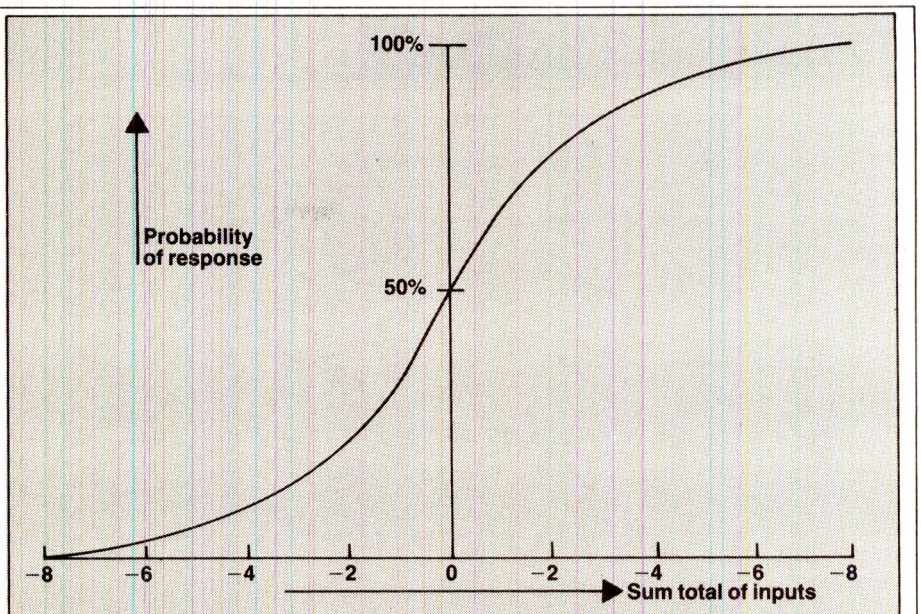
'Large and efficient natural automata are likely to be highly parallel'. (Von Neumann, 1958.)

Even today, in the age of array processors, floating-point chips, 'intelligent' database controllers and ULAs (all of which exhibit at least a degree of parallelism), it is not hard to find quotations in a similar vein.

'With the advent of the microprocessor and the ever-advancing technology of integrated circuits, it is becoming increasingly obvious that we need to break away from the straightjacket of the conventional approach to computing. The principles upon which it has been based are becoming less and less realistic in the light of present-day knowledge.' (John Sharp, 1985.)

But if there is one field where dissatisfaction with the Von Neumann model has been especially keenly felt, it is in artificial intelligence (AI). Many AI workers believe that a genuine breakthrough towards machine intelligence can only be achieved with radically new computer architecture, and this attitude has received a boost from the Japanese Fifth Generation Computer Project. The JIPDEC Report (1981) makes it quite clear that the basis for worthwhile advances in AI is a totally new approach to the design of highly parallel computing machines.

Now, I'll examine some of the ways that AI workers are seeking to overcome the shortcomings of traditional computing machinery, and consider whether the proposed solutions have shortcomings of their own. In particular, I'll look briefly at four novel kinds of computer architecture – the Boltzmann Machine, Igor Aleksander's WISARD, the Dataflow computer, and the Fifth Generation Project. All, in their different ways, have AI connections. That is, they are not just intended as improved computer designs, they are meant to move closer to the goal of thinking machines.



The basic processing element of a Boltzmann Machine is a probabilistic device. It computes the weighted sum of all its input convections and then decides whether to 'fire' – that is, to produce an output. Firing is determined according to the function graphed above.

During the 'simulated annealing' process, the response curve gets steeper. That is, it becomes more like a (deterministic) step function with a threshold at zero.

Fig 2 Processing unit response curve

'The logical design of the computers we all use today is attributed to John Von Neumann, a Hungarian mathematican . . .'

The Boltzmann Machine

Naturally enough, AI workers are fascinated by the human brain, and occasionally some of them are bold enough to attempt to simulate it. Simulating the brain as a way of designing intelligent computers found favour in the early days of AI, then fell from grace. The job was simply too hard. Recently there appears to have been a revival of interest in this approach, partly because we now have much more powerful hardware.

A team at Carnegie-Mellon University, led by Geoff Hinton, has begun to design a machine which is a deliberate attempt to mimic the behaviour of large neural networks, such as those in the human brain. They call their system the Boltzmann Machine (after Ludwig Boltzmann, a pioneer of statistical thermodynamics) as it works on statistical principals.

A Boltzmann Machine is composed of a network of many computing elements, all of which work in parallel. It can be simulated on a conventional computer, but the ultimate aim is to use it as a blueprint for a novel form of computer.

The elements in the network are threshold units which produce binary outputs (0 or 1) by summing their inputs and 'firing' if the sum exceeds a certain quantity; each processing unit is therefore a simplified nerve cell (neuron). An important point is that the thresholds are not fixed: they 'jitter'. The larger the input, the more likely the unit is to fire, but the response is probabilistic, not deterministic. This is illustrated in Fig 2.

All processing units are of the same type, but the connections between them vary. Connection strengths are symmetrical, so the link from A to B has the same value as from B to A. This is not like the real nervous system, but it makes proving theorems about the behaviour of such nets easier.

The network may be as complex as desired, and it may contain feedback loops, and so on. An example is shown in Fig 3.

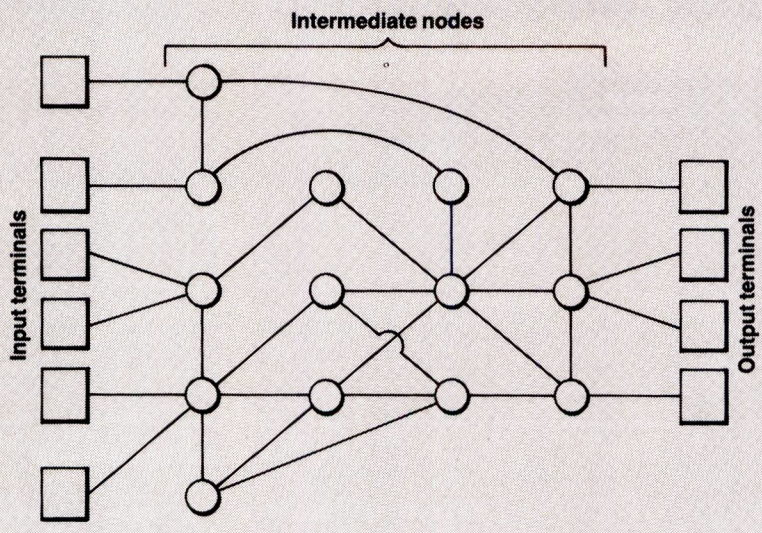
This system can be made to learn. It acquires new input-output relationships by adjusting the connection weightings in the following way:

Phase one

1a Clamp the training pattern to the input units and the desired response pattern to the output units.

1b Allow the network to settle to equilibrium.

1c Increment the weights linking any



The elements of a Boltzmann Machine are typically connected as in the schematic above. All connections are bi-directional and weighted. The system learns by adjusting the weightings.

There is no arbitrary limit on the number of intermediate processing nodes, nor on the complexity of their interconnections. More complex problems tend to require more nodes in a more complex network.

Fig 3 Boltzmann Machine network layout

two elements that are simultaneously active by a small amount.

Phase two

2a Remove the output connections but leave the inputs connected (that is, take away the teacher).

2b Let the network stabilise again.

2c Decrement the weights between any pair of elements which are active together by a small amount.

These two phases are repeated alternately until the input-output behaviour in phase two (unsupervised response) reaches some criterion of success. The procedure is known as 'simulated annealing' by analogy with the hardening of metal as it cools. A hot metal has plenty of random motion among its molecules. As it cools, they settle into fixed positions.

The idea behind simulated annealing is to 'shake' the system (by introducing randomness) in the early stages, but to let it become more and more deterministic later on. This helps to avoid the problem of getting stuck at a local optimum.

The Boltzmann Machine has brought neurological modelling back to the forefront of AI. Such systems can be taught a wide range of behaviour, but there is a catch. As Geoff Hinton says (1985):

'Our current simulations are slow for three reasons: it is inefficient to simulate parallel networks with serial machines; it takes many decisions by each unit before a big network approaches equilibrium: and it takes an inordinate number of I/O pairs before a network can figure out what to represent with its internal units. Better hardware can solve the first problem, but more theoretical progress is needed on the other two. Only then will we be able to apply this kind of learning network to more realistic problems.'

'Of course there has been progress — fantastic progress . . . but the fundamental design has stayed the same.'

The Boltzmann Machine is an exciting idea thrown into the melting-pot of proposals on how to design the next generation of computer systems, but it is not a practical device.

WISARD

Another innovative design with a neurological flavour is the WISARD system of Igor Aleksander (Aleksander & Burnett, 1984). The name stands for Wilkie, Stonham & Aleksander's Recognition Device. It was devised at Brunel University, although Professor Aleksander is now at Imperial College. It is a visual pattern recogniser.

The interesting point about WISARD is that it is a very highly parallel machine which is not a multi-processor system. In fact it has no processors at all, only memory. The system works by examining a TV image composed of 512 × 512 pixels, which are sampled in groups of eight at a time. There are over 32,000 groups, or octuples, and each can be in one of 256 states at any one time. In effect, each octuple is a primitive feature detector, and its state says something about the picture being presented.

Every octuple is connected to a bank of 256 RAM locations; this allows the system to use a form of content-addressing. The state of the detector is used as an address (between 0 and 255) which points into its own RAM bank. During training, the bit to which it points is set when the image being taught is present. After the training phase, when an image is presented, all 32,768 detectors point to particular locations within their own RAM banks. The contents of these are read out and added up. A high total indicates that many detectors are in the same state as when they were seeing training examples. A low total indicates that most of them are not, and that the image is therefore not one the system has seen before.

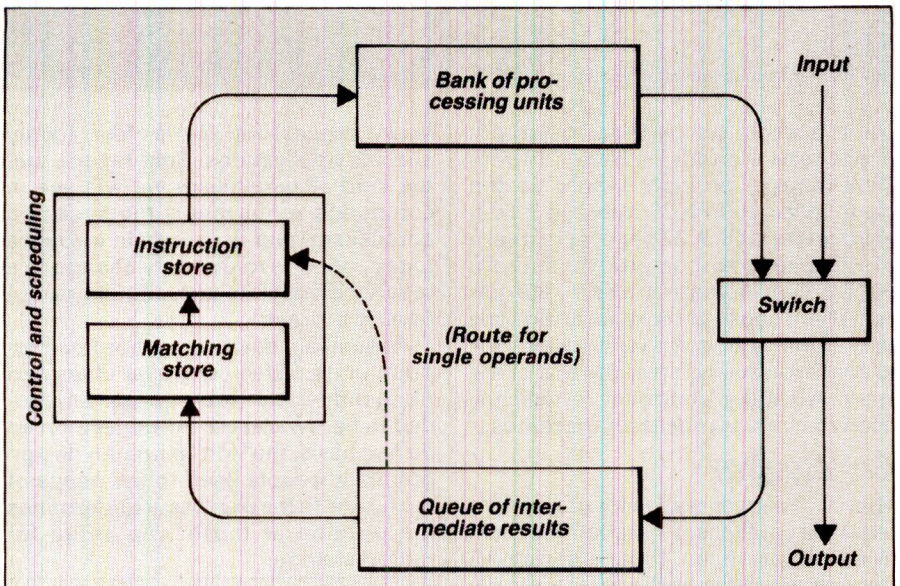
WISARD effectively computes a 'fingerprint' or 'signature' of what it sees and compares this to past experience. It needs a lot of memory (one megabyte) but these days that is not excessive. It is highly resistant to 'noise' (that is, random distortions of the image). For example, it can learn to recognise a bearded face and then respond correctly to the same face with the beard shaved off and in a different orientation.

This is rather impressive. It is the type of thing that people are good at but computers, until now, have always proved poor at doing. Moreover, WISARD forms the basis for a commercially successful image recognition system that operates in real time, unlike many other AI vision systems which take up to half an hour just to process one frame of a moving picture. Nevertheless, WISARD is not a general-purpose computer: it is fast, but not flexible.

Dataflow computing

Unlike WISARD, dataflow computers are, in principle, quite general. They are capable of doing anything a Von Neumann machine can do. There are several classes of dataflow computer, but they all share the idea of liberating the programmer from the need to specify temporal ordering that traditional designs impose. A dataflow computation is one in which operations are executed in an order determined by the availability of resources and by the dependencies between data, not by a control sequence laid down by the programmer.

This takes a chore away from the programmer and allows the system to decide when things should happen. If the system is well-designed, this



This model is based on a single ring structure. Data circulates clockwise. As new results are produced from the bank of processors, they are either sent for output or fed back to become inputs for succeeding operations.

Fig 4 Manchester University dataflow architecture

should permit better use of computing resources. Dataflow machines can work in two modes:

1) 'Greedy evaluation', in which operations take place as soon as their operands are ready.

2) 'Lazy evaluation', in which operations are performed until their outputs are needed.

Under the first regime a unit, such as a multiplier, will 'fire' as soon as its inputs arive; under the second, it will await their arrival and then delay further until the next unit 'downstream' issues a request for its result. Greedy evaluation is pushed by data, while lazy evaluation is pulled along by computations.

Several teams of computer designers are working on dataflow machines. Most exist only on paper, but one of the most advanced designs is in Manchester (Gurd & Watson, 1980). This is based on a ring architecture and illustrated in Fig 4.

The object of this design is to map the idealised dataflow model, where there are infinitely many specialised processing units, onto physical hardware. The solution, in brief, is to hold intermediate results in a buffer. At any given time, there are many operands awaiting a processor. As processors become ready they are despatched, the required operation is performed on them, and the result is then fed back to join the operand queue.

Dataflow computers have a lot in their favour. They help to enforce the modular programming style which is recognised as essential to software engineering. Not only do they ban global variables (a source of many bugs), they outlaw the concept of a variable entirely; such machines are programmed in 'pure' functional languages. In addition, for many tasks, they promise a worthwhile speed-up in execution time, which is one reason why the Japanese have recently become interested in the dataflow framework. The trouble is that dataflow machines do not run Fortran.

A great deal of capital is tied up in existing software. The problem of automatically translating procedural software to take advantage of dataflow computers is as yet unsolved. The associated problem of re-educating programmers to enjoy the delights of functional programming in its purest form may be soluble, but it could take even longer.

'Controlling a parallel machine is mind-bending fun for leading-edge thinkers in university AI labs.'

The dream machine

As I have mentioned, the Japanese are interested in dataflow concepts, but that is only one strand in the multi-coloured braid of the Fifth Generation plan. I do not have space here to do it justice, but there is one interesting fact that merits more attention than it has so far received. That is the fact that the first fruit of the ambitious Fifth Generation initiative is a sequential machine, the PSI, built by Mitsubishi.

The PSI is a personal sequential inference engine, optimised for running Prolog (or something like it). It was announced in 1984 and is now almost fully debugged. I find it interesting that, almost half-way through a project launched with much fanfare amid talk of 'massively parallel' new architectures, the only product to emerge is a sequential machine. It is no more of a departure from the Von Neumann paradigm than comparable Lisp engines that have been available in the US for years.

Paralellism in paralysis

The overall theme of doing many tasks in parallel has an intuitive appeal. It seems obviously more efficient than just doing one thing after another, and yet sequential machines go from strength to strength while their more ambitious parallel cousins remain, for the most part, laboratory curiosities. Why is this?

There are several reasons, of which the first and most important is the way we think. Parallelism is all very well when you are walking along chewing gum (indeed, life would be intolerable without it), but when it comes to thinking, by which I mean doing intellectual tasks of some difficulty, we go in for something else. We call it concentration: we focus our mental energies on one thing. Intelligent problem-solving, which is what AI is all about, demands single-mindedness.

You could argue that lots of things are going on in the brain. At the neural level this would undoubtedly be true: millions of neurons are busily firing away. But at the cognitive level – the level of conscious awareness – we only do one thing at a time, at least when the job is a serious one.

Even if you accept this point (that when we think hard, we are in effect single processors) you could reply that we are not necessarily the last word in thinking machines. The single-minded approach may just be a limitation of human intelligence which we might want our machines to surpass, but the problem is — we have to design those machines. And, one hopes, we will want to control them, too. To control them, we need to write their programs, and this is where the limitation really bites. When all is said and done, we find it very hard to write programs for computers that work in parallel.

The gist of my argument here can be summed up as follows. The Von Neumann machine's success is no accident. It arises chiefly because it fits the human mind like a glove (or perhaps a suit of armour). Sequential thinking is natural thinking. On the other hand, parallel machines are alien. Controlling a parallel machine is mind-bending fun for leading-edge thinkers in university AI labs. For the rest of us, thinking about one process at a time is enough to give most people a headache.

If you don't believe it, think about the way politicians run the economy. The economy really is a parallel system. It has tens of millions of processing elements (firms and individuals) beavering away at the same time. As a result, it behaves in the most contrary and counter-intuitive ways. Govern-

ments always get it wrong. A government dedicated to reducing public expenditure implements its policies and they lead to a huge increase in public spending. A government dedicated to reducing unemployment sends it shooting up, and so it goes on. They are not all scoundrels; they just cannot cope with the complexity of highly parallel systems.

To look at it another way, writing a symphony is much harder than composing a simple melody. You might be able to come up with a catchy tune, but still be incapable of orchestrating it. The latter task requires the composer to imagine the effects of a multitude of concurrent musical events.

That is the primary problem of parallelism, but there is also a secondary problem. Parallel computers are often rather slow; this is one of the best-kept secrets in computing.

'Hang on a minute!' I hear you cry. 'Slow is just what they're not.' In theory you may be right, but in practice the pay-off from increased parallelism has always proved disappointing. In certain specialised tasks parallel machines (like WISARD) perform well, but in many areas they unfortunately lag behind uniprocessor systems.

This is partly due to the fact that like all revolutionaries, designers of novel computers are split into factions. Each research lab is determined to prove that its pet project is the solution to the Von Neumann bottleneck. Consequently, there is no generally accepted design. This in turn means that most parallel machines are one-off jobs, put together with yesterday's technology. Inevitably, they cannot compete in cost/performance terms with mainstream products using the latest components.

Then there is the communications overhead to consider. Systems with multiple processors either share memory or have many processors with private memory sending messages to each other. With a large shared memory there is inevitably competition for access, and this leads to a degradation of performance which gets worse as the number of processors increases.

When each processor has to communicate with the others over a bus or a ring, the scarce resource is the communications channel. Delays arise while processors await responses from their neighbours. Ideally, a computation that takes T time units on a single processor should take T/N time units on a configuration of N processors, but in fact, this only happens with specially devised artificial problems. You will be lucky to find that a multi-processor system reduces the time taken to T/log(N).

There are many familiar instances of such diminishing returns in everyday life. Consider, for example, the rowing eight: a single sculler in the Olympics might take around 7 minutes to row 2000 metres; an eight would do the same distance in 5.75 minutes if they were going well. A 22 per cent increase of speed has been gained at the cost of a 700 per cent increase in effort – 800 per cent if you count the cox! And don't say that counting the cox is unfair: his role is to synchronise and steer the rest of the crew. A similar controller is typically needed in multi-processor machines.

Conclusion

There is a deeper reason for the relative failure of parallelism. Parallel machines have always been more specialised than sequential ones. They are typically optimised for one kind of task, such as signal processing, number-crunching, or database access. It would not be worth doing word processing on a CRAY-X/MP; on a Boltzmann Machine, it would not even be possible. The great thing about digital computers is their flexibility, not their speed. Designers of novel machines tend to forget this and sacrifice too much in the quest of raw computational power, which leads to over-specialisation.

Mankind as a species is a generalist – not very fast, not very strong, not (if the truth be told) very clever, but very adaptable. Until parallel computers can display the same kind of adaptability as their staid and boring conventional brethren, they will only be fit to act as slave processors for a few highly specific applications. That means that the kind of parallelism we will see in computing tomorrow is the 'creeping parallelism' that is already in evidence today; not a revolutionary change to a totally new architecture, but an evolutionary process.

As auxiliary devices (such as floating-point units, video controller chips and frequently-used subroutines embedded in hardware) are introduced on an *ad hoc* basis, the Von Neumann design gradually adapts itself to the needs of the future. In the process, it undermines the position of those who argue for radical change.

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END



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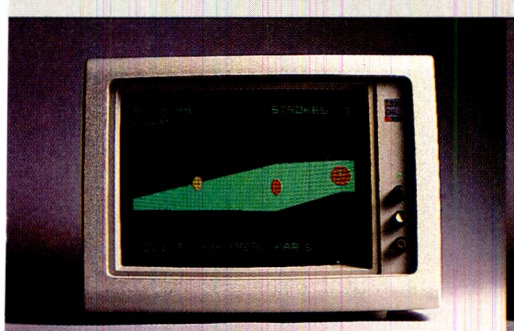

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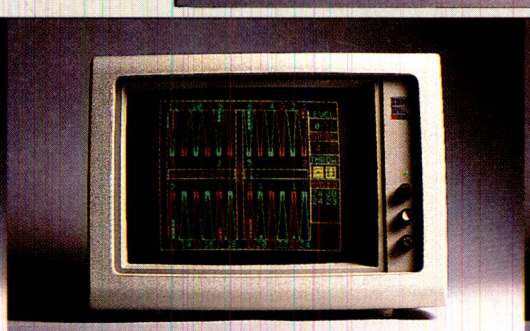

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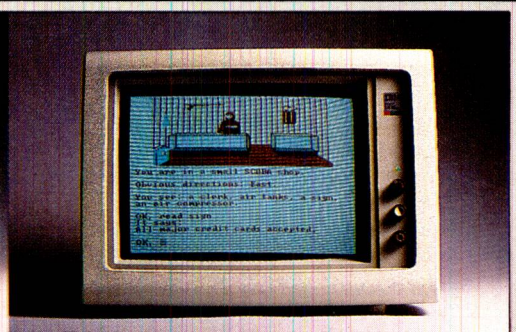

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Making haste

David McKay describes the use of macros in assembler on the BBC Micro, leading to increased versatility and friendliness within your programs.

Users have been singing the praises of the BBC's Basic interpreter for a long time now, but a point that seems to have been missed is how closely the Basic can interact with assembler. The mnemonic assembler is included in the Basic interpreter chip, and this leads to a programming environment with no sacrifices to friendliness or power. One function of this is the ability to develop macros in the assembly program which can generate sections of code as needed.

Code execution

The macro needs each routine to be entered only once, and, although the source code program will be longer than a similar section of code employing subroutines, it will execute faster. The assembly listing will be no longer than usual, and the source code will be easier to follow and to debug. This will make things easier for you, and for others.

Macros also encourage a modular style of program development, with each testable section of program added as it is developed, whether you favour a top-down, bottom-up, or combination style.

Consider the execution of the code generated by the following (incomplete) section of assembler:

```
JSR beep
.rest-of-prog
.
.
.
.beep
LDA #&7
JSR oswrch
RTS
```

As the call to subroutine beep is encountered, the program counter will hold the address which contains the next instruction to be executed. If this is a straightforward 'branchless' flow of execution, then the program counter will increment simply. If we need to jump to the start of a subroutine, the address in the program counter has to be saved, and referenced on return from the routine, to resume program execution from the correct point.

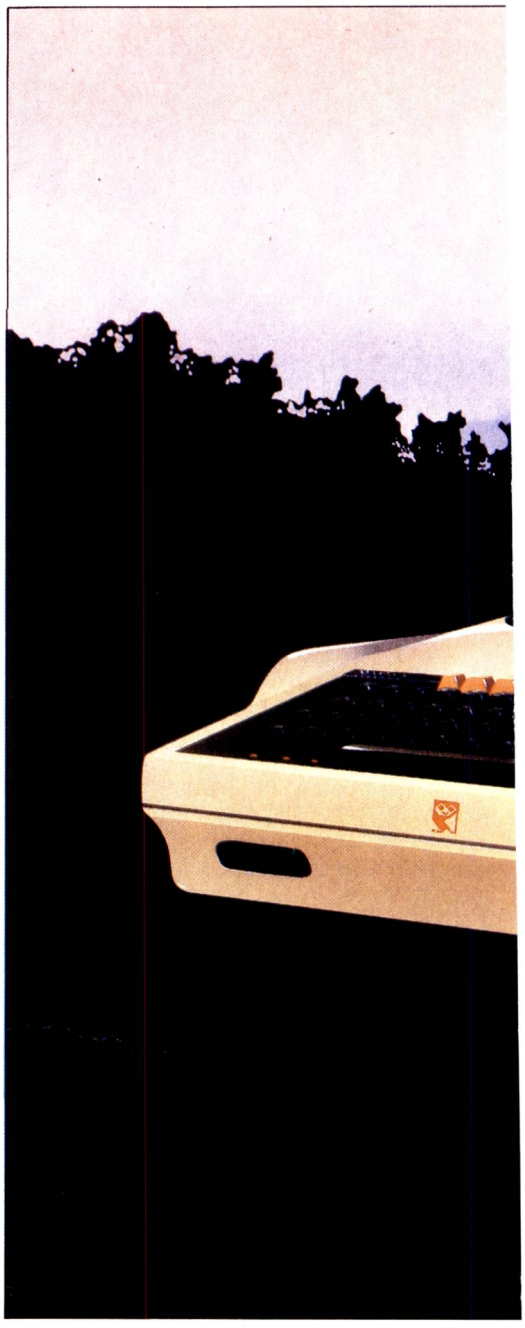
The saved address is held in the stack (page one, &1100-&1FF) as two eight-bit numbers. That is, a 16-bit memory address is held in two bytes, a high byte and a low byte. The high byte goes first, so the low byte is the top of the stack.

The subroutine in the example loads the accumulator with 7 and then 'prints' it, giving a 'beep'. The call to subroutine 'oswrch' will need to have the return address saved in the same manner as the call to beep. The return address from oswrch will be on the top of the stack, and will point inside beep. When it returns to this point the stack register notes the new top of the stack, and the return address from beep is again on top, ready to pass control back to the instruction after the calling JSR. You can therefore construct nested subroutines.

It would have made more sense to use a JMP to oswrch, and use the RTS in the oswrch routine to return us to the correct address. This would mean that there was no need to include an RTS of our own.

Now for the good news: all this stack manipulation is done for you, by the machine, and you don't need to be aware of it. However, as usual there are complications.

The BBC Micro uses a 6502A processor with a 2MHz clock, a cycle of which takes 0.5 microseconds. The saving and stack manipulation required for the subroutines adds to the execution time, as JSR and RTS take six cycles each, giving an increase of six microseconds for every subroutine call.



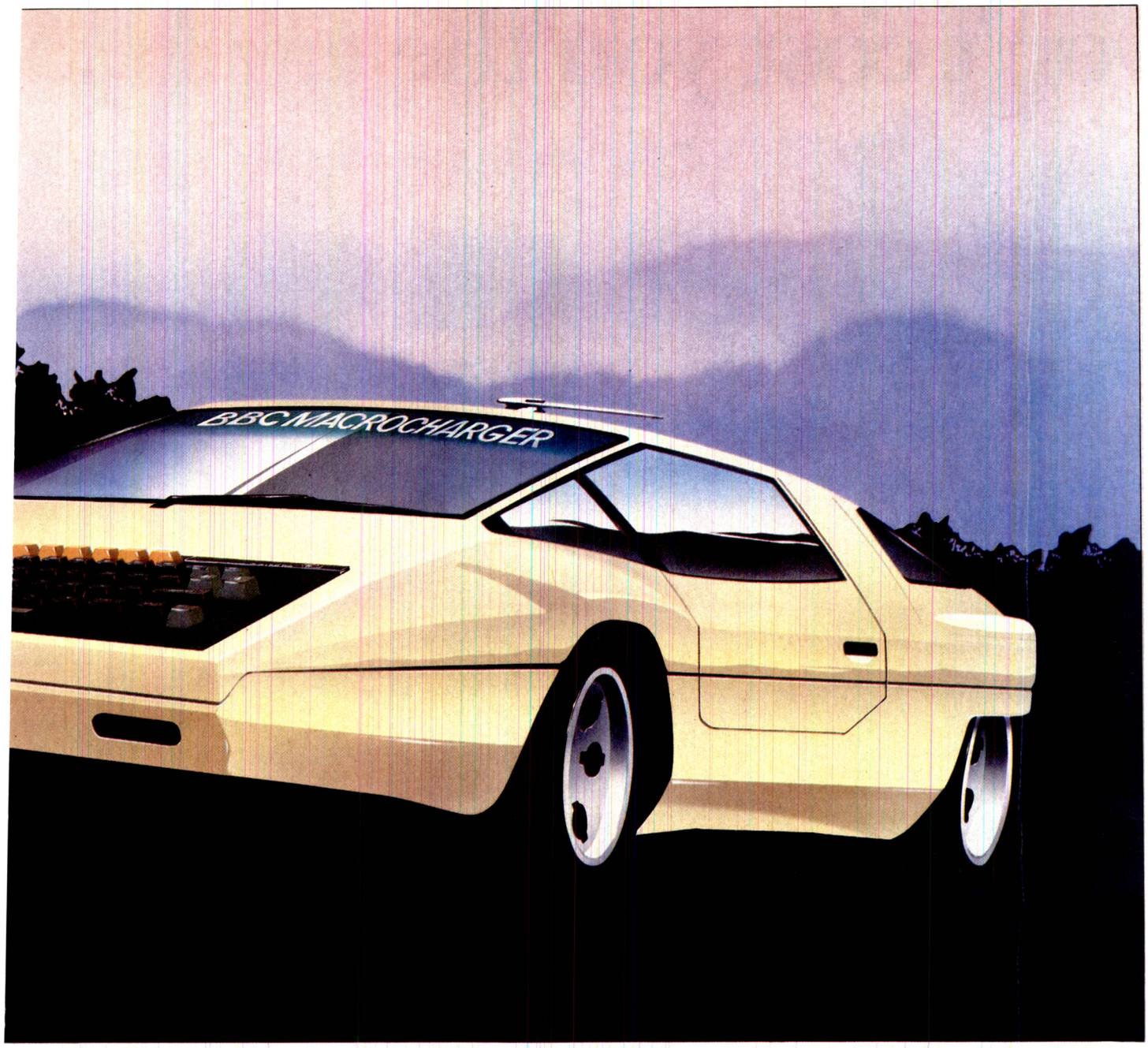
Further, if your subroutine uses the stack for saving registers, it must pull off as many as it pushes on, otherwise the address used as the return from the subroutine will contain a byte which is in fact a saved register, and nasty things will happen.

Speed

If speed is required but you don't want to bother about the number of pushes and pulls you have, or even if you want to use the stack as temporary storage, what can you do? You don't want to have to enter the same portion of code each time you want a certain function, for reasons of keyboard time and idleness, and also due to the length of the assembly listing. Before long you can run into the problems of finding a location at which the source code is to be assembled. Macros are the answer.

Looking at the program in Fig 1, it can be seen that macros are set up with the Basic function facility, FN. These are

Illustration by Peter Kelly/Meiklejohn Illustration



created and set out in the program below the main body of FN calls, in much the same way as all the DEF PROC lines are below the main body of PROC calls in Basic. This program does nothing apart from give a beep and serve as a demonstration of the techniques.

The operation is two-pass assembly, with the number of the pass held in the variable pass. The non-assembling statement, OPT, is used as an assembler directive to set up whether errors are flagged, or if a listing of the assembled code is shown at assembly time. The program here is using OPT 0 the first time round (no errors reported, no listing) and OPT2 the second time (errors reported, no listing).

A function is like a procedure except it returns a value. The value returned by all these functions is pass; the clever part is that between the FN being called and returning this value, a section of code is generated as a matter of course. No calculation is required to find pass, as the FN simply returns the current value to the OPT statement. The difference between a macro and a subroutine is that subroutines are called at run time and macros are called at assembly time.

Run the program, then type in command mode the following:

pass=1 <RETURN>
A=FNbeep <RETURN>

You will see something of the following form:

2012 OPT pass
2012 A9 07 LDA #&7
2014 20 EE FF JSR oswrch

Now type PRINT A and you will get the answer 1, the value of pass at the time the macro was called. Meanwhile, the above section of code has been generated. Note that OPT pass and LDA #&7 share the same memory address, 2012. Of course they cannot do this, and in truth OPT pass is not assembled.

If you change line 50 of Fig 1 to 50 FOR pass=0 TO 1 and run it again, you will see the complete listing, and you will be able to pick out the OPT FN lines and the code generated below them starting with an OPT pass, then the first true operation code. They again appear to

```
 10 REM  Example of simple macros
 20
 30 oswrch=&FFEE
 40
 50 FOR pass=0 TO 2 STEP 2
 60 P%=&2000
 70 [OPT pass
 80 OPT FNsaveres
 90 OPT FNbeep
100 OPT FNrestoreres
110 RTS
120 ]
130 NEXT
140 CALL &2000
150 END
160
170 DEF FNsaveres
180 [OPT pass
190 PHP:PHA:TYA:PHA:TXA:PHA
200 ]:=pass
210
220 DEF FNrestoreres
230 [OPT pass
240 PLA:TAX:PLA:TAY:PLA:PLP
250 ]:=pass
260
270 DEF FNbeep
280 [OPT pass
290 LDA #&7
300 JSR oswrch
310 ]:=pass
```

Fig 1 An example of simple macros

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share the one loction, but in fact only the opcode resides there.

That's how macros work, but how can you beneficially use them for code that requires parameters to be passed?

The program in Fig 2 demonstrates how this can be done, using a rather trivial example. FNdiv(address,no) will emulate the Basic DIV 2 command, on the contents of any given location and location+1 (that is, a 16-bit number). You specify the address and the number of times the value is to be held there to undergo a DIV 2.

```
10 REM Parameter passing in macros
20
30 !&2600=&00550044
40
50 FOR pass=0 TO 1
60 P%=&2500
70 [OPT pass
80 OPT FNdiv(&2600,2)
90 OPT FNdiv(&2602,3)
100 RTS
110 ]
120 NEXT
130
140 CALL &2500
150 PRINT"&44 DIV 4 = ";?&2600
160 PRINT"&55 DIV 8 = ";?&2602
170 END
180
190 DEF FNdiv(address,no)
200 FOR bit_move=1 TO no
210 [OPT pass:LSR address+1:ROR address:]
220 NEXT bit_move
230 =pass
```

Fig 2 Simple parameter passing

The value of pass is set to give a listing on the second pass, and you will see two lots of instructions generated by the first call and three sets of instructions generated by the second.

A nicer way to do things is to have 'conditional assembly' macros. Consider the following macro which will rotate a pair of locations, either right or left, a set number of times.

```
400 DE FNrotate(address,direct,no)
410 FOR bit_move=1 TO no
420 IF direct [OPT pass:LSR address+1:
    ROR address:] ELSE [OPT pass:ASL
    address: ROL address+1:]
430 NEXT bit_move
440 =pass
```

You specify the address and number of times to rotate as before, but you also specify the direction by typing −1 or 0 (or TRUE or FALSE) as the middle parameter. −1 (TRUE) will rotate right, 0 (FALSE) will rotate left.

Labels

More care must be taken when the macros become more complicated, such as those which contain internal loops as in the program in Fig 3, which is a demonstration of the constraints placed upon the use of labels. Labels in assembler follow the same rules of legality as normal Basic variable names, as they are treated in the same manner (they are, in fact, one and the same). A label in assembler is given the value of the address of the memory location it represents. If a macro names a location '.title', for example, then is called again and names another location '.title', problems occur when you try to assemble with forward referencing. Take this macro:

```
270 DEF FNtext(label)
280 [OPT pass
290 LDX #&O
300 .loop
310 LDA label, X
320 BEQ done
330 INX
340 JSR osasci
350 JMP loop
360 .done
370 ]:=pass
```

When the assembler tries to assemble an instruction telling it to jump or branch forward to a label, it won't know how far in bytes that jump needs to be until it has encountered that label in the assembly program. To do this, it needs to be able to pass through the whole lot twice and note the unknown jumps, as well as noting the correct number of bytes for each one as it subsequently meets the labels.

During this first pass, incorrect values are used for the time being. During the second pass through the program, it substitutes the correct values for the incorrect ones. In other words, at the end of the second pass, all the variables have been updated to their new, correct values.

```
10 REM M.LABELS
20
30 DIM loop(5),done(5)
40 osasci=&FFE3
50
60 FOR pass=0 TO 2 STEP 2
70 P%=&2500
80 [OPT pass
90 OPT FNtext(text1,1)
100 OPT FNtext(text2,2)
110 OPT FNtext(text3,3)
120 RTS
130 .text1
140 EQUS "My first....."+CHR$&D
150 EQUB &0
160 .text2
170 EQUS "My last....."+CHR$&D
180 EQUB &0
190 .text3
200 EQUS "My everything."+CHR$&D
210 EQUB &0
220 ]
230 NEXT
240 CALL &2500:END
250
260 DEF FNtext(label,no)
270 [OPT pass
280 LDX #&0
290 .loop(no)
300 LDA label,X
310 BEQ done(no)
320 INX
330 JSR osasci
340 JMP loop(no)
350 .done(no)
360 ]:=pass
```

Fig 3 A demonstration of the usage of labels

However, if the macro is called several times and a label is used several times, for example the label '.done', all occurrences of that label will be given the value it had during the last macro call. This is due to the one label of all the locations only holding one value, and this will have been updated to the final correct value. Code generated by the first call to the macro would exit to the code after that generated by the last call, which is where the incorrect value placed in .done would point to.

To overcome this, the labels are set up in an array that has as many elements as there are going to be calls to that macro. Fig 3 dimensions arrays 'loop' and 'done' to six elements each (0-5), although the program only needs three in this instance.

With the number of the call specified in the parameters passed to the macro, the labels used will be of the form loop(1), done(3), and so on. As they are different names they will have different and independent values given to them, so the program assembles correctly and the code executes according to plan.

Conclusion

It is to be hoped that the article and the examples presented have whetted readers' appetites, and shown the implications of this style (if not direct applications).

The shortening of execution times is not likely to inspire newcomers to 6502 to adopt the macro into their repertoire, but perhaps the other advantages, such as easy-to-read code and the modular format, will attract them. A library of macros *SPOOLed on disk or tape would facilitate quick and reliable program development.

I look forward to seeing other macros in *PCW*'s 'TJ's Workshop' or the 'Program File' pages. END



'Hey, you know this would make a great micro game!'

Artificial Stupidity

Bryan Baker explores the ultimate in computer garbage.

The preview copy of a new software system, Cacophony, has arrived and all my peripherals are tingling with excitement. Its creators say it's 'the most important advance in information technology since notched sticks'. They're too modest: Cacophony is the most important advance since fingers and toes.

Wordherder

The most conventional part of Cacophony is its word massage module, Wordherder. This does all the usual editing tricks, and features WYGIWYG (What You Get Is What You Get). Need to know exactly how your document will look when printed? Just print it and look at it!

Naturally, Wordherder can handle those pesky typos. Spellmeister, the strictest spelling checker available outside the Iron Curtain, won't let you enter a misspelled word. If you try to enter the same misspelling twice, Spellmeister delivers a mild electric shock. The word-whipping package also features Slangbang, the subroutine that seeks out and destroys vulgar usages.

Some of today's advanced word processors include a style checker, which can locate well-known, time-honoured hackneyed phrases and replace them with a variety of ultranew computer-generated alternatives. With these, you can have tomorrow's cliches today. Wordherder has something more useful, Tritewrite, which takes complicated and subtle metaphors and reduces them to easily understood cliches.

Alternate Brain

Word processing is just the beginning of Cacophony's talents. The next part of the package is Alternate Brain. More than a database diddler, more than an 'ideas processor', Alternate Brain is the first concept management program. It takes your idle thoughts, whims, daydreams and empty japes, and collates, coddles, cross-links, incubates, re-interprets and transforms them into luminous *concepts*. Finally, depending on the hardware available, it will print out these concepts, save them to disk, or make them into feature-length films.

One drawback of similar, primitive thought processors is that they tend to point out illogic, inconsistencies and non-sequiturs that most of us would just as soon not know about. The seventh-generation Cacophony system can either obfuscate or totally eliminate these embarrassments at the touch of a button.

This attribute, known in the industry as Artificial Stupidity (AS), will do much more than the highly touted Artificial Intelligence to make computers function in the complex realms of human thought. Artificial Stupidity makes your computer a useful friend rather than a dangerous sceptic.

Yesman/Yesbut

Potentially the most useful spin-off of Artificial Stupidity is Yesman, a Cacophony program that takes your concepts (generated by Alternate Brain) and renders them indistinguishable from your boss's. In file-update mode, Yesman will automatically search previous concepts and delete any evidence that you ever disagreed. At last, a program so smart it knows when not to be.

The most sophisticated version of Yesman, known as Yesbut, can handle employers who don't trust toadies, yet will not tolerate disagreement beyond a certain threshold. Yesbut enables you, by answering a few simple questions, to determine your boss's threshold and stay just below it.

Yesman and Yesbut will soon be an important part of every executive's safety equipment. For those who prefer rapid advancement over job safety, Yesman and Yesbut can, of course, ignore your immediate boss and concentrate on agreeing with *his* boss or, for the truly daring, his boss's boss.

Forgon

Expecially exciting is the application of Artificial Stupidity to so-called expert systems. Up to now, these programs have used Artificial Intelligence to emulate the ability of highly-paid professional experts to analyse masses of data, apply their specialised knowledge, and arrive at an expert judgement. This seems logical enough, but ignores a crucial element of the expertise of doctors, solicitors, and other professionals, most easily illustrated by real-life examples.

When a doctor examines a patient to determine which disease may be at work, he can't simply rely on history, symptoms, and test results. He has to know what kind of disease his patient can afford.

A solicitor, in representing his client, cannot simply look at the law and the evidence to sift out the objective truth; he must isolate that portion which supports his client's version. And, as with medical expertise, there is the question of how much justice a client can afford.

Or take engineers, often called upon in this technological age to provide expert opinions. This might mean assuring the local planning committee that the proposed Riverdale housing estate will never flood, or it could be assuring the authorities that a proposed nuclear power plant will run forever. In any case, a busy expert often does not have the time to produce data in support of his client's case. Finding the right data might take years; in what the experts themselves call 'worst-case scenarios', such data might be impossible to produce under any known system of physics or metaphysics.

What do these human experts have in common? They all keep the range of desired conclusions firmly in mind before, during, and after applying their expertise. To produce useful results on a timely basis, they must develop sophisticated analytical systems; systems which, given any credible set of data, will produce the desired result, and do it with leaps and flourishes too rapid for the non-expert to follow.

It is precisely this expert function that computers, even artificially intelligent fifth-generation computers, have

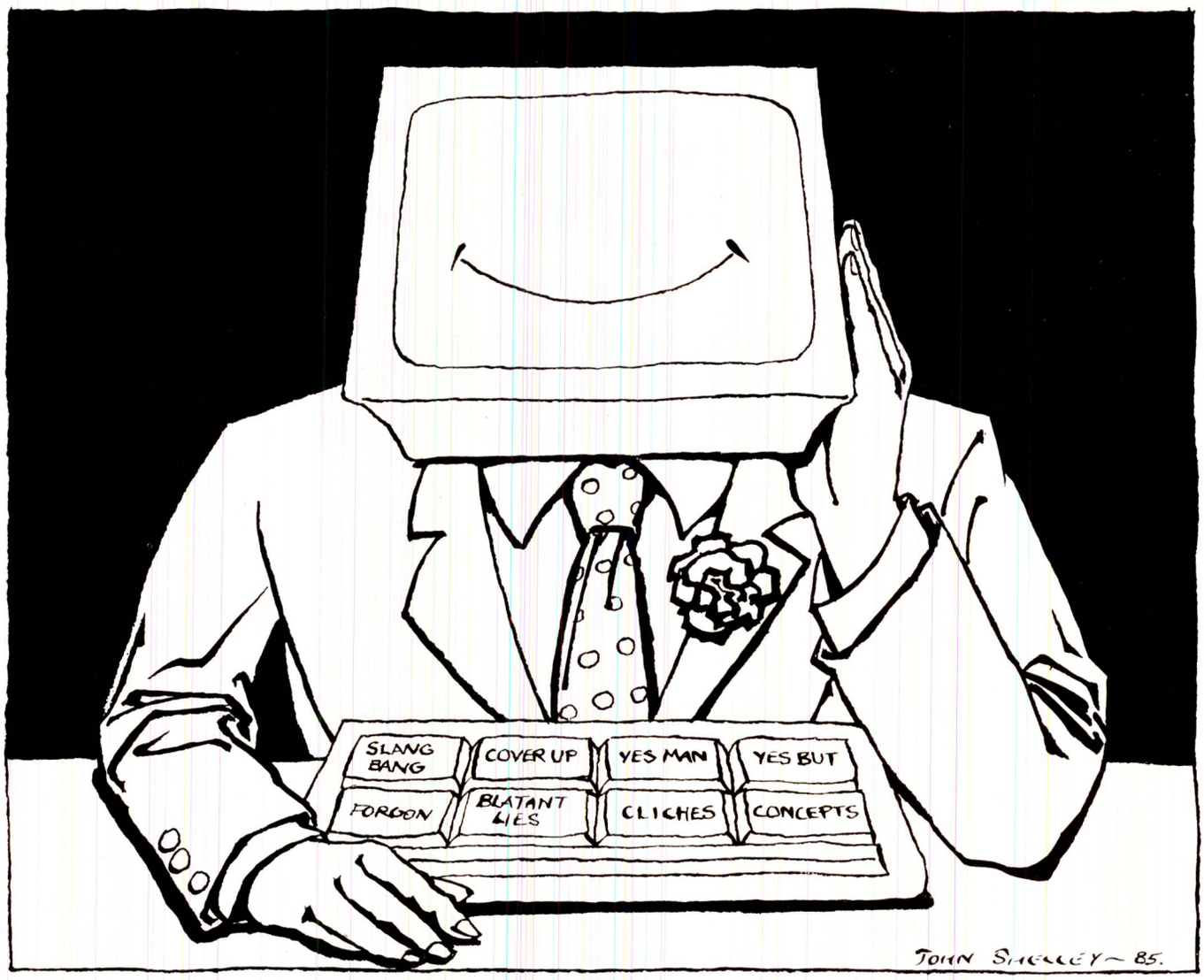


Illustration by John Shelley

heretofore been totally lacking. They are simply too literal-minded, too inflexible, too logical to emulate a human expert's generation of desired conclusions.

Even the few expert programs which attempt to perform conclusion-dependent analysis do it badly. These are the sixth-generation programs, which exhibit Artificial Dishonesty (AD). The subterfuge is clumsy, the manipulations obvious, each leap of faith a bit too unbelievable. These programs are the software equivalent of the 'accidental' erasure of the Watergate tapes. Any idiot can see the trickery: there is always the danger that even a planning authority might spot it. Nothing could be further from the performance of the human expert, where the result is always inherent in the method but never appears so.

With seventh-generation Forgon, a credible expert system is at last available. Forgon realises the fullest potential of Artificial Stupidity, ensuring that the smearing over and outright excision of unpleasant contradictions is carried out subtly and believably.

You might think Forgon is nothing more than Yesman with a different name and a higher price, but you would be wrong. So wrong, in fact, that if you were to put such a thought in writing, the good folks at Cacophony would be forced to alert their expert lawyer system to sue you for libel.

Of course, there are similarities between Forgon and Yesman. Both rely on Artificial Stupidity to function credibly in the executive environment, but where Yesman is one of the best AS *applications*, Forgon provides the first artificially stupid programming *language*.

Forgon includes many commands which could never be executed in primitive 'logical' languages, powerful commands such as:

IF <true> THEN IGNORE

IF <A is not equal to B> THEN DELETE <all reference to A>

WHILE <statement 1> THEN PRETEND <exact opposite of statement 1>

The Forgon language also has user-programmable dynamic true/false toggles: a random optimistic forecast generator; a three-tier scenario filter; and much, much more, all completely conclusion-dependent. Like the advertisement states: 'If it's a Forgon conclusion, you can rely on it.'

The future

Now that the seventh generation of computer systems has been reached, we have machines that can mimic the most sophisticated aspects of human performance. Most software companies would be content with that remarkable achievement.

Not Cacophony. It is already hard at work on the next generation, and planning for the generations to come after — systems that will transcend mere human capabilities. Here's how the company sees the present and the future. (While everyone agrees that AI is the fifth generation, no one seems to know what the first four generations were. It's best to leave them off the list.)

5th Generation — Artificial Intelligence (AI)

6th Generation — Artificial Dishonesty (AD)

7th Generation — Artificial Stupidity (AS)

8th Generation — Artificial Libido (AL)

9th Generation — Artificial Omniscience (AOS)

10th Generation — Artificial Omnipotence (AOP)

Even the folks at Cacophony don't know exactly how these future generations will work: they have only the dimmest vision of how they might transform the work environment of the future. Suffice it to say that the first person in the office to get Artificial Omnipotence up and running won't have to worry any longer whether his concepts agree with the boss's. END

A superior standard?

It is widely acknowledged that the RS232 'standard' leaves a lot to be desired. John Lewis welcomes a new interface standard, the S5/8.

Pin No	Signal Name	Abbreviation	Type
1	Data Input	DINP	Input
2	Signal/Common ground	Ground	Ground
3	Data Output	DOUT	Output
4	Handshake Input	HINP	Input
5	Handshake output	HOUT	Output
6	Subsidiary Input	SINP	Input
7	Subsidiary Output.	SOUT	Output
8	Power Supply - 5 volts	V+	Supply
Sleeve	Protective Earth	Earth	Earth/Ground

Fig 1 Pin connections for S5/8 serial interface

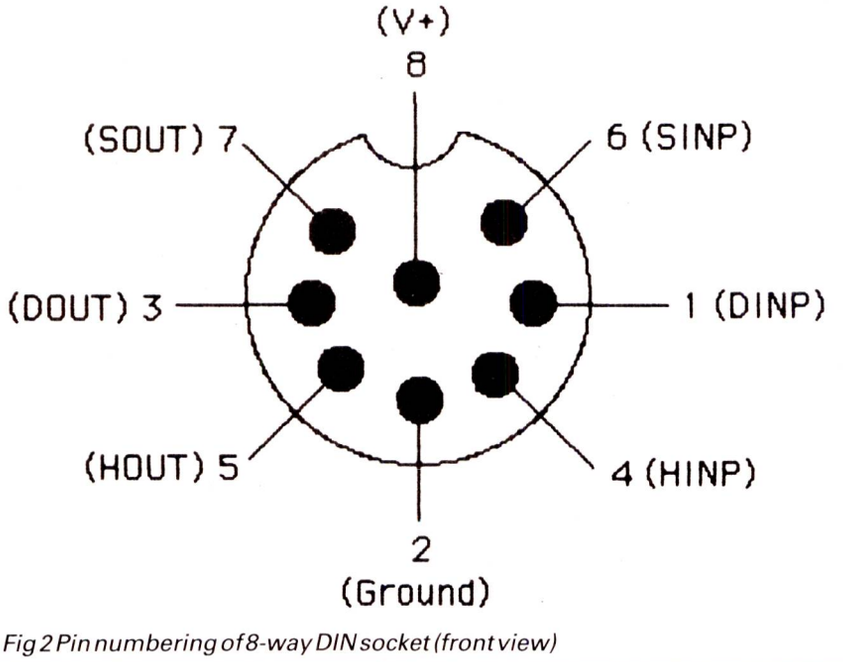


Fig 2 Pin numbering of 8-way DIN socket (front view)

Many of us know the frustration of trying to decide whether a device is DCE (Data Circuit-Terminating Equipment) or DTE (Data Terminal Equipment) and once that has been sorted out, what handshakes are being used: pins 2 and 3 may have to be interchanged as may pins 4 and 5 — and then what about pin 20? Some manufacturers also decide to use some of the designated pins for their own special purposes, with the result that you're never quite sure what signals are on which pins. Other manufacturers, usually for reasons of space and/or cost, decide that a 25-way D-connector is not convenient and use something else — for example, the IBM AT, which has a 9-way D-connector.

For a so-called *standard*, RS232 has so many flavours that one has to treat each case separately. It can also be argued that RS232 itself is an anachronism in that it specifies negative and positive voltages (−12 volts and +12 volts), whereas most computer equipment today is quite happy with TTL (Transistor/Transistor Logic) levels.

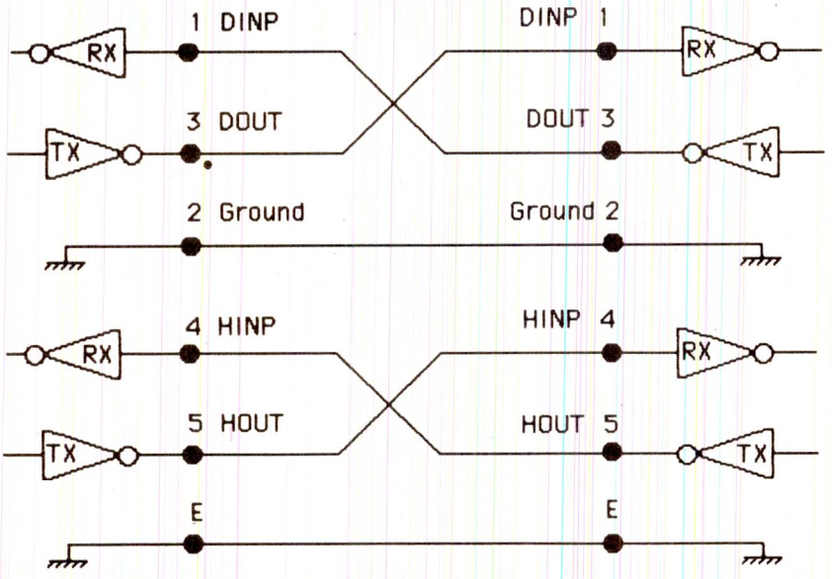


Fig 3a Interconnecting cable for a D to D device

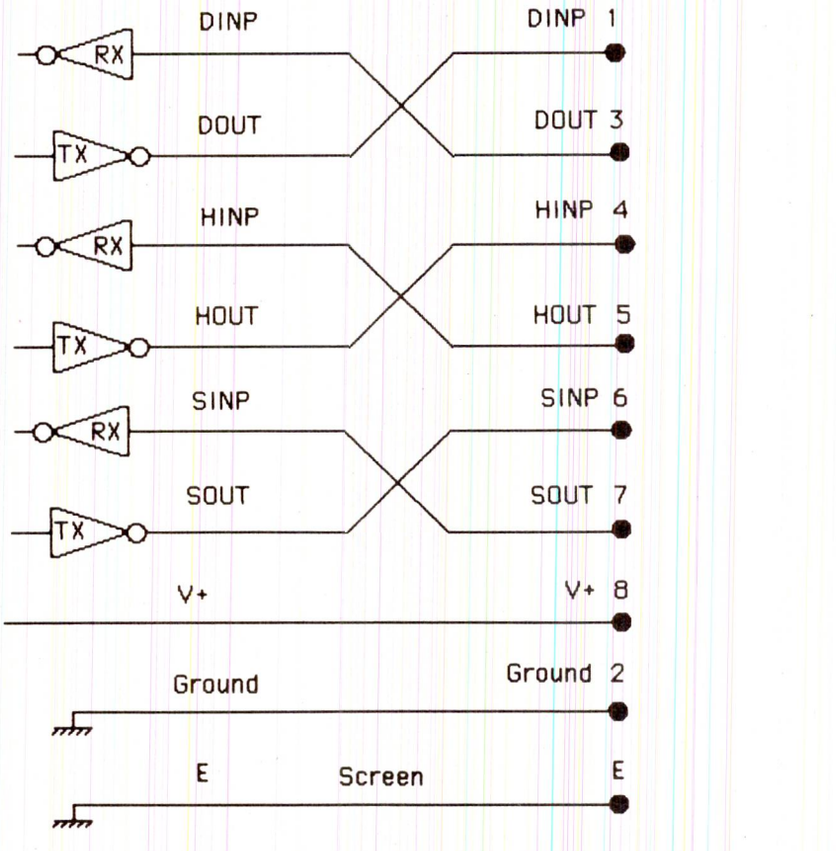


Fig 3b Interconnecting captive cable from an S to D device

A new standard

In the light of this, a Focus Action Group, comprising representatives from the Government Central Computer & Telecommunications Agency (CCTA), British Telecom, the National Health Service and others has proposed a new Public Services Standard known as the 'S5/8'. The S5/8 is named after the voltage levels and number of poles in the connector: **S**erial **5** volt **8** pin. The plugs and sockets used are standard 8 or 5 pin DIN.

This new interface rationalises and simplifies the interconnection of information-processing equipment and, at the same time, reduces the power consumption and space requirements of the interface. It will be of particular importance for portable, battery-operated equipment where size and power are at a premium. In order to reduce the user's setting up procedure, the specification only allows a 9600 baud rate with a 10-bit frame consisting of eight data bits, one start and one stop bit. The specification does not attempt to define the eight data bits in any way except that the least significant bit is assumed to be transmitted first. If required, a frame could be used for XON/XOFF protocols as well as data.

Design

The pin connections for the interface are shown in Fig 1, where it can be seen that there are two data lines, two main handshakes and two subsidiary handshakes, together with a 5-volt power supply and earths. The inputs and outputs refer to the device to which the connector is attached, so to get two devices to 'talk' to each other the relevant wires have to be crossed over — see Fig 3. The main handshaking signals HINP and HOUT control the data flow in such a fashion that a device must not transmit information to a remote device until the remote device's HINP is ON.

Similarly, a remote device cannot transmit data to a device until that device's HOUT is ON. SINP and SOUT are not defined in the standard, and are optional connections which the user can define for other handshaking purposes when connecting to S devices.

Rather than use the DCE/DTE convention, S5/8 defines two classes of device — a D device and an S device. For example, a D device could be a PC whereas an S device might be a printer or modem.

The D device is self-powered, or conceivably unpowered, and able to exchange information with any other device. An S device, on the other hand, is required to draw its power from the D device to which it is connected via the 5-volt line.

The user can easily differentiate between the two classes of device since S devices have their cable permanently attached with an 8-pole plug connector at the end. D devices, on the other hand, are fitted with 8-pin sockets into which you can plug either the connector from an S device or a 5-pin connector to another D device. The reason for using a 5-pin connector to join D devices is that the 5-volt supply is not required and neither are the subsidiary handshaking lines.

The future?

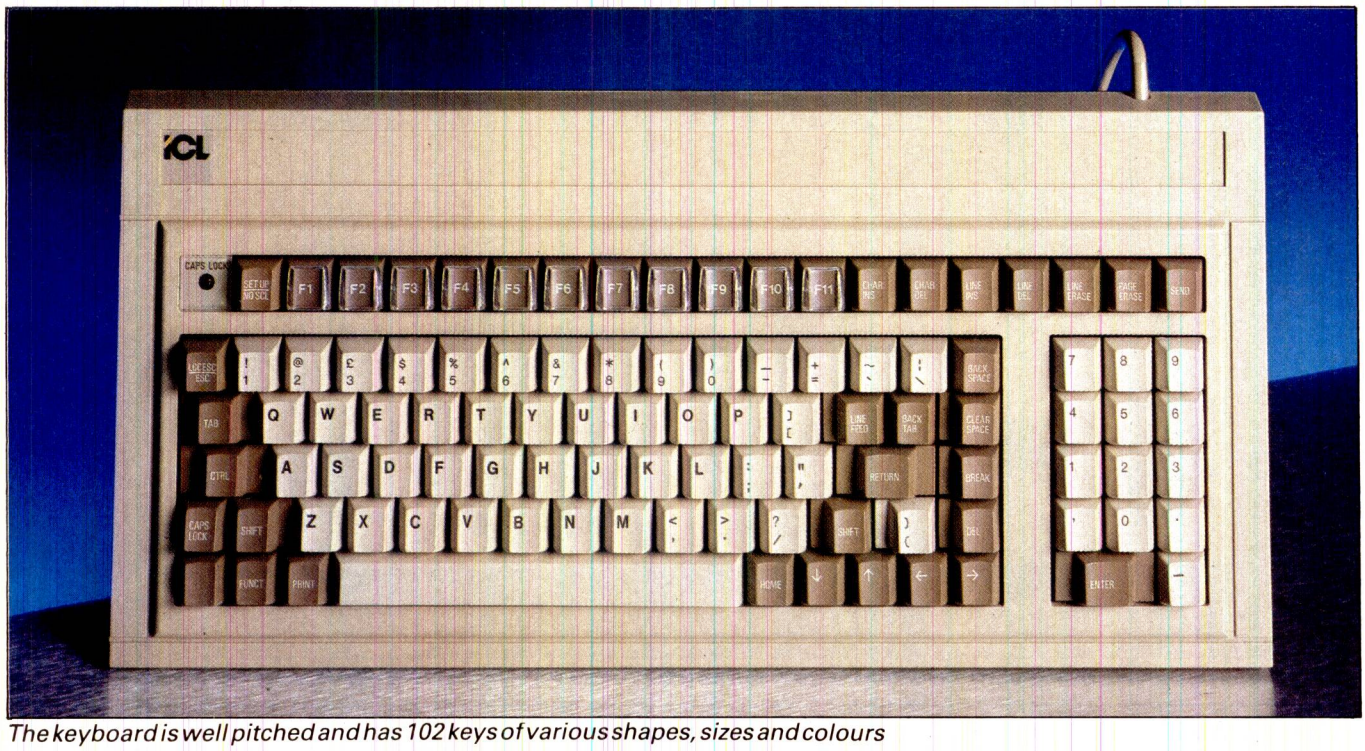
Such an interface could quite easily have wound up like so many other standards — a great idea but not used. However, some UK manufacturers are already committed to it. The new Liberator lap-held word processor from EMI developed for the Civil Service has a S5/8 printer interface fitted. Transam's new modem which works on cellular radio as well as normal telephone lines is fitted with it as, too, is the Challenger micro from Gemini.

However, for all its faults, RS232 is well established, and other standards such as RS423 are in use on the BBC and Apple's Macintosh. In any case, there will inevitably be strong resistance to the introduction of the S5/8 interface from the manufacturers of breakout boxes. **END**

ICL Quattro

The multi-user market is still an open one, with no definitive system as yet. ICL is attempting to fill this gap with the Quattro, a multi-user development of the Rair Black Box. Nick Walker tests its suitability as a small-business alternative to networked stand-alone micros.





The keyboard is well pitched and has 102 keys of various shapes, sizes and colours

With the current interest in networking stand-alone micros, it is all too easy to forget the alternative of purchasing a multi-user system from the onset. By the time you've bought the separate micros and the necessary network cabling and software, the total cost of the system can often come as a shock. If you have to buy a computer system for a small number of users, one of the most attractive propositions — and quite often one of the cheapest — is to go multi-user.

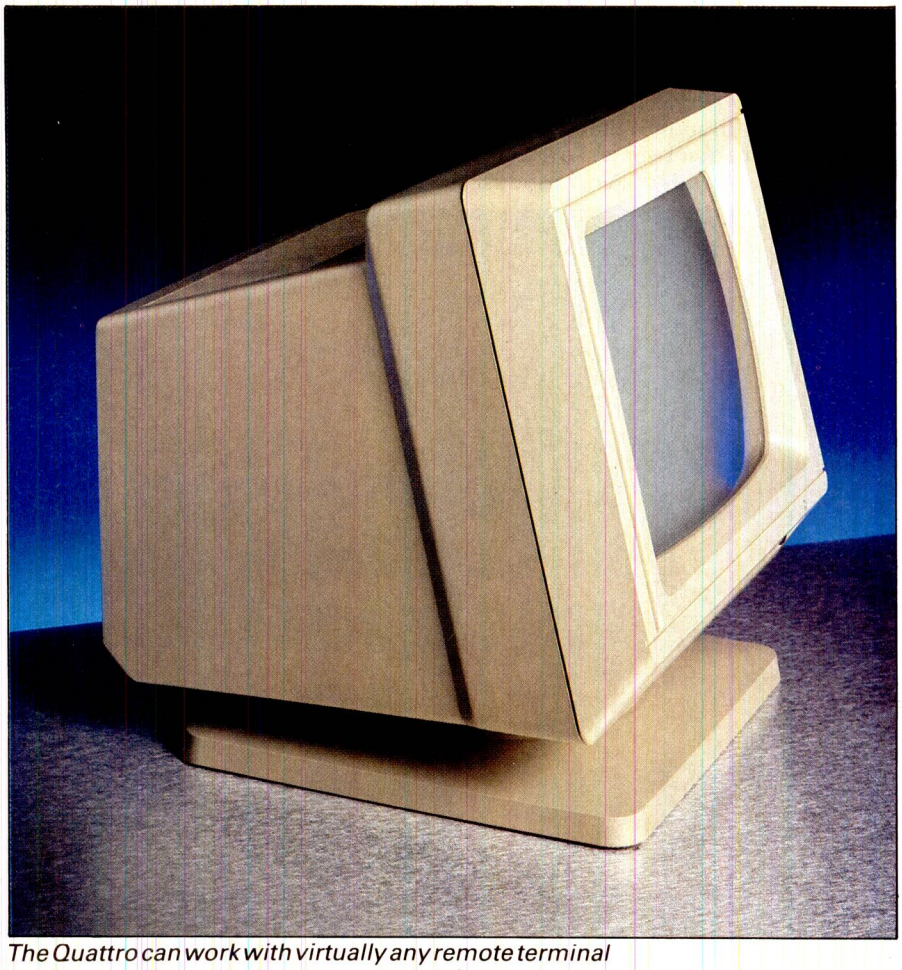
One company that has been in the business of providing small multi-user systems for many years has been our own corporate computing company, ICL. Its latest offering in the multi-user micro field is the Quattro. This machine is a development of earlier ICL PCs, which in turn are developments of the famous Rair Black Box.

The name Quattro didn't strike me as the most original name for a new product. After the success of the similarly-named Audi car and soft drink, I wondered whether ICL had named the machine in the vain hope of achieving the same level of glory. Apparently the machine is named Quattro as it supports up to four users, each user running up to four programs simultaneously. Four by four = Quattro — obvious, really.

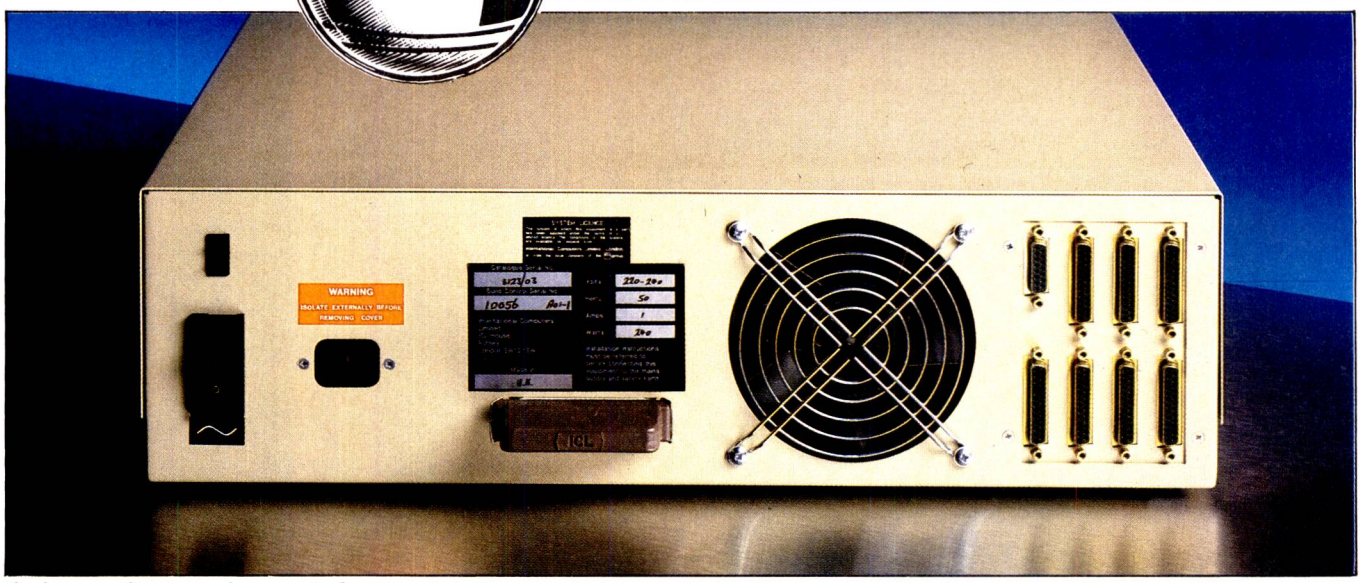
Hardware

As someone who gives a large proportion of desk space to an IBM PC, the ICL Quattro doesn't seem too large to me: the main unit is a large, pale brown box with a footprint slightly larger than the IBM. But it certainly isn't a small box, and although it could at a pinch sit on someone's desk, I certainly wouldn't like to be the one who had both the terminal and the main system box on my desk. The machine would benefit from a table of its own or from standing on its side at the side of a desk, and once it's there you'd be well-advised to keep it there as it weighs over 60lbs.

The front of the machine is plain — the review machine had a single small ICL label in the top left-hand corner, and below this a single green power-on LED. Judging by the literature, there will be a go-faster Quattro sticker on the final production machines. To the right there is a single floppy disk drive and a small black panel that covers the hard disk. The bottom-of-the-range machine, the Model 19, has two floppy disks rather than the one hard, one floppy configuration found on the rest of the range.



The Quattro can work with virtually any remote terminal



An interesting rear view: up to four workstations can be connected

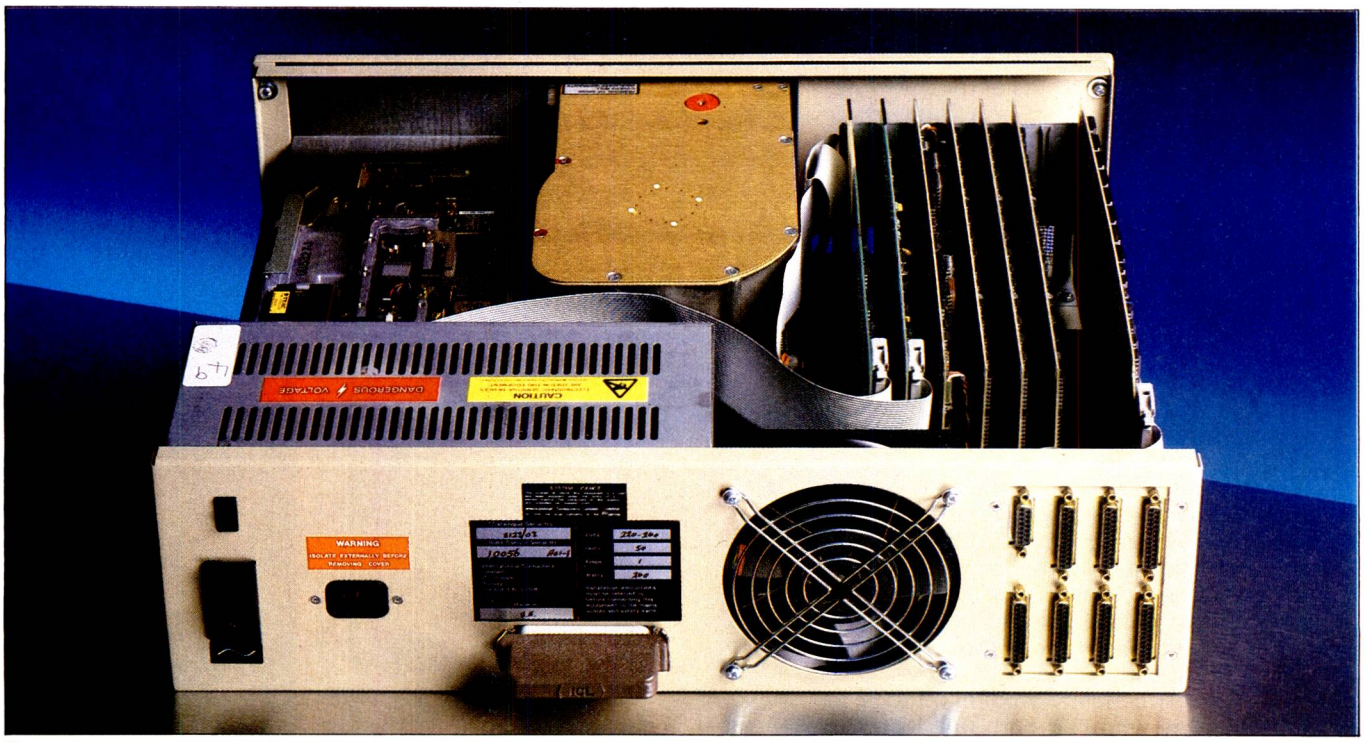
The rear panel is rather more interesting. To the right is a bank of eight ports, consisting of six asynchronous RS232 ports for up to four workstations, leaving the remaining ports free for printers, plotters, modems or any other peripheral you fancy hanging off the back. The other two ports are an RS422 port, allowing you to form a network of Quattros, and an RGB port. This is not for an RGB monitor as you might expect, but for the connection of a video system to create slides, or a projector to show them.

To the left there is a large fan. This is reasonably quiet and went unnoticed in *PCW's* office, although it may prove a little irksome in a quiet office. To the left of this is a non-standard synchronous port to give the necessary links to ICL and even IBM mainframes. At the far left-hand side is the power-in socket, on-off switch and a reset switch.

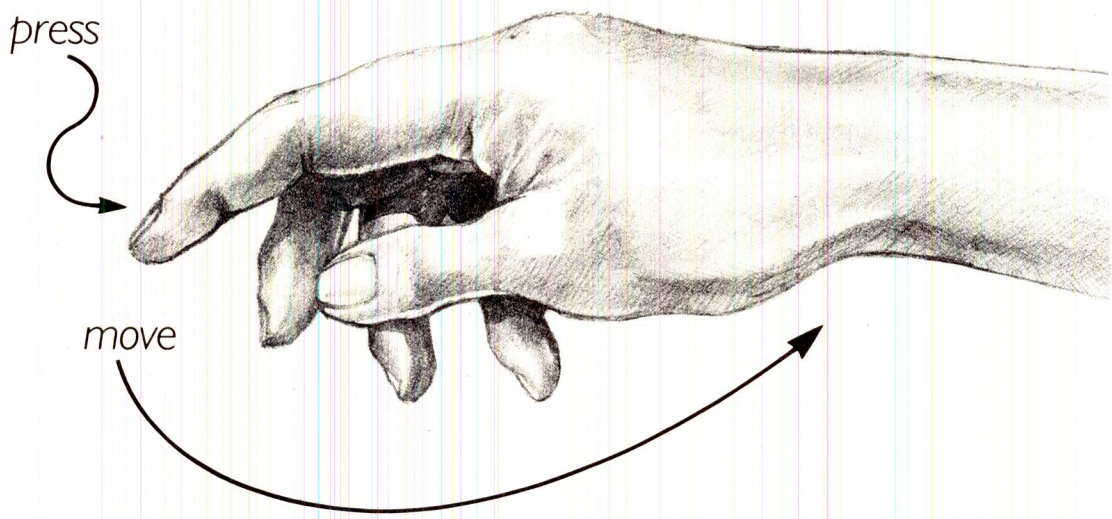
Getting inside the machine is easy — remove four small side screws and the lid slides forward and off. Once inside, a rack of PCBs is revealed to the left, with the hard and floppy disks to the right. To the rear at the right is the power supply.

There is no motherboard inside, just a bus running along the front left-hand corner which contains all the boards necessary to make the thing into a full working computer system. Although many people applaud this kind of open architecture, it does suggest a certain lack of permanence; a quick change of processor board and you have next year's model with the minimum of cost. Among the advantages of this arrangement, however, are the ease of memory expansion and the ability of the machine to accept special-purpose cards should ICL manufacture them.

From left to right the boards are serial I/O, three RAM cards, one processor and ROM card, a floppy disk drive controller and a card containing some miscellaneous hard disk circuitry (not a hard disk controller). The Quattro's processor is an 80862, Intel's go-faster version of the 16-bit 8086 being driven at its limit of 8MHz. On the review machine this was complemented by a 8087 maths co-processor, which is optional on the retail machine. Other than this there are a couple of ROMs and



There is no motherboard — which has its advantages



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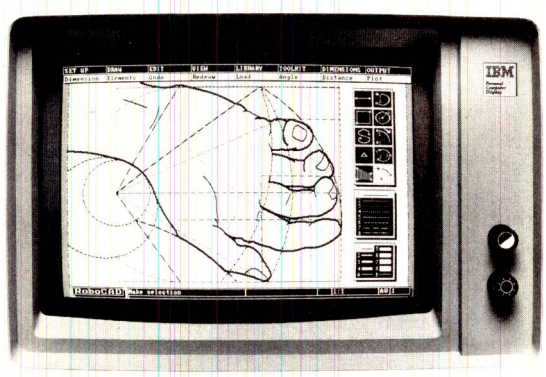

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the usual TTL circuitry found on any processor board.

The floppy disk controller card betrays the machine's origins and age, being labelled 'Rair 1981'. ICL claims that this shows how good the original Rair Black Box floppy disk controller was, but I'm not convinced. Surely floppy disk technology must have advanced a little in the last four years.

Next to the floppy disk controller is a card that I originally believed to be a hard disk controller, but on closer examination it turned out to be no more than a few TTL chips with a cable connected to the hard disk. In fact, the hard disk control circuitry is in two PCBs under the physical hard disk. The three RAM cards are nothing very exciting, being based on 64k × 1-bit DRAM chips and each offering a total of 256k, with the maximum of four cards equalling the physical addressing limit of 1Mbyte. The serial I/O board is the most densely packed, containing all the necessary circuitry to drive the aforementioned bank of I/O ports.

The Quattro is supplied in three models, labelled Model 19, Model 39 and Model 49, with the main difference between each being the disk drive configuration. The bottom-of-the-range Model 19 has 256k RAM and two 800k floppy disk drives: the Model 39 and Model 49 have 512k RAM, one 800k floppy and 10Mbytes or 20Mbytes 5¼in hard disks respectively. The review machine, a Model 49, had a Rodime, 20Mbytes hard disk which was rather slow compared with other hard disks, but according to ICL this is the price you pay for maximum reliability. The drive behaved faultlessly during the review, so it may have a point.

The Quattro can be made to work with virtually any remote terminal. Two terminals are recommended by ICL, and were supplied with the review machine. The first of these has the snappy title of The 6402G Monochrome Workstation. It reminded me very much of the kind of terminal you find connected to large mainframes, being both large and ugly and yet of undeniably high quality. The second terminal recommended by ICL is The 6404CG Colour Graphics Workstation, and is even larger and uglier than its monochrome brother. Both terminals are almost identical in terms of function, keyboard and external ports, with the colour version offering eight colours when in graphics mode.

The keyboards have 102 keys of various shapes, sizes and colours. All the keys are full-stroke and the keyboard is well-pitched, but if that isn't enough you can flip down two bars at the rear to increase the typing angle.

The main qwerty area occupies most of the space, with a numeric keypad to the right; both are coloured a similar light brown to the terminal casing. Surrounding these in a much darker brown is a host of control and function keys. At the very top of the keyboard is one long row of 11 function keys, seven text processing keys and a single key marked 'Set-up'. Pressing this key will take you into a terminal set-up screen from which you can configure the terminal for connection to any computer system.

In terms of display quality there is little to criticise with these ICL terminals. Apparently there was a fault with the review machine's monochrome screen display, but it's still one of the best I've seen. Both terminals are capable of a graphic resolution of 640 × 400 pixels with the appropriate software loaded, and both terminals could be tilted and swivelled into a comfortable operating position. At the rear of the terminals are two sockets, one for connection to the host system and a second for the connection of a printer. This second socket can also accommodate ICL's mouse, and a number of applications have been customised to use this feature. Overall, I liked the operation of these ICL terminals; it's just a shame they look so awful.

Four printers are sold by ICL for use with the Quattro: a dot-matrix, a daisywheel, a colour thermal printer and a printer/plotter. All the printers are re-badged proprietary makes, and the one supplied with the review machine was a thinly-disguised Oki-mate 20 — a tiny home computer colour thermal printer and not really the kind of thing you'd expect with a multi-user business system.

System software

The ICL Quattro, after initial configuration, will boot automatically into its operating system which is Concurrent CP/M-86 (reviewed in *PCW*, June 84). Switch on the machine and the terminal connected to serial port 0 will be covered in spurious junk as the machine goes through numerous self-tests. Eventually the screen clears and you are left with a copyright message from Digital Research and the infamous A> prompt.

Concurrent CP/M, now called Concurrent DOS, was introduced as Digital Research's answer to Microsoft's domination of the 16-bit operating systems market. As the name suggests, with Concurrent you can perform a number of tasks simultaneously and switch between them as required with the background tasks still running.

The version of Concurrent on the ICL had not only to be multi-tasking but also multi-user, and it's interesting to see how this problem has been tackled on the Quattro. With a single-user system Concurrent provides four virtual consoles, and switching between them is done by pressing a suitable function key followed by either 0, 1, 2, or 3. Concurrent on the Quattro controls a total of 16 consoles simultaneously, and allocates four to each user, so one user has tasks 0, 1, 2 and 3, the second user has tasks 4, 5, 6 and 7, and so on. This sounds all right until you realise that tasks higher than 9 are numbered in hexadecimal so that the third user has tasks 8, 9, A and B, and if you're unfortunate enough to be the fourth user on the system you'll be lumbered with tasks C, D, E and F.

Having accepted the slightly perverse numbering of the Concurrent tasks, the system performs well. It does seem a little old-fashioned, with each task occupying a full screen (I'm a great fan of windowing systems used in conjunction with multi-tasking). I don't expect that many users will be using all four terminals with each terminal running four tasks, and it's just as well. The system slows considerably at approximately six tasks unless they are all using different resources. The main bottleneck seems to be accessing the hard disk, as two disk-intensive tasks really slow the system. I suggest that the system be run with four users only if all the applications are fairly light in terms of computing power required. With intensive use such as program development, the machine would probably be better suited to two users at a time. Don't be fooled by the Benchmarks, as these were taken with nothing else running on the system.

Concurrent DOS version 3.1 is supposed to support a PC mode, giving some compatibility with IBM PC software, but sadly this was missing from the Quattro's version (also supposedly version 3.1). This is a great shame, as it would have made the machine somewhat more desirable. All that's left of the PC mode on the Quattro is a utility that allows the floppy disk drive to read IBM PC disks, giving data file compatibility — I suppose it's something.

A number of extra features are included as part of the system software, increasing its usability as a multi-user system. The first of these is a RAM disk facility. Any amount of RAM, from 18k to 764k, can be set aside to act as a RAM

Benchmarks

BM1	0.7
BM2	2.2
BM3	4.9
BM4	5.0
BM5	5.9
BM6	10.9
BM7	15.7
BM8	17.6
Average	7.8

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January 1985 issue.

When you think about how personal computers are actually used, you'll see why Xchange is the ideal office software

In our experience, most personal computer systems are acquired in a rather odd way.

People can spend months deliberating about what hardware to get, only to rush into buying often inappropriate software. They soon learn the hard way that without the right programs a computer is about as useful as an engine without petrol.

So how should you choose software for your office computer?

You could opt for the old favourites. The big drawback is that the software, being a good many years old, is relatively crude by today's advanced standards.

Or you could go for one of the new American 'integrated' programs. The problem here is rather different. Having been developed mainly with the financial executive in mind, they are not designed to handle the large files and big databases required by a busy office.

In practice, the two most heavily used functions in an office are word processing and database management. And that's exactly why the Xchange suite of programs contains both a sophisticated word processor (Xchange Quill) as well as one of the most advanced database programs (Xchange Archive) yet developed. Which Computer? recently named Xchange Archive as its "best buy" database program against such competition as dBASE III*, Delta* and Smart*. The other two programs in the Xchange suite provide excellent financial modelling and business graphics features.

As a result, Xchange can transform a personal computer into a highly efficient office workhorse, capable of providing every member of your staff with the facilities they need.

All four programs (which can be bought separately or as a complete set) have been designed to link together to form an integrated system. This allows you, for instance, to jump from job to job at the press of a key, and to exchange information between programs.

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The full version of Xchange costs £495. As individual programs, Quill, Abacus and Easel £175, Archive £250 (excl. VAT).

PCW/12/85

disk. I'm not a fan of RAM disks; it worries me to think of all that heavily-processed information sitting volatile in RAM. A RAM disk on multi-user systems, however, means that the system can be configured to spread the load more evenly over a number of resources.

The second and most useful facility is a print spooler. With four users, it's quite possible that they will need to use the printer simultaneously. The spooler system will take each request for printing and form a queue of files to be printed, leaving the users free to perform other tasks.

Taking me back to my college days, when I used an ICL mainframe, was the 'Help' facility. One enormous file on disk contains online help on practically every aspect of the system. Typing HELP followed by whatever you're having trouble with results in a few screens of help information — 90 per cent of the time. If you are unfortunate enough not to be able to specify the thing you are having trouble with, typing HELP alone will lead you into a menu of subjects, each leading to sub-menus and finally to the relevant text. All in all, a very useful facility.

An equally enormous file is the Learn file; typing LEARN from the A> prompt will take you into a giant online Quattro tutorial. Potential users should ideally run through this, but, be warned, it takes over 10 hours to complete but only half an hour to become bored with its tedious technical style.

Applications software

The use of Concurrent DOS means that a wide range of software is readily available, albeit not quite the wealth of software that is available for the 8-bit version of CP/M. The majority of the business packages that run on the IBM PC and its clones started life as CP/M software, so you will have no difficulty obtaining such classics as WordStar, dBaseII or Lotus 1-2-3, but you won't find some of the more modern packages such as Framework, Symphony or dBaseIII. As you would expect, Concurrent DOS runs all applications written for its single-tasking brother, CP/M-86.

It's good to see ICL actively persuading software manufacturers to customise applications to run on the Quattro. On the review machine, WordStar, GSX Graphics and DR Draw were thus customised to take advantage of the Quattro's facilities. No applications software is bundled with the machine, but a software catalogue is provided which lists hundreds of applications that can be run on the Quattro.

Documentation

Open the box containing your new, shiny ICL Quattro and you'll be greeted with an enormous sheet of card informing you in big, easy-to-read letters how to set up the machine, complete with a colour illustration showing you where to plug in the cables. It's a laudable attempt to persuade users to read the documentation before connecting the bits together, but even so it did seem rather comical.

There are also two manuals in a ring-bound binder — an introductory manual and a reference manual. Between the two of them they manage to exclude all that's important and give you very little information about the system. The front of the reference manual recommends further reading. I'd recommend that you at least read the *Concurrent 3.1 Operating System User Guide* or you'll soon find yourself lost.

Two further books are included: a useful paperback which lists applications that run on the Quattro, with a short introduction to the operation of each: and ICL's *Executive Guide to Personal Computing*. The latter is quite pitiful. I realise that it's aimed at non-computer types, but I get very worried when I read that ICL thinks that micros might be catching on and that it sees the Quattro as pitched somewhere between a Macintosh and an IBM PC. Oh dear, ICL: not very impressive.

Prices

The Quattro pricing shows no real desire to be competitive, but it isn't as ludicrous as the pricing of previous ICL PCs. The Model 19 (256k RAM, two floppy disk drives) sells for £2195; the Model 39 with 512k RAM, one 10Mbytes hard disk and one floppy costs £4395; and the top-of-the-range Model 49 with a 20Mbytes disk, one floppy and 512k RAM is £4995.

Monitor prices are rather frightening to micro users: the 6403G monochrome with mouse costs £899, and the colour version of the same model is £1399.

Conclusion

The market for multi-user micros is still very much an open market, with no definite trends at the moment. With an innovative product ICL might have been able to capture some of this market. Sadly the Quattro is not such a product, being little more than yet another development of the Rair Black Box using some of the rarer Rair boards.

Despite ICL's efforts to persuade me that the Quattro will sell to small businesses which would alternatively be considering a number of stand-alone micros, I can't really see it. The Quattro will take its place with previous ICL PCs, selling to corporate buyers who already use ICL mainframes. It's particularly disappointing given that the Quattro is being pushed as the machine with lots of ICL in-house innovation. END

Technical specifications (Model 49)

Processor:	Intel 8086-2 running at 8MHz
RAM:	512k
ROM:	40k
Mass storage:	One 5.25 20Mbytes hard disk; one 5.25 800k floppy disk drive
Size:	20ins × 15ins × 5ins
Weight:	65lbs
I/O:	Six RS232 serial ports, one custom asynchronous port, one RS422 port, one RGB port
DOS:	Concurrent CP/M version 3.1
Bundled software:	None
Peripherals:	Numerous ICL monitors, printers and so on
Options:	RAM expansion up to 1Mbyte, second 20Mbytes hard disk

In perspective

Assuming that you've made the decision to go for a multi-user system as opposed to networking stand-alone micros, a number of systems are worth considering. For example, the Viasyn 10 (formerly the CompuPro 10) runs Concurrent DOS and offers similar but somewhat better facilities for less cost.

Alternatively you may consider the current offering from IBM, and hence numerous clone manufacturers, the PC/AT. Its key advantage is the current level of support from software houses, now far exceeding CP/M. My current favourite in this field is the North Star Dimension, as it is the machine most able to cope with multiple users and still offer a high level of IBM PC compatibility.

If a high-performance multi-user system is your aim with less regard for compatibility — for example, for use in software development, machines such as the TDI Pinnacle blow the socks off the Quattro or PC/AT in terms of performance.

Four printers you can forget about two years running.



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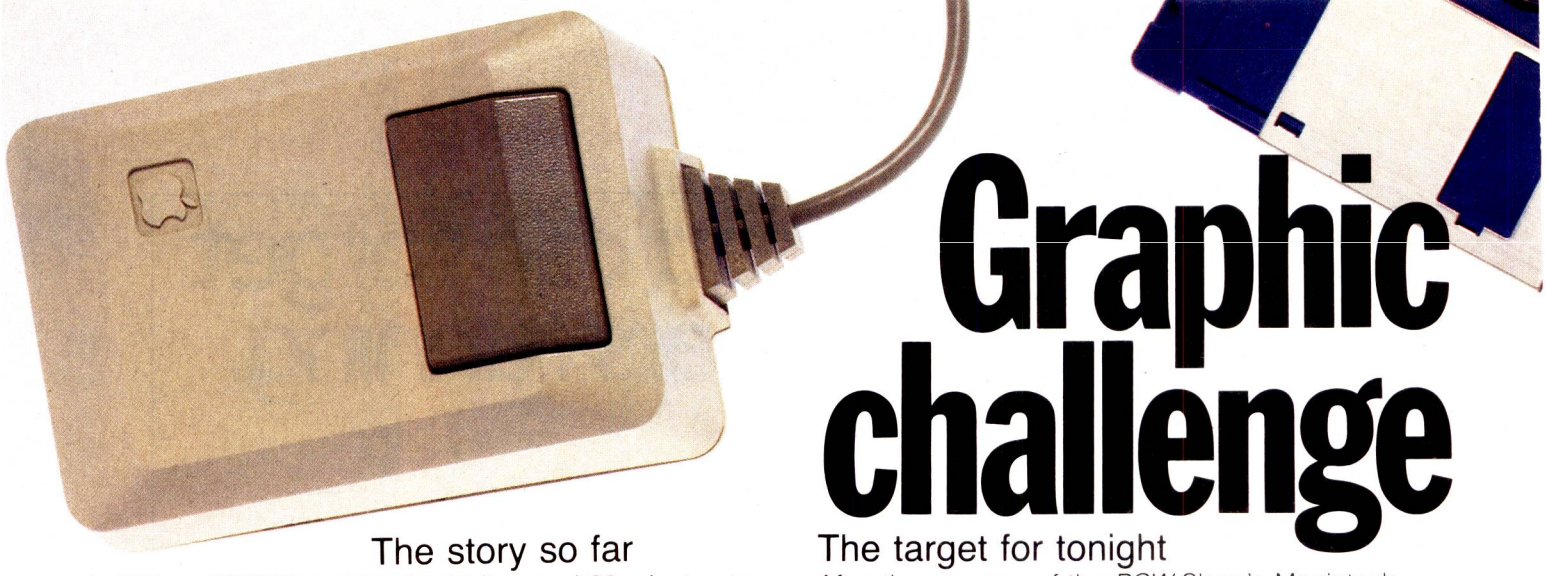
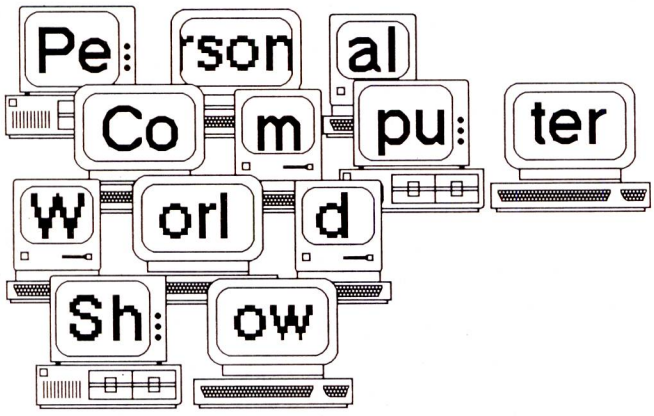


Graphic challenge

The story so far

With a *PCW* Show logo to design, and 30 minutes to design it in, Nigel Fowler took up his Macintosh mouse and MacPaint to good effect on the *PCW* stand at the Olympia show in September.



The winning design, printed out on Apple's LaserWriter and shown above, features the unique combination of different micro sizes and types that gives the *PCW* Show its special appeal.

Winning the prize of a complete Macintosh design system, Nigel — already a Mac user as a systems analyst at Willis, Faber & Dumas — should soon be producing bigger and better graphic displays.

Experience on the Mac obviously helped in his competition entry, but Nigel has also worked on IBM PCs as well as CP/M and MP/M systems, and even Atari machines.

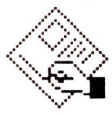
The target for tonight

After the success of the *PCW* Show's Macintosh graphic challenge, only something bigger and better could compete — so now Apple and *PCW* offer a once-only chance to redesign *PCW* the way you would like it to be.

The prize is special, too; a complete Macintosh design system from Apple as shown here, including a 512k Macintosh, the brand-new HD20 20Mbyte Winchester disk unit (reviewed in this issue on page 144), the equally new Imagewriter II colour printer with software-controlled sheet feeder, a second floppy drive, and the MacDraw draughting package along with MacPaint and MacWrite.

But the centrepiece of the prize and the competition is Aldus' revolutionary PageMaker software, reviewed in *PCW*'s November issue. With PageMaker you can take text and graphics from MacWrite, MacPaint, and MacDraw, or Microsoft's Word, Chart, and File, and pull them together to make professional-quality newsletters, magazines, and other publications. Add Apple's LaserWriter, and you have a complete short-run publishing house.

All you have to do in the first stage of the new Apple/*PCW* design challenge is arrange the list of magazine design features on the entry form into order of importance — if you think captions are the most important part of a design, just put '1' into the box next to that feature; if crossheads come second, put '2' into that box, for example. When you have put numbers in all 15 boxes, showing the order of importance, just send in the form.



PCW's Macintosh Design Challenge: join the new quest...

Select the items that you think contribute most significantly to a well-designed publication - put a '1' in the box alongside the most important feature, a '2' in the box of the second most important, and so on down to '15' for the least important.

- ☐ Choice of typefaces
- ☐ Logical division of text
- ☐ Suitable tints for highlighting text
- ☐ Borders for emphasis
- ☐ Variety of line spacings
- ☐ Quality and reproduction of photographs
- ☐ Design and repetition of logos
- ☐ Creative use of white space
- ☐ Apt and descriptive captions
- ☐ Sub-headings for section division
- ☐ Text justification
- ☐ Well-placed illustrations
- ☐ Relevant and strong headlines
- ☐ Apt and snappy crossheadings
- ☐ Positioning and content of tables

Send to: PageMaker Competition, Personal Computer World, VNU House, 32-34 Broadwick Street, London W1A2HG.

Name:.....
Address:.....
.....
.....
.....



The leading 10 entrants, as decided by our panel of expert judges, will be invited to a top London venue, given coaching in the use of PageMaker and the Mac, and invited to redesign a *PCW* feature from the large quantities of text, photographs, charts and other items that art editors normally have to juggle with on their drawing boards. There are no limits on what you can try, what cuts you want to make in text or pictures, or what dramatic design features you want to include. Just do a good job — and you could win the most powerful Macintosh system so far!

Publishing on the desk-top — a story for our times . . .

Desk-top publishing is a breakthrough in visual communication. Until recently, all printed materials had to be produced by traditional methods. The process, from conception of the design through rough layout, photography and illustration to finished artwork and printing, has been lengthy and expensive, often involving the services of a number of outside suppliers and agencies.

Now many of these stages can be performed by one individual sitting at a desk with the Apple Macintosh — true desk-top publishing has arrived.

The Macintosh has high-resolution graphics, and can combine graphics with a range of text typefaces, including traditional forms like Times and Helvetica, in a range of sizes and styles, lines and shades.

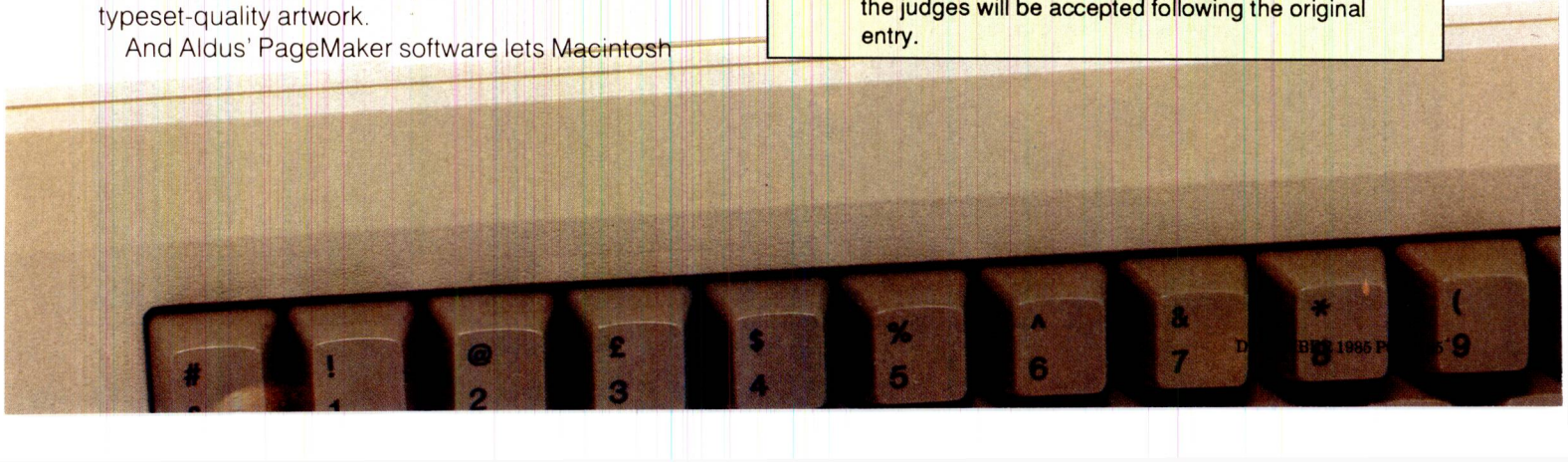
The LaserWriter printer, complete with unique PostScript software and built-in computer power, can turn those combinations of pictures and text into typeset-quality artwork.

And Aldus' PageMaker software lets Macintosh users incorporate pre-prepared text and graphics from a range of Macintosh programs into professional page layouts.

Desk-top publishing lets individuals and companies save on the production of newsletters, brochures, overhead projection transparencies, stationery, forms, invitations, reports — anything where high-quality text and high-resolution graphics need to be combined into a good-looking final document.

RULES

1: Applications are invited from all readers, not just Macintosh owners or graphic artists.
2: Competition entries must be made on the form provided, or on a photocopy.
3: The closing date for competition entries is 31 December 1985.
4: Employees of VNU Business Publications, Apple Computer, Aldus Corporation, or their affiliates and agents, are not eligible for the competition. Equally, families of such employees need not apply.
5: The 10 winners selected by our panel of judges will be invited to the second stage of the competition in London, all reasonable expenses paid, early in 1986.
6: The winning entries will be published in Personal Computer World as soon as practicable after the second stage.
7: All decisions of the judges are final, and no correspondence with Personal Computer World or the judges will be accepted following the original entry.





Voice Master

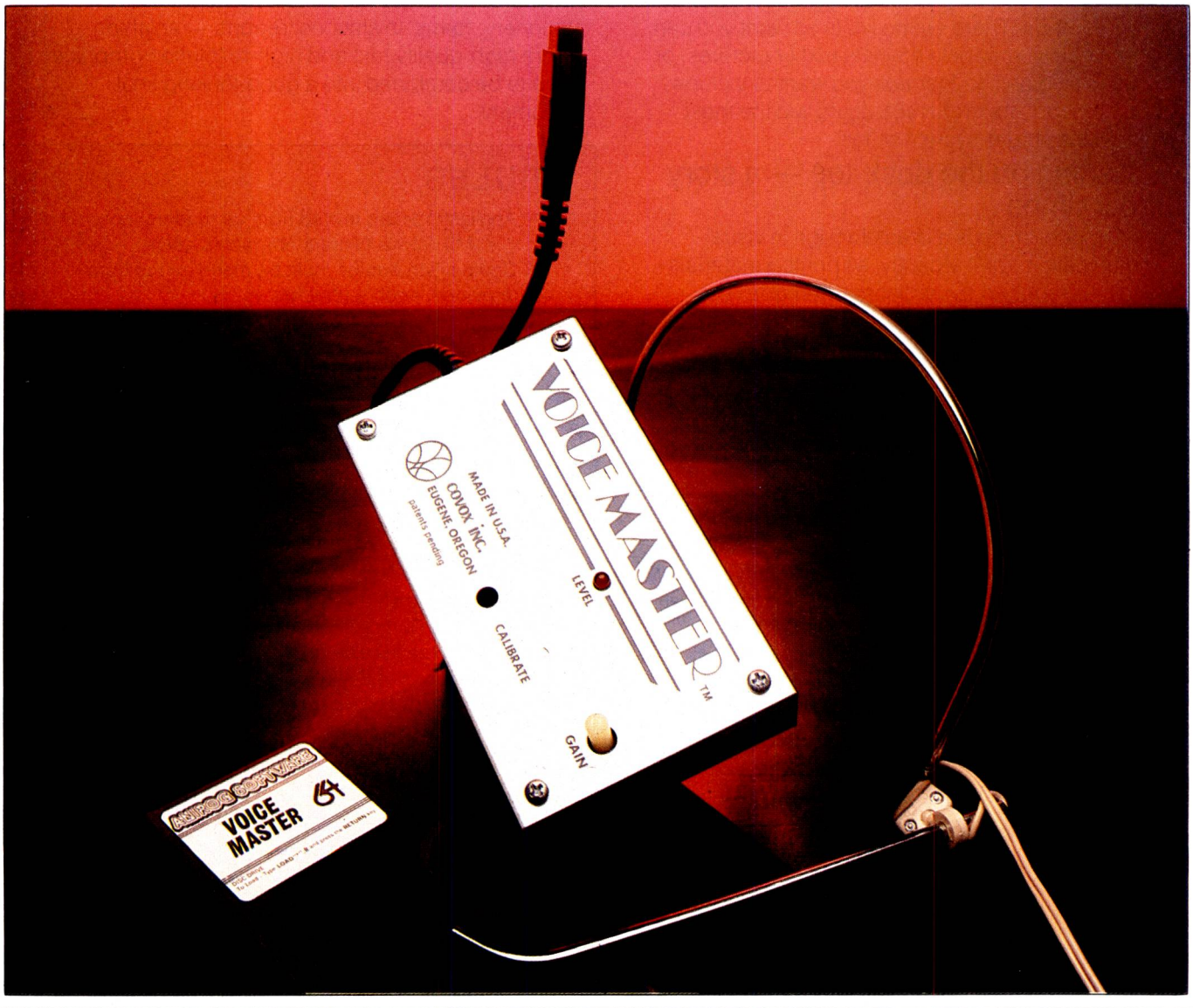
Make smalltalk — or even sweet music — with your Commodore 64 with the aid of Anirog's Voice Master speech digitiser. Stephen Applebaum conducts the conversation.

The trouble with many of today's speech synthesisers is that the time and effort required to make them say even the simplest words is extravagantly disproportionate to the result. Even some of the more expensive systems produce a voice that speaks with all the verve and clarity of a punch-drunk boxer with a glove in his mouth. Acorn's dedicated speech chip, containing the digitised tones of Kenneth Kendall, overcame the problem of incomprehensibility but was systematically dogged by a limited vocabulary.

It was with some anticipation, therefore, that I awaited the arrival of Anirog's Voice Master, a £59.95 speech digitiser for the Commodore 64 that's claimed to reproduce sounds with almost absolute fidelity.

In use

To use Voice Master you need a disk drive (or data recorder), and a thick skin to counteract the sardonic remarks that are bound to be hurled your way by amused onlookers. The object of their



hilarity is the ridiculous Captain Scarlet-like headset that you're required to wear to input sounds to Voice Master.

Getting going with Anirog's system takes little more effort than plugging a small silver box containing the encoding circuitry into the Commodore 64's joystick port two, and attaching the headset to the top of the box via a small jack plug. A program is then loaded from a utilities disk supplied by Anirog.

Prior to recording, it's necessary to calibrate Voice Master by adjusting a potentiometer in the box itself. The hardware manual suggests using a screwdriver to perform this operation, but I was lucky enough to have been supplied with a special designer tool — a thin piece of metal meticulously shaped to fit into a small hole on the front of the Voice Master.

Although there is no need to open Voice Master, it's worth it just to see the simplicity of its design. Inside the case is a printed circuit board (PCB) peppered with transistors. Inbetween these transistors are several capacitors, a potentiometer, and three chips. Towards the outer edges are three jack sockets comprising two ear-outs and one mic-in.

Voice Master's *pièce de resistance* is the digitisation of sounds input through the microphone. It can also respond to spoken words, albeit rather crudely. There is also an interesting little oddity called a voice harp, but more of that later.

Familiarisation with Voice Master's capabilities is best achieved with a small demo program found on the utilities disk. Short but sweet, this program gives easy access to the hardware's recording and playback functions, as well as allowing you to slow down, speed up or add echo to your recordings.

Although effective as an introduction, 'demo' is extremely limited, and ambitious users will want to move on to more complex activities such as adding speech to their own programs. To this end, Anirog has provided a small machine code utility called VM2.1.

There are several ways of loading VM2.1, but the simplest is to type:
LOAD "VM2.1",8,1 (RETURN)
SYS 49152 (RETURN)
NEW (RETURN)

These few lines load the VM2.1 code into memory at location 49152 (C000 hex), somewhere between the computer's random access memory (RAM) and Basic read-only memory (ROM). However, this method should not be used if there is already data in the Basic work area, as it will all be erased by New. But don't despair — VM2.1 can be loaded from within a Basic progam, although the method for doing so is rather more complicated than that shown.

Recording

To record a word, put on the headset, type LEARN n (where n is a number in the range 0 to 63) and talk into the microphone. As you speak, the Commodore's display goes blank, indicating that Voice Master is recording your utterance for posterity.

Playing back a recording involves using the command Speak. Similar in syntax to Learn, Speak also needs a number after it, to tell Voice Master the word that you want to hear. If, for example, you've recorded the word 'hello' as Learn 6, you'd type Speak 6 to hear it spoken.

Both Learn and Speak are recognised as legitimate Basic commands, and, therefore, can be included within a user program. The following two short listings give examples of how Learn and Speak can be incorporated into your own programs. The first is a routine to produce a screen prompt, asking the user to input a word; the second simply runs through the vocals recorded in the first.

Program 1

```
10 FOR M=0 TO 63
20 PRINT "SPEAK WORD NO."; M
30 LEARN M
40 NEXT M
```

Program 2

```
10 RESTORE
20 READ N
30 SPEAK N
40 GOTO 20
50 DATA 0,1,2,3,4,5,6,7 .....63
```

The speed at which Voice Master speaks is defined on a scale between 0 and 10. Normally, a word will be spoken with the default value of 6, but this can be altered to either speed up or slow down the intonation, using the command Speed.

Unlike Speed, which operates on pre-recorded speech, Rate alters the speed at which a word is recorded. Usually a word will be recorded at 7100 bits per second, but can be changed, along with Speed, to play back a phrase faster and with natural pitch.

The command New, as mentioned earlier, leaves digitised words in memory but erases all your Basic statements. Clear, on the other hand, is rather more drastic, wiping out both. Space-conscious programmers will find Clear useful though, as it can set aside chunks of memory for the storage of words.

Like all the Voice Master commands, Clear must be followed by a number, this time in the range 16 to 160; this number signifies the memory location for the new text. For example, if you were to execute the command Clear 160, you would actually be telling Voice Master to start loading a new vocabulary at memory location 160 × 256 = 40960 (which, incidentally, is the Basic workspace, giving the user maximum room for Basic programs).

One of Voice Master's major advantages is that words recorded with it can be played back on any Commodore 64, as long as VM2.1 is present in memory. In other words, even users who do not own the digitising hardware can utilise the speech in their programs. Although Anirog does not allow VM2.1 to be written into commercial programs, it has included a cut-down version which includes all its playback and word-finding facilities. What has been omitted, however, are the embedded Basic commands, so all words must be accessed with POKE and SYS functions.

Apart from recording straight speech, Voice Master, aided by a neat utility called Voice Harp, can turn your senseless verbiage into music. Not only that, it can even reproduce your musical score on hard copy.

Sub-programs

Voice Master comprises three sub-programs, the first of which is called Hum-Along. On loading, Hum-Along presents the user with a menu made up of 19 options. The first eight are pre-set sounds which can be manipulated to represent different instruments, and are then saved to disk. By selecting one of the sounds and humming into the microphone, you can create a simple melody using one instrument. In the main, Hum-Along does little more than allow you to perfect the sound of an instrument or become accustomed to the system.

Far more interesting than Hum-Along is a program called Composer. This has an advantage over the previous utility in that it allows users to construct whole songs and save their efforts onto disk. In addition, a Write mode gives a visual representation of the tune being constructed, in full musical notation.

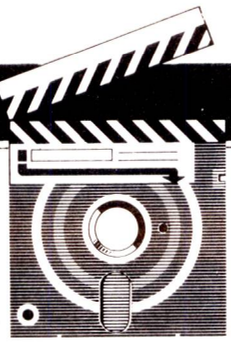
Writing a song means humming, whistling or dah-dah-dahing into the microphone, a process which is best performed in a quiet, and preferably empty room. During your — hopefully unwitnessed — performance, a musical staff slides across the screen with the appropriate notes appearing along its length. When you've finished, mistakes can be corrected in Edit mode and your full score printed out on a dot-matrix printer.

Conclusion

At £59.95, Anirog's Voice Master is an affordable leap forward for speech reproduction on the Commodore 64. Unlike phoneme-type devices, which always seem to babble away in a monotonous and neutral tone, Voice Master is able to differentiate between male and female voices, as well as capture the speaker's accent.

Voice Master is an excellent peripheral for both the serious user and those who merely want to dabble. It's just a pity that the spelling in the manuals couldn't live up to the same high standard.

For more details, contact: Anirog Software, Unit 10, Victoria Industrial Park, Victoria Road, Dartford, Kent DA1 5AJ. Tel: (0322) 92513/8. END



SCREENTEST

WordPerfect

WordPerfect is a comprehensive but pricey word processing package. Brian Whalley puts it on trial to test its vast range of facilities against ease of use.

A useful question when approaching a new word processor is: 'How easy is it to write a short letter or document without using control codes?' In this case, the answer must be 'very easy indeed'. WordPerfect comes close to the ideal of 'What you see is what you get' (WYSIWYG), and although it doesn't show right-hand justification onscreen, you work at all times on a screen uncluttered with control codes, simply with an indication (at bottom-right) of document, page, line and column.

Fig 1 is a screendump of some sample text. Start typing at the top of the screen and when you reach the bottom, the display will scroll up after each line typed. If you find the scrolling irritating at any time, pressing the Home key plus the down arrow key or the page down key, rewrites the screen so that you're typing about halfway down.

The clean screen look

How does WordPerfect achieve its 'clean screen' appearance? As it offers the usual options for justified and unjustified paragraphs, bold or underlined text, variable margins and line spacing, and so on, and allows these format instructions to be stored with the document, there must be control codes. But where are they? Within the text, but hidden from view, is the answer.

How can their presence be checked and edited? Take the cursor to the beginning of the document, press the appropriate function key to 'reveal codes', and a screen such as that shown in Fig 2 appears. It may look odd, but it is very revealing and extremely useful. The [] at the start is a flashing cursor which can be used within the reveal codes screen to delete unwanted codes; [W/O On] indicates 'Widows & Orphans On' to ensure that a paragraph never starts on the bottom line of a page and never ends on the top line of a new page; [Margin Set...] indicates the appropriate columns (column one is the left-hand edge of the paper, not of the print line); the paired [C] and [c], [B] and [b] enclose text to be centred and in boldface; and [HRt] indicates the use of the Return key at the end of a single line or paragraph, as distinct from a soft carriage return [SRt] automatically inserted with a paragraph at a point appropriate to the set margins (a process known as wordwrap). Pressing any key other than the left or right arrow, or Delete or Backspace, takes you back into the document. These invisible control codes can be entered anywhere within a document to change the formatting to exactly what you require.

Sensible defaults and a function key template make it possible to produce formatted letters and other documents virtually without using the manual (although it is an excellent one, and not to be ignored). WordPerfect comes with four diskettes: two copies of the main program disk (one labelled 'IBM PC, XT, AT' and the other labelled 'Use this version with IBM lookalikes... Use this version if you are running TopView'), a speller disk and a supplementary disk. None of the disks are copy-protected, and the manual gives clear guidance on making working copies of a program disk, a speller disk and a learning disk. The latter will carry a sequence of 12 documents (copied from the supplementary disk) to be used in conjunction with the 145-page learning section of the manual (supplemented by more lessons in the Special Features section covering newspaper-style columns, footnotes, tables and lists, macros, and so on).

The fact that an additional interactive tutorial disk (as well as a demonstration

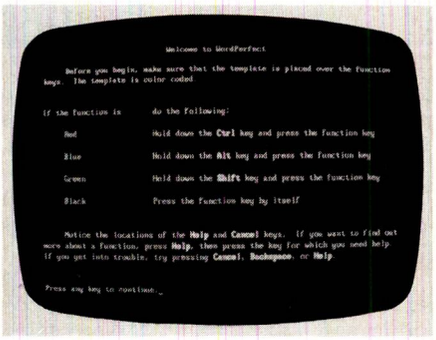
```
                    SAMPLE WordPerfect TEXT

This text has been prepared using the word processing software
WordPerfect from A M International.  WordPerfect comes very close
to the ideal of "what you see is what you get" (WYSIWYG), and
although it does not show right hand justification on the screen,
you work at all times on a screen uncluttered with control codes,
simply with an indication (at bottom right) of document, page,
line and column.  Since it offers the usual options for justified
or unjustified paragraphs, bold or underlined text, and so on,
there must be control codes, but they are hidden from view until
the Reveal Codes key is pressed.
```

Fig 1 Screendump to a dot-matrix printer

```
[^][RtJust On][W/O On][Margin Set:10,75][C][B]SAMPLE WordPerfect TEXT[b][c][HRt
]
[HRt]
[HRt]
This text has been prepared using the word processing software[SRt]
```

Fig 2 The Reveal Codes screen



The WordPerfect opening screen



The editing screen



Help commands are provided

disk) is available from dealers who may suggest that WordPerfect is hard to learn. In reality, few users are likely to plough through all the learning material, but when getting to grips with some of the software's more powerful features, it's useful to have some step-by-step instructions to follow, using a real document which is already waiting on the learning disk. The manual also has a brief and well-illustrated Getting Started section, a detailed alphabetical Reference Guide with abundant cross-references, and an excellent index. The software package also contains a Quick Reference booklet listing every function in alphabetical order along with its function key and a brief explanation, and an Installation Booklet with information about set-up, convert and printer programs, and printer test files.

Much of the program's success must be attributed to its use of function keys. A colour-coded template is supplied to fit round these keys, each of which has four functions depending on whether it is used alone or with the Shift, Alt or Ctrl key. This may appear complicated but quickly becomes familiar and easy to use, and I much prefer this approach to one using the normal letter keys — though I have heard it argued that a professional typist moving into a word processing system prefers control codes based on keys with which he/she is already familiar.

Regrettably, the lettering on the template is small. I use spectacles for reading but not normally for computing, and I am thankful that I use a Qubie keyboard which has the function keys in a line above the normal Qwerty keyboard, thus allowing me to make my own overlay in typescript. A standard template with larger, clearer lettering is needed, and should be possible.

Formatting features

Like many word processors, WordPerfect arrives with initial settings for a range of formatting features. For example, page length is set for a 66-line sheet of paper with 54 text lines at six lines per inch and single spacing, margins are set at columns 10 and 74 with tabs every five spaces, and right justification is on. Any default can be changed, or you can temporarily change one or more for a work session. There is always the option to change them for the current document or a portion of it, in which case the settings are stored on disk as an integral part of the document.

The special set-up program for changing defaults (entered by typing WP/S instead of the normal WP at the system A> prompt) also provides for selecting colours for a colour monitor (or whether to have underlined or highlighted on a suitable mono monitor), activating a timed back-up. This means that your current document is automatically saved to disk at a predetermined time interval (in minutes), defining special characters for access via use of the Ctrl and Alt keys, and specifying default drives (or directories, on a hard disk system).

Cursor control is impressive (you can even select the style of cursor you prefer) and makes full use of the PC's arrow keys. These move the cursor one character left or right, one line up or down; Ctrl plus left or right arrow takes you along a line one word at a time. The Home key plus the up or down arrow takes you up or down one screen of text (the + and − keys on the numeric pad do the same), while Page Up or Down will take you to line one of the previous or following page; Home plus the left or right arrow takes you to the end of the line, and you can also get to the right-hand margin by using the End key; Home pressed twice followed by the up or down arrow takes you to the start or the end of the current document.

Ctrl-Home produces a Goto prompt at the bottom left-hand corner of the screen, and typing an appropriate number takes you to line one of the specified page. A fast search facility (forward or reverse) will find any character string or control code, and position the cursor at that point. Replace provides for the deletion or substitution of characters or codes, either with a request for confirmation of each occurrence, or automatically right through the document.

WordPerfect holds an entire document available for viewing and editing: moving from page to page, from start to finish, is achieved with ease and speed. Page endings are produced automatically according to the page length default or an inserted choice, and they are shown visually by a line right across the screen. A page end can be forced at any point by using Ctrl-Return, and you can specify a number of lines (of a table or list, for instance) which must be kept together: this is known as a conditional page end.

Text can be marked for bold face printing, underlining, subscript or superscript; for changes between character sets on a dot-matrix printer; or to pause printing for a daisywheel change (or any other purpose). The appropriate control codes can be entered either while initially typing the text, or later. Press the function key before typing the text and, on a colour screen, boldface text will be shown highlighted, and underlined text in a selected colour; press the function key, and you're typing normal text again. To mark text that has already been typed, Alt-F4 is pressed to produce a flashing 'block on' message at the bottom-left of the screen. Moving the cursor then marks text in inverse video, one character at a time or more quickly by word, line or even page moves. When the text has been highlighted, pressing a function key marks it appropriately and switches off the block.

Erasing text is simple, with the Delete key acting on the character at the cursor position and Backspace deleting the character which is to the left of the cursor. Ctrl-Backspace removes either the word the cursor is on, or the previous word if the cursor is at a space. Ctrl-End erases to the end of the line (the Cancel function key will restore it if it's an accident or a mistake). Ctrl-PgDown allows you to erase from the cursor to the end of the page after replying Y to a request for confirmation — a valuable safety feature.

Ctrl-F4 is a 'Move' key: pressing it gives you a choice of the sentence, paragraph or page on which the cursor is positioned, followed by a choice of Cut (for deletion, or transfer to another position) or Copy. In either case, the text is saved in a buffer until you use Move again.

Sections of text can also be marked for deletion, transfer or copying by the use of the Block command already described. While a block is highlight-



SCREENTEST

ed, the Move menu allows you to cut, copy or append the block. Cut can be used to transfer the marked text not only to a new position in the current document, but also to a second document which can be held in memory at the same time. Append allows you to add the marked text to a file already on disk (there is also a Retrieve function which allows a disk file to be inserted into the current document), while pressing the Save key will allow you to save it as a named file.

Tabs are available on most word processors, and while WordPerfect's default is to tabs at every fifth column, it is quite easy to clear them and set tabs wherever you require them within a particular document. There is also an Indent facility which is remarkably easy to use, either to indent from the left (at the tab position selected) until the Return key is next pressed, or to indent an equal amount from each margin (for quotations, for instance). Used with Margin Release (Alt-Tab), hanging paragraphs (the first line projecting beyond ther left margin) are possible.

For producing a long report, there is an automatic paragraph numbering facility with a choice of three predefined styles — and the option to create your own by selecting from six number/letter styles and four punctuation styles.

Spelling

The spelling program works on the current document rather than on a disk file, and entails replacing your document disk with the speller disk unless you are fortunate enough to have a hard disk, to which all WordPerfect's utilities are easily transferred. You are offered six choices: to check a word, the current page, or the full document; to look up on a wildcard search or to use the phonetic facility; or to change dictionary. Any error located is immediately shown in context and you can correct it manually, or look up the correct spelling either by entering the letters you're sure about and a * for the rest, or by selecting the phonetic look-up.

The latter is rather curious and unpredictable. Although entering CUF produces a selection of eight alternatives including cuff, cough, coif, and the less likely cafe and chief, and THERE yields their and they're, entering COUGH produces no alternatives at all, the same being true of BOW and BOUGH, which is rather disappointing.

If the speller fails to recognise an acceptable word (perhaps a technical term) you can skip it once, skip it for the rest of the document, or add it to the dictionary (facilities also exist on the supplementary disk for editing the main dictionary by additions and removals, and for creating special-purpose dictionaries of your own). When you've checked and corrected a document, it's important to remember to save the edited version — a process which is not automatic.

Advanced features

There are still more advanced features which will appeal to professional writers with large documents to produce. Text can be marked for the creation of a table of contents, an index, or lists of various types (for example, of tables, graphs and illustrations). Footnotes and endnotes can be created in several styles.

Headers and/or footers can be defined for the automatic printing of the same text at the top or bottom of every page, with provision for page numbering and for alternative message or layout on odd and even numbered pages.

There is provision for mailmerge, label printing, form-filling, document assembly, and many other features which take a little time to learn but could save a remarkable amount of time in a busy office. For any frequently repeated text, format or operation, a macro can be created which reduces complexity to a couple of keystrokes. Non-WordPerfect files can be imported, and there is a special Convert program to cope with such formats as WordStar and DIF files.

A mathematical facility will provide automatic totals and subtotals of columns and rows, with limited provision for using formulae as on a spreadsheet. There is a special tab function which lines up figures on the decimal point, and producing columns with centred headings is no problem. However, WordPerfect takes the notion of columns a step further with its facility for defining columns such that a document can be automatically printed out in newspaper style, or a report can have sections printed in parallel column format (Fig 3). Up to five columns, of the same or differing widths, are easily defined within the limits of the margin settings being used.

Printers

Fig 1 is a dump from the screen to an Epson MX-80 dot-matrix printer, while Fig 4 shows WordPerfect's output to the same printer. Fig 5 shows the results on a Qume Sprint 9 daisywheel printer.

The micro-spacing and justification of the Qume required no installation work on my part — merely the selection of the printer from a list of 30 printers (Fig 6).

Documents can be printed from screen or disk: from screen you can

SAMPLE WordPerfect TEXT

This text has been prepared using the word processing software **WordPerfect** from A M International. WordPerfect comes very close to the ideal of "what you see is what you get" (WYSIWYG), and although it does not show right hand justification on the screen, you work at all times on a screen uncluttered with control codes, simply with an indication (at bottom right) of document, page, line and column. Since it offers the usual options for justified or unjustified para-

Fig 3 Printing in multi-column format

SAMPLE WordPerfect TEXT

This text has been prepared using the word processing software WordPerfect from A M International. WordPerfect comes very close to the ideal of "what you see is what you get" (WYSIWYG), and although it does not show right hand justification on the screen, you work at all times on a screen uncluttered with control codes, simply with an indication (at bottom right) of document, page, line and column. Since it offers the usual options for justified or unjustified paragraphs, bold or underlined text, and so on, there must be control codes, but they are hidden from view until the Reveal Codes key is pressed.

Fig 4 Formatted print on dot-matrix printer

print the whole document, the currently displayed page or a marked block, to the default printer; from disk you can select start and end page numbers, and print to any one of up to six printers for which details have been stored on the working copy of your program disk (using the set-up program and the supplementary disk). These six printers normally include a DOS text printer (which allows printing to disk of a standard text file without formatting codes), and can include the same printer twice for, say, continuous forms and single-sheet operation. The printer control menu is easy to reach, but offers so much choice that although many users will rarely need to use it, it does warrant very careful reading of the manual.

Specifying your printer is very simple if it appears on the printer list (Fig 6), but detailed guidance is provided for installing other printers, and for making extensive modifications to the printer definitions and character tables if you have exceptional requirements. The supplementary disk contains a README file which can be used to print a 33-page, thoroughly indexed, printer program manual. There are also the aforementioned printer files, one of which is a printer test using the full range of control codes for you to check your printer's response. Another is a font test in order that you can correlate the characters displayed onscreen with those on a particular print wheel, providing a facility for you to produce an appropriate translation table if needed; a third allows you to make adjustments to the positions and widths of a proportionally spaced font.

These are sophisticated facilities which many users will rarely, if ever, use, but allow a dealer or the more enthusiastic user to achieve a remarkable degree of optimisation in the use of the wide range of standard printers already catered for by WordPerfect, or for newly introduced models.

Weaknesses

You might have the impression that you've been reading a eulogy rather than a review, and you can hardly expect any software to be entirely perfect, whatever the implications of its name! WordPerfect does have its faults, although they are few in number, and I'd rather call them weaknesses. For example, I've already mentioned the program's inability to display right justification in true WYSIWYG style, and I hope this will be introduced at the next revision. In the meantime, I'd be grateful for a patch that puts a justified message on the screen, like the one for 'typeover' which is switched on and off by the Insert key.

Changing the format defaults to those you most frequently need is very easy, but it's a pity that default values are not entered into the document like specifically selected values. Reprinting a document produced in accordance with defaults which you have since changed can have unexpected results, especially if tabs are involved. There are some oddities when text is being reformatted after you've added or removed text. Although no specific user action is needed (like the Ctrl-B to re-Block text in WordStar), the process is not entirely immediate and can cause some wordwrap shifts as you cursor down a page. However, whatever you've done by way of editing, moving from the start of the document to the end by Home-Home and the down arrow will re-format and repaginate the entire document, perhaps with a few requests to decide about hyphenating if you're using that facility. Occasionally the blank line between paragraphs will appear at the top of a page (hardly noticeable unless your pages have a header) or the second space after a full stop will appear at the start of a line, but these hiccups have been very rare in my experience.

I've already mentioned some weaknesses of the speller facility, especially in the phonetic look-up. The thesaurus utility on the much less expensive Perfect Writer from Thorn-EMI is of considerably more value, and I would gladly substitute it for WordPerfect's phonetic oddities. The speller produces a word count after a page or full document check, but it really would be nice to have a running word count such as is provided by some quite cheap home computer word processors — or at least some way of bypassing a full spelling check to obtain the count.

It would also be nice to have something like the automatic presentation of probable correct spellings which is a feature of SpellStar (in the WordStar Professional suite). There certainly should be a prompt to remove the speller disk and save the edited document after correcting spellings — it's far too easy to forget to save it (potentially a very serious waste of time and effort), or to write it onto the speller disk (although this is merely an irritation and not dangerous).

Conclusion

WordPerfect is quite an expensive package compared with many word processors for the IBM PC and compatibles, and if considering using it you will wonder about value for money. If you simply want to use your computer for the occasional letter, or for simple documents with little or no formatting, you can select from several cheaper programs. If you intend to create a variety of long documents, some with complex formatting, then do consider this very comprehensive package against others of similar power and complexity.

WordPerfect is a winner due to its sheer range of facilities allied to a remarkable simplicity of operation.

WordPerfect costs £425 and is distributed by AM International Information Systems, Mayland Avenue, Hemel Hempstead. Tel: (0442) 42251. END

SAMPLE WordPerfect TEXT

This text has been prepared using the word processing software WordPerfect from A M International. WordPerfect comes very close to the ideal of "what you see is what you get" (WYSIWYG), and although it does not show right hand justification on the screen, you work at all times on a screen uncluttered with control codes, simply with an indication (at bottom right) of document, page, line and column. Since it offers the usual options for justified or unjustified paragraphs, bold or underlined text, and so on, there must be control codes, but they are hidden from view until the Reveal Codes key is pressed.

Fig 5 Formatted print on a daisywheel printer

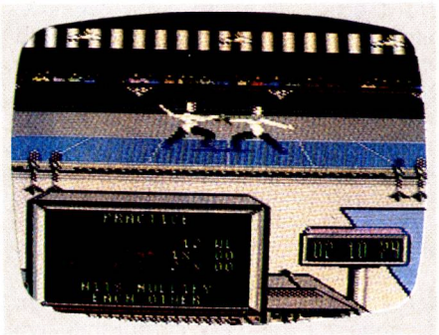
Printers Currently Defined

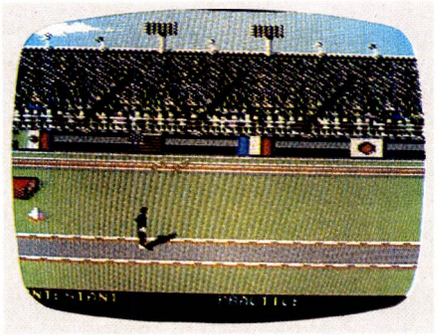
1 Line Printer	2 DOS Text Printer
3 Brother HR-15 / Dynax DX-15	4 C.Itoh Starwriter/Printmaster
5 Centronics 351	6 Diablo 630 ECS
7 Diablo 620/630 (Daisywriter)	8 Epson FX
9 Epson MX-Graftrax/MX-Type III	10 Epson LQ-1500
11 HP 2686A LaserJet-A	12 HP 2686A LaserJet-B
13 IBM Graphics Printer	14 IBM Color Printer
15 IBM Wheelprinter/5218	16 IBM Quietwriter
17 NEC 2050	18 NEC 3510/3530/7710/7730
19 NEC 3550	20 NEC 3515/5515/7715/3525/7725
21 NEC Pinwriter P2/P3-2,P2/P3-7	22 NEC Pinwriter P2/P3-3
23 Okidata Microline 84	24 Okidata Microline 93
25 Qume Sprint 5/9/11/11+	26 Star Gemini
27 Texas Instruments 855	28 Toshiba P1350/P1351
29 Toshiba P1340	30 Standard Typewriter
31 DataProducts DP Series	

Fig 6 List of printers already defined on disk



Christmas is coming, so why not indulge in a spot of summer and winter gaming — doves, eternal flames and all? Stephen Applebaum goes downhill while looking at the new games releases, including the weird William Wobbler, for the Commodore 64/128 and the Spectrum.







Summer games

Title: Summer Games II
Computer: Commodore 64/128
Supplier: US Gold
Format: Cassette, disk
Price: £9.95, £14.95

With Christmas just around the corner, it's ironic that one of the season's strongest contenders for stocking space should be US Gold's Summer Games II. Paradoxically this follow-up to Summer Games looks like becoming a massive hit, especially in the current climate where it's considered trendy to have a number in the title of your product; a method of marketing assiduously pursued by the incomprehensible Sylvester Stallone.

Summer Games II is a remarkable piece of software. Not surprisingly, it owes a lot to its predecessor in terms of design and the way in which it is played. This similarity makes reviewing difficult, as you find youself looking for comparisons rather than judging the sequel on its own merits. What I have done, therefore, is to look at Summer Games II as an extension of its predecessor, which in fact it is, as both can be linked together to form one mega-competition.

The Games open with all the pomp of the first day of the Olympics. Following the clichéd but well-executed lighting of the eternal flame, doves fly out across the stadium in solemn recognition of the peace and (somewhat affected) brotherhood between the competing nations.

After this pre-game ritual, players are requested to select a flag under which they wish to compete. There are as many as 18 countries to choose from, all of which are not only represented by their flags, but also their national anthems. When this has been done, the Games proper can begin.

The first event is the knee-crunching triple jump. Thankfully, the joystick movement required to make your man jump is rather more subtle than in other games of this kind. Instead of the usual frantic thrashing, four sharp taps of the stick are all that is required to send him bounding along the runway and, hopefully, into the pit. Successful jumps are rewarded with a slow-motion action replay on a small video screen situated above the main arena, while all the loser receives is a faceful of sand.

After wrecking your athlete's legs, you then subject his arms to the rigours of world-class rowing. You are spared from what could have been a gruelling experience, and have little more to do than to languidly move the joystick from side to side.

Throwing the javelin, and the high jump, are the only events where you have to belabour your joystick under a hail of speedy taps. Only the equestrian event comes close in the mindless thrashing stakes, but is redeemed by the amount of skill involved in keeping your rider astride his horse as it leaps over the more difficult obstacles.

There are also fencing, cycling and kayaking events. The cycling wins hands down for the most unusual use of a joystick: instead of the conventional side-to-side movement, you have to rotate the stick in time with a spinning arrow. The more in sync the two are, the faster the cyclist pedals.

Kayaking is the most difficult part of Summer Games II. As in the real thing, the idea is simply to steer your way through a series of 'gates'. This is all very well in theory, but when you're up against a strong current, the going can get quite tough.

Probably the biggest mistake in the design of this event was the choice of colours for the kayak. If viewed on a colour monitor or television, the craft is easily identifiable. On a black and white TV, however, the front is almost indistinguishable from the water, making orientation with the sides of the gates very difficult.

Unless you've seen an Epyx game first-hand, you can't appreciate just how much work its programmers put into the graphics. Those in Summer Games II, for example, are a superb example of the art of animation, and should be seen by anyone who enthuses about good graphics.

Although I have no qualms about the game itself, there is one bugbear and that's the age-old problem of loading speeds. Like so many games for the Commodore 64, Summer Games II is seriously hampered by the slow data transfer rates of Commodore's storage devices. Even the disk drive, which is a veritable hare when compared to the tortoise-like cassette deck, leaves you wondering whether you have time for a second cup of tea.

Although this causes a certain amount of hassle, I'd advise potential buyers not to be put off—the results are really worth waiting for.





Winter games

Title: Winter Games
Computer: Commodore 64, Spectrum
Supplier: US Gold
Format: Cassette, disk
Price: £9.95, £14.95 (Commodore prices)

Sports games come and go, but only Epyx has produced programs that capture the thrill and excitement of the real thing. Summer Games I and II are two classics of their genre, and now they are joined by a third in the form of Winter Games.

Winter Games leaves behind the sun-scorched running tracks of Epyx's previous two masterpieces, and takes us to the snow-capped mountain peaks of Calgary, Candada, where the action is equally febrile and hard to master.

There are seven events, plus the by-now familiar opening ceremony. As is the case with most of Epyx's software, Winter Games is the product of programmers possessing an acute eye for detail. Nowhere is this more evident than in the figure and free-skating competitions.

Figure skating (short program) is one minute of sheer hell for a skater. In this event, the competitor is asked to perform seven different movements in one minute. Points are subsequently awarded not just for the execution of a movement, but also for the skater's grace and form.

The free program is similar to the figure skating, except that each of the seven moves must be performed three times in two minutes. The method of scoring is much the same as before.

In both these events, the screen displays a small though brilliantly animated female skater who glides across the ice until the joystick is moved and the fire button is pressed. Depending on the direction of the joystick, the skater will either jump, sit or spin.

The craziest sport in Winter Games is Hot-Dog Aerials. Skiers propel themselves over mounds of snow in order to perform mid-air acrobatics. It's not surprising that one of the movements is called a 'daffy': this is one of the daftest pastimes going.

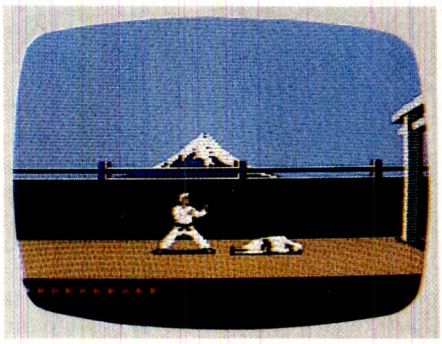
Like the skaters, a hot-dogger's points depend on how well a manoeuvre is performed. Landing in the snow face down, feet up or without skis gains nothing, even in hot-dogging.

Rather more dangerous is the ski jump. Here the idea is simply to ski down a long ramp and hurl yourself into the ether, hopefuly to land further from the take-off point than your opponents. The screen display for this event is particularly interesting. At the start of the jump, your skier is depicted as a small stick man speeding down a ramp. When he is in the air, a box showing a larger, much more detailed picture of your man opens in the top right-hand corner of the display. The idea is then to change his mid-air stance in order to prolong his flight.

Once again, points are gained for style, as well as distance.

There are two major stamina events in the games — speed skating and the Biathlon. Speed skating speaks for itself, but the Biathlon is more obscure. It is basically a mixture of cross-country skiing and prone target shooting. Not only does each competitor have to complete the course with a rifle strapped to his back, he also has to fire at several discreetly placed targets along the way. If this sounds easy, just you try aiming a rifle when your heart rate is well into the 100s. Following the Biathlon it's on to the seventh and final event of the games, the bobsled.

Winter Games is an excellent piece of software which no serious games player should be without. It ranks equal to Epyx's two previous forays into the world of sport. Winter Games is nothing short of excellent.



Chopping and changing

Title: Karateka
Computer: Commodore 64/128
Supplier: Ariolasoft
Format: Cassette
Price: £9.95

The martial arts are once again becoming the big money-earner they were 10 years ago. Hollywood has certainly realised this fact, and so too, it seems, has the software industry. Although there have been several karate games launched over the past few months, only Melbourne House's Way Of The Exploding Fist has stood out. Now it has a strong and worthy antagonist in the form of Ariolasoft's Karateka.

On the surface, Karateka is just another game where you kick and punch your way through a series of increasingly difficult fights. What makes it different is the way in which the contests have been woven into a film-like tale of good and evil.

You are the good guy who has returned home after years of study under a Master of Karate, only to find that your village has been burned to the ground. The instigator of this malicious act is Akuma, the warlord. Unfortunately he has not only deprived you of your home, but also your fiancee, the Princess Mariko, whom he has abducted and incarcerated in his mountain fortress. The way ahead is clear, but the road is dangerous. You must enter the mountain fortress and rescue your bride-to-be before she's lost to you forever.

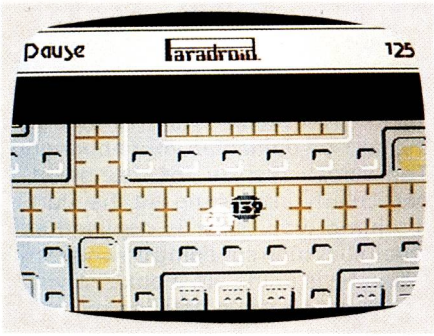
During the loading of Karateka, the story behind the game is flashed up onscreen and followed by a beautiful piece of computerised melodrama. Akuma is shown looking sternly at Mariko. He points to one side, and she sombrely walks off the screen. The scene cuts to show the princess collapse onto the floor of her tiny cell, where she is left to languish until being rescued.

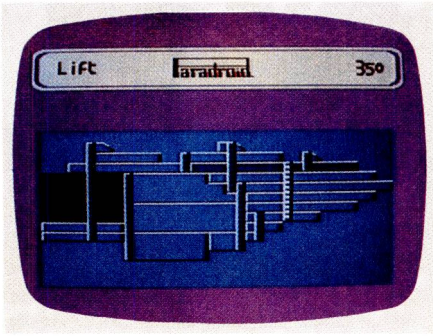
Akuma's palace, where Mariko is held prisoner, is guarded by a host of warriors, all of whom are also well-versed in the subtleties of karate. Your only hope of seeing her again is to defeat each one in turn, before finally coming face to face with the evil Akuma.

One of Karateka's nicest touches is the way in which Akuma sends out a new guard. Just one point of the master's finger sends a warrior running from the palace towards you. The screen then cuts back and forth between the two fighters. Although rather like *Wuthering Heights*, this neat touch does add drama to the proceedings.

During a fight you have full control over all your man's movements. You can even make him retreat, although this is not advisable unless your name's Lemming. If you go back too far, you'll topple over the edge of the mountain.

Karateka is a wonderful little game. I have one gripe, though, and that is that each time you're defeated, you have to re-load part of side two. That aside, Karateka is a strong challenger to Way Of The Exploding Fist.





Mutinous influence

Title: Paradroid
Computer: Commodore 64
Supplier: Hewson Consultants
Format: Cassette
Price: £7.95

After the abysmal Southern Belle, the unpredictable Hewson Consultants seems to be back on the right track with Paradroid, a fast-action arcade adventure.

Paradroid begins just after a mutiny onboard a space freighter by a band of rebellious Droids. In an attempt to quell the revolt, a Droid Influence Device has been beamed aboard the freighter. Now under your control, it's up to you to guide the mechanical exterminator on its mission of destruction.

The Influence Device can be used to either shoot or ram Droids, or even to transfer to another, more powerful one, so placing the superior fire-power of the hapless Droid at your disposal. The strength of a Droid is indicated by its serial number. Due to your initial Influence Device being of very low power, it has the serial number 001.

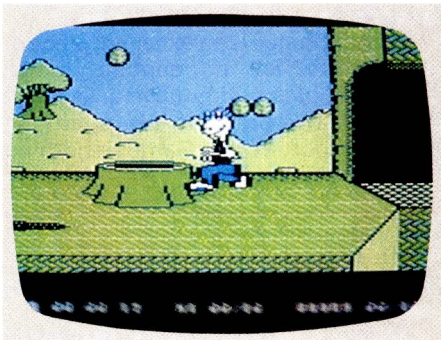
In play, Paradroid is quite complex and takes some fathoming out. Although much of the game consists of zapping rebellious Droids, there are a few additional bits and pieces which come in handy, if you can figure out how to use them.

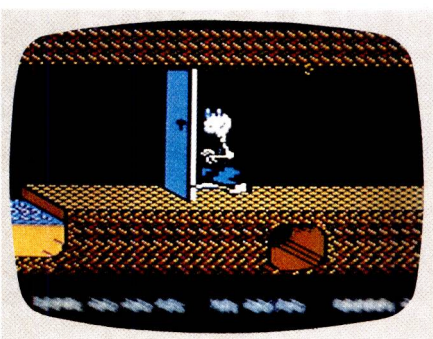
Transferring to a more powerful Droid, for example, takes a lot of practice and uses up a lot of Droids. A great deal of concentration is needed as you attempt to give your device a quick upgrade. The slightest loss of concentration and you are likely to overload your machine's circuits, despatching it to a galactic scrap-heap.

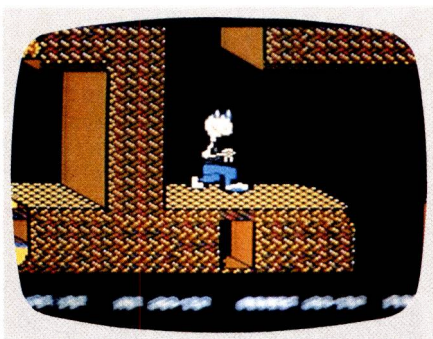
Clearing the ship of obstreporous Droids is a lengthy process: the space freighter has 20 decks spread over a massive 400 screens.

To make life easier, the ship is equipped with computer consoles for the instant access of information about the position of lifts, consoles, energise points, and even the characteristics of different Droids. Whenever a floor is cleared of insurgents, the ship's computer automatically shuts down that deck's lights and awards you bonus points.

After Hewson Consultants' recent transgressions, it is good to see it return with a new and exciting piece of original software.







Wobbling around

Title: William Wobbler
Computer: Commodore 64, Spectrum 48k (Amstrad soon)
Supplier: Wizard Development
Format: Cassette, disk
Price: £10.95, £14.95 (Commodore prices)

Tony Crowther has masterminded many great games, as well as being the creator of such oddball characters as Potty Pigeon and Monty Mole. Now, at a time when other programmers seem to be running out of new ideas, Crowther introduces William Wobbler, his weirdest hero yet, who is a lizard-like hominid with a Groucho Marx gait.

Like Crowther's Monty games, William Wobbler is an arcade adventure. The idea is to scour a series of underground tunnels for objects which will hopefully lead the player to unravelling a puzzle worth £1000.

William's adventure begins above ground, in a screen which looks like a set from an amateur dramatic society's Christmas panto. As he plods along, his head bobs up and down on a long, ET-like neck. The entrances to the underground labyrinth are formed by a line of 10 hollow tree stumps. On finding one, William must be quick to jump down it, or his head is knocked off by a careless, low-flying bluebird, or is temporarily crushed by his grotesque, broom-wielding mother-in-law. William only has one life, so it's a good idea to keep mind and body intact for as long as possible.

When underground, the game begins in earnest. William must find a glowing orb. This is always at the end of the same tunnel, although the tunnel is not always in the same place at the start of a new game. The importance of the orb becomes apparent when he meets a droid. Deadly to the touch, these lozenge-shaped creatures form a lethal impass unless our hero is in possession of the orb.

Within each tunnel is the opening to a vertical shaft leading directly down to the maze's lowest level, or back up to the surface. Going down takes you to a long tunnel inhabited by slithering snakes and flying frogs. If William can avoid these, he can make this way to a small niche at one of the far ends, where he'll find a disk drive. By placing a disk found elsewhere in the caverns into the drive, William can temporarily extend his life. Until a disk is found, the drive lies dormant at the end of the tunnel.

As well as the many useful objects that are scattered around the tunnels, there are also several odd-looking shapes which can be joined together to form a picture. Only by completing this jigsaw can you hope to have a chance of winning the £1000.

William Wobbler is another delightful Crowther game. Those who buy it, spurred on by the thought of winning the competition, should be warned that they will only be able to enter if they have access to a Commodore disk drive, as all entries must be saved onto a free floppy disk that is provided with the game. END

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Processing speech

Before you spend money on a commercial speech unit, how about trying to construct one at home? Paul Hardy, armed with a soldering iron and allophones, is your guide.

Having seen some commercial speech units for the Spectrum, I decided to make something for my CP/M system. As I was interested in the concept of a talkative micro rather than a complex construction project, it had to be cheap, and both easy and fast to make.

The unit I came up with uses less than 20 discrete components and cost around £20 to build. It took me a couple of hours to make, and should be well within the capabilities of anyone who can handle a soldering iron and CMOS ICs. To make life even simpler, a printed circuit board has been designed for the project. The unit will work on any machine which has a parallel printer port, CP/M-based or not.

Allophones & phonemes

Before moving on to the construction details, a brief look at phonemes and allophones is necessary. A phoneme is a language sound defined by the way the human mouth is used to construct it. The 's' in 'snow', for example, is a phoneme; specifically, an alveolar voiceless fricative. 'Alveolar' means the tip of the tongue touches or nearly touches the Alveolar Ridge, which is the bit of upper jaw just behind the top teeth. It is voiceless because the vocal cords are not being used to make a sound. The voiced phoneme is the 'z' in 'zoo'; this time, the vocal cords are making a sound.

Each language has a phoneme set which is slightly different to those in any other language. A speech processor with a look-up table of phonemes could be expected to successfully generate any desired word. However, this is not so as, despite the apparently accurate definition of the mechanics used in making the phoneme, a phoneme which occurs twice in a word may sound rather different in each position, due to the sounds around it. Each of these different-sounding phonemes is an 'allophone': the sounds are allophones of the same phoneme. An allophone, therefore, sounds the same wherever it is. With enough allophones, it should be possible to fairly accurately reproduce any word. The allophones are defined by how they sound rather than the mechanism used to make them.

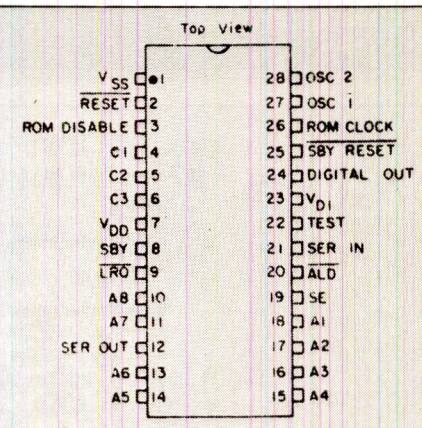
This speech processor unit has an allophone set on ROM as a set of 59 allophones and five pauses. The pauses are of various lengths from 10ms to 200ms, and are important tools in forming words accurately. For example, a short pause before the consonants B, D and G is needed to allow the sound to appear 'true' to the ear.

The allophone set on the chip I used, the SP0256AL, contains two or three versions of some phonemes. These tend to be varying-length consonants such as DD1 and DD2, as one will sound better than the other in any particular location. To create a long initial sound, for example a sibillant 's', there is nothing wrong with repeating the same allophone a couple of times. This can only be done with the fricatives and short vowels, as the sounds are relatively 'pure': they sound the same at the end as at the beginning, and so stringing them together makes the same sound last longer. A 'complex' allophone which undergoes a tonal change during its use — for example, the /OW/ representing the 'o' in 'zone' — can't be doubled, as you then get a distinct 'o-o' rather than a longer version of the original sound.

The sounds which require pauses

Address (Decimal)	Word Nr	Allophone	Duration (millisec)	Example
0	64	PA1	10	(pause)
1	1	PA2	30	(pause)
2	2	PA3	50	(pause)
3	3	PA4	100	(pause)
4	4	PA5	200	(pause)
5	5	/OY/	420	boy
6	6	/AY/	260	sky
7	7	/EH/	70	end
8	8	/KK3/	120	comb
9	63	/PP/	210	pow
10	10	/JH/	140	dodge
11	11	/NN1/	140	thin
12	12	/IH/	70	sit
13	13	/TT2/	140	to
14	14	/RR1/	170	rural
15	15	/AX/	70	succeed
16	16	/MM/	180	milk
17	17	/TT1/	100	part
18	18	/DH1/	290	they
19	19	/IY/	250	see
20	20	/EY/	280	beige
21	21	/DD1/	70	could
22	22	/UW1/	100	to
23	23	/AO/	100	aught
24	24	/AA/	100	hot
25	25	/YY2/	180	yes
26	26	/AE/	120	hat
27	27	/HH1/	130	he
28	28	/BB1/	80	business
29	29	/TH/	180	thin
30	30	/UH/	100	book
31	31	/UW2/	260	food
32	32	/AW/	370	out
33	33	/DD2/	160	do
34	34	/GG3/	140	wig
35	35	/VV/	190	vest
36	36	/GG1/	80	got
37	37	/SH/	160	ship
38	38	/ZH/	190	azure
39	39	/RR2/	120	brain
40	40	/FF/	150	food
41	41	/KK2/	190	sky
42	42	/KK1/	160	cannot
43	43	/ZZ/	210	zoo
44	44	/NG/	220	ding
45	45	/LL/	110	lake
46	46	/WW/	180	wool
47	47	/XR/	360	repair
48	48	/WH/	200	whip
49	49	/YY1/	130	yes
50	50	/CH/	190	church
51	51	/ER1/	160	fir
52	52	/ER2/	300	fir
53	53	/OW/	240	hoe
54	54	/DH2/	240	they
55	55	/SS/	90	vest
56	56	/NN2/	190	no
57	57	/HH2/	180	hoe
58	58	/OR/	330	store
59	59	/AR/	290	arm
60	60	/YR/	350	clear
61	61	/GG2/	40	guest
62	62	/EL/	190	saddle
63	63	/BB2/	50	business

Fig 1 Allophones, listed by ROM address and location in the vocabulary file VOCABUL.RY, generated by routine FILELOAD.BAS



Pin	Name	Function
1	VSS	Ground (0V)
2	RESET	Must be logic 1 for normal operation
3	ROM DISABLE	Disables external ROMs when at logic 1. Unused.
4	C1	} Control lines for external ROMs Unused.
5	C2	
6	C3	
7	VDD	Power supply (5V)
8	SBY	STANDBY. Goes to logic 0 when an address has been loaded, then returns to logic 1. Used by this project.
9	LRQ	LOAD REQUEST. Goes to logic 1 whenever the input buffer is full. Returns to logic 0 when the buffer is empty. Used by this project.
10	A8	} The 8 address lines. Used.
11	A7	
13	A6	
14	A5	
15	A4	
16	A3	
17	A2	
18	A1	
12	SER OUT	SERIAL ADDRESS OUT. Used to address external ROMs. Unused.
19	SE	STROBE ENABLE. Tied to logic 1 for mode 1 operation. See text.
20	ALD	ADDRESS LOAD. When pulsed low by 'STROBE' from the micro, the 8 address bits A1 to A8 are loaded and LRQ goes high.
21	SER IN	SERIAL IN. Serial data input from an external speech ROM. Unused.
22	TEST	Tied to ground (0V).
23	VD1	Power supply.
24	DIGITAL OUT	Digital speech output, pulse width modulated. Used as an audio signal after filtering through a 5kHz low-pass filter.
25	SBY RESET	Tied to logic 1 for normal operation.
26	ROM CLOCK	A clock output, half the frequency of the crystal oscillator on pins 27 and 28. Would be use to drive external speech ROMs but unused here.
27	OSC1	} The connections to the oscillator which determines the voice pitch and speed.
28	OSC2	

Diagram 1 SP0256AL2 integrated circuit

before them (PP, TT, DD, KK, GG, CH and JH) do,in fact, have very short pauses built into them, but trial and error might indicate the need for additional pauses. Word design is subjective. A word that is difficult to generate and sounds 'false' when spoken alone, might be perfectly acceptable when sounded as part of a sentence. This is due to the brain not needing all the aural information being fed to it, and when it grasps what is being said, any missing bits are filled in and extraneous bits are ignored. The frequency response of the brain is about 50Hz to 20KHz, which is why hi-fis are designed with the same frequency response; any more is wasted. On the other hand, the frequency response of the telephone network is up to about 5KHz. It obviously isn't hi-fi, but it is readily understandable. This speech processor has roughly the same frequency response.

The allophone set in this IC is, in effect, 59 sounds snipped out of a large set of spoken words (Fig 1). These sounds were 'snipped' in the United States. I mentioned earlier that no two languages have precisely the same phoneme set; this is true of English and American. The result is that it is very difficult to stop the speech processor sounding like an American shouting down the telephone. If you accept this, then word design becomes much easier.

The processor

The single SP0256AL2 integrated circuit is an MOS LSI device in a 28-pin package (Diagram 1). It consists of four basic sections:

— a software-programmable digital filter which models the vocal tract;

— a 16k ROM holding the program and the data;

— a processor which uses the program and data to control a digital filter; and

— a pulse width modulator which creates the digital output. The output is passed through an external low-pass filter to form the audio signal.

The SP0256AL2 needs an external processor (a micro) to concatenate the separate sounds. It has eight address lines which are loaded with the address of the sound to be made. There are 64 sounds stored in the ROM (or, more accurately, 59 sounds and five pauses) numbered 0 to 63.

This means that it should be possible to address all the locations using just six address lines (in fact, the two highest address lines are not required). This sounds rather complicated, but is not: it acts like a parallel printer and so can be treated as such by the software.

The IC can be addressed in two modes. Mode 0 does not require the ALD pin to be strobed, but simply waits for any address line to go high. The problem is that it isn't possible to make the sound associated with location 0, as all address lines are then low. This is a 10ms pause, and as there are four other pauses available of differing lengths, it may not be missed.

Mode one (which the project uses) requires the address to be loaded, and then the address load pin (ALD) to be pulsed low. This is exactly what a printer expects. When the address is loaded and the ALD pin strobed (many printer manuals call the pin 'Strobe'), the speech processor sets Load Request (LRQ) high to signal that the input buffer is full, and Standby (SBY) low to signal that the processor is now busy. Either signal can be used.

ICI SPO256-AL2

Resistors 0.25W 5 per cent carbon film

R1-R6	10k
R7	100k
R8, R9	33k

Capacitors

C1, C2	22pF ceramic plate
C3, C6	100nF dipped polyester
C4, C5	22nF dipped polyester
C7	47uF electrolytic

Diodes

D1	1N4148
D2	1N4001

Miscellaneous

20-pin IC socket
Centronics socket, 90-degree PCB mounting type
Four two-way PCB mounting terminal blocks
Printed circuit board

Fig 2 Parts list

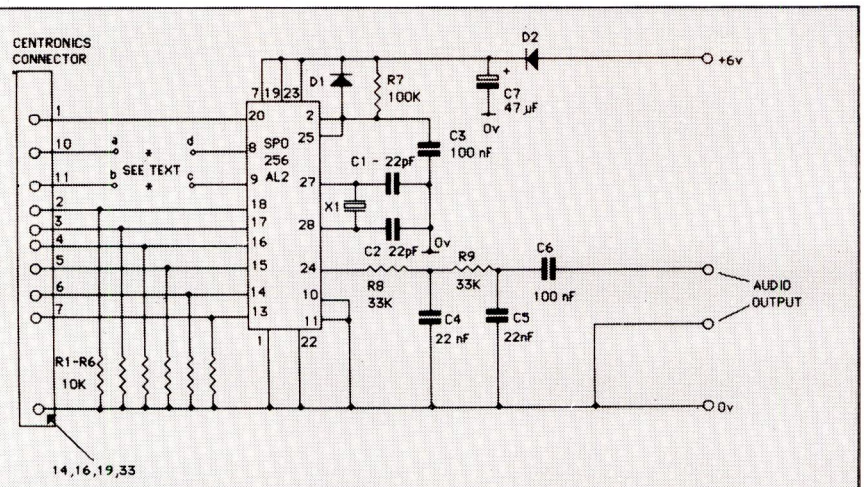


Diagram 2a Speech synthesiser circuit

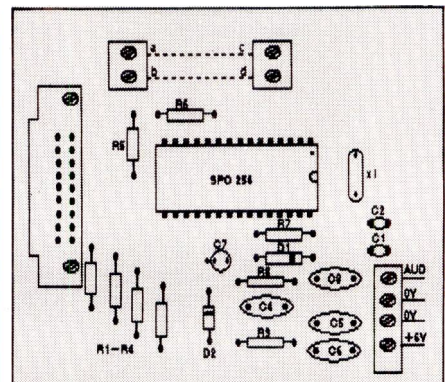


Diagram 2b Overlay diagram

The speech processor therefore behaves like a parallel printer with a very small input buffer. As the shortest sound it makes lasts 10ms, the controlling software does not have to run very fast: if the software can supply it at a leisurely 100Hz, it will never run out of things to say. It should be possible to construct sentences within Basic and output them to the speech processor without pauses.

The speech processor can access further ROMs which can be used to house words or complete sentences. The full eight-pin addressing would then be required. (This project uses just the 59 allophones and five pauses in the IC's ROM.)

```
10 REM ====>  SPEAK.BAS copyright (c) 1985 by Paul Hardy
20 REM ====>  Says "Hello, I am talking to you."
30 REM ================================================================
40 REM
50 CLEAR 2000  :  DEFINT A-Z
60 REM =====>  Note that /PP/ will not work in an LPRINT statement
70 REM =====>  because it is the 'tab' character:  see text.
80 REM
90 PA1=0 : PA2=1 : PA3=2 : PA4=3 : PA5=4 : OY=5 : AY=6 : EH=7 : KK3=8 : PP=9 :
   JH=10 : NN1=11 : IH=12 : TT2=13 : RR1=14 : AX=15 : MM=16 : TT1=17
100 DH1=18 : IY=19 : EY=20 : DD1=21 : UW1=22 : AO=23 : AA=24 : YY2=25 : AE=26 :
    HH1=27 : BB1=28 : TH=29 : UH=30 : UW2=31
110 AW=32 : DD2=33 : GG3=34 : VV=35 : GG1=36 : SH=37 : ZH=38 : RR2=39 : FF=40 :
    KK2=41 : KK1=42 : ZZ=43 : NG=44 : LL=45 : WW=46 : XR=47 : WH=48 : YY1=49
120 REM
130 REM =====>  NOTE allophone /OR/ is written as OOR to avoid a clash with
140 REM =====>       the reserved word OR.
150 REM
160 CH=50 : ER1=51 : ER2=52 : OW=53 : DH2=54 : SS=55 : NN2=56 : HH2=57 : OOR=58
    : AR=59 : YR=60 : GG2=61 : EL=62 : BB2=63
170 LPRINT CHR$(HH); CHR$(EH); CHR$(LL); CHR$(AX); CHR$(OW); CHR$(PA5);
        CHR$(PA5);  : REM    hello
180 LPRINT CHR$(AA); CHR$(AY); CHR$(PA3);  : REM  I
190 LPRINT CHR$(AX); CHR$(AX); CHR$(MM); CHR$(PA3);  : REM  am
200 LPRINT CHR$(TT2); CHR$(AO); CHR$(AO); CHR$(KK1); CHR$(IH); CHR$(NG);
        CHR$(PA3);  : REM  talking
210 LPRINT CHR$(TT2); CHR$(UW2); CHR$(PA3);  : REM to
220 LPRINT  CHR$(YY2); CHR$(UW2); CHR$(PA3);  : REM you
230 LPRINT CHR$(PA5); CHR$(PA5); CHR$(PA5);  : REM (pause)
```

Listing 1 HELLO.BAS

Building the unit

I bought a small, ready-built unit from Tandy, not much larger than a radio speaker and taking an internal battery, which also solves the problem of coming up with a clever power supply for the different voltages needed by the speech processor and the amplifier.

I bought my parts from Tandy as well, and a very good information booklet came with the IC: much of the technical information in this article comes (with thanks) from it. However, the circuit diagram printed here is somewhat simpler.

The IC will work from about four-and-a-half volts up to seven volts. Above that, it will die rapidly. I use a four-cell holder to give me six volts and that works fine, as will any battery that supplies six volts. Do not be tempted to use a nine-volt battery, as the circuit is heavy on batteries — say, 100 milliamps when it is talking. However, batteries do not need isolating from noise sources, smoothing or anything else. My rechargeables and charger cost about the same as a power supply that could do the job.

One important thing to remember is to handle the IC carefully. It is a CMOS IC, and can be damaged by static and current leakage from soldering irons, as well as the usual threat of being stood on. The IC will be on a bit of conductive foam: leave it there until the moment you want to fit it. When you do come to handle it, touch some earthed metalwork, such as a radiator, to get rid of any

A	115	D	118	G	121	May	107	robots	177	thirteen	78
alarm	141	date	154			memory	169			thirty	86
April	106	daughter	155	H	122	million	95	S	133	thousand	94
ate	73	day	156	hello	161	minute	170	Saturday	102	three	68
August	110	December	114	hour	162	Monday	97	score	178	Thursday	100
				hundred	93	mouth	171	sea	117	time	187
B	116	E	119					second	179	times	188
be	116	eight	73	I	123	N	128	seconds	180	to	67
bee	116	eighteen	83	infinitive	163	nine	74	see	117	too	67
beer	142	eighty	91	investigate	164	nineteen	84	September	111	Tuesday	98
bread	143	eleven	76	investigator	165	ninety	92	seven	72	twelve	77
buy	144	escape	157	investigators	166	no	172	seventeen	82	twenty	85
by	144	equal	158			November	113	seventy	90	two	67
		equals	159	J	124			sister	181		
C	117	error	160	January	103	O	129	six	71	U	135
calendar	145			July	109	October	112	sixteen	81		
clock	146	F	120	June	108	one	66	sixty	89	V	136
clown	147	February	104					start	182		
check	148	fifteen	80	K	125	P	130	stop	183	W	137
checker	149	fifty	88			plus	173	Sunday	96	Wednesday	99
cheque	148	five	70	L	126						
computer	150	for	69	letter	167	Q	131	T	134	X	138
correct	151	forty	87	little	168			talk	184		
corrected	152	four	69			R	132	talking	185	Y	139
correcting	153	fourteen	79	M	127	ready	174	talks	186	year	189
		Friday	101	March	105	red	175	tea	134	yes	190
						robot	176	ten	75		
										Z	140
										zero	65

Fig 3 Word numbers

```
10 ' ================================================
20 ' =====> FILELOAD.BAS copyright (c) Paul Hardy.  ==
30 ' =====> Program creates a random-access disk file  ==
40 ' =====> and loads it with the speech vocabulary.  ==
50 ' =====>                                          ==
60 ' =====> The program may be used for personal,    ==
70 ' =====> non-commercial purposes only.            ==
80 ' =====>                                          ==
90 ' ================================================
100 '
110 OPTION BASE 1                       :' Start arrays at 1, not 0
120 WIDTH 255                           :' Allow longer MBASIC lines
130 '
140 ' =====> Array A can hold 200 words of 19 allophones
150 ' =====> plus one location for word length.
160 '
170 DIM A(20)
180 TOP=190                                     :' Number of words
190 '
200 DATA 1,1                                    :' PA2
210 DATA 1,2                                    :' PA3
220 DATA 1,3                                    :' PA4
230 DATA 1,4                                    :' PA5
240 DATA 1,5                                    :' /OY/
250 DATA 1,6                                    :' /AY/
260 DATA 1,7                                    :' /EH/
270 DATA 1,8                                    :' /KK3/
280 DATA 1,63                                   :' /PP/ (-SEE TEXT
290 DATA 1,10                                   :' /JH/
300 DATA 1,11                                   :' /NN1/
310 DATA 1,12                                   :' /IH/
320 DATA 1,13                                   :' /TT2/
330 DATA 1,14                                   :' /RR1/
340 DATA 1,15                                   :' /AX/
350 DATA 1,16                                   :' /MM/
360 DATA 1,17                                   :' /TT1/
370 DATA 1,18                                   :' /DH1/
380 DATA 1,19                                   :' /IY/
390 DATA 1,20                                   :' /EY/
400 DATA 1,21                                   :' /DD1/
410 DATA 1,22                                   :' /UW1/
420 DATA 1,23                                   :' /AO/
430 DATA 1,24                                   :' /AA/
440 DATA 1,25                                   :' /YY2/
450 DATA 1,26                                   :' /AE/
460 DATA 1,27                                   :' /HH1/
470 DATA 1,28                                   :' /BB1/
480 DATA 1,29                                   :' /TH/
490 DATA 1,30                                   :' /UH/
500 DATA 1,31                                   :' /UW2/
510 DATA 1,32                                   :' /AW/
520 DATA 1,33                                   :' /DD2/
530 DATA 1,34                                   :' /GG3/
540 DATA 1,35                                   :' /VV/
550 DATA 1,36                                   :' /GG1/
560 DATA 1,37                                   :' /SH/
570 DATA 1,38                                   :' /ZH/
580 DATA 1,39                                   :' /RR2/
590 DATA 1,40                                   :' /FF/
600 DATA 1,41                                   :' /KK2/
610 DATA 1,42                                   :' /KK1/
620 DATA 1,43                                   :' /ZZ/
630 DATA 1,44                                   :' /NG/
640 DATA 1,45                                   :' /LL/
650 DATA 1,46                                   :' /WW/
660 DATA 1,47                                   :' /XR/
670 DATA 1,48                                   :' /WH/
680 DATA 1,49                                   :' /YY1/
690 DATA 1,50                                   :' /CH/
700 DATA 1,51                                   :' /ER1/
710 DATA 1,52                                   :' /ER2/
720 DATA 1,53                                   :' /OW/
730 DATA 1,54                                   :' /DH2/
740 DATA 1,55                                   :' /SS/
750 DATA 1,56                                   :' /NN2/
760 DATA 1,57                                   :' /HH2/
770 DATA 1,58                                   :' /OR/
780 DATA 1,59                                   :' /AR/
790 DATA 1,60                                   :' /YR/
800 DATA 1,61                                   :' /GG2/
810 DATA 1,62                                   :' /EL/
820 DATA 1,63                                   :' /BB2/
830 DATA 1,0                                    :' PA1 (--At the
840 '                   end because the direct access file
850 '                   records start with nr 1
860 '
870 DATA 3,43,60,53                             :' zero
880 DATA 3,46,15,11                             :' one
890 DATA 2,13,31                                :' two, to, too
900 DATA 3,29,14,19                             :' three
910 DATA 3,40,40,58                             :' four, for
920 DATA 4,40,40,6,35                           :' five
930 DATA 7,55,55,12,12,2,41,55                  :' six
940 DATA 6,55,55,7,7,35,11                      :' seven
950 DATA 3,20,2,13                              :' eight, ate
960 DATA 4,11,24,6,11                           :' nine
970 DATA 4,13,7,7,11                            :' ten
980 DATA 7,12,45,7,7,35,12,11                   :' eleven
990 DATA 6,13,48,7,7,45,35                      :' twelve
1000 DATA 7,29,51,1,2,13,19,11                  :' thirteen
1010 DATA 7,40,58,1,2,13,19,11                  :' fourteen
1020 DATA 8,40,12,40,1,2,13,19,11               :' fifteen
1030 DATA 11,55,55,12,2,41,55,1,2,13,19,11      :' sixteen
1040 DATA 11,55,55,7,33,29,11,1,2,13,19,11      :' seventeen
1050 DATA 6,20,1,2,13,19,11                     :' eighteen
1060 DATA 8,11,6,11,1,2,13,19,11                :' nineteen
1070 DATA 9,13,48,7,7,11,1,2,13,19              :' twenty
1080 '
1090 DATA 6,29,52,1,2,13,19                     :' thirty
1100 DATA 5,40,58,2,13,19                       :' forty
1110 DATA 9,40,40,12,40,40,1,2,13,19            :' fifty
1120 DATA 10,55,55,12,2,41,55,1,2,13,19         :' sixty
1130 DATA 10,55,55,7,35,12,11,1,2,13,19         :' seventy
1140 DATA 4,20,2,13,19                          :' eighty
1150 DATA 6,11,6,11,2,13,19                     :' ninety
1160 DATA 11,57,15,15,11,1,33,39,12,12,0,21     :' hundred
1170 DATA 9,29,24,32,43,29,0,0,11,21            :' thousand
1180 DATA 7,16,12,12,45,49,15,11                :' million
1190 '
1200 DATA 8,55,55,15,15,11,1,33,20              :' Sunday
1210 DATA 7,16,15,15,11,1,33,20                 :' Monday
1220 DATA 6,13,31,43,1,33,20                    :' Tuesday
1230 DATA 8,46,7,7,11,43,1,33,20                :' Wednesday
1240 DATA 6,29,52,43,1,33,20                    :' Thursday
1250 DATA 6,40,39,6,1,33,20                     :' Friday
1260 DATA 8,55,55,26,2,13,1,33,20               :' Saturday
1270 DATA 7,10,26,26,11,25,47,19                :' January
1280 DATA 9,40,7,7,0,28,39,31,47,19             :' February
1290 DATA 4,16,59,2,50                          :' March
1300 DATA 7,20,2,63,39,12,12,45                 :' April
1310 DATA 2,16,20                               :' May
1320 DATA 3,10,31,11                            :' June
1330 DATA 4,10,22,45,6                          :' July
1340 DATA 8,23,23,1,61,15,55,2,17               :' August
1350 DATA 12,55,55,7,2,63,2,13,7,7,0,63,51      :' September
1360 DATA 9,24,1,41,2,13,53,0,63,51             :' October
1370 DATA 9,56,53,35,7,7,16,0,63,51             :' November
1380 DATA 10,33,19,55,55,7,7,16,0,63,51         :' December
1390 '
1400 DATA 1,20                                  :' A
1410 DATA 2,63,19                               :' B, be, bee
1420 DATA 3,55,55,19                            :' C, sea, see
1430 DATA 2,33,19                               :' D
1440 DATA 1,19                                  :' E
1450 DATA 4,7,7,40,40                           :' F
1460 DATA 2,10,19                               :' G
1470 DATA 4,20,1,2,50                           :' H
1480 DATA 2,24,6                                :' I
1490 DATA 3,10,7,20                             :' J
1500 DATA 3,42,7,20                             :' K
1510 DATA 3,7,7,62                              :' L
1520 DATA 3,7,7,16                              :' M
1530 DATA 3,7,7,11                              :' N
1540 DATA 1,53                                  :' O
1550 DATA 2,63,19                               :' P
1560 DATA 3,42,49,31                            :' Q
1570 DATA 1,59                                  :' R
1580 DATA 4,7,7,55,55                           :' S
1590 DATA 2,13,19                               :' T, tea
1600 DATA 2,49,31                               :' U
1610 DATA 2,35,19                               :' V
1620 DATA 7,33,15,1,63,62,49,31                 :' W
1630 DATA 6,7,7,2,41,55,55                      :' X
1640 DATA 2,46,6                                :' Y
1650 DATA 5,43,7,7,1,21                         :' Z (English one!)
1660 '
1670 DATA 4,15,45,59,16                         :' ALARM
1680 DATA 2,63,60                               :' BEER
1690 DATA 6,28,39,7,7,0,21                      :' BREAD
1700 DATA 3,63,24,6                             :' BY, BUY
1710 DATA 9,42,26,26,45,7,11,1,33,51            :' CALENDAR
1720 DATA 6,42,45,24,24,2,41                    :' CLOCK
1730 DATA 4,42,45,32,11                         :' CLOWN
1740 DATA 5,50,7,7,2,41                         :' CHECK
1750 DATA 6,50,7,7,2,41,51                      :' CHECKER
1760 DATA 8,42,15,16,63,49,22,13,51             :' COMPUTER
1770 DATA 8,42,52,7,7,1,42,1,17                 :' CORRECT
1780 DATA 11,42,52,7,7,1,42,1,17,12,1,21        :' CORRECTED
1790 DATA 10,42,52,7,7,1,42,1,17,12,44          :' CORRECTING
1800 DATA 4,33,20,2,13                          :' DATE
1810 DATA 4,33,23,13,51                         :' DAUGHTER
1820 DATA 3,33,7,20                             :' DAY
1830 DATA 9,7,55,55,2,42,1,2,20,63              :' ESCAPE
1840 DATA 7,19,1,2,8,48,15,62                   :' EQUAL
1850 DATA 8,19,1,2,8,48,15,62,43                :' EQUALS
1860 DATA 3,7,47,58                             :' ERROR
1870 DATA 5,57,7,45,15,53                       :' HELLO
1880 DATA 2,32,51                               :' HOUR
1890 '  INFINITIVE, INVESTIGATE, INVESTIGATOR, INVESTIGATORS
1900 DATA 13,12,11,40,40,12,12,11,12,1,2,13,12,35
1910 DATA 16,12,12,11,35,7,7,55,1,2,13,12,0,36,20,1,13
1920 DATA 17,12,12,11,35,7,7,55,1,2,13,12,0,36,20,1,13,51
1930 DATA 18,12,12,11,35,7,7,55,1,2,13,12,0,36,20,1,13,51,43
1940 DATA 6,45,7,7,2,13,51                      :' LETTER
1950 DATA 6,45,12,12,2,13,62                    :' LITTLE
1960 DATA 6,16,7,7,16,52,19                     :' MEMORY
1970 DATA 6,16,12,11,12,2,13                    :' MINUTE
1980 DATA 4,16,15,11,29                         :' MOUTH
1990 DATA 3,56,15,53                            :' NO
2000 DATA 6,63,45,15,15,55,55                   :' PLUS
2010 DATA 6,14,7,7,0,33,19                      :' READY
2020 DATA 5,14,7,7,0,21                         :' RED
2030 DATA 7,14,53,1,63,24,2,13                  :' ROBOT
2040 DATA 8,14,53,1,63,24,2,13,55               :' ROBOTS
2050 DATA 5,55,55,2,8,58                        :' SCORE
2060 DATA 9,55,55,7,2,42,12,11,1,21             :' SECOND
2070 DATA 10,55,55,7,2,42,12,11,1,21,43         :' SECONDS
2080 DATA 8,55,55,12,12,55,2,13,51              :' SISTER
2090 DATA 7,55,55,2,13,59,2,13                  :' START
2100 DATA 7,55,55,2,17,24,2,63                  :' STOP
2110 DATA 5,13,23,23,1,41                       :' TALK
2120 DATA 7,13,23,23,2,42,12,44                 :' TALKING
2130 DATA 6,13,23,23,1,41,55                    :' TALKS
2140 DATA 4,13,24,6,16                          :' TIME
2150 DATA 5,13,24,6,16,43                       :' TIMES
2160 DATA 2,25,60                               :' YEAR
2170 DATA 5,25,7,7,55,55                        :' YES
3000 '
3010 ' =====> CREATE RANDOM-ACCESS DISK FILE  ==============
3020 '
3030 OPEN "R", £1, "VOCABULA.RY", 40
3040 '
3050 ' =====>  Define 20 two-character fields in the file
3060 '
3070 FIELD£1,
     2 AS F1$,2 AS F2$,2 AS F3$,2 AS F4$,2 AS F5$,2 AS F6$,2 AS F7$,
     2 AS F8$,2 AS F9$,2 AS F10$,2 AS F11$,2 AS F12$,2 AS F13$,
     2 AS F14$,2 AS F15$,2 AS F16$,2 AS F17$,2 AS F18$,2 AS F19$,
     2 AS F20$
3080 '
3090 ' =====>  LOAD ARRAY  ================================
3100 '
3110 FOR WORD=1 TO TOP
```

Listing 2 FILELOAD.BAS

Here's

IBM, Epson QX-

Acorn Electron, ACT

Ericsson...and

that fits them all-the

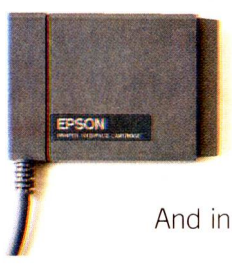
At last, your computer can have an Epson printer.

Even if it's only supposed to be compatible with 'own brand' printers (like Atari).

Our latest printer, the GX-80, has a revolutionary new interface called PIC (it means Printer Interface Cartridge and that's it on the right). The cartridge slips into the back of the GX-80 and enables the GX to understand commands from the host computer.

So if you've ever wanted to have an Epson printer for your micro but thought you couldn't, here it is.

But first, read about the GX-80's other cracking advantages . . .



What happens when I change computers?

Gone are the days when you had to scrap a perfectly good printer just because it 'didn't go with' your new computer.

Once bought, your GX-80 stays put. (Epsons tend to stick around for ages anyway; now we've taken tradition a little further.)

When the time comes to upgrade your computer, you simply go back to your Epson dealer and buy the corresponding new PIC.

It's a far sight cheaper than being forced to sell/scrap out your printer only to buy another one. And in effect it makes the GX-80 your printer for life.

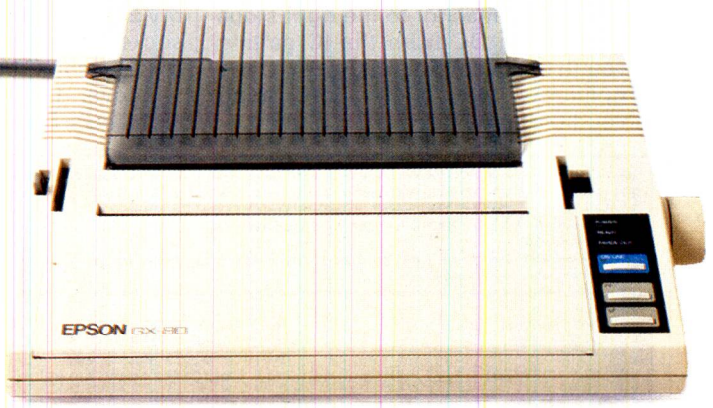
plug for any Atari,

5, Apple IIc, BBC,

Sirius/Apricot, Compaq,

his is the printer

new Epson GX-80.



A printer for life? What's the catch?

Sheer, unremitting boredom.

The GX-80 takes all the fun out of printer ownership. You can't shout, "Lousy printer! It's fouled up again!" because it won't. It's just as reliable as every other Epson.

Nor can you gleefully chuck it merely because you've changed computers — PIC's seen to that.

But all is not lost. You could change your computer a bit more often. Just for fun.

EPSON

Epson (UK) Ltd., Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone 01-902 8892.

I'm looking for a permanent relationship too. Tell me the rest about the GX-80 with PIC.

KPW1

Name _____

*Position/Company _____

Address _____

_____ Tel No. _____

*Please leave blank if inapplicable.

continued

```
3120    READ A(1)
3130    FOR J=2 TO A(1)+1
3140      READ A(J)
3150    NEXT J
3160 '
3170 ' =====> Load file as right-justified characters
3180 '
3190    RSET F1$=MKI$(A(1)) : RSET F2$=MKI$(A(2))
3200    RSET F3$=MKI$(A(3))
3210    RSET F4$=MKI$(A(4)) : RSET F5$=MKI$(A(5))
3220    RSET F6$=MKI$(A(6)) : RSET F7$=MKI$(A(7))
3230    RSET F8$=MKI$(A(8)) : RSET F9$=MKI$(A(9))
3240    RSET F10$=MKI$(A(10)) : RSET F11$=MKI$(A(11))
3250    RSET F12$=MKI$(A(12)) : RSET F13$=MKI$(A(13))
3260    RSET F14$=MKI$(A(14)) : RSET F15$=MKI$(A(15))
3270    RSET F16$=MKI$(A(16)) : RSET F17$=MKI$(A(17))
3280    RSET F18$=MKI$(A(18))
3290    RSET F19$=MKI$(A(19)) : RSET F20$=MKI$(A(20))
3300 '
3310 ' =====> Put the record in the buffer
3320 '
3330    PUT£1,WORD
3340 '
3350 ' =====> Display the word just written to prove it worked
3360 '
3370    PRINT WORD
3380 NEXT WORD
3390 '
3400 ' =====> Close file and exit
3410 '
3420 CLOSE
```

charge you might have accumulated. I always have a radio on when I am doing this type of thing. If the radio goes 'click' when I touch the radiator, then I know that there is a lot of static about. But there is no great need to be paranoid. I have never destroyed a CMOS IC due to careless handling.

For full details of all the parts required, see Fig 2. Tandy is worth checking for the components, as is your local electronics shop. The printed circuit board designed for the project is available from Magenta Electronics. Magenta will supply this board complete with all the components as a ready-to-build kit for £22.89. If you prefer to buy the components yourself, it will supply just the board for £3.48. Both prices include VAT — add 60p postage and packing on each order.

Magenta's address is Magenta Electronics Ltd, 135 Hunter Street, Burton-on-Trent, Staffs DE14 2ST, tel: (0283) 65435. The circuit details are shown in Diagrams 2a and 2b.

The 0.022 microfarad capacitors near pin 24 and the 33 kilohm resistors form a 5KHz low-pass filter. In other words, anything below 5KHz gets through. Pin 24 is the output from the IC, but it is a stream of zeros and ones. The filter rounds it all off and the result is an analogue signal of sorts. The one-microfarad capacitor to the right stops any standing DC from the IC getting through to the amplifier. After that, any amplifier will do the job of generating an audible signal.

Check everything thoroughly before plugging the IC into its socket. The chances are that the IC's legs will be splayed too far apart to fit into the socket. Touch an earth (like a radiator — *not* a mains socket earth) to discharge any static, and bend the chip's legs into position.

Resistors have been connected to the six data lines to ensure that they are held at logic 0, even when the printer lead is disconnected. Without these, the circuit has the disconcerting habit of producing random allophones whenever the computer lead is disconnected. The two unused data lines have been permanently connected to the negative supply.

A Centronics socket is fitted to the PCB to enable the speech unit to be connected to almost any computer. The simplest way to connect a micro is to buy a Centronics printer cable and plug it in. A link-wire arrangement has been provided to overcome the differences between micros when addressing a Centronics port. The link wire straddles the SBY and LRQ outputs (pins 8 and 9 of the IC, and pins 10 and 11 of the Centronics connector).

Wiring up your own Centronics connector takes a bit of thought. Datasheets on the IC number the data lines from A1 to A8. The data sheet for my printer (which I used to work out the socket wiring) refers to them as lines 0 to 7. Be careful not to get confused — whatever the numbering, there are eight lines. Do not wire it up one line out and have one left over at the end.

On your micro, the connection may be different, but the speech processor does not need a comprehensive set of connections. Of course, a socket is not necessary, and some ribbon connector could be wired straight onto the board.

Software

I wrote three programs (see Listings 1 to 3) to test the finished board and to provide the basis for a speech system. The programs are written in Microsoft Basic and are very simply structured, so their functions are obvious and conversion to other dialects is easy.

Listing 1 (HELLO.BAS) is the test program. The statements at the beginning assign the allophones to the numbers that generate them. Note that allophone /OR/ is given as DOR, because OR is a reserved word. Note also that many Basics only allow two-character variable names, whereas this program uses three-variable names to stay as close as possible to the actual allophone names.

Output to the speech processor is via LPRINT. Note the use of semicolons to suppress carriage returns. Variable PP (allophone /PP/) is set to the value 9. On my Osborne, I get nine spaces output instead of a tab character, so I can't use this phoneme. In the other listings, I have cured this by cheating.

To set up the links, type in and run this program. Without any links connected the computer will 'hang-up', awaiting

```
10 ' ================================================
20 ' =====>  VOCABTST.BAS copyright (c) 1985 Paul Hardy      =
30 ' =====>  Reads the word number specified in from        =
40 ' =====>  file VOCABULA.RY and speaks it.                =
50 ' =====>                                                 =
60 ' =====>  Program may be used for personal, non-commercial =
70 ' =====>  use only.                                      =
80 ' ================================================
90 '
100 OPTION BASE 1                       : ' Start arrays at 1 not 0
110 WIDTH 255                           : ' Allow long Basic lines
120 DEFINT A-Z                          : ' Integers for speed
130 DIM WORD(20)                        : ' Temporary word array
140 TOP=190
150 '
160 ' =====>  Open random access file, 40 chars per record ====
170 '
180 OPEN "R",£1,"VOCABULA.RY",40
190 '
200 ' =====>  Define the record: 20 2-character fields
210 '
220 FIELD £1,2 AS F1$,2 AS F2$,2 AS F3$,2 AS F4$,2 AS F5$,2 AS F6$,
            2 AS F7$,2 AS F8$,2 AS F9$,2 AS F10$,2 AS F11$,2 AS F12$,
            2 AS F13$,2 AS F14$,2 AS F15$,2 AS F16$,2 AS F17$,
            2 AS F18$,2 AS F19$,2 AS F20$
230 '
240 ' =====>  Request word number.  If out-of-range, ask again.
250 '                              If 999, then stop.
260 '
270 INPUT "Enter word number ";NUM
280 IF NUM=999 THEN CLOSE : STOP
290 IF NUM<1 OR NUM>TOP THEN PRINT CHR$(7) : GOTO 270
300 '
310 ' =====> Get requested record number  ====================
320 '
330 GET£1, NUM
340 '
350 ' =====>  Convert the character fields back to integer
360 '
370 WORD(1)=CVI(F1$) : WORD(2)=CVI(F2$)
380 WORD(3)=CVI(F3$) : WORD(4)=CVI(F4$)
390 WORD(5)=CVI(F5$) : WORD(6)=CVI(F6$)
400 WORD(7)=CVI(F7$) : WORD(8)=CVI(F8$)
410 WORD(9)=CVI(F9$) : WORD(10)=CVI(F10$)
420 WORD(11)=CVI(F11$) : WORD(12)=CVI(F12$)
430 WORD(13)=CVI(F13$) : WORD(14)=CVI(F14$)
440 WORD(15)=CVI(F15$) : WORD(16)=CVI(F16$)
450 WORD(17)=CVI(F17$) : WORD(18)=CVI(F18$)
460 WORD(19)=CVI(F19$) : WORD(20)=CVI(F20$)
470 '
480 ' =====>  Say the word.  First element says how many
490 ' =====>  allophones follow.
500 '
510 FOR I=2 TO WORD(1)+1
520 LPRINT CHR$(WORD(I));
530 NEXT I
540 LPRINT CHR$(4);                     : ' Send a pause at the end
550 GOTO 270                            : ' Request next word
```

Listing 3 VOCABTST.BAS

an Acknowledge and/or Busy signal. Try linking terminal d to a or b and the terminal c to a or b. When the correct combination is achieved, the string of allophones will be sounded with correct timing. Note that the last allophone will continue sounding at the end of the test. Probably only one link will be required, but two links can be inserted if necessary. Note that terminals c and d must not be linked to each other, or the IC may be damaged.

If it still doesn't work, disconnect the battery and check the following:
— that the software is correct:
— that the IC is in the right way round;
— that any pins that should be tied to ground actually are, and not to the positive supply rail (and *vice versa);*
— that none of the legs are bent under;
— that if any of the capacitors display '+' or '−' signs, check they are in the right way; and
— check that you have correctly identified pin one on the cable connector you are using, and that you have not wired the connector up as a mirror image.

If the speech unit continually repeats AR, there is a semicolon missing from one of the LPRINT statements.

Listing 2 (FILELOAD.BAS) is the most important listing. It is well commented. The allophones for each word are stored in data statements. The standard I have chosen is that the first integer indicates the number of allophones that follow: for example, the word 'zero' consists of allophones /ZZ/, /YR/ and /OW/. These are represented by the three numbers 43, 60 and 53; hence the DATA statement: DATA 3, 43, 60, 53.

Line 110 allows statement lines of 255 characters, rather than the 72 which Microsoft Basic defaults to.

Microsoft Basic under CP/M 2.2 supports random file access. A random file is one where data can be retrieved from anywhere within the file if you know the exact location of the data. In practical terms, this means that the file does not have to be loaded into an array at the start of the program, saving space. To create a random file, you must specify the file name, the file number, the length of each record, and the construction of the fields in that record. I have assumed that no word will need more than 19 allophones to generate it, and I have used the first field to store the number of allophones, just like the data statements. Each field is two characters as I don't need to store anything higher than 63. Twenty fields of two characters means that each record is 40 characters long; this is done in lines 3030 and 3070. Note that each field must have an associated field name which must be a string variable: I chose F1$ to F20$. Microsoft Basic stipulates that the names can only be used in the FIELD statement, and line where they are loaded. They cannot be used or modified elsewhere in the program because the assignment statements in lines 3190 to 3290 are not assigning values to F1$-F20$, but using them as pointers to the locations of the variables A(1)-A(20) in the record.

Lines 3190 to 3290 need closer examination. The function MKI$ is a Microsoft-supplied function to convert an integer to internal record format. Real and double-precision variables have their own conversion functions MKS$ and MKD$. RSET means the field will be right-justified. Therefore, RSET F1$=MKI$ (A(1)) means convert the integer in array element A(1) from integer format to internal record format, and store it right-justified. F1$ points to its location in the record.

Line 3330 PUTs the record into the file buffer. Line 3370 just prints the number of the word on screen so that you know the program is running.

When the program ends, there will be a random access disk file called 'VOCABULA.RY' containing all the words listed in the data statements. Fig 3 lists the words in alphabetical order with the numbers needed to call them from VOCABTST.BAS (Listing 3). The allophones in Fig 1 are also available.

Listing 3 (VOCABTST.BAS) complements Listing 2. When run, it prompts for a word number. Enter a number, and the word corresponding to that number will be spoken. This is really the heart of the software side of the project. The other routines provide various 'support' functions.

'It should be possible to construct sentences and output them to the speech processor without pause.'

It uses the random access file VOCABULA.RY created by FILELOAD.BAS. The program has to know the exact structure of the file. This is done in lines 180 and 220, which have exact equivalents in Listing 2.

Line 270 prompts for the word number. That record number is then 'got' by the GET statement in line 330. (GET is the functional opposite of PUT.) At this point, the record number is available to the program.

Lines 370 to 460 convert the data held in the record back from internal format to integer. CVI is the Microsoft function to convert from a two-character string to integer. There are similar functions for single and double-precision variables: CVS and CVD, operating on four-character and eight-character strings respectively. WORD(1)=CVI (F1$) means get the field pointed to by pointer F1$, convert it to integer, and assign it to element one of array WORD.

Lines 510 to 530 loop through array WORD from the second element to the one specified by the 'length' indicator in element one. Each integer is output to the printer port (the speech unit) and the carriage return is suppressed with the semicolon. Line 540 sends a short pause to end the word.

Going further

The program listings are meant as guides; they illustrate a few of the possibilities of driving the speech unit. Perhaps their most useful aspect is the fact that the hard part, working out the allophones, has been done in the data statements. If you use the data statements but not the programs, remember to omit the first number in each line if your program does not need to know how many allophones are in each word.

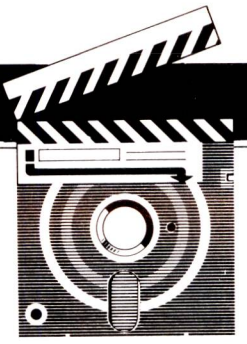
My use of random access files is also not strictly necessary. An alternative would be to have a single program to load all the data into an array, and just access rows of that array. Or, instead of having a random access file, write everything to a 'normal' sequential file (the only type supported by a lot of Basics) in one routine, and load the file into an array in a second routine. However, you may run into space problems as more words are added to the vocabulary.

In VOCABTST. BAS (Listing 3), the random file reading code in lines 330 to 530 would make a suitable subroutine within a more sophisticated program which could generate entire sentences, either through the keyboard or by accessing a file of word numbers. A way of cutting down the vocabulary file would be to keep common word endings separate and concatenate them on the word roots. The plural 's', and so on, would be prime candidates. My routines always end by sending a pause to stop the speech board talking; this would have to be removed for the concatenation technique.

One final note: there is an allophone for the sound /PP/, or the letter 'P' in a word. This is a decimal 9. If the programs were talking to a printer, this would be a 'tab'. My Osborne sees the 'tab' and sends out nine spaces which are really decimal 32s, so instead of saying 'P', the board gets a severe case of the stutters and goes 'a-a-a-a-a-a-a-a-a-' instead. I use the phoneme for 'B' instead. You could get round this in the programs by using the Basic OUT command instead of LPRINT, but this is not possible on the Osborne as the OUT command can only be used for bank-switching to access the video RAM, and so on.

While doing this, I was worried that the random file access might be too slow to keep the speech unit talking smoothly, In fact, I have not come across this problem. If you do, and you have a CP/M (and presumably just about any other) system, one solution might be to always construct the dictionary file on a blank disk so that the disk sectors are contiguous and read/write head movement is limited.

Another solution is to make good use of the way MBasic does not use all the RAM available to it by creating a smaller CP/M system using MOVCPM, and writing the code for a small RAM disk to reside above CP/M. END



SCREENTEST

Intuitive Solution

Intuitive Solution differs from conventional data management systems in that it uses a Macintosh-like environment to provide extensive data handling. Kathy Lang takes a closer look.

Most of the packages reviewed in this series have been conventional data management systems, storing records in a fixed format and with a fixed amount of space per record, using text instructions to handle the data. The great majority have been systems for use by one person at a time, rather than those where several people share one set of information.

Intuitive Solution in its purchased form is very much a system developer's tool, in that both the appearance of the system to the final user and the way in which data is handled is very much up to the system designer. (That said, the approach to system development is sufficiently straightforward to be well within the grasp of most users, and may be much easier than conventional command language-based systems for people with office administration skills but no computing backgrounds.)

The aspect of Intuitive Solution which immediately strikes one as unusual is its desk-top approach. It has much in common with both the Mac and with Gem, in that it makes use of icons, is controlled mainly by a mouse, has pull-down menus, and windows which can be moved and sized. As you might expect, the system can act as an interface between the user and all the applications in use on the PC — both those provided through Intuitive Solution's own functions and also outside packages such as WordStar, Supercalc, and so on.

Screendump 1 shows a desk-top, as it could appear when the user has logged into the system. The two columns of icons on the right contain the functions which come ready set up for use with Intuitive Solution, including such items as the bin (trash can to those familiar with American desk-tops) and the printer. The networking options of electronic mail and communication with an IBM host computer are also shown. At the top are the two icons from which individual applications can be created: the folder pad and the forms pad. The icons on the left are the user's creations; in this instance the icon images are standard system icons, but you can design your own icons. The row of options at the top of the screen comprises the menu headers — clicking and holding the mouse pointer on any of these causes the appropriate menu of choices to appear.

Conceptually, all information in Intuitive Solution is held in folders, which can contain forms and documents, and/or more folders, down to any level of nesting. All entry and display of information in Intuitive Solution is carried out through forms, which are intended to mirror the forms filled in under manual data-handling systems. Part of the process of systems design includes creating 'pads of forms', from which a single form can be 'torn off' and filled in. Screendump 2 shows the desk-top again, with an open folder containing several pads of forms, distinguishable by the double image of the icon. When a form has been filled in, any entries which involve changes to the stored data underlying the form are made, according to processing rules entered when the form was designed.

A major feature of the Intuitive Solution approach is that forms can have a life of their own. On completion, a form is normally stored as a document — complete with layout information — and stands as a record of the transaction involving data entry and file updating. Since each document has a header which automatically records the date of creation and the name of the person who filled it in, this gives a full audit trail of each transaction. When a document is completed in this way, it can no longer be edited, only printed, copied, filed or sent out over the network. This provides an exact mirror of the conventional office situation, where, for example, an invoice will be stored in a manual file and not altered after despatch, likewise a memo to all heads of department about annual holidays.

The mention of memos may surprise some: but another unusual feature of Intuitive Solution is that it largely ignores the distinction between numeric and textual information, except in not allowing you to calculate with text fields. Any field on the form, whether or not it is to be stored in the underlying database, can be of unlimited length. Where the amount of space shown on the screen display of a form is insufficient to hold the full contents of the field, Intuitive Solution simply scrolls the data as desired. The example of a memo shown in screendump 3 (in one window) could contain, in any field, as much information as necessary — a 10,000 word dissertation if need be. This feature makes the package particularly attractive to people who need to store some fixed information, such as salary or credit limit, some relatively fixed information such as name and address, and some potentially highly variable information such as comments on a client's creditworthiness or business plans. The utility of this approach in applications such as library-cataloguing is also obvious. As far as I know, the ability to store unlimited amounts of information as well as display it within scrollable fields is unique to Intuitive Solution.

Sometimes, it will not be necessary to keep a copy of the form and its contents permanently or even temporarily: for example, many electronic mail messages may just need to be sent without keeping a permanent record of their contents. This is accomplished by

creating forms which have no processing instructions attached to them; they do not become documents or perform operations on the database. A copy of a form can include data without being stored as a document, which makes it possible to have updatable textual records of the kind handled by conventional word processors. It is also possible to use a form to update the database without keeping a record of each transaction in a document.

In addition to these relatively unusual features, Intuitive Solution provides the expected range of facilities for handling both structured and unstructured information, including both simple word processing and business graphics.

Constraints

Limitations on the use of Intuitive Solution are few. Probably the most notable is the paucity of data types — only numeric and text types are recognised, though there are special functions for dealing with time and date information. Variables of either type may be scalars or arrays, so you can easily handle situations such as storing one set of information about a customer's name, address, and so on, together with a set of fields summarising each order placed with your firm, one set per order. (The form window in screendump 4 shows such an example.)

File creation and indexing

Intuitive Solution stores all data in one subdirectory in a single database: this may belong exclusively to one user or be shared among many, according to the way the system has been set up. The number of files in the database, and their interconnection through forms processing statements, are controlled by the system developer: indeed, the end user need never be aware of the existence of the file structure underlying the storage of information during forms processing.

Once created, the structure of a file can be altered at any time, even after data has been entered, with the exception that the type of a field may not be changed. Field names do not need to be unique throughout the database, since within processing statements they are referred to using a filename prefix: for example, custdet.name, custaccts. balance.

The next stage is to create one or more forms to process the stored data: forms are related to specific files only through processing statements, which are carried out when an instance of the form has been filled in.

There are two main parts to form design. The first step is to copy a form from the forms icon, to fill in the header information (which applies to all copies of that form unless superseded during forms processing) and to lay out within it the areas for captions, messages to the operator, data entry fields, and so on. Paint-a-screen techniques are employed for this exercise. During this process, a variety of form design aids are available: text may be in several fonts, and justified or underlined; and boxes may be in various shades of greyscale. Examples of blank forms are shown in screendumps 4 and 5.

The form template need not be empty of data: you can include default values for as many fields as you wish. You can also include unalterable information, protected from change by the user — clearly captions, and so on, would need to be protected, but you can apply this to data fields too. This applies also to the form header.

Every form has a header with five fields: name of creator, date created, title, subject, and abstract. The first two fields are always filled in by Intuitive Solution, the remainder may be specifed when the form is designed, entered by the user on request (the header is not normally displayed during data entry), or given values during the COMMIT process described later.

Data input & updating

All data entry in Intuitive Solution is carried out through forms, using templates created through the forms design process. Records are selected for amendment using whatever search criteria have been set up with the form. If there is no record matching the criteria you enter, this is interpreted as a desire to create a new record.

To enter data into a form, the user uses the mouse to point at a forms pad, 'tear off' a copy, and selects the copy. Each data entry field can also be selected, using the mouse (this is rather tedious, since it means taking your hands off the keyboard once for each field — and pressing Return is interpreted as 'clear this field or array' unless it is a multi-line field!). Data may be entered, edited, deleted, copied to a scrap area, and pasted in from the scrap area (scrap is stored on a last in, first out basis). During data entry, you can vary font, size and emphasis of text just as in form design. The memo in screendump 3 shows a variety of typestyles and sizes, with some boldface text.

Screen display

All data display is via forms, using the facilities described earlier.

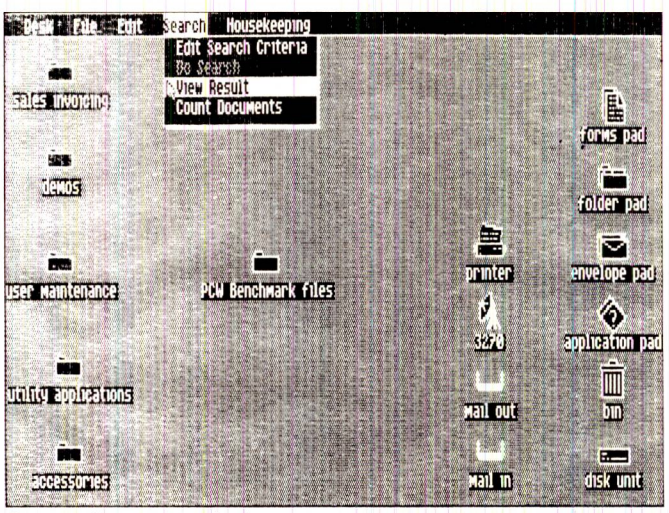
Printed reports

This is probably the weakest area of Intuitive Solution at present. Simple printing can be achieved by copying the icons to be printed — individual forms, or a folder-full — to the printer icon; then each form is printed on a separate page. You can also dump the screen contents. (Intuitive Solution supports the IBM Graphics printer and the HP Laserjet.)

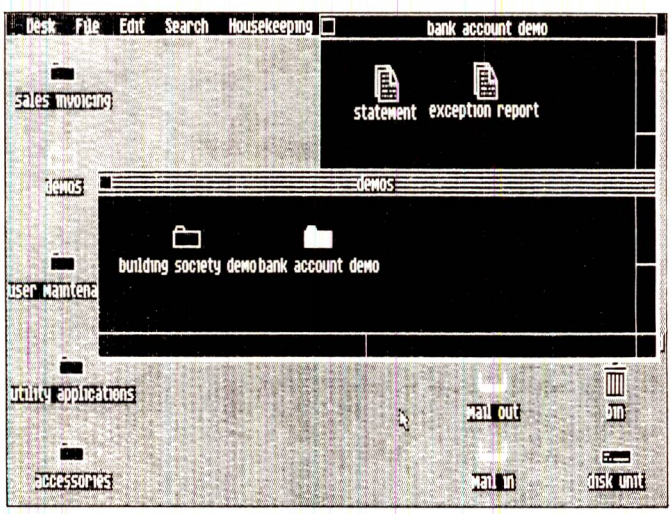
For the more ambitious, you would have to do-it-yourself at the moment, using the interface to one of several programming languages. A proper report generator is promised for the next release.

Selection & sorting

There are two ways to select groups of forms. You can use Intuitive Solution's search facility, which allows you to enter criteria for selecting on the basis of information in the form header, after you have defined the scope of the search by selecting those folders or



Screendump 1: a desk-top screen



Screendump 2: an open folder



SCREENTEST

groups of documents which you wish to search. (Folders within folders will be searched if their parent is selected; groups of documents from several folders can be copied to a single folder first before searching.) You can test several criteria within a field, and AND or OR the results; tests on several fields are ANDed. Wild codes are permitted. This gives a very flexible way of handling text searches especially. For example, you could mark all keywords within a text memo, and have the COMMIT process collect the marked words together in a string to be stored in the Abstract field. Or you could use a similar approach to store in the header the subject of each item on a committee agenda, thus making it possible subsequently to search for all meetings which discussed a particular topic.

Next, you may, and will if this is a form used to change the database, set up processing instructions to be carried out when data is entered into the form. Four types of processing instructions are provided in Intuitive Solution. The DECLARE section contains declarations of files to be used in the processing, and of the name and type of memory variables. Then, the RELATIONS section defines the relationship between fields stored in files and field information displayed on the form, including identifying the fields to be used to retrieve existing records. For example, you might wish to allow a user to search a customer file either by name or by reference number: whichever route is used, once the record is found, the screen boxes are filled with the appropriate field information, and control returned to the user.

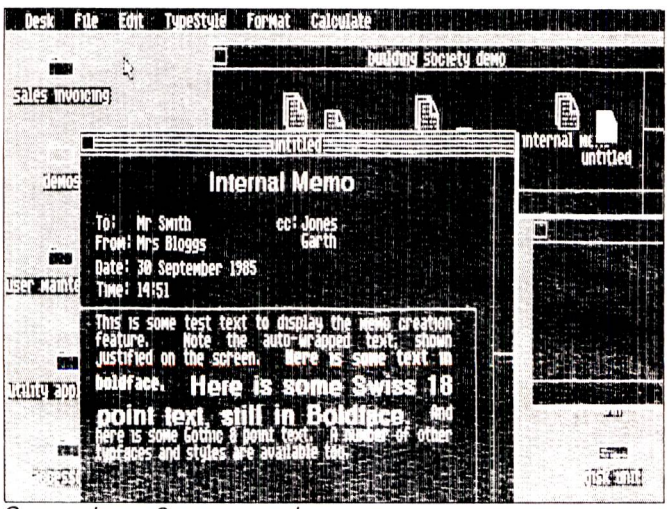
When amending or viewing the current form is complete, the user indicates this by activating the Commit option from the File menu. Intuitive Solution will only accept this instruction if the criteria specified in the CRITERIA section have been complied with — for example, you might want to prevent people entering customer account details which do not have a valid reference number. You can at this stage include messages to be displayed showing in what way the criteria have not been met. Once they have been passed, processing enters the COMMIT phase: instructions allowed here include updating the database files, and also amending fields in the header record. This can be especially helpful when searching.

When you are satisfied with the form layout and the forms processing instructions, you instruct Intuitive Solution to make the form into a transaction. All instructions are checked for correctness, and the form is then compiled. Should you subsequently want to modify the form, you simply call up the form and choose the 'Make Form' option from the File menu. This menu shows the 'Make Transaction' option when the form design is capable of being edited, and 'Make Form' when the form is in its compiled state: likewise, the form itself flips between its editable and compiled (executable) versions. This approach makes it easy to prototype forms and try them out on the eventual users, before fixing their appearance and processing. Once this has been done, and the form compiled in its final form, you can then make a pad of such forms for subsequent filling in by the user.

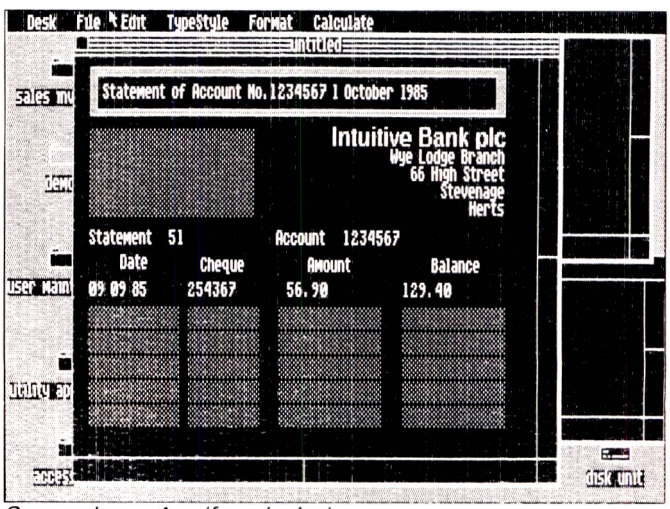
When the search is complete, all selected documents comprise the result set; further selection is possible. The alternative is to set up a form which

Maximum file size	UL	Unique keys	No
Max record size (ch)	UL,	Report formatting	Paint-a-screen,
Max no fields	UL		default, letters
Max field size	UL	Store calculated data	Input, edit, batch
Max digits	UL	Totals & statistics	Yes
Max prime key length	UL	Store selection criteria	Permitted
Special disk format?	No	Combining criteria	And, Or
File size fixed?	No	>1 criterion/field?	Yes
Link to ASCII files?	Yes, varying	Wild code selection?	Yes
Data types	N, C, Array, Ref	Browsing methods	Any field
Fixed rec structure?	Yes	Interaction methods	Menus,
Fixed record length stored?	No		commands, full tailoring, use
Amend rec structure?	Yes		Basic/Cobol/C
Link data files?	Yes	Reference Manual+	Draft
Number data files open	UL	Tutorial Guide+	In prep
Number sort fields	UL (indexes)	Reference Card+	In prep
Number keys	UL	Online help+	☆☆
Max key length (chars, fields)	UL, 1	Hot-line?	Dealers
Subsidiary indexes kept up-to-date?	UTD	Notes: UL = Unlimited + = max five stars	
Data validation	DIY	***For a full explanation of abbreviations, see 'Database dossier' page 188, January 1985 issue.***	
Screen formatting	Paint-a-screen		

Fig 1 Features and constraints



Screendump 3: an example memo



Screendump 4: a 'form' window

allows the user to enter search criteria for a specific type of query: such a form could involve retrieval for viewing only, with no COMMIT section.

All sorting is done by Intuitive Solution's indexing features. At present you can sort only on one field, but indexing on multi-field keys is due.

Calculation

The calculation facilities during forms processing are extremely powerful, and include assignment and arithmetic, a variety of numeric functions including totals, averages, and so on, and the use of memory variables. All calculations can take place either on scalar values or on one-dimensional arrays.

Multiple files

Relationships between file elements are entirely the responsibility of the system developer. Any number of files can be accessed within one forms process, and files can be accessed either sequentially or using indexed fields. Clearly, speed of retrieval is greater if you index fields to be used for cross-file retrieval.

Tailoring

Intuitive Solution comes with its own forms processing language, which uses a declarative rather than a procedural approach. This takes a bit of getting used to if you have been accustomed to conventional algorithmic languages such as Basic or C, but comes with practice. Most kinds of tailoring can be accomplished in this way, given that you can attach execution strings to forms which make it possible to execute external programs as well as Intuitive Solution functions. You can also string sets of keystrokes together to be 'remembered' as one entity. For those with programming skills, there are interfaces to Basic (compiled or interpreted), Cobol and C, and other interfaces are likely to be provided soon. (Apparently the method of interfacing has been chosen to make it very easy to add new languages.)

Security & housekeeping

Intuitive Solution provides a complete environment through the desk-top, and therefore all housekeeping activities are available from there. These include some unusual goodies, such as a clock and a calculator, and the ability to interact with DOS without leaving Intuitive Solution, as well as the more mundane features such as deleting documents or folders.

Security is provided through password protection on user names and forms.

Links with outside

In addition to the ability to interface with programming languages, Intuitive Solution also has a simple import facility for reading ASCII text files.

More extensive importing facilities are in the pipline.

Summary

Supplier:	Intuitive Sytems
Telephone:	(0438) 317966
Cost :	£726 (single user), £1440 (multi-user)
Systems:	PC, MU
Version reviewed:	1.0
Type:	Varying length data. Experienced users.
Features:	Single-user or networked system capable of handling wide variety of data formats: no limit on field or record length, features for text handling and graphics display as well as data management features. Multiple files and indexes. Icon-based, uses mouse.
Drawbacks:	Reporting very skeletal in late 1985 version. Processing language must be mastered to set up working system.
Ease of use:	Excellent at the user level: uses mice, icons and pull-down menus. Command language takes unusual approach.

BM1	Time to add one new record	Inst
BM2	Time to select record by primary key	Inst
BM3	Time to select record by secondary key	Inst
BM4	Time to access 20 records from 1000 sequentially on three-character field (same field as in BM2 key)	3secs rec
BM5	Time to access record using wild code	Inst
BM6	Time to index 1000 records on three-character field	1min 12secs
BM7	Time to sort 1000 records on five-character field	54secs
BM8	Time to calculate on one field per record and store result in record	NT
BM9	Time to total three fields over 1000 records	NT
BM10	Time to add one new field to each of 1000 records	Type time

Time to import a file of 1000 records: 4 mins 35 secs

Notes: NT = Not tested NP = Not possible + = including scrolling. Where two times are given, first is access to first record, second is access to each subsequent record.

Fig 2 Benchmark times recorded on IBM PC/XT/Hard

User image

The icon approach is employed extremely well in Intuitive Solution. For example, icons are selected by pointing, and change shade when selected. Windows are opened automatically to display open folders or forms, and these windows can be sized, dragged, scrolled or put away; in each case, the mouse cursor changes shape according to the permitted action. Menus are pulled down by pressing the mouse select button, and then releasing it when the desired option is highlighted. Items within windows—folders, forms, documents — can be copied or moved to other folders, or to system icons for printing or deletion, or for sending through the electronic mail system.

Documentation

The manual I used was a draft version. Although it was very readable and included abundant illustrations direct from the screen, it lacked an index and was not comprehensive.

The new manual, which includes a tutorial section, should now be available.

Conclusion

Intuitive Solution provides some unique features as well as some unusual facilities, and employs an approach which is rare on the IBM PC and AT. For those whose applications involve the manipulation, in a structured way, of a mixture of text and numeric data, it demands consideration. Equally, for those who need a multi-user database system on a Torus or Corvus network, Intuitive Solution has a lot to recommend it. But it is essential either to be able to develop a system yourself, using system development tools, or have those at your beck and call. Given that, and the computing resources Intuitive Solution requires, it would appeal most to large corporate users.

For all that, those who need its special blend of text and data handling should seriously consider putting in the effort to get to grips with this powerful and attractive system.

Intuitive Solution is at present available only for the IBM PC and AT. It is, unusually, designed for use on a network, under either Torus Icon or Tapestry (the version adopted by IBM), or the Corvus Omninet, and when used in this way has full record-locking facilities and password protection on user work areas. In order to run Intuitive Solution, you need at least 512k of memory, and 650k is recommended. You also need a graphics board and a mouse. (Those who run on either Torus network will already have most of these 'extras'.) END



TJ'S WORKSHOP

Our monthly selection of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to TJ's Workshop, PCW, 32-34 Broadwick Street, London W1A 2HG. Please keep your contributions concise and enclose a stamped addressed envelope if you want them returned. We will pay £5-£30 for any tips we publish. PCW can accept no responsibility for damage caused by using these tips, and readers should note that any hardware modifications may render the maker's guarantee invalid.

SPECTRUM REPEAT... UNTIL COMMAND

This routine adds a REPEAT/UNTIL looping structure to a 48k ZX Spectrum with an Interface 1. Type in the program and RUN it. The program will POKE the code into memory and then tell you how to save it to microdrive or cassette. When you have done this, clear the program with NEW. Before you can use the new commands, you must enable them by typing RANDOMIZE USR 65000; you can then type in the sample program to test out the routine. Both the new commands are preceded by ★ and have to be typed in letter by letter, but any condition following until may be typed in as normal.

Before loading the code, CLEAR RAMtop down to 64999 and remember that before using the new commands, or after using NEW, you must enable the commands with RANDOMIZE USR 65000. To use the commands in your own programs, make the first line of the program RANDOMIZE USR 65000. The command allows up to 100 nested loops, and if it comes across an ★UNTIL without a corresponding ★REPEAT, it will give the NEXT WITHOUT FOR error message.

David Hales

```
  1 REM
  2 REM   REPEAT / UNTIL
  3 REM   by David Hales
  4 REM
 10 CLEAR 64999
 20 PRINT AT 10,10; FLASH 1;"PLEASE WAIT"
100 FOR A=65000 TO 65174
110 READ B
120 POKE A,B
130 NEXT A
140 CLS
150 PRINT "   THE CODE IS NOW IN MEMORY"
160 PRINT
170 PRINT "BEFORE RUNNING THE DEMONSTRATIONPROGRAM SAVE THE CODE FIRST."
180 PRINT
190 PRINT "SAVE TO TAPE WITH:"
195 PRINT
200 PRINT "SAVE ""R/U""CODE 65000,174"
210 PRINT
220 PRINT "OR MICRODRIVE 1 WITH:"
230 PRINT
240 PRINT "SAVE *""M"";1;""R/U""CODE 65000,174"
250 STOP
900 REM
910 REM MC DATA
920 REM
1000 DATA 33,183,92,54,252,35,54,253,33,154
1010 DATA 254,34,151,254,62,0,50,153,254,201
1020 DATA 215,24,0,254,42,40,3,195,240,1
1030 DATA 215,32,0,254,82,40,7,254,85,40
1040 DATA 54,195,240,1,6,6,215,32,0,16
1050 DATA 251,205,183,5,58,153,254,254,100,32
1060 DATA 5,253,54,0,3,239,60,50,153,254
1070 DATA 42,151,254,58,69,92,119,35,58,70
1080 DATA 92,119,35,58,71,92,60,119,35,34
1090 DATA 151,254,175,193,5,6,5,215,32,0
1100 DATA 16,251,215,130,28,205,183,5,58,153
1110 DATA 254,254,0,32,5,253,54,0,0,239
1120 DATA 215,148,30,254,1,40,26,42,151,254
1130 DATA 229,43,126,50,68,92,43,126,50,67
1140 DATA 92,43,126,50,66,92,225,34,151,254
1150 DATA 195,193,5,42,151,254,43,43,43,34
1160 DATA 151,254,58,153,254,61,50,153,254,195
1170 DATA 193,5,0,0,0

  1 REM
  2 REM   REPEAT UNTIL DEMO
  3 REM PROGRAM TO FIND FIRST
  4 REM  OCCURENCE OF A BYTE
  5 REM  IN THE SPECTRUM ROM
  6 REM (NOT ONE GO TO HERE!)
  7 REM
  8 RANDOMIZE USR 65000
 80 LET INFINITY=0
 90 *REPEAT
 95 *REPEAT:*UNTIL INKEY$=""
100 PRINT AT 10,3;"REPEAT UNTIL DEMONSTRATION";AT 12,5;"PRESS ANY KEY TO START"
110 *REPEAT:*UNTIL INKEY$<>""
120 CLS
140 *REPEAT
150 INPUT "TYPE A NUMBER BETWEEN 0 & 255   ";N
160 *UNTIL N>=0 AND N<=255
165 PRINT AT 5,5;"SEARCHING ROM FOR ";N;AT 7,7;"PRESS ""X"" TO EXIT"
170 LET ADDRESS=-1
180 *REPEAT
190 LET ADDRESS=ADDRESS+1
195 PRINT AT 10,5;"SEARCHING ADDRESS ";ADDRESS
200 *UNTIL PEEK ADDRESS=N OR INKEY$="X"
205 CLS
210 IF PEEK ADDRESS=N THEN  PRINT AT 5,6;"FOUND AT ADDRESS ";ADDRESS
220 *UNTIL INFINITY
```

ORIC RESTORE COMMAND

The RESTORE command in Oric Basic does not allow the flexibility of RESTOREing to different line numbers.

The routine below adds this facility to Oric Basic, and works on the Oric 1 and the Atmos.

It is used in the following way:

DOKE 0,line number
CALL #400
DOKE 176,DEEK(2)−3

The data pointer will then be set to the specified line. If the line number does not exist, the pointer will be set back to the start of data.

Giles Nelson

```
10 CH=0:FOR I=#400 TO #441
20 READ A$:A=VAL("#"+A$):POKE I,A:CH=CH+
A
30 NEXT
40 IF CH<>6013 THEN ZAP:?"DATA INCORRECT
":STOP
100 DATA A0,0,A2,0,84,2,A0,5,84,3,84,5,A
0,1,84,4,B1,2,C5,0,F0,20,C0,FF,F0,4
110 DATA C8,4C,10,04,A9,B3,C5,3,F0,9,E6,
3,E6,5,A0,0,4C,10,04,A9,5,85,3,A9,3
120 DATA 85,2,60,B1,4,C5,1,F0,3,4C,16,04
,84,2,60
```

BBC EASY DISK LOADING

This utility speeds up the loading of Basic programs from disk, and should be used when !BOOT is unsuitable. The utility places a piece of code at &900 which inserts a VDU 12 control code, followed by a CH. "HHHHHHH" and a return control code, into the keyboard buffer. The program can then be loaded as a ★ command, as the code strips off the filename after the ★ and automatically chains it.

To use the program, first check that the required Basic program is on disk, then chair the Easy Load program (which you should have previously typed in and saved). You will be asked to name the Basic program Easy Loader; this name should be entered exactly as it is given in the disk catalogue. You will then be asked for the name of the machine code loader (the name to be placed after the asterisk) which should be as short as possible. You must ensure that this name is not the same as any of the OS commands, or any other Easy Load programs.

Huw Rees

```
 10 REM   +++++++ EASY-LOAD +++++++
 20 REM   A Disc Utility for easier
 30 REM   loading of BASIC programs.
 40
 50 REM       Written By Huw Rees.
 60 REM          13th Aug 1985
 70 MODE 7
 80
 90
100 P%=&900
110 REM   Start of assembler.
120 [
130 OPT 2
140 PHA
150 TYA:PHA
160 TXA:PHA
170 LDA #&8A
180 LDX #&0
190 LDY #&C
200 JSR &FFF4
210 LDY #&43
220 JSR &FFF4
230 LDY #&48
240 JSR &FFF4
250 LDY #&2E
260 JSR &FFF4
270 LDY #&22
280 JSR &FFF4
```

```
290 LDY #&48
300 JSR &FFF4
310 LDY #&48
320 JSR &FFF4
330 LDY #&48
340 JSR &FFF4
350 LDY #&48
360 JSR &FFF4
370 LDY #&48
380 JSR &FFF4
390 LDY #&48
400 JSR &FFF4
410 LDY #&48
420 JSR &FFF4
430 LDY #&22
440 JSR &FFF4
450 LDY #&0D
460 JSR &FFF4
470 PLA:TAX
480 PLA:TAY
490 PLA
500 ]
510 PRINT'SPC(15)"EASY LOAD"
520 INPUT''"What is the name of the BASIC program to be converted to EASY-LOAD
";name$
530 A=ASC(MID$(name$,1,1))
540 B=ASC(MID$(name$,2,1))
550 C=ASC(MID$(name$,3,1))
560 D=ASC(MID$(name$,4,1))
570 E=ASC(MID$(name$,5,1))
580 F=ASC(MID$(name$,6,1))
590 G=ASC(MID$(name$,7,1))
600 REM  Separate each letter in the          filename up into variables
        containing their ASCII                numbers.
610
620 ?&923=A
630 ?&92B=B
640 ?&92D=C
650 ?&932=D :REM  Here each letter is
660 ?&937=E :REM  sent in turn to
670 ?&93C=F :REM  the assembled code.
680 ?&941=G
690
700 INPUT'"What is the M.C. loader to be called?"'code$
710 PRINT'"Please type :-"
720 PRINT'"*SAVE """code$""""
730 PRINT"900 954 900"
740 PRINT"....and depress 'RETURN'."
750 PRINT"It will then save the loader."
760 END
```

TATUNG EINSTEIN BACK-UP FILES

This is a short utility which can be added to programs under development to allow back-up copies of existing work to be made easily at any time.

The routine is in XTAL Basic and takes full advantage of the HOLD command. By using a simple GOTO 64999 or CHAIN 6499, it will load itself from disk. It then creates a .BAK file of your current program from an existing .ASC file and saves the current file as the new .ASC. Finally it deletes itself from memory, ready for further work on the program.

To use it, type in the listing (leaving out REMs if you wish) and save it as SAVER.XBS. Then type in the keyline 64999 and save it as SAVELINE.ASC. Load in SAVELINE.ASC and add it to the end of your current work file, amending the dots to the name of the current file. When you want to back-up the program, use GOTO 64999 or CHAIN 64999 as described.

Nick Cooper

```
65000 GOSUB 65100
65010 P0$=PNAME$+".BAK":PD$=PNAME$+".*"
65020 P1$=PNAME$+".ASC"
65030 UNLOCK P0$
65040 UNLOCK P1$
65050 ERA P0$
65060 REN P1$ TO P0$
65070 SAVE P1$ 0,,64999
65080 LOCK P0$
65090 LOCK P1$:DIR PD$:DEL 65000,65180:END
65100 ON ERR GOTO 65110:RETURN
65105 REM
          If File P0$ does not exist then go to next line.
65110 IF ERL=65030 THEN GOSUB 65100:GOTO 65040
65115 REM
          If File P1$ does not exist then SAVE it.
65120 IF ERL=65040 THEN GOSUB 65100:GOTO 65070
65125 REM
          If File P1$ does not exist then SAVE P1$
65130 IF ERL=65050 THEN GOSUB 65100:GOTO 65060
65140 REM
65150 REM
          If File P0$ does not exist then go to next line.
65160 IF ERL=65080 THEN GOSUB 65100:GOTO 65090
65170 REM
          Use this line at the end of the program to be SAVEed.
      Access by a GOTO in immediate mode.
65180 REM

Line No. 64999. To be placed at end of Work File. 'HOLD 65000:P
NAME$="........":CHAIN "SAVER.XBS"
```

COMMODORE 64 SPRITE TEXT UTILITY

This is a utility which allows you to easily put text into sprites. This can be useful for adding titles to programs, or for moving large text easily. A sprite is made up of a grid of 24 dots across by 21 down, and a character is made up of 8 by 8 dots, so it's possible to fit three characters side by side into a sprite. It is also possible to use double-height characters.

The utility consists of a Basic loader program which POKEs the machine code into memory, which could be incorporated into any other program. This is followed by a short program which demonstrates the utility. The routine is used as follows: SYS52480,ADDR,S,C,D1,D2,D3, where ADDR is the address of the sprite data area; S is the character size (128 for double or 0 for normal); C determines whether or not a sprite is cleared before altering it; 1 means clear; and 0 means don't. D1, D2 and D3 are the three characters to be placed in the sprite. Any of the 255 characters can be used and the numbers should be the POKE codes of the characters, not the ASCII values.

Steve Mehew

```
10 REM
20 REM
30 REM
40 REM
50 REM
60 :
70 S=52480:CS=0:C=CS
80 FOR L=0 TO 22:LC=0:FOR D=0 TO 9
90 READ B:POKE S+C,B:C=C+1:LC=LC+B
100 CS=CS+B:NEXT:READ B:CS=CS+B
110 IF LC<>B THEN 200
120 NEXT:IF CS<>60074 THEN 300
130 PRINT:PRINT"ALL DATA IS CORRECT.":END
200 PRINT"DATA ERROR IN LINE";500+5*L:STOP
300 PRINT"SERIOUS DATA ERROR.  LINE CHECKSUMS"
310 PRINT"COULD BE WRONG.  CHECK ALL DATA.":STOP
320 :
500 DATA 32,141,205,165,190,240,3,32,202,205,1415
505 DATA 173,14,220,41,254,141,14,220,165,1,1243
510 DATA 41,251,133,1,162,1,134,2,189,212,1126
515 DATA 205,133,251,169,0,133,252,162,2,6,1313
520 DATA 251,38,252,202,16,249,165,252,24,105,1554
525 DATA 208,133,252,160,0,177,251,132,158,72,1543
530 DATA 185,216,205,36,183,16,5,133,159,24,1162
535 DATA 101,159,168,104,145,253,36,183,16,26,1191
540 DATA 72,165,253,24,105,3,133,253,144,2,1154
545 DATA 230,254,104,145,253,165,253,56,233,3,1696
550 DATA 133,253,176,2,198,254,164,158,200,192,1730
555 DATA 8,208,198,230,253,208,2,230,254,166,1757
560 DATA 2,232,224,4,208,156,165,1,9,4,1005
565 DATA 133,1,173,14,220,9,1,141,14,220,926
570 DATA 96,32,253,174,32,138,173,32,247,183,1360
575 DATA 165,20,133,253,165,21,133,254,32,253,1429
580 DATA 174,32,158,183,134,183,32,253,174,32,1355
585 DATA 158,183,134,190,32,253,174,32,158,183,1497
590 DATA 142,213,205,32,253,174,32,158,183,142,1534
595 DATA 214,205,32,253,174,32,158,183,142,215,1608
600 DATA 205,96,160,63,169,0,145,253,136,16,1243
605 DATA 251,96,0,0,0,0,0,3,6,9,365
610 DATA 12,15,18,21,0,255,0,255,0,255,831
```

```
10 REM TEXT TO SPRITE DEMONSTRATION
20 REM
30 POKE 53280,0:POKE 53281,0:PRINTCHR$(147);
40 CLR:V=53248:TS=52480
50 FOR R=1 TO 8:POKE V+38+R,R:NEXT
60 POKE V+23,0:POKE V+29,255
70 FOR R=240 TO 247:POKE 2040+R-240,R
80 READ A,B,C
85 SYS TS,64*R,0,1,A,B,C :NEXT:S=50
90 FOR R=0 TO 8 STEP 2:POKE V+R,S:S=S+48:NEXT:S=98
95 FOR R=10 TO 14 STEP 2:POKE V+R,S:S=S+48:NEXT
100 FOR R=1 TO 15 STEP 2:POKE V+R,100-30*(R>9):NEXT
101 :
200 DATA 19,20,5,22,5,39,19,32,20,5,24,20,32
201 REM  S  T  E V  E  '  S     T  E X  T
210 DATA 20,15,32,19,16,18,9,20,5,19,32
211 REM  T  O     S  P  R  I T  E  S
212 :
230 POKE V+21,255:A=1:B=15:C=2
250 FOR T=0 TO 100
260 FOR R=A TO B STEP C:POKE V+R,PEEK(V+R)+A
265 NEXT:NEXT:PA=150
270 FOR R=0 TO 7:FOR T=0 TO PA:NEXT
280 POKE V+23,PEEK(V+23)OR 2^R:NEXT
290 FOR R=0 TO 7:FOR T=0 TO PA:NEXT
300 POKE V+23,PEEK(V+23)AND 255-2^R:NEXT
310 PA=PA-58:IF PA>=0 THEN 270
320 FOR R=1 TO 15 STEP 2:S=PEEK(V+R)
330 FOR Y=S TO 0 STEP -3
335 WAIT V+17,128,127:POKE V+R,Y:NEXT:NEXT
340 PRINT"THAT'S ALL FOLKS !":END
```

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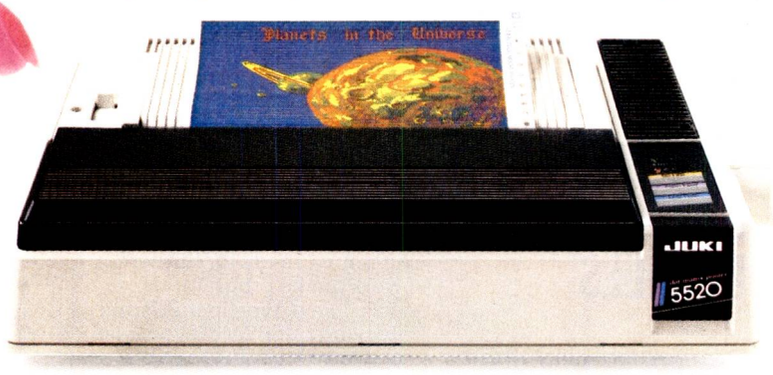

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BBC COLOUR CHANGER

This short routine sits in a buffer of the BBC Micro, and directly changes text and background colours by pressing CTRL−f0 or CTRL−f1. The routine generates a 6502 file on disk, which can be loaded and run by the single command ★/CHANGE (or whatever name you put in line 140). Loading this routine does not interfere with a Basic program in RAM. Foreground colours can be altered in modes 0,3,4 and 6; background colours in all modes other than 7.

The program works by trapping the OSWRCH vector, checking to see if CTRL−f0 or CTRL-f1 have been pressed, changing colours by using VDU 19, and returning.

David McKay

```
10 REM Dr. Dupree's COLOUR CHANGES IN MODES 0-6
20 REM from the SCROLLED GOLD SOFTWARE LABORATORIES
30
40 REM CTRL f0 CHANGES TEXT COLOUR IN MODES 0,3,4,6
50 REM CTRL f1 CHANGES BACKGROUND COLOUR IN ALL MODES
60
70 REM AFTER THE PROGRAM HAS 'RUN', A FILE IS SAVED TO
80 REM DISC...THIS CAN THEN BE LOADED AND RUN WITH THE
90 REM COMMAND: */CHANGE. THIS WILL NOT INTERFERE WITH
100 REM A BASIC PROGRAM IN RAM WHEN YOU DO IT.
110
120 FOR N=&A00 TO &A5F:READ A%:checksum=checksum+A%:?N=A%:NEXT
130 IF checksum<>10455 PRINT"There is an error in a DATA statement.":END
140 CALL &A00:*SAVE CHANGE A00 A60 A00
150
160 DATA169,15,141,14,2,169,10,141,15,2,169,0,141,101,10,201,144,240,15,201
170 DATA145,240,3,76,93,10,169,0,141,102,10,76,39,10,169,1,141,102,10,238,101
180 DATA10,169,7,205,101,10,144,3,76,57,10,169,0,141,101,10,169,19,32,227,255
190 DATA173,102,10,32,227,255,173,101,10,32,227,255,32,227,255,32,227,255,32
200 DATA227,255,169,13,162,0,169,21,32,244,255,96,76,164,224
```

DRAGON MUSIC

The Dragon's musical capabilities from Basic have always been limited to a mundane reed organ sound, and for anything more you have to resort to machine code.

However, the sound can be changed using a couple of simple POKEs. Although these do not significantly change the sound, with careful use they can provide more interesting sound effects.

The two addresses 223 and 224 control the music high and low volume settings, and can be altered by POKEing them with different values. The short program demonstrates how this can affect the sound.

WG Jones

```
0 'Dragon's Play Demo Program by:W.G.Jones [1985]
10 F1$="T403L8DD£EO4CP8O3EO4CO3EO4CCCCCP8CDD£ECDEP8O3BO4DP8CC
CCCCO3DD£EO4CP8O3EO4CP8O3EO4CCCCCP8O3ACF£RO4CEP8DCO3RO4DDDDP8
P8O3DD£EO4CP8O3EO4CP8O3EO4CCCCCP8CDD£ECDEP8O3BO4DP8CCCCCP8CDE
CDEP8CDCE"
20 F2$="CDEP8CDECDEP8O3BO4DP8CCCC"
30 F3$="EFF£GGAGGEFF£GGAGGGECO3GABO4CDEDCDEFF£GAGEFF£GGAGGEFF
£GGAGGAA£BBBGAGGGGGEFF£GGAGGEFF£GGAGGGECO3GABO4CDEDCDCCCCECO3
GABO4CDEDCFF£GAGECO3ABO4CDEEECCCCCC"
40 F4$="CDEP8CDECDEP8O3BO4DP8CCCCC"
50 PLAY"T8"
60 POKE&HDF,180:POKE&HE0,65
70 PLAYF1$:PLAYF2$
80 PLAYF3$
90 POKE&HDF,155:POKE&HE0,255
100 PLAYF1$:PLAYF4$
```

MS-DOS COUNTRIES

MS-DOS versions 2.0 or higher use a file called CONFIG.SYS during booting to set up various operating system parameters, one of which is COUNTRY=44. This refers to the operating system's ability to express the date in different formats, depending on the country of use.

These are coded into CONFIG.SYS using the international trunk dialling codes, as shown in Fig 1.

These codes only configure the operating system and do not affect programs such as dBasell, so you won't be able to configure these to the local date format.

RJ Akers

CONFIG.SYS entry	date format	country
COUNTRY=01	month:day:year	USA
COUNTRY=44	day:month:year	UK
COUNTRY=81	year:month:day	Japan

Fig 1

BBC TWO-SCREEN UTILITY

This routine stores two different screens in mode 5, and switches between them on demand. It works by using VDU 23 calls and altering the HIMEM value. Pictures that you want to use should be saved by ★SAVE pict 3000 57FF.

PR Sweatman

```
10 REM **********************
20 REM *                    *
30 REM *  Duo-screen Util.  *
40 REM *                    *
50 REM *   P.R.Sweatman     *
60 REM *                    *
70 REM **********************
75
80 MODE5
90 HIMEM=&2FFF
100 VDU 23;8202;0;0;0;
110 CLS:PRINT"       Page 2."
120 PROCmake1
130 FORI%=0 TO &27FC STEP4:!(&3000+I%)=!(&5800+I%):NEXTI%
140 CLS:COLOUR 3:PRINT"       Page 1."
150 PROCmake2
160 REPEAT
170 A$=GET$
180 IF A$="1" THEN PROCone
190 IF A$="2" THEN PROCtwo
200 UNTIL FALSE
202 END
205
210 DEFPROCone
220 VDU 23,0,12,11,0;0;0;23,0,13,0,0;0;0;0;
230 ?&34E=&58
240 ENDPROC
250
260 DEFPROCtwo
270 VDU 23,0,12,6,0;0;0;23,0,13,0,0;0;0;0;
280 ?&34E=&30
290 ENDPROC
295
300 DEFPROCmake1
310 GCOL 0,2
320 MOVE 400,300:MOVE 750,300:PLOT 85,750,650
330 MOVE 400,300:PLOT 85,400,650
340 COLOUR 1
350 PRINTTAB(3,27);" Square test "
360 ENDPROC
365
370 DEFPROCmake2
380 GCOL 0,1
390 MOVE 300,300:MOVE 300,650:PLOT 85,475,475
400 MOVE 850,300:MOVE 850,650:PLOT 85,675,475
410 MOVE 400,750:MOVE 750,750:PLOT 85,575,600
420 MOVE 400,200:MOVE 750,200:PLOT 85,575,350
430COLOUR 2
440 PRINTTAB(3,5);" Smashing !! "
450 ENDPROC
```



'This is the Hemmingway word processor, sir. It only works with a bottle on it.'

BIBLIOFILE

Now that there's no end to what can be done with computers, there's a book to explain how it all started. David Taylor pores over this and other tomes in this month's book review.



Chips off the monolithic block

Title: Microchip: the story of a revolution and the men who made it
Author: TR Reid
Publisher: Collins
Price: £9.95

Bemused by all that computers can do today, and confused by the ever more extravagant claims for what they'll be able to do tomorrow, the world from time to time wonders whose smart idea it was in the first place — *who invented the computer?*

There is, alas, no simple answer. There never was one sudden and dramatic flash of inspiration, no single mad boffin (not even feverish Sir Clive Sinclair) to slap his forehead and cry 'Eureka!' Rather than a big leap forward, the history of the computer has been a series of small, but significant hops. Computers were not so much invented — they *evolved*.

Daft as it may seem, the crazily complex, early 19th-century mechanical calculator or 'analytical engine' of the redoubtable Charles Babbage is, as often as not, cited as the first stirrings of computers' conceptual operations. Then again, I dare say Leibniz contributed with calculus, Boolean algebra must have helped, and Bell Labs' Messrs Shockley, Brattain and Jardeen ought certainly to be given credit for their Nobel Prize-winning invention in 1947 of that most useful of electronic devices, the transistor.

There are umpteen others who might claim to have honed this or perfected that along the twisty trail of turning computer theory into practice, but here comes eager Mr Reid (of *The Washington Post*) to urge that we single out two relatively unknown pioneers for the hall of fame. America's Jack Kilby (*who?*) and Robert Noyce (*never heard of him!*) changed the world in the late 1950s as much as ever had Thomas Edison, Alexander Graham Bell or Henry Ford (*sic*), insists Mr Reid, for it was their rare and unsung ingenuity which first gave us the 'monolithic integrated circuit' or semi-conducting microchip.

Mr Reid tells his stirring story with gusto . . .

'Kilby was strangely nervous as he hooked up the wires from the battery to his small monolithic circuit, and from the circuit to the oscilloscope. He fiddled with the dials. He checked the connections. He looked up at his colleague who gave him a here-goes-nothin' shrug. He checked the connections again. He took a deep breath. He pushed the switch. Immediately a bright green snake of light started undulating across the screen in a perfect, unending sine wave. The integrated circuit, the answer to the tyranny of numbers, had worked. Everybody broke into broad smiles. A new era in electronics had been born.'

In Dallas, it turns out, where Kilby was a Texas Instruments lab-hand. Noyce,

meanwhile, was in San Francisco's Silicon Valley and moving independently towards a similar invention. In due course he was to co-found Intel Corp and produce this thing called a 1k RAM chip.

The pace of detailed development and production of solid-state devices was soon reaching breakneck speed. By 1975, America's *Popular Electronics* magazine would be describing how to wire up what Mr Reid reckons was the world's first personal micro. This book, too, maintains a cracking pace, and if you can cope with the rather breathless gee-whiz, drum-beating-for-Yankee-ingenuity style, it is a lively and informative read. Highly recommended for your Christmas list.

Student power

Title: Microcomputer Interfacing
Author: MD Beer
Publisher: Collins
Price: £8.95 (paperback)

UNDER NO CIRCUMSTANCES, shrieks Dr Beer in his preface, should mains voltages be connected directly to the microcomputer, as they will almost certainly cause permanent damage to the microcomputer's electronics, or serious personal injury.

He's writing for computer sciences students, you see. Apparently they can't be too careful, especially as they are not expected to have any knowledge of electronics. Still, assuming that they can one day be taught to power up safely and stay away from pylons, what students have here is a primer for programming (on a BBC) and a book which earnestly seeks to redress the balance of most computer science courses away from numerical and data processing, towards 'the ever-growing range of communications, data-logging and control applications'.

Not a lot is assumed. *What Is Software?* wonders chapter two. *What Is A Data Recorder?* asks chapter four. Whereas the object of chapter six, it says, 'is to look at a much larger project — computer control of a model railway.'

Look lively, lads, you're never going to get a BSc at this rate!

The book has a strongly practical approach, says Dr Beer, and I'll drink to that. It demonstrates, step-by-laborious-step, how to devise a few simple Beeb programs which I'd imagine most *PCW* readers could knock off on the back of an envelope. It also tries to demonstrate how to produce a book directly from a micro's printer, without recourse to proper typesetting. What it does not do, as far as I can make out, is demonstrate a convincing argument for others besides Dr Beer's students to contemplate spending £8.95.

Between the sheets

Title: Computer Spreadsheets
Authors: Nigel Day & Owen Rees
Publisher: BBC
Price: £6.95 (paperback)

Spreadsheets are one of the most useful pieces of software available to the businessman, say the authors, and go on to demonstrate the point with an example of how to use a spreadsheet to calculate business expenses.

Less convincingly, they hold hands through organising the schedule for a horse show, analysing cricket batting averages, maintaining a telephone directory, or doing the household accounts.

What we're at for the most part is Ultracalc 2 on a BBC, although there are comparisons with the latest version of its precursor, VisiCalc 1.37 on an Apple II Europlus, and with Lotus 1-2-3 on an IBM PC plus Hercules card. This is scarcely a comprehensive guide to spreadsheet software (as is implied by the suggestion you read this book before deciding which spreadsheet to buy) but it is, I suppose, a reasonable introduction to the basic ideas and techniques of using models and templates, and making what-if calculations.

Whether there's much hands-on experience to be had here that cannot be got from any decent software's manuals is doubtful. Even more doubtful is the usefulness of this book's read-before-you-buy advice, such as this typical snippet: 'The main thing about choosing a computer is to find one that you can afford, that you will not outgrow, and that you find easy to use. The same arguments also apply to the choice of spreadsheet programs.'

Indeed. And the same arguments apply to buying a three-piece suit, come to that. Do you need a book to point it out?

Softly, softly

Title: Software Author's Yearbook 1985/86
Editor: Liz Cooper
Publisher: Macmillan
Price: £6.95 (paperback)

'There are huge amounts of money to be made from writing successful programs,' it says here, making thousands of happy hackers slaver at the thought of it. 'The proceeds from writing a "hit" program now exceed the income that writers get from best-selling books, and rival that of the most successful pop stars.'

It's true, it's true — but wait! Try this simple exercise, writing yourself a quick spreadsheet to help if you wish. Estimate the number of top best-selling authors and most successful pop stars. Then have a stab at adding up the number of would-be writers of best-sellers, and unknown pop stars who are pretty hopeful of hitting the big time any day now. Which number is the greater?

I'd be the last to discourage anyone from trying their hand at writing their own software. Or from doing the pools. But I'd also be the last to encourage false hopes of millionaires round every corner. It is a terrible, all-consuming sweat to devise truly original programs, let alone commercial ones. It's one thing (and great fun) to have *PCW* publish your ingenious listing (£50 per published page, since you ask) but quite another to expect to clean up with your very own Lotus 4-5-6.

Still, if you're determined to dream your dream, or a programming genius, or soft in the head, this handbook is for you. Part one lists the rudiments — choosing machines, organising documentation, making neat submissions, inching towards a contract — and part two is a comprehensive list of software houses and publishers who might be interested.

In theory, the market is vast and wide open: the micro-mad British have four million machines out there, and they're itching for novelty. If you think you do have an aptitude, £7.95 is a small price to pay for some useful as well as overblown advice, plus a handy list of potential patrons!

Ask me another

Title: The Pre-Basic Book
Author: FA Wilson
Publisher: Bernard Babani (Shepherds Bush)
Price: £2.95

A riveting title, you'll agree, and on the face of it a snip at £2.95. 'Most books on Basic are written for people with computers,' begins FA Wilson, CGIA, C Eng, FIEE, FIERE, FBIM, and right away you can see there are no flies on him.

'This one is different,' he continues. 'Our title may seem a little odd considering that we actually dabble in the most common forms of Basic, but surely for those about to cross the Sahara, a preliminary but short excursion into the outskirts is sensible.'

Right you are, Mr Wilson, lead on!

'Any would-be programmer must first become *au fait* with the keyboard.'

Yup. Next point, please.

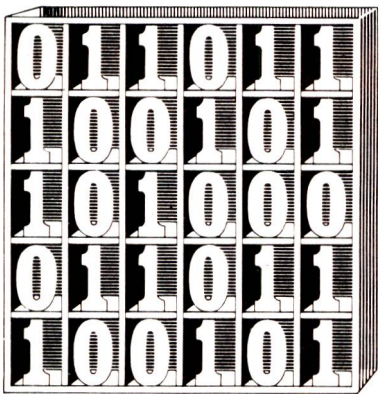
'Typing is quite straightforward, even fun, and our instruction manuals tell us which keys must be pressed to do this or that.'

By Jove, he's right. I think I'm starting to get the hang of this already.

'When via Basic a computer is instructed to "do this" or "do that", "do" is the word of action, the keyword. What is to be done is "this" or "that", and these latter two are the arguments . . . We can sum up by saying that Basic keeps control through a system of rules and keywords built up from English words and punctuation.'

We're still quite a way from Timbuctu, but Our Guide plods on regardless. This book, I can sum up, is marginally more taxing than Postman Pat. But not much. END

SUBSET



David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to SubSet, PCW, 32-34 Broadwick Street, London W1A 2HG.

6809 BIT ROTATION

CHROT (Datasheet 1) from FR Ellahi of Halifax is a 6809 version of the character rotation routine. Corresponding 6502 and Z80 versions can be found in the October issue. 68000 and 8086 versions do not exist yet.

As the temporary result storage space used by CHROT is appended to the routine, it can be initially indexed by using the 6809's Program Counter Relative effective address mode. This makes the routine's code relocatable to anywhere in memory, but prevents both ROM-fixing of the routine and also re-entry from an interrupting program. An alternative method would be to initialise the temporary storage on stack above the stack pointer.

None of the rotation routines are particularly quick. The 6809 and Z80 routines take 1544 and 3191 clock cycles respectively to rotate one small character anywhere in memory. The 6502 version is possibly the most trim, taking only 919 cycles to rotate an 8-bit by 8-bit matrix located in page zero—both the source and result matrices could need to be transferred, and that would add significantly to the overall time.

The slowness of these routines would not be noticeable were they employed to convert horizontal screen images to the vertical Epson standard bit image modes, as printing is such a slow operation. If, however, they are to be used for real-time graphics on a bit-mapped screen, then the slowness could be all too apparent with no more than a hundred or so characters rotated in 0.1 seconds.

Any significant timing improvements would be welcome, as would routines to effect quick rotations on larger images.

DATASHEET 1

```
:
:= CHROT     Rotate an 8 × 8 character matrix.
:
:JOB         To rotate an 8 × 8 bit matrix, stored as eight
:            contiguous bytes, anticlockwise by 90 degrees,
:            storing the result in the original source space.
:ACTION      For source byte 7 to source byte 0
:            [ For result byte 0 to result byte 7
:              [ Shift source lsb to Carry.
:                Rotate Carry into result byte msb. ] ]
:            Copy result 8-bytes to source location.
:
:CPU         6809.
:HARDWARE    None.
:SOFTWARE    None.
:
:INPUT       8-byte source matrix at (X+0) to (X+7).
:OUTPUT      8-byte result matrix at (X+0) to (X+7). X unchanged.
:            CC changed. All other registers unchanged.
:ERRORS      None.
:REG USE     X, CC
:STACK USE   (S): 10
:RAM USE     None.
:LENGTH      48 (code: 40.  temporary storage: 8).
:CYCLES      1544
:
:CLASS 2      -discreet      *interruptable      -promable
:-*--**       -reentrant     *relocatable        *robust
:
:
CHROT   PSHS U,X,D      :Save registers used in CHROT.     34 56
        LEAU TEMP,PCR   :Address appended temp store.      33 8C 23
        PSHS U,X        :Save temp & source addresses.     34 50
        LEAX 7,X        :Address source last byte.         30 07
        LDA  #8         :Count for 8 source bytes.         86 08
:
OUTER   LDU  2,S        :Get temp result start address.    EE 62
        LDB  #8         :Count for 8 temp result bytes.    C6 08
:
INNER   LSR  ,X         :Get next source bit, this byte,   64 84
        ROR  ,U+        :into next result byte msb.        66 C0
        DECB            :Repeat for all 8 bits from one    5A
        BNE  INNER      :source byte into 8 result bytes.  26 F9
:
        LEAX -1,X       :Address next source byte and      30 1F
        DECA            :repeat until all 8 source bytes   4A
        BNE  OUTER      :are rotated into result bytes.    26 F0
:
        PULS U,X        :Restore temp & source addresses.  35 50
        LDB  #8         :Count for 8 byte transfer.        C6 08
:
COPYLP  LDA  ,U+        :Get next temp result byte to      A6 C0
        STA  ,X+        :source location, indexing next    A7 80
        DECB            :byte of each and repeat until     5A
        BNE  COPYLP     :all 8 result bytes are moved.     26 F9
:
        PULS D,U,X,PC   :Restore regs and exit CHROT.      35 D6
:
TEMP    RMB  8          :8-byte temp store appended to CHROT.
:
```

Z80 SCREEN COMPRESSION

Regular readers will know that John Hardman of Welling has already contributed many useful and intriguing routines to the SubSet library. His latest offerings, COMPCT (Datasheet 2) and its inverse EXPAND (Datasheet 3), are no exception.

They provide a magnificently simple method of compressing large data blocks for more rapid tape storage or for disk economy.

The system used by COMPCT/EXPAND depends entirely on the probability that long sequences of identical byte values will occur in the source data. Each sequence is reduced by COMPCT to two bytes of information—the value of the repeated byte and a count of the repetitions up to a maximum of 256. EXPAND uses the two bytes to write a string of identical values to the destination area.

The most obvious application is in compacting full graphics screens with large background areas, block colours and horizontal lines, either for quicker storage on a slow medium or to fit a complete sequence of motion 'frames' on one disk. In a best-case situation, where each different value is repeated 256 times, 16k of screen data would be compressed to a mere 128 bytes. By keeping the images simple, one disk could hold a couple of minutes of moving graphics.

Conversely, the compacted data of a very complex screen image might end up longer than the original. The worst case would be a screen with no consecutively identical values. Such an unlikely phenomenon would result in a 'compacted' block twice the length of the original data.

Although John's tests have shown that the average compression of screens displaying cartoon characters is about 1/8 of the original size, he suggests playing safe by comparing the compacted result from COMPCT with the original to determine which should be stored.

DATASHEET 2

```
:
:= COMPCT    Compact screen data.
:
:JOB         To compact data containing sequences of identical
:            value bytes, e.g. screen data.
:ACTION      WHILE src-cnt > 0
:            [ Occurrence-cnt = 0.
:              Value-byte = (src-ptr).
:              REPEAT UNTIL src-cnt = 0
:                     OR occurrence-cnt = 256
:                     OR value-byte <> source-byte
```

```
:              [ Src-ptr = src-ptr + 1.
:                Occurrence-cnt = occurrence-cnt + 1.
:                Src-cnt = src-cnt - 1.
:                IF scr-cnt > 0 THEN
:                [ IF occurrence-cnt < 256 THEN
:                  [ Source-byte = (src-ptr).
:                    Compare value-byte with source-byte. ] ] ]
:              (Dst-ptr) = occurrence-cnt, dst-ptr = dst-ptr + 1.
:              (Dst-ptr) = value-byte, dst-ptr = dst-ptr + 1. ]
:-------------------------------------------------------------------
:CPU          Z80.
:HARDWARE     Source and destination RAM.
:SOFTWARE     None.
:-------------------------------------------------------------------
:INPUT        BC holds number of source bytes to compact.
:             DE addresses compact destination 1st byte.
:             HL addresses source 1st byte.
:OUTPUT       BC holds number of compacted data bytes.
:             All other registers and flags are unchanged.
:ERRORS       No check for destination overwrite of source data.
:REG USE      BC DE HL
:STACK USE    10
:RAM USE      None.
:LENGTH       56
:CYCLES       Not given.
:-------------------------------------------------------------------
:CLASS 2      *discreet      *interruptable      *promable
:*****-       *reentrant     *relocatable        -robust
:===================================================================
:
COMPCT PUSH AF          :Save flags and accumulator.       F5
       PUSH HL          :Save source start address.        E5
       PUSH IX          :Save IX and use as dest pointer,  DD E5
       PUSH DE          :getting address from DE, so DE    D5
       POP  IX          :free for byte & count regs.       DD E1
:
       PUSH DE          :Save destination start address    D5
                        :last for computing dest length.
:
NXTBYT LD   A,B         :Test source byte count in BC      78
       OR   C           :and terminate if initially zero   B1
       JR   Z,END       :or compaction completed.          28 1E
:
       LD   D,0         :Zeroise occurence count for next  16 00
       LD   E,(HL)      :byte in D; get next byte in E.    5E
:
LOOP   INC  HL          :Address next source byte and      23
       INC  D           :increment occurence count.        14
       DEC  BC          :count off source byte got then    0B
       LD   A,B         :test if end of source data        78
       OR   C           :reached, storing byte & count     B1
       JR   Z,STORE     :to destination if so.             28 08
:
       INC  D           :Else test for max count of        14
       DEC  D           :256 (D = 00H), store byte &       15
       JR   Z,STORE     :count to destination if so.       28 04
:
       LD   A,(HL)      :Else read next byte and compare   7E
       CP   E           :to previous byte, loop to inc     BB
       JR   Z,LOOP      :occurence count if same value.    28 F1
:
STORE  LD   (IX+0),D    :Store byte occurence count        DD 72 00
       INC  IX          :to destination, followed by       DD 23
       LD   (IX+0),E    :byte value, incrementing          DD 73 00
       INC  IX          :pointer to next location.         DD 23
       JR   NXTBYT      :Go do next, or terminate.         18 DE
:
END    PUSH IX          :Move destination + 1 address      DD E5
       POP  HL          :into 16-bit accumulator, get      E1
       POP  DE          :destination start address in DE.  D1
       AND  A           :Clear carry for subtraction.      A7
       SBC  HL,DE       :Compute length of compacted       ED 52
       LD   B,H         :data and move into BC for         44
       LD   C,L         :output information.               4D
:
       POP  IX          :Restore IX.                       DD E1
       POP  HL          :Restore source pointer.           E1
       POP  AF          :Restore accumulator & flags.      F1
       RET              :Exit, data compacted.             C9
:===================================================================
```

DATASHEET 3

```
:===================================================================
:= EXPAND     Expand compacted screen data.
:===================================================================
:JOB          To expand data containing sequences of identical
:             value bytes compacted to value + occurrence count
:             byte pairs, e.g. screen data.
:ACTION       Src-cnt = src-cnt / 2.
:             WHILE src-cnt > 0
:             [ Occurrence-cnt = (src-ptr), src-ptr = src-ptr + 1.
:               Value-byte = (src-ptr), src-ptr = src-ptr + 1.
:               REPEAT UNTIL occurrence-cnt = 0
:               [ (Dst-ptr) = value-byte.
:                 Dst-ptr = dst-ptr + 1.
:                 Occurrence-cnt = occurrence-cnt - 1. ] ]
:-------------------------------------------------------------------
:CPU          Z80.
:HARDWARE     Source and destination RAM.
:SOFTWARE     None.
:-------------------------------------------------------------------
:INPUT        BC holds number of source bytes to expand.
:             DE addresses expand destination 1st byte.
:             HL addresses source 1st byte.
:OUTPUT       BC holds number of expanded data bytes.
:             All other registers and flags are unchanged.
:ERRORS       No check for destination overwrite of source data.
:REG USE      BC DE HL
:STACK USE    8
:RAM USE      None.
:LENGTH       34
:CYCLES       Not given.
:-------------------------------------------------------------------
:CLASS 2      *discreet      *interruptable      *promable
:*****-       *reentrant     *relocatable        -robust
:===================================================================
:
EXPAND PUSH AF          :Save accumulator and flags.       F5
       PUSH HL          :Save source start address.        E5
:
       PUSH DE          :Save dest start address last for  D5
                        :computing dest length.
       SRL  B           :Source bytes / 2 gives no. of     CB 38
       RR   C           :different source value bytes.     CB 19
:
NEXT   LD   A,B         :Test source count in BC and       78
       OR   C           :terminate if initially zero       B1
       JR   Z,DONE      :or expansion completed.           28 0D
:
       PUSH BC          :Save source count and get         C5
       LD   B,(HL)      :occurrence count in B, bump       46
       INC  HL          :source pointer and get            23
       LD   A,(HL)      :value byte in A.                  7E
       INC  HL          :Address next count/value pair.    23
:
OUTPUT LD   (DE),A      :Store occurrence of value byte    12
       INC  DE          :and address next dest location,   13
       DJNZ OUTPUT      :repeat for all occurrences.       10 FC
:
       POP  BC          :Restore source count and count off C1
       DEC  BC          :value just written to destination. 0B
       JR   NEXT        :Repeat for all source values.     18 EF
:
DONE   EX   DE,HL       :Move destination + 1 to 16-bit    EB
       POP  DE          :accumulator, get dest start address D1
       AND  A           :Clear Carry for subtraction.      A7
       SBC  HL,DE       :Compute expanded destination      ED 52
       LD   B,H         :byte length and move to BC        44
       LD   C,L         :as output information.            4D
:
       POP  HL          :Restore source start address.     E1
       POP  AF          :Restore accumulator and flags.    F1
       RET              :Exit, data expanded.              C9
:===================================================================
```

COMPACT IMPROVEMENTS

I know that John is always eager to improve the implementations of his ideas, so I hope he doesn't mind a few suggestions and a little criticism.

The sequence of three instructions used in COMPCT to save IX and then transfer the destination address from DE to IX takes five bytes and 40 clock cycles, as shown in the LONG section of Fig 1. A better method is shown in the SHORT section. This uses one of the Z80's stack exchange instructions to save two bytes and six clock cycles, as well as reducing the process's stack use from four to two bytes. The transfer of the destination end address from IX to HL and the restoration of IX in the END section of COMPCT can be cut from five to three bytes, similarly if DE is first restored.

I am never happy about using the Z80's IX or IY registers. They do not have anything like the flexibility afforded by the index registers or addressing modes of the 6502, 6809 or 68000, and always seem to consume bytes and time states as though there were no tomorrow. Consequently, I am always sorely tempted to rearrange routines which employ IX or IY, just to see if they do indeed operate more efficiently when limited to the 8080 register set AF, BC, DE and HL.

In the case of COMPCT, I was able to knock out 11 bytes by replacing John's use of IX with top-of-stack storage accessed by EX (SP), HL in the STORE section. The cost of this reduction in length is an increase of six clock cycles in the operating time of STORE. The slight increase in STORE timing can be more than offset in the LOOP section by testing the occurrence count D before the source count BC, and this also saves another two bytes. The change is shown in Fig 2.

Fig 1

```
:===================================================================
:                                                  cycles  code
:
LONG   PUSH IX          :Save IX                   15      DD E5
       PUSH DE          :Move DE to                11      D5
       POP  IX          :IX via stack.             14      DD E1
:
SHORT  PUSH DE          :Move DE to IX             11      D5
       EX   (SP),IX     :via stack, saving IX.     23      DD E3
:
:===================================================================
```

Fig 2

```
:===================================================================
:
LOOP   INC  HL          :Address next source byte and      23
       DEC  BC          :count off source byte got then    0B
       INC  D           :increment occurence count but exit 14
       JR   Z,STORE     :loop if count = 256.              28 08
:
       LD   A,B         :Test if end of source data        78
       OR   C           :reached, storing byte & count     B1
       JR   Z,STORE     :to destination if so.             28 04
:
       LD   A,(HL)      :Else read next byte and compare   7E
       CP   E           :to previous byte, loop to inc     BB
       JR   Z,LOOP      :occurence count if same value.    28 F3
:
STORE  EX   (SP),HL     :Get dest address, saving source   E3
       LD   (HL),D      :address on stack, and store       72
       INC  HL          :occurrence count followed by      23
       LD   (HL),E      :value byte, moving dest address   73
       INC  HL          :on for next byte pair. Save dest  23
       EX   (SP),HL     :address, restore source address   E3
       JR   NXTBYT      :and repeat until source end.      18 E4
:
:===================================================================
```

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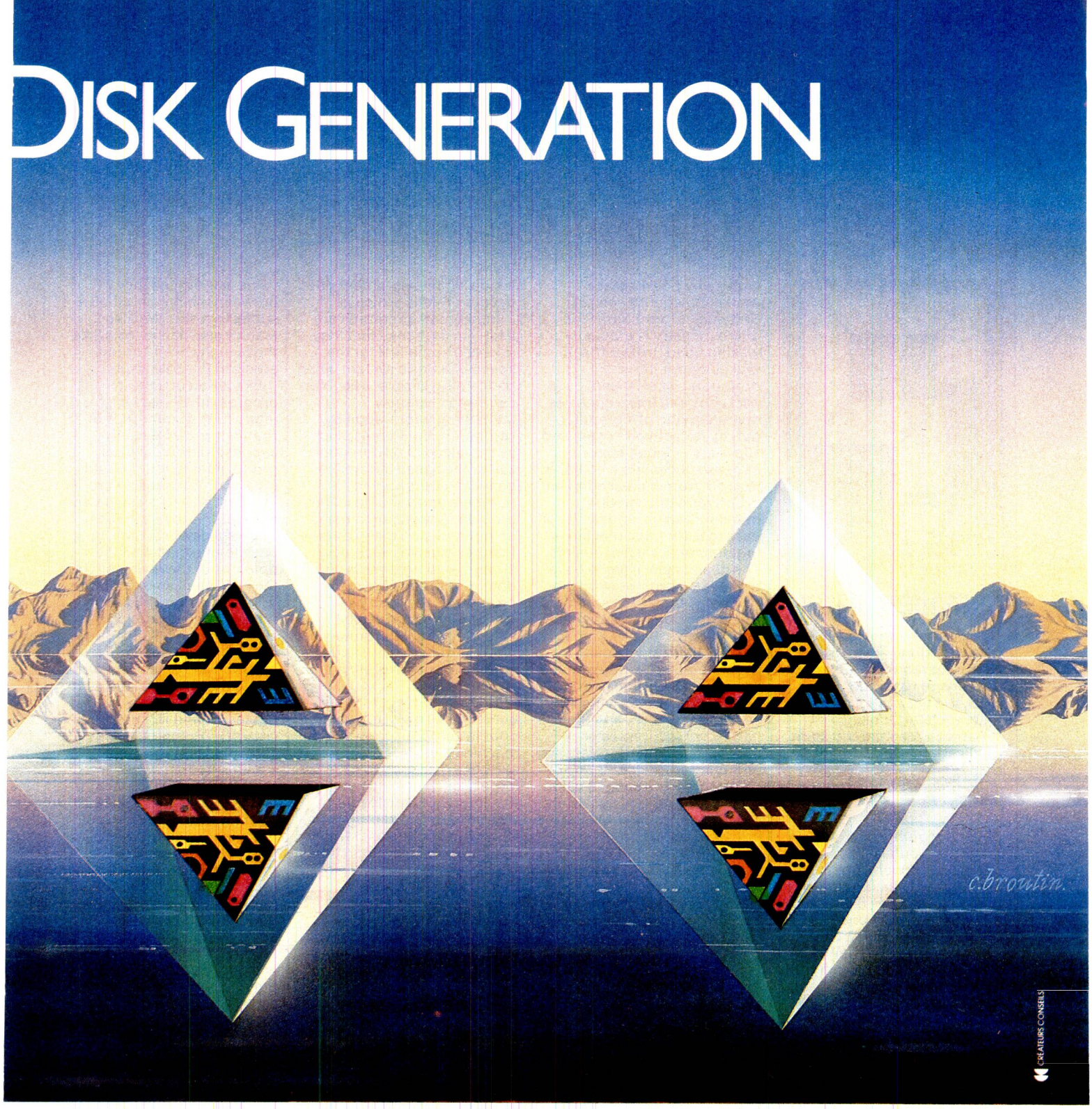
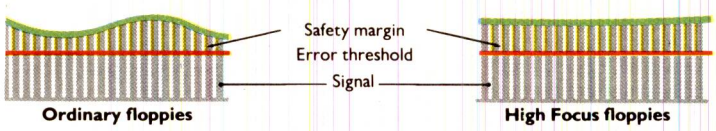


The result is a cyclical variation in the signal received from the read head - Where the signal is weak, the safety margin above the error threshold is at a minimum.



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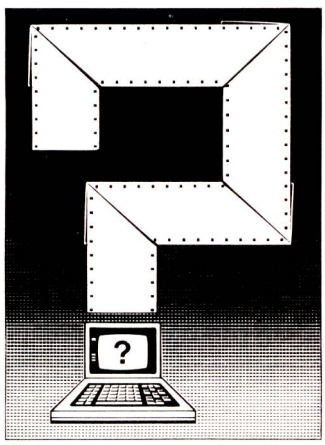


Computer dating

As a dealer I often have to face situations where a customer requests a special package to run under MS-DOS, but I haven't a clue where to start looking.

Can you recommend some publications which might be of help?
Jean-Claude Elias, Amman, Jordan

Several monthly micro magazines publish lists of business software, but these are invariably incomplete: there are so many packages, advertised in so many different areas, that it would be impossible to assemble a full list. The rate at which packages appear and disappear means that such guides are inevitably inaccurate as well by the time they are published.

Even if you can find what you want in such a guide — and they tend to concentrate on popular applications rather than obscure ones — you then have the problem of tracking down a dealer. Some of them seem to appear and disappear faster than the packages they sell!

The best way to find obscure packages is to scan the advertisements in a range of micro magazines, particularly those which specialise in your type of computer. If the software you need is aimed at a vertical market you may find what you want more quickly by scanning through trade magazines for the appropriate field — most such titles carry advertisements for specialist packages.

If this sounds like too much work, why not contact a marketing agency such as Software Information? The micro industry is gradually waking up to the fact that it makes a poor job of promoting 'specialised' packages and these agencies operate a kind of 'computer dating' for software users and suppliers — albeit at the expense of dealers who hope to profit from increased sales.

Software Information maintains an up-to-date list of packages for most machines, together with a list of dealers. The dealers pay a fee to have their wares promoted by the company, but as the service is free to the potential purchaser why not give it a go? Ring (01) 831 0071 and state your requirements. The agency will phone you back later with details of packages which fit your specification, and the names and addresses of appropriate dealers. Overseas enquiries are welcome.

Of course, the snag of using such a service is that you only hear about products available from the dealers on the agency's books, but it's invaluable if you can't find the required program any other way, and naturally you don't have to act upon the agency's recommendation.

Lies, damned lies!

I would like to know the outcome of any Benchtests carried out on either the Atari 520ST or the Acorn 32016 second processor.

Would the Atari 520ST be compatible with Apricot F1 software, as they both use CP/M but have slightly different processors?
Michael Charnley, Bradville, Milton Keynes

PCW reviewed the Atari 520ST in the June 1985 issue, but there were no Benchmarks for Personal Basic in the article because the interpreter was not finished. However, I would caution you against giving them much credance in any case, as the Kilobaud Benchmarks (on which the *PCW* tests are based) bear about as much relation to the power of a computer as your inside leg measurement does to your athletic prowess.

Benchmark programs are useful in the sense that they give you some feel for the speed of a Basic system when performing simple tasks. You can extract vaguely interesting information by comparing the figures, such as the speed of a subroutine call or the speed difference between references to numbers and variables. The problem is that Benchmarks do not measure many other features, such as accuracy, string-handling time (which dominates many business programs), the ease with which a language can be extended (fast interpreters are often hard to extend) and the change in speed as program size increases.

Modern 16-bit computer Benchmarks often appear poor in comparison with older machines, as they use software designed to cater for large programs efficiently — this imposes a misleading overhead on short programs. Older Basic interpreters, such as Microsoft Basic, limit the user to 64k of code and slow down dramatically as programs expand towards that limit.

Modern computers show their power when programs become larger and more complex. The SuperBasic used on Sinclair's QL can cope with 600k programs with little speed degredation. Its disappointing Benchmark figures also stem from the way that the interpreter is designed to allow new commands to be added easily. This was deliberately done so that users could eliminate Basic 'bottlenecks' with 'add-on' commands for sorting, coping, searching and other time-consuming operations.

Beware of 'optimised' timings which make computers look stunningly fast on Benchtests. For example, some of the test timings for BBC Basic, used on Acorn computers, are slowed by a factor of four if a few extra variables are declared and the loop counter is re-named!

Given these limitations of Benchmarks, why do we bother? The *PCW* Benchmarks do have some value as a limited index between machines, albeit a subjective one. We also feature alternative tests, like those in the 'Fast Timing' article in the July issue.

Execution of a Basic program involves the interaction of hundreds of routines and dozens of circuits; there is no brief group of tests which could give a comprehensive profile. The best way to measure any computer is to use it. In the case of a new machine, you have to make do with the opinions of the reviewer and the published specification.

Be wary of simplistic measures such as 'clock speed', which tells you nothing about how much the machine can do between one tick of the clock and the next (this depends on the processor and its surrounding circuitry). Remember that software is often more significant than hardware speed, and a Benchmark for one language tells you little or nothing about the speed of other languages or compilers.

That said, the 32016 is a more sophisticated processor than the 68000 in most respects. I expect the 32016 to be significantly more powerful than the 68000, assuming that it is coupled with an efficient memory organisation — the Atari, QL and Macintosh are all slowed down by the fact that the processor and display electronics must 'share' access to memory, whereas the 32016 second processor should not be constrained in that way. However, there is much more software for the 68000, and without software a processor is nothing more than a sliver of expensively-processed sand.

Turning to your second question, Apricot software will have to be rewritten (or at least recompiled) for the Atari. The processors used in the two machines are much more than *slightly* different.

There are stories that an 8086 emulator will be produced for the 68000, but the stories are rather misleading. Such an emulator will be very slow, very complex, and not totally compatible, due to the differences between the respective machines'

hardware. It is true that both the computers you mention have operating systems with names starting with the letters CP/M, and a similar interface for programmers and users, but the code is completely different for each.

Programs written in a high-level language (such as C) may be converted fairly easily (with, say, a quarter of the effort needed for a total rewrite). Machine code programs, which tend to be the most powerful, will need to be rewritten completely. However, the similarities between the operating systems should help users who want to swap their attention, or their data files, from one machine to the other.

Help for Apricot users

I own an ACT Apricot, and would like to know if there are any clubs for Apricot owners and users.
Magnus Unemyr, Jonkoping, Sweden

As far as I know there is no established club for Apricot users, but there are plans to start such a group.

Unfortunately I was unable to contact the organiser for further details before this issue went to press, but you should be able to find out more by writing to FS Cartwright, 'Rockside', 13 Worley Ridge, Nailsworth, Gloucestershire GL6 0PD, England. It would be polite to send an SAE, or an International Reply Coupon, if you are writing from outside the UK.

Curse on C

I have recently learnt how to program in the C language but I don't know how to write C functions equivalent to Basic's GET$ or INKEY$. Our compiler (cc) is a full implementation of C, as specified in Kernighan and Ritchie's book, *The C programming language*.

I tried to use the routines in the book, but with no success. Altos has provided a screen package called CURSES in which it provides the function 'getch()' to do the job. This consumes large amounts of memory — my 512k of source code produces about 12k of object code and still does not function properly. Can you provide a better function to do the job?
AF Segar, Al-Khobar, Saudi Arabia

Firstly, an apology as I do not have the time nor space to provide full-scale programming solutions on these pages. However, I can point out the likely cause of a problem, and explain how I would go about tackling it.

Although the syntax of the C language is defined in the book you mention, the input and output commands are not fully specified. The designers of the language recognised that such facilities would inevitably vary from one machine to another and they deliberately avoided building such facilities into the core of the language. In C, input and output are performed by calling functions, rather than through the use of specialised routines (such as Basic's INPUT, INKEY$, and so on).

This approach makes it easy for systems programmers to move a C compiler from one machine to another, especially as C compilers are usually written in C. The implementors need only re-write the functions required by their compiler — without delving deep into machine code. The snag from the user's point of view is that the precise performance of input and output functions may vary between one type of computer and the next.

In this case it seems that the READ function will not return a 'dummy' character with the value zero when there is no data immediately available. This may stem from lazy implementation or incompatibility between the terminals you are using and the device drivers — the machine code routines at the heart of any Unix or Xenix system which handle the nitty-gritty details of communication with external devices. These routines vary a great deal between one implementation of Unix and another, as they communicate with the hardware at a very low level.

It is possible that the terminals which you are using are not configured correctly. Check this by consulting the person who installed the system, and reading through the configuration instructions. Make sure that the terminals you are using are set up to match the requirements of the device drivers.

The Altos terminal package consumes a lot of memory because it contains several functions associated with screen-handling which you do not require. When you include the CURSES package, you tell the compiler to process the entire contents of the associated file. Unfortunately the source library feature of C means that most compilers are not clever enough to eliminate unused routines from the final output file, so much of your 12k object file contains routines that are never called by your test program. This would not be the case if you were using a more sophisticated language, such as Ada.

The solution is to extract the required routines from CURSES, and discard the rest. All of the CURSES routines should be in a standard text file, which you can copy and edit. Although this is a simple operation in theory, in practice you may find that getch() interacts with other routines and variables declared in the file, so it could take you a while to discover which parts can safely be discarded.

It is best to remove routines one by one if you're not certain whether or not they are needed. You might be able to save time by contacting the person who implemented the package, but it tends to be difficult to track such people down without a lot of time, persistence and a big telephone budget!

Since you say that the screen package does not work properly in any case, it is likely that you will need to adjust the configuration of your system when you have reduced the size of the package. Check that your terminals transmit each character as it is typed — some terminals store characters and transmit a whole line at a time. Some terminal interface boards (inside the computer) work similarly.

In both cases you should be able to inhibit this *buffering*, but you may find that system performance suffers as a result as the processor will be interrupted by the terminal more often. This is the price you pay for interactive computing, and one reason why micro networks often out-perform multi-user systems on larger computers.

Assembly time

Could you tell me how to convert an assembly program into machine code for the IBM PC? Could I use 'Debug' to achieve this? If so, how? I find the Debug menu very difficult to understand.
Anita, no address supplied

In theory you could use Debug to enter programs, just as you could hammer nails into a wall with your fist — Debug is not designed for that purpose. Debug is a tool for experienced programmers who wish to test and make modifications to machine code.

You need an assembler. This is a program which translates mnemonics — the text of your assembly-language program — into binary instructions which can be directly executed by the PC's processor. You should be able to order an assembler from any PC dealer — there are several such programs available, including the Digital Research assembler which is supplied with a set of debugging tools. Be warned, though, that assembly-language programming is pretty tough going.

Lighting-up time

I am using a Torch computer with a BBC Micro and Torch colour monitor. I recently purchased an Apricot F1, expecting that it would be able to drive the Torch monitor. Alas, it will not. The input on the Torch monitor is a six-pin DIN socket and the output from the Apricot is a nine-pin D-type socket. Apricot advertises that its machine will run any IRGB monitor — is there any way, please, that I can get a lead made up? I have very little technical ability and the work would have to be done by a dealer.
PE Kemp, Drayton, Norwich

Apricot now says that the F1 will work with *most* IRGB monitors — the 'I' is important, since it indicates that the computer generates an 'Intensity' signal — if your monitor will not accept this you will be restricted to eight colours, rather than the 16 normally available. The Apricot generates two separate synchronisation signals — these will have to be combined for a monitor which expects 'composite sync', and some electronics may be needed to ensure that the signal polarity is correct.

Your local Apricot dealer is United Sumlock, of 37 Prince of Wales Road, Norwich, tel: (0603) 617083. The company should be able to sort out a lead to connect the Apricot and the monitor together, although you may find that some small-scale modifications to the monitor are required. You may end up having to choose between having a monitor compatible with the Torch and having one compatible with the Apricot. *Note: check whether components are compatible before parting with cash.* END

Mum's not the word

The password this month is security, with Peter Tootill offering sound advice on keeping intruders at bay.

Security of online systems has been getting some publicity again recently with the breach of a Telecom Gold mailbox. Someone left Gold just by dropping carrier instead of using the normal command 'bye'. A faulty modem meant that the system didn't realise, so the next caller found himself logged into another person's ID. Gold is said to be criticising the original caller for not signing off properly!

Every online system should be able to cope with lost carriers as a matter of course. No matter how good the phone lines are, there is always the chance that a caller will lose the connection through no fault of his own. The system should be able to cope in order to guarantee a user complete security.

While on the subject of security, it's worth mentioning passwords. Most systems suggest that you change your password regularly. This is a little confusing, especially if you use several different ones and want to use a different password on each. However, it's certainly worth doing so on systems where, for example, someone could run up a big bill for you if they got hold of your password. Be especially careful if you use such a system in an environment where others might see you logging on.

Neither should you use a password which is easy to guess — you'd be surprised how many people log onto my BBS and use their girlfriend or wife's name as their password. One US network suggests that you use two unconnected words joined by a symbol — for example, 'book:dog'. Not all online systems allow symbols, but it's a good tip — such passwords are very difficult to guess.

I use a two-level system of password for online systems, using a low level for bulletin boards, where it wouldn't be such a disaster if someone were to guess it. This one is rarely changed.

I use the high-level password for sensitive systems where it would be a serious matter if the wrong person obtained access. Sensitive systems are those which could prove expensive, such as BT Gold or Prestel, or those where I have access to facilities which could be misused if they fell into the wrong hands. At this level I use different passwords for each system. You should never use the same password on a BBS as on a commercial system: if someone did manage to hack into a BBS (and some are less secure than others), he might well be able to view everyone's passwords. If you use the same password as on BT Gold, for example, the hacker has only to find out your mailbox number — a simple enough task — in order to obtain access to your account.

Security on PSS is more of a problem. Once you have been issued with an account (the equivalent of a password) you can't change it yourself, and PSS charges about £25 to do it for you. If your PSS account number fell into the wrong hands, someone could run up a very large bill for you very quickly. In my opinion, it's about time PSS allowed subscribers to change their own passwords at will as the present system is obviously no longer good enough.

'Hacking is a controversial subject. Some people say that it's just a harmless pursuit . . .'

Hacking is a controversial subject. Some people say that it's just a harmless pursuit with people who have no intention of causing any damage. However, there are a few who definitely do cause damage — whether accidentally or on purpose. There have also been cases of BBSs carrying confidential information such as PSS accounts and passwords. Using someone else's PSS account may be fun, but it is theft — just as much as if you took someone's wallet and used actual pound notes to pay your bills.

BT and the police are now taking a very serious view of these matters. I have an unconfirmed report that one sysop has been raided by the fraud squad, and another has had not only his BBS telephone line, but also his voice line taken from him by BT. I understand that he has been told that he will never be allowed a phone line again. So be warned: hacking could get you into serious trouble.

New BBSs

New numbers include one for Tandy users — run by the same people who run the Tandy area on Micronet (which is now back, after an outcry followed Micronet's removal of it earlier this year). Another is aimed at OS9 users (and runs on a Dragon). OSI users are also catered for, as are Christians with a UK branch of the Computers for Christmas system.

TUG-Tandy Users' Group: 24 hours. 300 b/sec. Tel: (01) 200 7577.

OSI: 24 hours ring-back. 300 b/sec. Tel: (01) 429 3047.

Dark Crystal: 24 hours. 300 & 1200/75 b/sec. Tel: (01) 954 9847.

CFC-Computers for Christ: 24 hours. 300 b/sec. Tel: (0395) 272 611.

CYMRUTEL: 24 hours. 1200/75 b/sec. Tel: (0492) 49 194.

System 2000 Computer Club: Mon-Friday, 7pm-7am. 300 b/sec. Tel: (0642) 481 643.

BBS09: Wednesdays & Saturdays 7pm-10pm, Sunday 10am-10pm. Mainly for Dragon and OS-9 users. Tel: (0705) 736 025.

FBBS£1 Portadown (N Ireland): 10pm-1am ring-back. 300 & 1200/75 b/sec. Tel: (0762) 333 872.

Communitree Hope: 24 hours. 300 b/sec. Tel: (0874) 711 147.

CBBS (London NW): 24 hours. 300 b/sec. Tel: (0895) 420 164.

NBBS Cheshire: 24 hours. 300 & 1200/75 b/sec. Tel: (0936) 77 025.

Books

If you're looking for a book on Communications then take a look at *Talking to the World* by John Newgas at £4.95, and the *Hacker's Handbook* by Hugo Cornwall at £5.95.

Talking to the World is a good introduction to using bulletin boards while the *Hacker's Handbook* gives general hints on how to guess passwords — however, all the system managers have read it, so now it won't be so easy to crack BBSs. The book also provides technical information on interfaces and standards, as well as information on viewdata systems. Both books are published by Century. END

UK free networks

Bulletin Board	Phone Number	Notes
Aberdeen ITEC	(0224) 641585	V.23
BABBS-Bath	(0225) 23276	300/300 baud rate; 9pm-8am weekdays, 9pm-noon weekends; Atari-based system, ring-back system
BABBS-Felixstowe	(0394) 276306	300/300 baud rate; 24 hours daily; Apple users' group
BABBS TWO-Basildon	(0268) 778956	300/300 baud rate; 24 hours daily; Apple users' group with special area for queries to Apple UK
Basildon ITeC	(0268) 22177	Prestel type service
	(0268) 25122	Atari based 300 baud. 24 hour
BASUG	(01) 373 6337	24 hour
Blandford Board TBBS	(0258) 54494)	300/300 baud rate; 24 hours daily
CABB TBBS	(01) 631 3076	300/300 baud rate; 24 hours daily + 1200/75
CBBS SW	(0392) 53116	300/300 baud rate; 24 hours daily
CBBS Surrey (Woking)	(04862) 25174	1200/75 and 300/300 baud rates; 24 hours daily; jokes, jobs, reviews, news
Chatham (Kent)	(0634) 815805	6pm/9am daily + weekends 7 bits, even parity; sales and wants — cars, houses, computers
CNOL Lancaster TBBS	(0524) 60399	300/300 baud rate; 24 hours daily; Clinical Notes Online service, mainly for medical users; works in conjunction with a database on the Datastar network
Computers Incorporated Newcastle (CBBS)	(0207) 543555	300/300 baud rate; 24 hours daily; primarily business-oriented
Forum 80 Hull	(0482) 859169	300/300 baud rate; 5-11.30pm weekdays, noon-11.30pm Sundays, Bell 103 standard, midnight-8am daily; international electronic mail, library for up/downloading
Forum 80 SPA	(0926) 39871	300/300 baud rate; 11pm-midnight daily; TRS-80 and Genie users' group
Forum 80 Wembley	(01) 902 2546	300/300 baud rate; 7-10pm weekdays, midday-10pm weekdays; electronic mail, library for down loading; ring and ask for Forum 80
Fido Compulink	(06286) 63571	24 hour
Fido Fastnet	(051) 260 5607	10pm-8am BELL 103/212a tones only at present
Fido Fore TBBS	(01) 301 4110	Fido 1am-8am
Hackney BBS	(01) 985 3322	V.23 Password: PUBLIC
Hamnet Hull	(0482) 497150	300/300 baud rate; 6pm-8am daily
Livingstone, Scotland	(0506) 38526	Atari, 24 hours daily
London Underground	(01) 863 0198	24 hours V.21/V.23 (Viewdata coming soon) BBC Based (colour for BBC users)
Liverpool Mailbox TBBS	(051) 4288924	300/300 baud rate; 24 hours daily; sponsored by INMAC; electronic mail, program downloading, TRS-80 information; messages for *PCW* can be left on the board and will normally be read by us within 24 hours
Mactel (Nottingham)	(0602) 289783	V.21/V.23 Macintosh users 24 hours daily
Mailbox-80 W Midlands Stourport TBBS	(0384) 635336	300/300 baud rate; 6pm-8am daily
Manchester Open Bulletin Board TBBS	(061) 7368449	300/300 baud rate; 24 hours daily + 1200/75
Marctel	(01) 346 7150	10am-10pm daily (24 hour coming, watch for announcement on Marctel) BBC based system (FBBS) with colour for Commstar users
MBBS-Mitcham	(01) 648 0018	300/300 baud rate; 24 hours; BBC-based system with jokes, graffiti, electronic mail, and Atari and BBC sections
MG-Net CBBS London	(01) 399 2136	300/300 baud rate; 5-10pm Sunday; electronic mail, program downloading
Microweb Manchester TBBS	(061) 4564157	300/300 baud rate; 24 hours daily; *Micro User* magazine, mainly for BBC users
NBBBS-North Birmingham TBBS	(0827) 288810	300/300 baud rate; 24 hours daily
NBBS-E BBC Micro	(0692) 630186	BBC Based 24 hours daily V21/V23
NBBS Lutterworth	(04555) 4798	Mon-Fri 8pm-8am, weekends 24 hrs
NKABBS	(0795) 842324	9.30pm-midnight
OBBS Manchester	(061) 4271596	300/300 baud rate; 24 hrs except 10am-10pm
Octopus RAS	(0272) 421196 (Bristol)	6pm-8.30am V21 using public domain Octopus software
PIP-Sheffield TBBS	(0742) 667983	300/300 baud rate; 24 hours daily. Bell 9pm-8.00am
REACT UK	(0376) 518818	24 hours. Mainly Dragon
SABBS Glasgow	(0698) 884804	Atari, 24 hours daily
SBBS Southern	(0923) 676644 (Watford)	11pm-8.30am daily; BBC based V.21/V.23
Southern BBS	(0243) 511077	300/300 baud rate; 8pm-2am daily; ring-back system (dial the number, let phone ring once, and then ring back); messages, downloading
Stoke ITEC	(0782) 265078	1200/75 Viewdata system; 24 hours daily
TBBS London	(01) 348 9400	300/300 baud rate; 9am-7pm daily
TYNESIDE BBS	(091) 251 4271	V.21 BBC based
VISA	(01) 958 7098	8am-11pm daily V23 Prestel type
WABBS-Worthing	(0903) 42013	300/300 baud rate; 24 hours daily; ring-back system (dial the number, let phone ring once, and then ring back); Atari-based

UK subscriber commercial/business systems

Bulletin Board	Phone Number	Notes
Comet	(0527) 28515	Message handling system: Details from Istel Ltd, Grosvenor House, Prospect Hill, Redditch, Worcs
Micronet 800	(01) 278 3143	Prestel database information for micro users. Details from Micronet 800, 8 Herbal Hill, London EC1R 5EJ
Prestel	Freefone 100 Prestel sales	Subscribers only
Telecom Gold	(01) 403 6777	All information from Sales Admin, 60-68 St Thomas Street, London SE1 3QU

TRANSACTION FILE

● EPSON HX-20 expansion unit. No cassette drive, needs charger. Good condition. Offers over £200. Brand new Amstrad CPC464 software worth £60, spreadsheet database games. Offers over £200. Tel: Leon (01) 881 3435.

● WANTED: Strathclyde. Basic tutor Pet/800. Prefer disc. Also interested other software for 8032 and books. Tel: 0379 2875.

● APRICOT PC 256k. 2×720k drives 9 monitor, including usual software. Bought April 1985 for one-off project. Still under guarantee. Also: 256k card, FX80 printer. Sensible offers only. Tel: 01-834 5891.

● ACORN ELECTRON. With plus one and ten games cassettes, including Elite. Also books, (programming, listings etk). Boxed as new. Only £120. Tel: Paul (01) 954-2962 (eve).

● COMMODORE 64 for sale. With disk drive, FX80 printer. Complete with extras, disks, manuals, software, joysticks. All as new. Only £549 ono, may split. Tel: Colin, Uxbridge (0895) 35129.

● KNUTH Vol 1 Fundamental Algorithms. Vol 2 Seminumerical Algorithms. Vol 3 Sorting and Searching. All hardback in excellent condition. £25 + p&p. For all three volumes. Tel: (04203) 7194, Alan Fay.

● EXTEND YOUR APPLE 11+. Microsoft Softcard with CP/M 2.2 and Mbasic, £130. Videx 80 column card £80, Calcmaster spreadsheet £20, Hilderbay Bookkeeper £20. All with documentation. Hereford area. Tel: (0600) 84317.

● APRICOT PC 256k, 2×315k drives, 91N monitor, latest B10S. All ACT bundled software plus Wordstar plus Multiplan plus Sensible Solution top of range database. £1000. Tel: (01) 995 0478.

● OSBORNE 01 D/D 52/80/ 108 COL with Wordstar, Supercalc, nbasic, cbasic, utilities, CP/17 Mailman, manual 120 discs. Also 10MB hard disk for above. £1800 ono both. Will consider split. Tel: 802-0839.

● COMPUTERS AND ACCESSORIES: Epson HX20 with micro cassette recorder £250, ZXSpectrum + £70, Alphacom 32 printer £50, £100 worth of software £50. Tel: 0428 734935.

● VIDEO GENIE MARK II. EG3013 expander, 2×100k disc drives, monitor, SMALLDOS 5.1, Newdos+, CCA DMS (database). All leads, most parts still with box. £250. Tel: Jim Rooney 031-225 6716.

● AMSTRAD CPC464. Green screen with joystick, books, £50 worth software. All in excellent condition, boxed, good as new. Cost over £300, will sell for £180 ono. Tel: (01) 228 0659 Eves.

● CBM 710, 128k RAM, production model with built-in screen. All leads and original packaging. Offers around £600. Tel: Dave (0386) 852089.

● SIRIUS 128k 1.2Mb disks, boxed with manuals plus 384k RAM expansion, MS-DOS CPM86, hardware reference manual £1,250 Ex-VAT. Also available Basic, Pascal 'C' compilers and assembler. Tel: Dave (0386) 852089.

● SINCLAIR QL. Microvitec cub colour monitor, 30 microdrive cartridges, version 2 software and Sinclair toolkit. Cost £770 — Sell £400 ono. Tel: (0782) 542115. After 6.30pm.

● SHARP MZ70B. Twin disc drives, P5 printer, graphics expansion, running C/PM, personal Pearl database, home use, perfect business use, accessories, dust cover, manuals. £600. Tel: Eves Watford 22960. Day (0727) 32032.

● WANTED Memory expansion for Commodore PET 2001. 32K or 6k boards acceptable. Also Eprom programmer for PET. Good prices paid. Tel: (01) 551 0308.

● COMMODORE SX64 PORTABLE. Includes colour display and disk drive. Complete with joystick, white lightning, Hobbit, Superhuey, basic compiler, easy script, etc . . . £350. Tel: Crowthorne (0344) 761341 after 7pm or weekends.

● CP/M2.2 SOFTWARE. Mbasic compiled, basic two pascals, 'C' Z80 assembler, Wordstar, Datastar, Supersoft, Spellstar, Bstam, games, utilities. Plus Superbrain DD to run on. £500 the lot. Tel: (Hitchin) 0462 32511. Herts.

● BBC (B). Acorn DNF5 with DSDD 400k drive, graphics and music. ROMs, joysticks, metal TV stand, external speaker socket, loads of software plus new B/W TV. £550 ono. Tel: (01) 808 1898.

● BBC B. DFS, 32k SWR, Pascal, Exmon, £290. Dual 40 track, single sided disc drives £175. Colour monitor £180. Shinwa printer £140. Beastie and 2 Servos £20. Books, software available. Tel: 04207 443 after 6pm.

● MICRONIX ESB-1. 68008-based computer with 059-68k operating system. Populated board with 128k RAM, disk interface, twin RS232. Supports two users. Much documentation. Offers over £450. Tel: Yateley (0252) 874542.

● APRICOT F1. With bundled software and 9in APPLE IIc. Green screen monitor (very compact). Microsoft MS-DOS pack with GW basic. Also Turbo Pascal. Centronics printer cable included. £700 (no offers). Tel: Uxbridge 336688 0-4pm.

● 256k QL, T.R disk interface, Centronics printer interface plus serial to parallel printer interface. RAM disks, 35 Micraft's, books, plus software, chess, toolkit, etc. £350. Tel: Bracknell 485231 after 6.30pm.

● EPSON HX20 £250. Expansion RAM £45. Tel: Robert on 08675 5983.

● APRICOT PC. Twin drives, 256k Memory-1, plus software. £12.90. Also Hitachi 4 pen plotter. £395. Epson HI-80 4 pen plotter £295. Tel: John Austin Tel: (01) 573 3888 Ex 2882 (day), Slough 683854 (eves).

● STATISTICAL PACKAGE WANTED by Sociology student. Similar functions as SCSS for CP/M Newbrain. Second hand packages accepted with proper documentation. Tel: (01) 878 7168 after 6pm or (01) 836 5454 (ext 2664) office hours. (Peter).

● AMSTRAD CP464. Colour monitor, disk drive, Protek serial interface, CP464 firmware manual. Software: Tasword, Fighter pilot, Sorcerly, plus many Amsoft. £330. Very quick sale. Tel: Tilbury (03752) 5934.

● MONOTYPE 80 PC SYSTEM. Primarily used as wp system. 2×8" drives, Diablo printer, feeders, hood, disks, software and desk. £1175. Contact Michele Tocci. Tel: Weybridge 47272.

AS NEW. Q.L., Fully compatible HR-5 printer (pumps from easel), bundled software including QL chess, Caverns, Sinclair assembler. Bargain at £400 ono. Contact: Steven Wilson, 64 Sudbury Court Drive, Harrrow, Middx. Tel: (01) 904 4964.

● DOT MATRIX PRINTER. Star DP510. 100 CPS, Epson MX compatible, Parallel interface, all print codes/ graphics. 10 inch tractor/ friction feed. Perfect working order. £130. Tel: Howard (01) 446 5512.

● BBC 'B' Amcom DFS, Kaga green monitor, Mitsubishi 80TK 400k disk drive, Kaga KP810 dot-matrix printer, view, games, books, magazines, + more! Ring for more information. Bargain £1050 ono. Bude (0288) 4682 Jonathan.

● APPLE II EUROPLUS, 48k, monitor, two drives, MX-100 printer, softcard clockcard, software plus manuals. £550. Tel: (01) 689 2266 Ext 2743.

● COMPLETE SYSTEM. Epson QX-10 256k and FX-80 (NLQ) printer. Software: Micropro suite, Bibliographic database, Utilities, games, et. 6 months old. Will install myself. Everything supplied. £1680 ono. Tel: Matthew (041) 427 1088 (eves).

● ITT 2020. 48k plus 16k language card, manuals and cables, in box, running autopalsoft. Apple in box, compatible, £250 ono. Tel: (01)530 6126 (eves).

● MEMOTECH MTX. 96k user RAM, 16k graphics RAM, NewWord word processor ROM board, Pascal ROM board, speech board, tapes, books. Current cost £350+. Will accept £265. Tel: 061 865 5809.

● MICRO-PERIPHERAL M165 CPS PRINTER 80-137 column according to print size with microway interface adaptor. £200. Tel: Green on (01) 828 8591.

● SPECTRUM PLUS. Interface 1, two microdrives, cables, manuals, cartridges, £100 worth books and software. £175. Tel: (01) 459 7207.

● HELP MY SUPABASE PROGRAM TAPE FOR MZ80A DAMAGED. Would Mr. Hearn of CP Electronics lately of Withington please contact Alan Smith. Tel: Epsom (03727) 22804.

● PARADISE MODULAR GRAPHICS CARD. Provides full screen graphics on both IBM Monochrome and colour displays. Unused. £260. Tel: Guildford (0483) 503163 (eves).

● RODIME HALF-Height 10mb Internal fixed disk for IBM-PC incl. Controller £695. Hardly used. Tel: Guildford (0483) 503163 (eves).

● BBC (B). Acorn DFS, disc doctor, 32k RAM CARD, AMX mouse, joystick interface, lots of software and all issues of Acord and Micro User. Plus reference books and manuals. Excellent condition. £375 ono. Tel: Clive on Ruislip 30965.

● IBM PERSONAL COMPUTER. Twin floppy memory 64k. Still in box, unused. Sale owing to death of owner. £1,500. Mrs Hurst, 61 Queens Road, Devizes, Wiltshire. Tel: 0380 2597.

● PORTABLE COMPUTER. Epson HX20. (Brand new(with expansion unit. Plus 'Sendata' acoustic coupler. Beautifully contained in Spartanite case. For computing and communicating on the move. £600. Tel: Bradford (0274) 614611.

● XXXX APRICOT XXX.1 I want contact with Apricot users/owners. I also want to change programs and knowledges. Is there any Apricot club? Magnus Unemyr, Valhallau. 25 5525-9 Jónköping, Sweden.

● NEWBRAIN PRINTER CABLE. Adapted for use with Brother EP44 wanted. Tel: (01)461 4606.

● TANDY TRS-80. Model 1, level II, 48k, expansion interface, numeric key pad, micropolis disk drive, VDU, surge protector, Newdos; Assembler, Word prossor, Statistical analysis, Compiler, Games, Disks, leads £300. Tel: 0609 6766.

● COMMODORE 1541, Disk, 280 CPM, RS232, C2N, Simon's basic, Pascal compiler, easy script, all excellent condition. £200. Tel: Paul Bartlett. Home: Long Crendon 201372. Work: 0296-5941 Ext 395.

● ADVANCE 86B. IBM COMPATIBLE, micro 256k memory. Twin disk drives, perfect (writer, calc filer) & games. Software 3 months old. RGB monitor & joysticks. £1100 ono. Tel: 0787-210 173.

● CBM 4040. Twin disk drive £360. Interpod plus 1EEE cable £45. IBEK CBM serial to Centronics printer interface £20. All suitable 64, VIV-20 or new 128. Tel: 0258 55420. After 6pm.

● WANTED. CBM disk drive, preferably 805 but will consider any other model. Tel: (0633) 212090 or write to: Raza, 256 Corporation Road, Newport, Gwent. NP9 0DZ.

● BBC SOFTWARE FOR SALE: Includes Killer gorilla, Elite, Battle tank, Chouls, Beeb art, Music processor, and many more on (0703) 845371 after 5pm weekdays, all day weekends. Ask for Mark.

● TANDY model 100, lap held computer, 24k, includes word processor, data base, was £550 will accept £290. Tel: (990 83) Alsager 77388.

● APPLE II EUROPLUS. Two disk drives, language card 64k total), 80 column card, serial interfaces, word processor, Pascal, games, £650 (offers considered). Tel: Maidstone (0622 77777 Ext 4273 (Office hours).

● COMMODORE 8032, 8050 disk, 3040 printer, 8010 modem, Epsom programmer, instant ROM, toolkit, many disks including wordprocessor, spreadsheet assembler/disassembler — games and much more. £800 the lot. Tel: (01) 543 8198 — 997 4404 Ext 25 office hours.

● MEMOTECH 512. Plus Pascal ROM and printer cable, books. Cost over £400. Offers over £200. Tel: High Wycombe (0494) 444265.

● BROTHER HR-5 printer £100, Cheetah speech synth £15, Quickshot II + Starstick ROM £15, 15 BBC cassettes inc. Elite, Scrabble, Jetpac £45. G. Pegler, The Cricketers, East End Road, Bradwell-on-Sea, Essex.

● COMMODORE 64. Plus Datassette plus MPS801 printer (nearly new). Also Easy Calc and other software, books. £300. Tel: 061 748 4768 (Eves) 061 320 6197 Ext 216 (Day).

● AMSTRAD 464 CPC. Green monitor, excellent condition, under one year. Manual and boxes retained. £170. Business type software for above extra if required. Tel: (0506) 37602 (Eves).

● BBA ACOM. Complete with manuals, Acorn bundled software ProPascal, ProFortran, perfect writer, +BBC software. Includes Kaga monitor, Epson printer, Solidisk 32k RAM and system case. Tel: Watford 46284 after 6pm. £980 ono.

● EPSONS: HX20 with expansion. Two tapedrives, interface, forth ROM and programs. £300. Also PX-8 only £450. Tel: Gordon (0379) 870339.

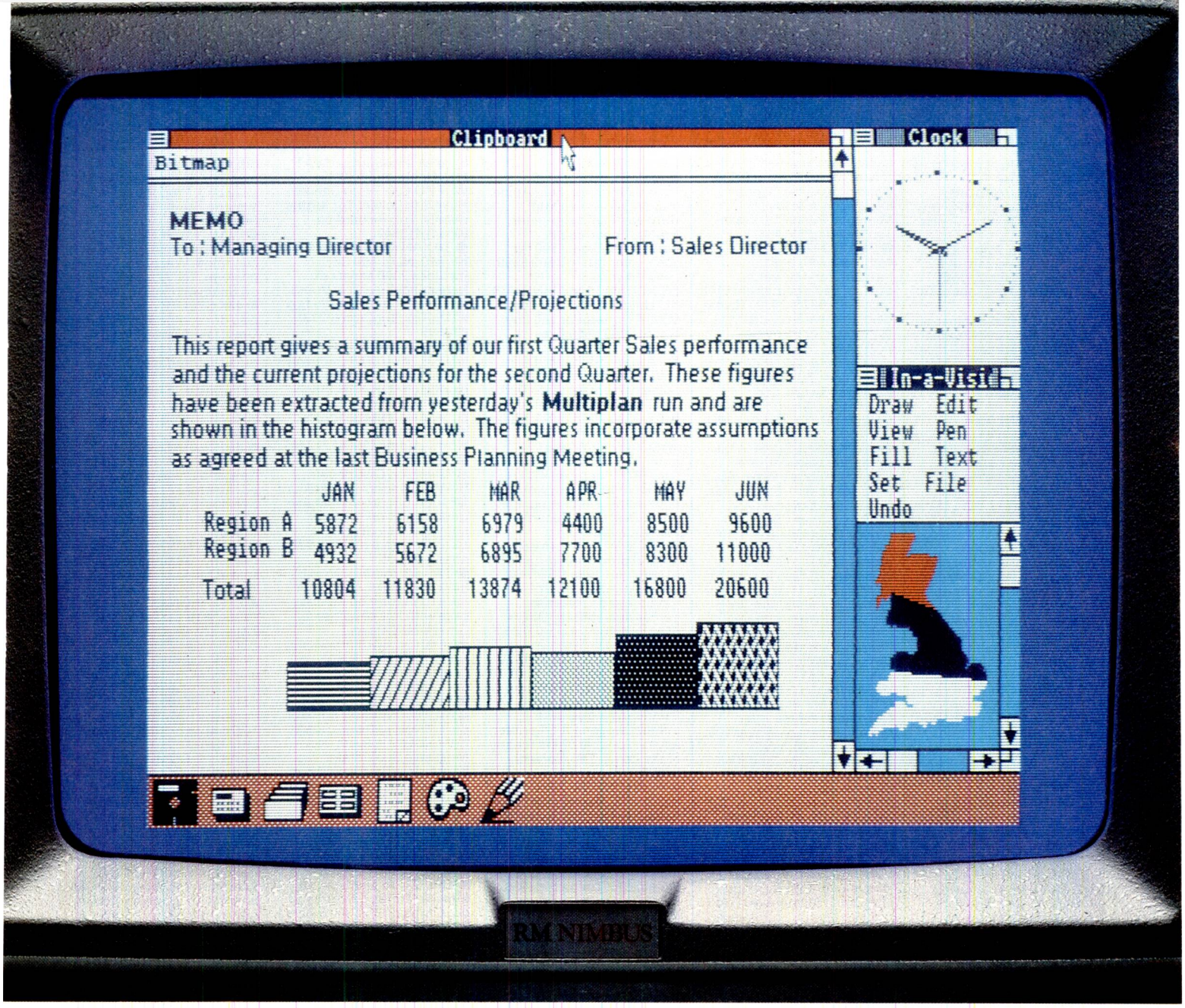
● HP-41cX POCKET COMPUTER. As used on space shuttle two. Extended memory modules plus standard, and circuit analysis modules. Much software, cost new £630. Want £398 ono. Tel: Ivan (01) 892 6057.

● NEW BBC+. (64k) +800k drive, + software (£200). + Books + mags £595. The ultimate printer — MP165-NLQ (Epson-code) £229. 800k drive £109. All new & guaranteed. Unbeatable! Jonathan 0992-57805 after 4pm.

● OSBORNE 01.52 col, double density. Wordstar, Mailmerge, Patastar, Supercalc, M-basic, Devpac 80, Supersort and public domain software. 60 diskettes, technical manual and centronics lead. £450. Tel: (01) 470 4542 after 6pm.

● IBM hardware and software sale. Basic compiler £120, APL £100, 8087 co-processor with diagnostics etc. £100, basic development system £50. All well under half price. Hayling Island (0705) 468778.

● ACT SIRIUS COMPILER. Micro focus, level II cobol with forms-2 screen generator. Latest ACT version (2.1). Perfect condition, never used. List £795 (Excl. VAT) bargain at £295. Tel: Mike 0707-371560 (Office) 0992-31157 (Home).



RM NIMBUS WINDOWS WIDEN YOUR VIEW

Windows,* the latest software advance from Microsoft, lets you look at computing in a new light - and RM Nimbus, with its brilliant graphics, makes the most of this exciting facility.

Now you can run MS-DOS packages, several at a time, each in its own window. You can work on your spreadsheet without having to leave your database system, and by using the mouse to point your way around the on-screen icons, you don't have to remember file names or look up operating system commands.

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And this is just the beginning. Software vendors are working on a new generation of applications to exploit the outstanding graphics and ease of use made possible by Windows.

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Windows on Nimbus. The natural choice. For further information, contact Research Machines Ltd., Mill Street, Oxford OX2 0BW. Tel: Oxford (0865) 249866.



*Wordstar, Windows and Multiplan are trade marks.

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(Office) 0992-31157 (Home).

● COMMODORE CBM9032 COMPUTER £200. CBM8050 twin disc drive £300. Wordcraft £25, Approx 30 discs £25. Wordcraft and discs free if you buy both computer and disc drive. Tel: (01) 540 2029.

● BUYING HOUSE. Must sell Apple Macintosh 512k plus Imagewriter printer (10 inch). £190 or near offer. Tel: Mr Martin (01) 432 3233, Ext 244, 9.30am to 4.30pm Monday to Friday.

● ATTENTION! Atari owners, make backup copies of your software. For your program send £5 to: M.J. Scott, 9 Peregrine Place, Long Benton, Newcastle-Upon-Tyne NE12 8QP. Make cheques, P.Orders payable to M.J. Scott.

● BBC MODEL-B DFS. Wordwise, Disc-doctor and Exmon on ROM, SS-SD disc drive, Tandy 4-colour printer plotter, green screen monitor, cassette, joysticks, lightpen, 20-discs including Aviator, Elite, Hobbit, £725. Tel: Barnsley 727660.

● NEWBRAIN MODEL AD. With ZENITH GREEN SCREEN MONITOR, CASSETTE, S/W manual and some software, £250 ono. Tel: (01)302 9512.

● AMSTRAD OPC464 with disc drive and MP-1. Epson RX80F/T. Advanced Amsword, Pitman typing tutor and other discs. Housed in Shinecrest desk. £550 complete. Tel: Leeds (0532) 557779 after 6pm.

● BBC DISC INTERFACE — UDM DDFS V2.0, unused, worth £110, just £50. Half-height 800k drive — new, complete, guaranteed — just £95. Incredible! Numerous unusued BBC firmware + software. Tel: Jonathan 0992-57805 (After 4pm).

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● BBC Solidisk sideways RAM 64k inc software and manual £65. Tel: (01) 699 3426 Eves. Will fit if required.

● ORIC ATMOS and Oric-1 original software titles from £1.25. For details send SAE to Mr J Blair, 39 Gateside Cresent, Airdrie, Lanarkshire ML6 6EP.

● EPSON PX8. 64k CPM portable cardbox +Auto Answer modem plus registratin to Easylink for Telex use £650. Equipment unused. Tel: Oxford 0865 66471 or 66146.

● ACT SIRIUS. 256k 1.2Mb. Excellent condition, DBasell, Supercalc, Wordstar, Victor business graphics. Many utilities including island set. Also demonstration picture slides, etc. £12,000. Tel: (0749) 75783.

● CBM 4032, 3040 dual disk drive, 3022 printer, c2N cassette compsoft dms, manuals etc. All for £40. Tel: Debbie at Cimtel on 021 359 0981 (day).

● AMSTRAD CPC464, with monitor, leads, manual, four blank tapes, £180 ono. Microscript disk-based word processor with manual £30. Games cassettes; Fighter Pilot, Eden, Football Manager, Punchy. £5 each. Tel: Reading 751483.

● SHARP MZ80K. 48k complete with built in monitor, tape cassette, manual basic games etc £100 ono. Tel: (0276) 28291 (Eves) Reid, Camberley, Surrey.

● COMMODORE SX-64 PORTABLE. 5inch colour monitor and disk drive, Brand new. Business and games software. C64 compatible. Sell for £450 or swop for V.JS QL and extras. Tel: 0532 714232.

● BACK ISSUES: Personal Computer News (first 23 issues!), Hobby Electronics (first 34 issues!), Electronics Today International (April 1978 to January '81) +5 others. Offers Please: John Tel: 051-420 4167 (Eves/ Weekends).

● SHARP PC1500 POCKET COMPUTER (11.5k), 4-colour plotter, manuals, software, etc. plus Olympus stereo radio/microcassette recorder (for program storage). Will sell separately. — Offers to John. Tel: 051-420 4167 (Eves/Weekends).

● SHARP MZ-80K (48k) with 4MHz and reverse video modifications, plus over 100 cassettes containing languages, games, utilities (Wordpower, Datapower, Superanimation, basic compiler, etc). £195 ono. Tel: John 051 420 4167 (Eves/ Weekends).

● APPLE MACINTOSH. + Imagewriter printer. Macwrite wordprocessor + Macpaint graphics design programs. All manuals and cables + various other discs. As new, unused. Offers. Tel: (01)952 8562.

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● SINCLAIR Q.L. Including all leads, user guide, Superbasic book, 4 blank cartridges, C/W bundled software, unused, as new. Genuine reason for sale. £200 ono. Please phone to negotiate. Tel: 041 952 9346.

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● HEWLETT PACKARD HP41CV. Programmable calculator £105. Card reader £95, X-function/Memory and time modules £40 each, survey and aviation modules £15 each, rechargeable batteries £20 ono. Any item. Tel: (01) 748 3607.

● APPLE II EUROPLUS. Phoenix monitor, twin Apple disc drives. Basics tutor software, Flight simulator, Paddle, Epson cable. Virtually unused. £500 for quick sale. Tel: (01)668 5559 Eves/Wkend.

● EXCHANGE MY SINCLAIR QL. Unused. For your Epson MX80FT printer or will buy. Tel: (01)668 5559 Eves/ Wkend.

● TANDY TRS80. MODI LEVEL II with monitor and cassette recorder. £95. Tel: (01) 668 5559 Eve/Wkend.

● EX DEMO TOSHIBA T300. MSDOS system for sale, including colour and monochrome monitors, hard disk, 640k floppy disk drive, full documentation, word processing, serial + parallel ports. Best Offer Secures. Tel: 0602 268620.

● BBC B WITH Acorn Z80 second processor, inc all CP/M software, twin DSDD 800k drives, printer, colour monitor, tape recorder, games and utilities. Offers over £999 only. Tel: (01) 368 4748 (eves).

● PRESTEL 75/1200 PRISM ACOUSTIC MODEM. With Communications software for BBC, Acornsoft forth language on tape with manual, Epson FX-80 printer, any reasonable offers for any of the items. Tel: Norwich 57087.

● COMMODORE 1701 MONITOR. Nearly new, £120. Seven disk games, including Infocom Witness, Epix Jumpman, Fort Apocalypse, Lode Runner, Commodore High Flyer, David's Midnight Magic, £35. Tel: Luton (0582) 841600.

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● DIABLO HYTYPE II. Carbon replacement ribbons suite. All diablo printes including the 630, ten available in manufacturers box in unopened plastic wrappers £15 for the box of ten. Tel: (04203) 7194.

● PORTABLE COMPUTER: Tandy model 100. Little use, as new, in box, manuals, etc. Cost £650 new, accept £490 or P/X for IBM hardware/ software (Hercules colour card?) Tel: (01) 543 6585.

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● TRANSOM TUSCA NS100 BUS SYSTEM. 8k RAM can be expanded. Full ASCII keyboard with B&W monitor built in modem and RS232 interface £450. Tel: 0935 813097 (eves).

● ACT APRICOT PC 256K, 2×720k drives, 12" monitor SuperWriter, SuperCalc1, SuperPlanner, BASIC ASYNCS software. Purchased April 1985, still under guarantee. Cost £2352 inc VAT new. Offers around £1800 including delivery. Carnoustie (0241) 54189 after 6pm.

● DRAGON 32 £50. Einstein software sassy £50, Micro-Simpex accounts and VAT £50. Home budget £15, WDPRO £20. Disco Dan £8. Buyers to collect, for further details. Tel: Richard on (0454) 413547.

● TAXAN KAGA PRINTER KP-810. NLQ. 160 CPS, includes 2000 sheets of paper and 4m cable. Brand new, never used, still in box. £225. Tel: Brighton (0273) 672515.

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● BBC B & DFS, Speech synthesiser, Disc doctor ROM, joysticks, + Seikosha GP100A printer, all manuals, good condition + lots of software including Elite. £320. Tel: Paul (01) 751 0280 after 6.00pm.

● TRS-80, model I, level II, 848k, two disks, sound, u/l case monitor, pop up disk case with lots of software. Smal LDOS, Pascal, assembler, word processor, system diagnostic and games. Bargain £155. Tel: 09277 62683 (eves).

● TANDY TRS-80 MODEL 1. 48K CPU, interface, monitor, disk drives, software, desk, printers LP7 + 8, etc, etc. Must sell. Separately, bargain prices. Cheeseman, 35 Longpark, Chesham Bois, Amersham, Bucks HP6 5LF. Tel: (024)-03 3829.

● UK101, working. Extras: 8k RAM, colour board, sound board, revised monitor. £190 ono. Tel: 0786 (Stirling) 74508. (Ewan Lisbister, 19 Melville Terrace, Scotland).

● COMMODORE 3032. Plus 3022 printer and 800k computhink twin drives. Robin Morritt. Tel: 045 15 274 (Near Cheltenham) £495.

● ORIC-1 48k and some software. £85 ono. Also ZX81 16k £35 ono. Tel: Sean on East Kilbridge 22138.

● CBM 64 COMPUTER, 1541 disk drive, cassette, easy script, some games, manuals. Still under guarantee. Hardly used, mint condition. £300. Tel: Chipping Sodbury (0454) 314217 eve/weekends.

● LYNX 96K. Parallel printer interface, manuals, user group magazines, 3 books plus software (Database, Home Busget, Chess, Backgammon, Colossal Adventure, etc.) Hardly used. £100 the lot. Tel: 0970 828933 (eves).

● APPLE IIE. 128K dual drives, monitor, printer, 80 cols, Z80 card, CP/M, Appleworks, Pascal, Wordstar, DOS 3.3, Prodos etc. All VGC. Tel: Greg I.O.W. (0603) 37429. £895 ono.

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● DEC PDT 150. Twin 8" floppy drives, IBM SDSS standard, full LSI-11 instruction set, 60Kb RAM, 3 programmable serial ports, technical manual. Non-runner. £300. TVI 920/52 manual, £200. Tel: (077) 382 5718 (eve).

● SHARP MZ-80K. i/o unit, P3 printer, twin disk drives, full boxed, complete with all manuals. Various software. £500 ono. Prepared to split system. Tel: (0282) 26265 (eves).

● WANTED. PCW Feb '84 back copy. Must be in mint condition. Will pay £3.00 plus postage. Tel: Martin C. Howe on Sandwich (0304) 617875.

● 48K SPECTRUM. With DD disc drive interface. Tasword, Omnicalc, Masterfile, disc. Professional keyboard. RGB monitor interface, programmable j/stick and Centronics RS232 printer interface plus much good software. £250. Tel: Watford 2600/44052.

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● MACINTOSH 512K. Home use only. Genuine reason for sale at the low price of £1500. Tel: 0602 734373 after 6pm.

● ELECTRONIC DAISYWHEEL TYPWRITER/ PRINTER: Brother CE51+ BBC B "View" wordprocessor interface/ lead/ROM/three daisywheels including "Symbol". Cost £410. Sell £280. Casio databank £20. Tel: Ed Conley 10am-4pm on 051-920 6962 after 6pm.

● BBC (B) COMPUTER. Acorn DFS OCCS Pascal, Sanyo monochrome monitor, CDC DS/DD disks, books, software, bargain. £400. Tel: (01) 470 7193 (eves).

● BBC-B, Acorn speech, Hobbit microdrive, tapes, Acorn printer, joystick, ROM board with graphics, toolkit, AID monitor, Wordwise. Cassette recorder, programs. Offers around £550. Write: Hoe, 19B, Wainfleet Road, Skegness, Lincs.

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● FOR COMMODORE PET 3016. 100+ games, also Simplicalc including manual, cassette recorder. Various books, Raeto West, Alcock, Cambridge basic course. Will split. Offers John Daneills, 51 Barnwell Street, Kettering, Northamptonshire.

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● COMMODORE 4040. Dual disk drive, £350. CBM (9") 4032 computer, £150. IEEE to IEEE cable, £20. Interpod interface, £35. All in VGC. Tel: (01) 803 5222.
● CENTRONICS 702 PRINTER. 132 column, full professional width, 180 CPS, STD. Centronics interface, fitted with paper tape VFU reader.Full documentation. As new condition. £200 ono. Tel: Worcester (0905) 640807.
● COMMODORE 64. Six months old, cost £200, want £130 ono, and VIC 1541, four months old, cost £190 want £150 ono. Tel: (01) 471 0669. Ask for Danny after 5pm.
● ACT SIRIUS 1. RAM, 2.4M drives, hard disc interface, also Wordstar, Superwriter, Bstam, MS Pascal, MS Basic, Programmers, Toolkit and other softwae. £1,500 ono. Tel: (01) 653 6825 (eves) (South London).
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● BACK ISSUES OF PCW. Continuous run from April 1981 to Sept 1985. Total 54 copies. £27 the lot. Write to Cross, 81 Derwent Avenue, Allestreet, Derby DE3 2DP.
● CP/M COMPUTER. Also a printer wanted by Community Resource Centre. Gemini Galaxy would be ideal, must be in good condition. Tel: 0602 470906 (day) or 0602 501842 (home).
● SHARP P3 printer and interface unit. Home use only. In original boxes. £210 ono. Tel: (01) 850 5046 (Sidcup, Kent).
● HARD DISK DRIVES. Two Diablo series 30, 2.5Mbyte, £260 each plus two Wangco 5Mbyte, £340 each. Buy both Diablos get third one free. Tel: John (0883) 40234 (eves).
● BBC MICRO. Model B, disk interface, twin double sided drives. Metal drive/CPU board casing, sideways ROM board with 16K sideways RAM. Remote keyboard. All for £462 ono. Software (ROMS) if required. Zenith Amber monitor. £57 ono. Christopher, Berhkamsted (04427) 2657.
● ALPHACOM 81. Thermal dot matrix printer, 80 column text and graphics, as new, less than six months old, Centronics interface, spare paper rolls, £75 ono. Tel: (0264) 4038.
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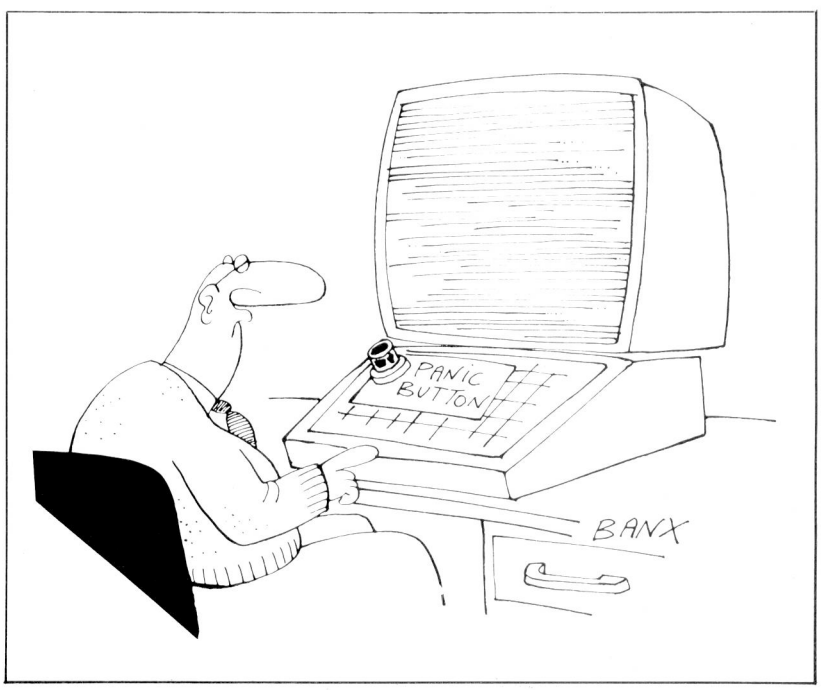

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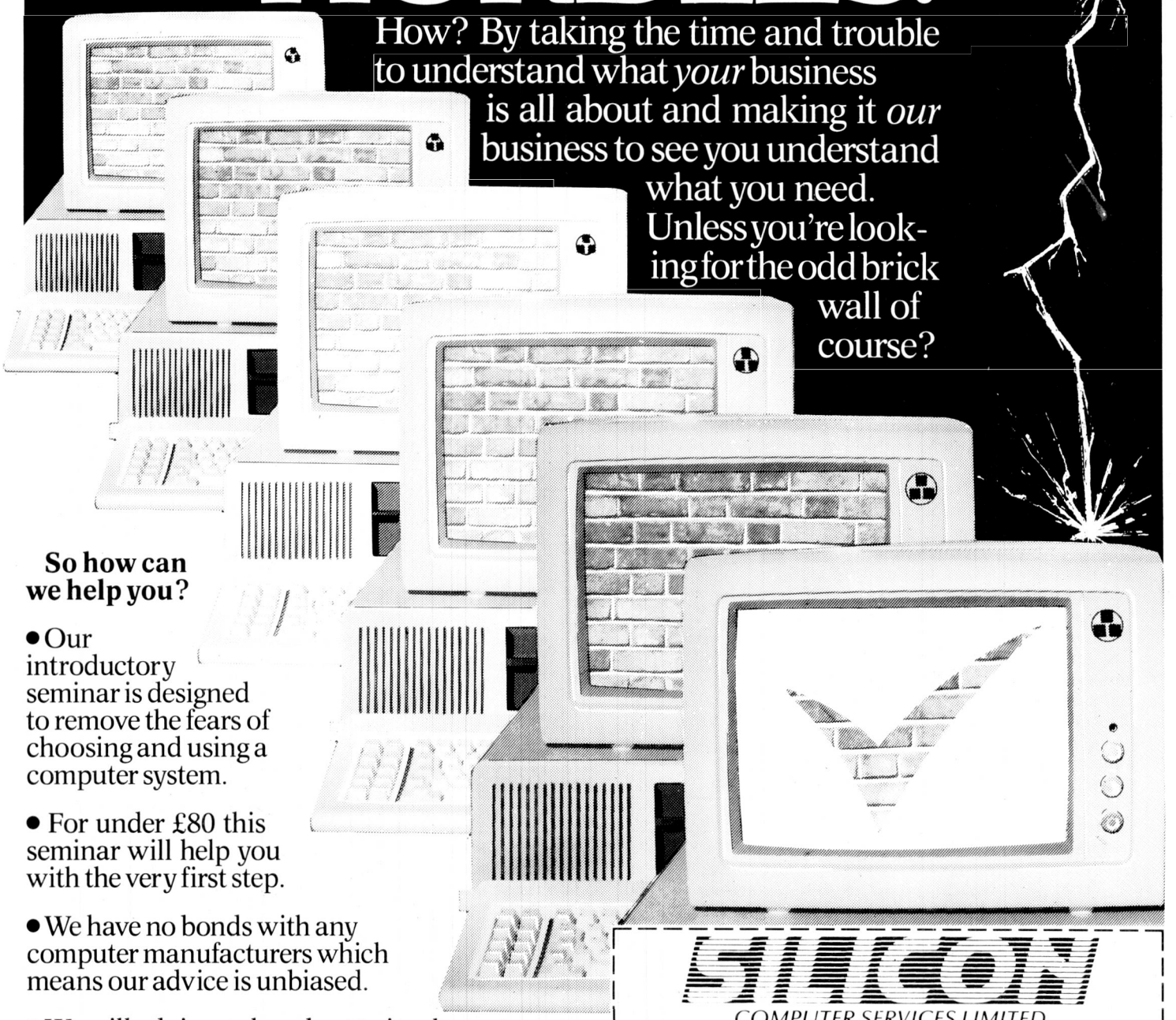

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● BBC B 1.2 0.5 DFS. Nearly new and hardly used, £200 ovno. Also R/C Sony KV-1612UB Trinitron colour TV. Tel: 0375 32639 (Grays, Essex) (eves only) and ask for Lawrence Stone.

MICROCHESS

Kevin O'Connell reports on a Grandmaster's simultaneous display against a program embodied in a stand-alone chess machine.

During the Fifth World Microcomputer Chess Championship, played in Amsterdam in September, an interesting side event was held. The Dutch number two, Genna Sosonko, a Grandmaster ranked in the world's top 50 players, gave a simultaneous display against 31 chess programs, most of them embodied in stand-alone chess machines.

It is always interesting to see a simultaneous display in progress, with the massed ranks of players, in this case computers and operators, spread out in a circle, with the player giving the simultaneous display walking around the inside of the circle, making a move at each board, then passing on to the next to see his opponent's move and reply to it.

Simultaneous displays can often last a long time, and the opposition can pick up quite a few points from the Grandmaster, although these statements have not applied to simultaneous displays against computers. Not, that is, until now. Sosonko's display lasted for eight hours (in which time he must have walked many miles) and he lost five games. His final score was won 25, drew one, lost five. Sosonko said how difficult it was now, compared with a simultaneous against human opponents who often start to make mistakes just out of the opening, because the computers played solidly and did not make silly mistakes. Here is one of the games in which a computer did rather better than simply avoid making mistakes.

White: Genna Sosonko. Black: Super Constellation. Opening: King's Indian Defence.

1	Ng1-f3	Ng8-f6
2	d2-d4	g7-g6
3	c2-c4	Bf8-g7
4	Nb1-c3	0-0
5	e2-e4	d7-d6
6	Bf1-e2	e7-e5
7	0-0	Nb8-d7
8	Rf1-e1	c7-c6
9	Be2-f1	a7-a5

This is the main line continuation of this particular variation of the King's Indian. As in all lines of the King's Indian, a major theme is Black's dark-squared bishop and the possibility of engineering some opening of the long dark-squared diagonal for it.

10 d4xe5

This is uncommon. 10 Ra1-b1 is the usual move in Grandmaster play, although Sosonko himself has also essayed 10 h2-h3. He probably wishes that he had played either of those moves instead.

10 ... Nd7xe5

10...d6xe5 has been more usual, but there is nothing wrong with this. Indeed, with a bit of luck, Black will emerge with a nice, open, long dark-square diagonal.

11 Nf3-d4

11 Nf3xe5 would be dead level, but Sosonko wants to beat all of his electronic opponents.

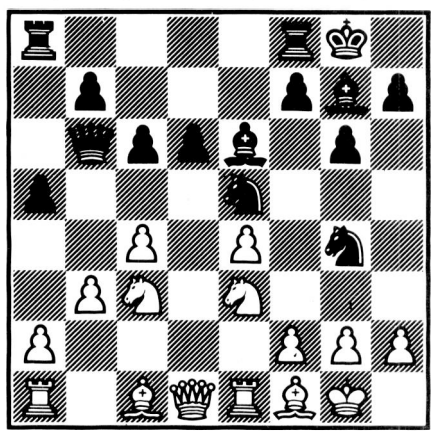
11 ... Qd8-b6

Very good, exerting still more pressure on the dark squares.

12 Nd4-c2 Bc8-e6

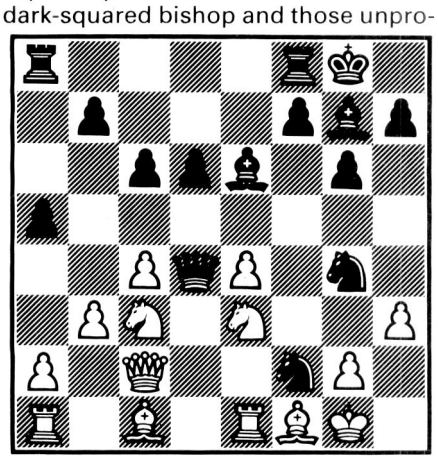
13 b2-b3?

Now was the time for Nc2-e3. This move is much too weakening. It is always risky to have unprotected pieces



It is risky to have unprotected pieces

(like the knight on c3 and the rook on a1), especially if Black has fianchettoed his dark-squared bishop and those unprotected pieces are sitting on that dangerous diagonal.



A horrifying situation

13 ... Nf6-g4

14 Nc2-e3

14 ... Ng4xf2!

15 Qd1-c2

If 15 Kg1xf2 then 15...Ne5-g4+ is horrifying.

15 ... Ne5-g4!

16 h2-h3 Qb6-d4!

The energy of Black's pieces forms a remarkable contrast with the passivity and uselessness of the white ones.

17 Bc1-d2

If 17 h3xg4 then 17...Qd4xc3, and a white rook drops off the board.

17 ... Ng4xe3

18 Re1xe3

Not 18 Bd2xe3 Qd4xc3, and Black will emerge at least an exchange (rook for minor piece) ahead after, for example, 19 Qc2xc3 Bg7xc3 20 Kg1xf2 Bc3xa1.

18 ... Nf2xe4

Black emerges from the complications two pawns up, and correctly simplifies down to a won ending.

19 Ra1-d1 Ne4xd2

20 Qc2xd2

Unfortunately for him, White has no option but to comply with Black's wishes.

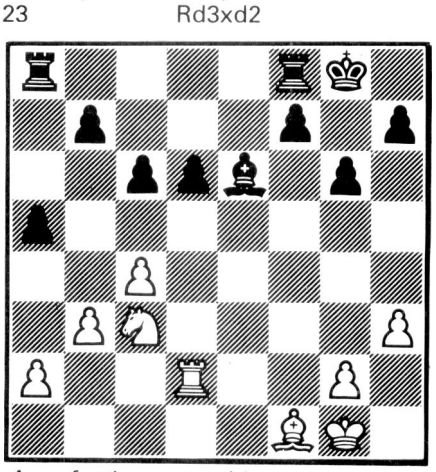
20 ... Qd4xd2

21 Rd1xd2 Bg7-h6!

22 Re3-d3 Bh6xd2

Under these circumstances, it is perfectly reasonable to part with the dark-squared bishop.

23 Rd3xd2



A perfectly reasonable move

The game is effectively over and Sosonko would certainly have resigned by now against a human opponent, but everyone knows that computers cannot

MICROCHESS

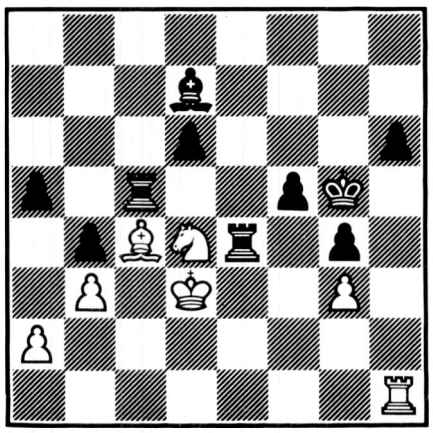
play endgames ... or can they?

23	...	Rf8-d8
24	Kg1-f2	Kg8-g7
25	Kf2-e3	f7-f5
26	h3-h4	Rd8-e8
27	Ke3-f4	

Of course, not 27 Rd2xd6? Be6xc4+ and 28...Bc4xf1, winning another piece.

27	...	Ra8-d8
28	h4-h5	Kg7-f6
29	Bf1-e2	g6-g5+
30	Kf4-f3	h7-h6
31	Be2-d1	g5-g4+
32	Kf3-f4	Be6-f7
33	Bd1-c2	Re8-e5
34	g2-g3	b7-b5

There is no rush to take the h-pawn. Indeed, it would not be good at the moment due to 34...Bf7xh5 35 Rd2-h2 Kf6-g6, and Black's bishop is stuck.



Black is in control

35	c4xb5	c6xb5
36	Nc3-e2	Re5-c5
37	Ne2-d4	Bf7-e6
38	Rd2-f2	b5-b4
39	Kf4-e3	Rc5-e5+
40	Ke3-d2	Be6-d7
41	Bc2-d3	Kf6-g5
42	Rf2-f1	Rd8-c8

Now Black has taken over all the important squares.

43	Bd3-c4	Kg5xh5
44	Bc4-f7+	Kh5-g5
45	Rf1-h1	Rc8-c5
46	Bf7-c4	Re5-e4
47	Kd2-d3?	

The final mistake. 47 Nd4-e2 would have enabled him to prolong the hopeless struggle.

47	...	d6-d5
	0-1	White resigns

After the bishop moves, 48...Rc5-c3+ forces away the knight's defender so that the other rook can remove the hapless steed.

NUMBERS COUNT

Mike Mudge looks at the interesting sums of reciprocals.

The harmonic series 1/1 + 1/2 + 1/3 + 1/4 + . . . is known to be divergent, which means that the sequence of partial sums:

$S_n = 1/1 + 1/2 + 1/3 + 1/4 + \ldots 1/n$

does not tend to a limit as n tends to infinity.

The sequence, S_n, in its lowest terms begins (1/1, 3/2, 11/6, 25/12, 137/60, 49/20, 363/140 . . .)

Problem 1a. What is the most frequently occurring denominator?

Problem 1b. Can there be a repetition among the numerators?

Note. $S_{13} = 1145993/360360$,
$S_{14} = 1171733/360360$,
$S_{15} = 1195757/360360$.

Now $S_n - \log_e n$ tends to Euler's Constant, denoted conventionally by a small Greek letter gamma, as n tends to infinity. This constant is of fundamental importance in number theory and is approximately 0.577.

Problem 2. Determine this constant as accurately as your hardware allows.

The sum of a finite number of different terms chosen from the harmonic series may itself yield an integer — for example, 1/2 + 1/4 + 1/6 + 1/12 = 1.

Problem 3. How can a given integer be expressed as a sum of such terms?

Reference: RC Lyness, *Math Gaz* 24, 1940, pp206-209, established that the decomposition of 10 requires more than 12366 terms.

Consider now the sum of three fractions of the form 1/n (not necessarily all different) write $T_3 = 1/x + 1/y + 1/z$.

Can T_3 yield 4/n for any n greater than 1? For example, 4/2 = 1/1 + 1/2 + 1/2,
4/3 = 1/2 + 1/2 + 1/3.

R Oblath and SA Rosati have proved this for n less than 141648.

Can T_3 yield 5/n for any n greater than 1? For example, 5/2 = 1/1 + 1/1 + 1/2, 5/3 = 1/1 + 1/1 + 1/3.

G Palama, *Boll Un Mat Ital* (3) 13, 1958, pp 65-72, has proved this for n less than or equal to 922321.

Problem 4. Construct possible T_3 decompositions of 4/n, 5/n, 6/n . . . for a range of n and investigate possible patterns. How does this extend to T_4 . . .?

Appendix . . . . . a large number

The largest number which the author has met recently is SKEWES' Number:

79
(e)
(e)
e

where e as usual is approximately 2.71828.

Investigate the significance of Skewes' number in number theory and determine (approximately) how many decimal digits it has.

Readers are invited to submit the results of the above investigation (to be used in the event of a tie-break situation), together with solutions to some, or all, of the above problems to: Mike Mudge 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffordshire WV4 5NF. Tel: (0902) 892141.

Submissions, which must reach me by 1 March 1986, will be judged using suitably vague criteria. A prize will be awarded for the best entry received.

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 winning entry may also be requested.

The Moebius function — June review

Readers interested in some background to this and other elementary functions of number theory are referred to *An Introduction to the Theory of Numbers* by GH Hardy and EM Wright, OUP, 4th Edition 1960; those with mathematics background may find *Exercises in Number Theory* by DP Parent, Springer-Verlag 1984, most rewarding reading.

The efficient handling of the Moebius Function on a digital computer clearly requires its storage to be restricted to two bits. (Recall that it is a three-valued function.) Thus, for example, its value for eight consecutive integers can be represented in one 16-bit integer variable: the efficient insertion and extraction of this information then being an interesting programming exercise.

The holiday period, or the predominance of Greek characters in the original article, may have been responsible for the poor response to this problem. However, the clear winner is Herr M Meuser, Aloysiusstrasse 13, 4047 Dormagen 5, West Germany, who used his Tandy model 100 with 24k RAM to tabulate M_n and S_n up to n = 5439600. The strange behaviour of these functions is clearly visible and the theoretical explanation seems as far away as ever.

Perhaps other interested readers would contact Herr M Meuser directly for an exchange of information relating to the details of his prize-winning effort. Details of the many tables produced

END ZONE

NUMBERS COUNT

before the days of digital computers are to be found in *Guide to tables in the theory of numbers* by DH Lehmer, Bulletin Number 105, National Research Council, Washington DC, 1941.

LEISURE LINES

Quickie

If the earth were a perfect sphere and a steel band could be placed around it, how much extra length would be needed to ensure that the band was raised 6in from the ground all the way round?

Prize puzzle

Short and sweet this month — and not too hard since it's Christmas. Can you make a fraction, using all the 10 digits 0-9, which has a value of 9 exactly?

Answers on postcards please, or backs of envelopes, to reach us not later than 30 December 1985.

Merry Christmas to all, and keep puzzling — it could be your turn to win next.

September prize puzzle

Obviously the September prize puzzle was much harder than usual. About 35 entries were received for this problem — and only 32 of them contained the correct solution.

The winning entry — chosen at random from the pile — came from Mr Sam Bowlin of Cambridge in the US!

Congratulations to you, Mr Bowlin — your prize is on its way.

The winning solution is as shown.

2	3	5		1
	1	0	7	6
2		1		3
1	1	4	1	
4		4	5	5

ACC NEWS

Rupert Steele looks at the changing face of computer clubs and this month's club news.

The amateur computer movement is growing up! It started in 1972 with the formation of the Amateur Computer Club, the first computer club in the UK. Members built their own two or four-bit processors from discrete TTL chips (and a hefty power supply), with a particular design called the 'weeny bitter' being promoted by the club. Now it's all changed. With the help of Intel, Clive Sinclair and others, home computer enthusiasts can afford to avoid detailed knowledge of the electronics and concentrate on the software.

As 'home brewing' of micro systems became less necessary, so the function of computer clubs has changed. Some clubs have 'games evenings' where the delights of the latest flight simulator or adventure game can be tried out. Others aim to give their members information, with talks and presentations. Many are showing an increasing interest in communications, with systems such as Prestel, and they are accessing computers running MUD (Multi-User Dungeon — probably the most addictive of all computer games).

As well as the local clubs, which meet to share the hobby, there are user groups for most major machines where members can obtain software (public domain, of course!) and information about the particular quirks of the machines. One of the most successful of these groups is the CP/M Users' Group, which has a large library of 8080/Z80 software written for the (machine-independent) CP/M operating system. For more information, send an *sae* to Mrs D Fordred, 72 Mill Road, Hawley, Dartford DA2 7RZ.

The Association of Computer Clubs is the national body that represents all these clubs. Our national database of clubs allows us to tell you where your nearest club or user group is, and we also have free information and advice for those contemplating starting their own clubs.

Around the clubs

Steve Janday has written with news of the Gravesend Computer Club. The club meets at 7pm every Thursday at the Council Tenants' Club, Whitehill Lane, Gravesend, and you can get more details from Steve at 58 Apsledene, Hever Farm Estate, Singlewell, Gravesend, Kent DA12 5EE. The club has a wide variety of computers, including the Spectrum, the BBC, the Commodore 64 and the Vic-20.

Kendall Jones is chairman of the Deptford Adult Games Group (no, not *that* type of 'adult games'). It has a thriving computer games section which includes competitions — including a recent one for American Football. The club meets on the first and third Sunday of every month at 3pm, until late or sometimes very late, at the Community Centre, Idonia Street, Deptford, London SE8 4LY. For more information, write to Ken, c/o the club, at the Community Centre.

Mr GA Hudson writes from 53 Alma Road, Sheerness, ME12 2PA to tell me of the Sheppey Computer Club. Its main interest is in Spectrums and QLs, but there are Commodores and occasionally IBM PCs, Epson 20s, and so on. The club meets twice a week, on Saturday afternoons, at the Seaview Hotel and Wednesday evenings at the local teachers' college. During the Wednesday meeting, there are teaching sessions in Basic, machine code/assembly language and Pascal. The club has an extensive lending library of books and (games) tapes, as well as some items of loan hardware, including a modem. For more information about this well-organised and equipped club, contact Mr Hudson at the above address.

Mr MK Gates is secretary of the Mid-Kent Micro Club (formerly the Mid-Kent TRS-80 Users' Club). The club, which now caters for all types of micro, meets at the Maidstone Teachers' Centre, Sittingbourne Road, Maidstone. The meetings are held about once a month, on Friday evenings. For more information contact Mr Gates at 65 Buckland Road, Maidstone, Kent.

Peter Kiff is the organiser of ComputerTown! Thanet. A ComputerTown! is a club, often meeting in a library, which places great emphasis on hands-on use of the micros, and may have a

ACC NEWS

special appeal for children. CTUK! Thanet meets about once every six weeks, and last year had special Christmas sessions: 'Which home micro shall I buy?', and afterwards: 'What to do with your home micro, now that you've bought one.' To find out what the club is up to over Christmas, write to Peter at Flint Cottage, 2 Ranelagh Grove, St Peters-in-Thanet, Broadstairs, Kent CT10 2TE. The club meets in local libraries in Broadstairs and Ramsgate.

Jim Fanning is the teacher and leader of Duncan Bowen Youth Wing in Ashford. A computer club has been formed at the youth wing, called the Duncan Bowen Computer Club, and it meets every Thursday — 3.30pm-5.30pm for juniors, and 7pm-9pm for seniors. The club is a Prestel member, and has used this to communicate with other enthusiasts around the country. For further details, contact Jim at Duncan Bowen Youth Wing, Kingsnorth Road, Ashford, Kent TN23 2LY.

Paul Gray writes to tell me about ComputerTown! South Shields. CTSH! meets every Wednesday from 7pm-9pm at the local branch of the YMCA. About 30 people attend each meeting, ranging in age from 10 to 60, and the group's objectives are to swap information and provide services best obtained by a group (for example, discounts from stores and block bookings for exhibition trips). Details from Paul at 1 Morton Walk, South Shields, Tyne & Wear NE33 2EA.

Mr JR Christer, of 16 Redwell Road, Oaklands Estate, Prudhoe-on-Tyne, Northumberland, NE42 5AP runs a club at the Kimberly Clark mill there, which is open to anyone in the area interested in micros. Machines catered for include Commodore, Sinclair and BBC models. Mr Christer has the details.

Peter Cheshire, of 60 Croft Road, Eaglescliffe, Stockton-on-Tees, Cleveland TS16 0DY has written to me, mentioning the Stockton Amateur Computer Club. Write to him to find out more about the club.

Mr K Clarke runs the Wrekin Computer Club, which meets on Tuesday evenings at the Oakengates Community Centre in Telford. Many of its meetings are on a 'Bring a micro and play or program' basis, but it is planning to have some teaching sessions covering such items as assembler programming. The meetings are from 7pm-9pm and more information is available from Mr Clarke at 21 Clunbury Road, Wellington, Telford TF1 3PA, or call him, between Friday evening and Sunday evening, on Telford (0952) 55148.

For a mention in this column, to notify the ACC of a new or existing computer club, or to obtain address labels for mailing information to computer clubs, write to Rupert Steele, 12 Philbeach Gardens, London SW5 9DY.

For any other enquiry, including the address of your local computer club, or that of your micro's user group, write to John Bone, ACC Chairman, 2 Claremont Place, Gateshead, Tyne & Wear NE8 1TL, or call (091) 477 3339.

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making arrangements, in order to avoid wasted journeys due to cancellations, printer's errors, and so on.

London	Olympia, Compec '85. Contact: Mike Birch, (01) 643 8040	12-15 Nov
London	Barbican, Computers in the City. Contact: ONLINE Conferences Limited, (01) 868 4466	18-22 Nov
London	Central Hall Westminster, Acorn User Christmas Show. Contact: Howard Heath, (01) 346 6566	22-23 Nov
Scotland	Anderston Centre, Scottish Home Computer and Electronics Show. Contact: Trade Exhibitions, Scotland, (0764) 4204	22-24 Nov
London	6809 Show, Royal Horticultural Halls. Contact: Howard Heath, (01) 346 6566	23-24 Nov

WRITING FOR PCW

Your chance to contribute to the magazine.

We're offering readers the chance to get rich (well, at least richer) and to influence what's published in the magazine — by writing for it. We welcome approaches from would-be writers, including those who have never appeared in print before. It's often users with practical experience who have the most interesting things to say, so don't worry if your prose is less than perfect, we can take care of the polishing.

If you have an idea for a feature write, with a brief synopsis, outlining the proposed structure and content. If your article is already written, then send it in for consideration. Remember to put your name and address on both the covering letter and the manuscript — along with a daytime phone number if possible. Manuscripts should be typed or printed out (dot matrix output is fine), in double-line spacing with ample margins top and bottom and on each side.

We'll try to return all submissions sent in with a suitable sae, but make sure you keep a copy of everything you submit as well for reference.

Any accompanying program listings should be supplied on disk or cassette, ideally with a printout 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

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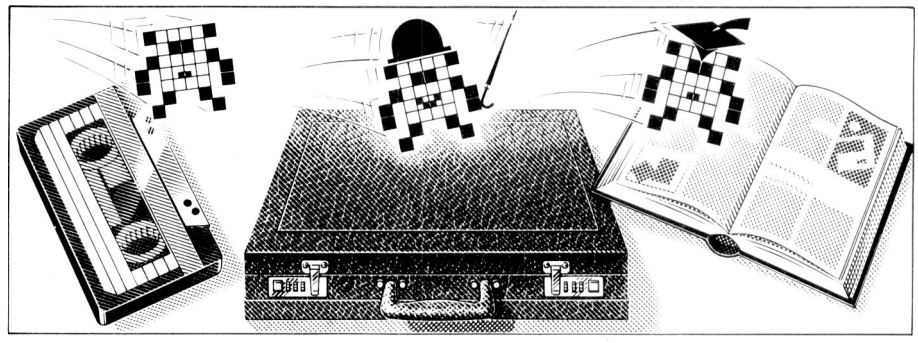

Owen Linderholm selects the best of readers' programs. For details on submitting your own, see the end of this section.

Christmas is coming and lots of people are shopping for a micro, or an expansion, or a new peripheral, or software. If they aren't, then some computer manufacturers are in for a rough ride financially.

However, many of you will have brand new reasons to do some programming after Christmas, so for all those readers who have itchy minds and want to submit programs to *PCW*, here are a few guidelines as to what is likely to be accepted for publication.

Take some time to study the type of program we publish regularly. Obviously, a program which has wider appeal than solely for the owners of one machine will be more popular. It helps if the coding is clear, in order that other users can understand what you are trying to do. Remember that people will be typing in the programs, and will be unwilling to spend time on something that is lengthy and incomprehensible.

PCW is interested in all types of program and in all languages, but what is published must refelct the desires of the average reader. No-one is likely to want a program about butterfly migratory patterns written in Ada. Generally, utilities, business, educational, scientific and games programs are welcome, but remember that most of our readers are serious computer users and are less interested in games than in original and useful ideas.

We want original, well-written, useful, interesting and preferably general-purpose programs. For more information on submitting programs, see the end of Program File.

This month's Program of the Month may well be the last WIMP (windows, icons, menus, pull-down menus) program that I accept for the BBC Micro. It was in fact written for the Electron, but works fine on the BBC as well. It provides an easy way to put windows and icons into your own programs, making them far more friendly.

For the Amstrad there is a drawing program that is packed with facilities such as colour-filling, airbrushes, line-drawing, circles, and so on. You can also save pictures to cassette (or disk, if you alter the program to cope with it).

Apart from the star over the stable in Bethlehem, there is another heavenly visitor hanging round the sky at the moment. This is Halley's Comet (which some say *was* the star of Bethlehem) which should be visible early next year. This program, written for the Sharp MZ-700 in Hu-Basic but easily converted to other machines with no-digit precision, can be used to calculate the position of this or other comets, or planets and asteroids.

BBC users can type in a couple of utilities, a disk sector editor or a Basic program compactor. There is a topical graphics and sound demo for the Commodore 64, and an untopical cricket game for the Atari to remind you of summer.

Games

Scientific/mathematic

Business

Toolkit/utilities

Educational/Computer Aided Learning

Program of the Month
Electron CS-Bureau
by Patrick Coleman

This program provides a desk-top environment in which software can be written. The features include windows, icons, a pointer and a pull-down menu. The commands available and their syntax are as follows:

PROCscreen — no parameters

This draws up the standard screen for CS-Bureau, under which most tasks should be run. It shades the screen, and

creates a title bar and work windows.

PROCtitle (<width>,<title>)

<width> should be a number giving the width of the current window. <title> should be a string giving the title to be placed at the top of the current window.

PROCinput (<X>,<Y>,<length>,<characters>)

<X> should be a number representing the x coordinate of input. <Y> should be a number representing the y coordinate of input. <length> should be a number giving the maximum length of input. <characters> should be a string of the characters that can be input.

This should be used in place of the Basic input command as it allows better error-trapping capabilities. The input is stored in ret$ on return from the routine. For example, PROCinput (10,10,5,0123456789) will input a string of up to five characters in length, consisting only of numbers.

PROCdb1 (<X>,<Y>,<string>)

<X> should be a number giving the x print coordinate. <Y> should be a number giving the y print coordinate. <string> should be the string to be printed.

This prints a string of double-height characters at (x,y).

PROCtime (<A>,<B>,<C>,<D>)

<A>,<B>,<C> and <D> should be numbers giving standard screen coordinates as in the *User Guide*.

This procedure prints the time at the right-hand side of the title bar of a window, and should only be used with the standard CS-Bureau screen. The <A>,<B>,<C> and <D> parameters give the coordinates of the text window to return to after the time is printed.

PROCwindow (<A>,<B>,<C>,<D>)

<A>,<B>,<C> and <D> are screen coordinates as before. This procedure produces a window at the specified coordinates.

PROCtime_set — no parameters

This should be called when in the standard CS-Bureau format. It asks the user to enter the hours, minutes and seconds of the current time, and sets TIME accordingly.

PROCmove (<size>,<source>,<dest>)

<size> should be a number representing the number of bytes to be moved. <source> should be a number giving the address of the first byte to be moved. <dest> should be a number giving the address to which data is to be moved.

This procedure is a machine code routine to move chunks of memory around; it is written for the production of pull-down menus. The portion of the screen to be covered by the menu should be saved, the menu printed, and when an option has been chosen, the piece of moved memory should be moved back. This obviously has many more uses. Care should be taken that the program in memory is not over-written.

FNschr (<X>,<Y>)

<X> should be a number representing the x coordinate of the cursor. <Y> should be a number representing the y coordinate of the cursor.

This function reads the ASCII code of the character at the given cursor position. For example, character%=FNschr(5,5).

PROCmouse (<X>,<Y>,<A>,<B>,<C>,<D>)

<X> should be a number representing the start coordinate. <Y> should be a number representing the finish coordinate. <A> should be the least value the cursor can be moved to horizontally. <B> should be the greatest value the cursor can be moved to vertically. <C> should be the greatest value the cursor can be moved to horizontally. <D> should be the least value the cursor can be moved to vertically.

This procedure produces a pointer cursor on the screen which is controlled by the cursor keys and Return. The coordinates of the cursor after Return has been pressed are held in X% and Y%.

PROCinit — no parameters

This creates all the user-defined graphics used by CS-Bureau, assembles the machine code, and sets the time to six o'clock. It must be called before any other routines are used.

PROCass — no parameters

This assembles two machine code routines: one to shade the screen; and the other to set up the move routine. The shading routine can be called by CALL shade.

CS-Bureau is approximately 4k in length and must be used in mode four. This leaves about 14.5k for a Basic program.

```
30000REM ****************************
30005REM **      COLES SOFTWARE      **
30010REM **                          **
30015REM **       CS-BUREAU V5       **
30020REM **                          **
30025REM ** A  desktop  enviroment **
30030REM ** for the Acorn Electron **
30035REM ** and BBC B micro.        **
30040REM **                          **
30045REM **      COPYRIGHT 1985      **
30050REM ****************************
30055
30060DEFPROCscreen
30065*FX19
30070X%=0:Y%=0:VDU23,1,0;0;0;0;19,7,0;0;:CALLshade:PROCwindow(1,2,38,2):VDU31,1,
0,224:PROCwindow(1,28,38,5):VDU19,7,7;0;
30075ENDPROC
30080
30085DEFPROCtitle(width%,title$)
30090LOCALw%,len%
30095w%=width%:len%=LENtitle$:IFwidth%MOD2=1 width%=width%+1:IFlen%=width%OR1en%
```


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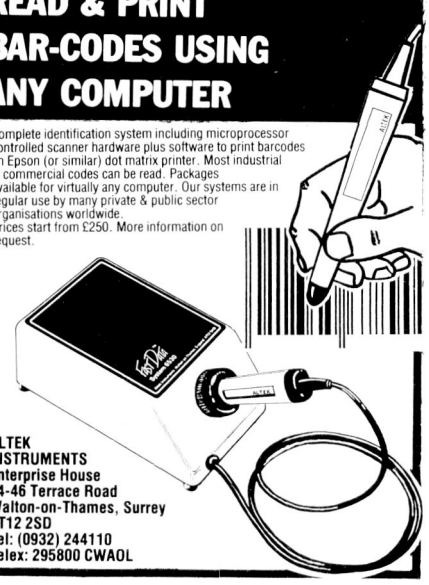

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PROGRAM FILE

```
=width%-1 PROCt3 ELSEIFlen%<width%-8 PROCt1 ELSEIFlen%>=width%-8 PROCt2
30100PRINTTAB(0,1)title$TAB(0,2)STRING$(w%,"_")
30105ENDPROC
30110
30115DEFPROCt1
30120title$=CHR$225+CHR$226+CHR$227+STRING$((width%-6-len%)DIV2,CHR$228)+title$+
STRING$((width%-len%)DIV2+len%MOD2,CHR$228)
30125ENDPROC
30130
30135DEFPROCt2
30140title$=STRING$((width%-len%)DIV2,CHR$228)+title$+STRING$((width%-len%)DIV2+
len%MOD2,CHR$228)
30145ENDPROC
30150
30155DEFPROCt3
30160ENDPROC
30165
30170DEFPROCinput(x%,y%,len%,ch$)
30175LOCALcount%,key$
30180ret$="":count%=0
30185REPEAT
30190REPEAT
30195key$=GET$
30200UNTILkey$=CHR$13ORkey$=CHR$127ORINSTR(ch$,key$)
30205IFINSTR(ch$,key$)ANDcount%<len% PROCchr ELSEIFkey$=CHR$127ANDcount%>0 PROCd
el
30210PRINTTAB(x%,y%)ret$;
30215UNTILkey$=CHR$13
30220ENDPROC
30225
30230DEFPROCchr
30235ret$=ret$+key$:count%=count%+1
30240ENDPROC
30245
30250DEFPROCdel
30255VDU31,x%-1+LENret$,y%,32:ret$=LEFT$(ret$,LENret$-1):count%=count%-1
30260ENDPROC
30265
30270DEFPROCdbl(x%,y%,a$)
30275LOCALa%,c%
30280FORa%=1TOLENa$:c%=49152+(ASC(MID$(a$,a%,1))-32)*8
30285VDU23,229,?c%,?c%,?(c%+1),?(c%+1),?(c%+2),?(c%+2),?(c%+3),?(c%+3),23,230,?(
c%+4),?(c%+4),?(c%+5),?(c%+5),?(c%+6),?(c%+6),?(c%+7),?(c%+7),31,x%,y%,229,31,x%
,y%+1,230:x%=x%+1:NEXT
30290ENDPROC
30295
30300DEFPROCtime(a%,b%,c%,d%)
30305LOCALh$,m$,h%,m%
30310h$="":m$="":VDU28,1,2,38,2:h%=(TIME DIV360000)MOD12:m%=(TIME DIV6000)MOD60
30315IFh%=0 h$="12" ELSEIFh%<=9 h$=" "+STR$h% ELSEh$=STR$h%
30320IFm%=0 m$="00" ELSEIFm%<=9 m$="0"+STR$m% ELSEm$=STR$m%
30325PRINTTAB(26,0);"TIME: ";h$+":"+m$;:VDU28,a%,b%,c%,d%
30330ENDPROC
30335
30340DEFPROCwindow(a%,b%,c%,d%)
30345VDU18,0,128,24,a%*32-4;1023-(b%+1)*32;(c%+1)*32;1023-d%*32+4;16,24,a%*32+8;
1023-(b%+1)*32-8;(c%+1)*32+8;1023-d%*32-8;16,17,135,17,0,24,a%*32;1023-(b%+1)*32
;(c%+1)*32;1023-d%*32;28,a%,b%,c%,d%,12
30350ENDPROC
30355
30360DEFPROCtime_set
30365LOCALh%,m%,s%
30370CLS:PROCtitle(38," TIME SET "):PRINTTAB(1,6)"Enter hours   (1-12):   [  ]":
REPEAT:PRINTTAB(26,6)"  ":PROCinput(26,6,2,"0123456789"):UNTILVALret$>0ANDVALret
$<=12:h%=VALret$
30375PRINTTAB(1,9)"Enter minutes (0-59):   [  ]":REPEAT:PRINTTAB(26,9)"  ":PROCi
nput(26,9,2,"0123456789"):UNTILVALret$<=59:m%=VALret$
30380PRINTTAB(1,12)"Enter seconds (0-59):   [  ]":REPEAT:PRINTTAB(26,12)"  ":PRO
Cinput(26,12,2,"0123456789"):UNTILVALret$<=59:s%=VALret$
30385TIME=100*s%+6000*m%+360000*h%:PROCtime(1,28,38,5):CLS
30390ENDPROC
30395
30400DEFPROCmove(size,source,dest)
30405X%=0:Y%=0:!SIZE=size:!SOURCE=source:!DEST=dest:CALLmove
30410ENDPROC
30415
30420DEFFNschr(x%,y%)
30425VDU31,x%,y%:A%=135
30430=(USR(&FFF4)AND&FFFF)DIV&100
30435
30440DEFPROCmouse(x%,y%,a%,b%,c%,d%)
30445X%=0:Y%=0:GCOL0,0:VDU5:*FX11,1
30450*FX12,1
30455REPEAT
30460PROCmove(8,FNsta(x%,y%),22000):PROCmove(8,FNsta(x%,y%+1),22008):*FX15,0
30465PROCprint:REPEATUNTILADVAL(-1)<>0
30470PROCmove(8,22000,FNsta(x%,y%)):PROCmove(8,22008,FNsta(x%,y%+1))
30475IFINKEY-122 IFx%<c% x%=x%+1 ELSEIFINKEY-26 IFx%>a% x%=x%-1
30480IFINKEY-42 IFy%<b% y%=y%+1 ELSEIFINKEY-58 IFy%>d% y%=y%-1
30485UNTILINKEY-74
30490VDU4:*FX12,0
30495X%=x%:Y%=y%:*FX15,0
30500ENDPROC
30505
30510DEFPROCprint
30515MOVEFNpos(x%),1023-FNpos(y%):VDU231:MOVEFNpos(x%),1023-FNpos(y%+1):VDU232
30520ENDPROC
30525
30530DEFFNpos(p%)=p%*8*4
30535DEFFNsta(x%,y%)=22528+y%*320+x%*8
30540
30545DEFPROCinit
30550PROCass:VDU23,224,24,60,60,126,0,126,60,0,23,225,252,0,252,0,252,0,252,0,23
,226,255,129,129,129,129,129,129,255,0,23,227,63,0,63,0,63,0,23,228,255,0,255,0
,255,0,255,0,23,231,0,128,192,224,240,248,252,254
30555VDU23,232,255,252,248,216,140,12,6,6:TIME=100*0+6000*0+360000*6
30560ENDPROC
30565
30570DEFPROCass
30575DIMspace% 35:FORpass%=0TO2STEP2:P%=space%:[OPTpass%:.shade:LDA#22528MOD256:
STA&70:LDA#22528DIV256:STA&71:LDX#10241DIV256:LDY#0:.loop:LDA#170:STA(&70),Y:EOR
#255:INY:STA(&70),Y:INY:BNEloop:INC&71:DEX:BNEloop:RTS:]NEXT
30580SIZE=&70:SOURCE=&72:DEST=&74:DIMmove 40:FORi%=0TO2STEP2:P%=move:[OPTi%LDY#0
:LDXSIZE+1:BEQli:.l:LDA(SOURCE),Y:STA(DEST),Y:INY:BNEl:INCSOURCE+1:INCDEST+1:DEX
:BNEl:.li:LDXSIZE:BEQdo:.l1:LDA(SOURCE),Y:STA(DEST),Y:INY:DEX:BNEl1:.do:RTS
30585]NEXT
30590ENDPROC
```

BBC Sector

by Alex Kiernan

This program is a utility for a disk-based BBC system, and is designed to allow any sector to be viewed, modified or changed. The disk can be searched for any numeric or alphanumeric string. An accidentally deleted file may be recovered, and program load and execution addresses may be changed.

The program should be typed in as listed and saved before running, as the program selects a mode three screen and modifies the video registers to turn it into a mode zero screen with only 25 lines. This can make a mess of the program in memory if the screen is scrolled or cleared.

Entering a ? will list all the available commands. To use the program to recover a deleted program, locate the start and finish of the program using the normal commands, then set the current sector to the start of the program and press R. You will be asked for a filename for the program, as well as load and execution addresses. The end of the program is the final piece of information requested, and should be given as track, sector. If the program is in Basic, the end-of-program marker can be searched for using the sequenceMI!!?.

```
  10*FX4,1
  20*FX219,9
  30DRIVE=0
  40@%=&909
  50DIM BLOCK 20,length 0,string 80
  60MC=&880
  70data=&900
  80PROCSETUP
  90SECTOR=0
 100DRIVE=0
 110FDCTRACK=0
 120MODE3:VDU23;4,38;0;0;0;23;7,31;0;0;0;23;9,7;0;0;0;23;10,103;0;0;0;23;11,8;0
;0;0;
 130?&355=0:?&356=0:?&360=1:?&361=7:VDU26
 140VDU19,0,3;0;19,1,0;0;
 150MOVE16,240
 160DRAW1264,240
 170DRAW1264,1008
 180DRAW16,1008
 190DRAW16,240
 200PRINTTAB(20,1);"D I S C   S E C T O R   E D I T O R"
 210MOVE16,944
 220DRAW1264,944
 230PRINTTAB(4,3);"Command:"
 240MOVE16,880
 250DRAW1264,880
 260PRINTTAB(3,5);"TRACK:00  SECTOR:00  ABSOLUTE:000  DRIVE:0"
 270MOVE16,816
 280DRAW1264,816
 290MOVE194,816
 300DRAW194,880
 310MOVE366,816
 320DRAW366,880
 330MOVE592,816
 340DRAW592,880
 350MOVE736,816
 360DRAW736,880
 370VDU28,2,23,78,7,12
 380DX=0
 390FORP%=0TO15
 400PRINTTAB(P%*3+5,0);RIGHT$("0"+STR$~P%,2)
 410PRINTTAB(0,P%+1);STR$~P%+"0 :";
 420NEXT
 430ONERRORVDU28,47,5,78,5:REPORT:GOTO480
 440PROCREAD(FDCTRACK,SECTOR,DRIVE)
 450VDU26:PRINTTAB(9,5);FNB(FDCTRACK);TAB(20,5);FNB(SECTOR);TAB(33,5);RIGHT$("0
00"+STR$~(FDCTRACK*10+SECTOR),3);TAB(44,5);DRIVE
 460VDU23,1,1;0;0;0;
 470PROCOSCLI("DRIVE "+STR$DRIVE)
 480*FX21,0
 490PROCCOMMAND
 500A$=GET$
 510IFA$="T"THENINPUT"Track="B$:FDCTRACK=EVALB$
 520IFA$="S"THENINPUT"Sector="B$:SECTOR=EVALB$
 530IFA$="D"THENINPUT"Drive="B$:DRIVE=EVALB$
 540IFA$="F"THENINPUTLINE"Find:"B$
 550IFA$="F"ANDB$<>""THEN$string=B$:Y%=0:X%=0:C%=1:?&F2=string MOD256:?&F3=stri
ng DIV256:CALL&FFC2:REPEATR%=USR&FFC5:Y%=(R%AND&FF0000)DIV&10000:string?X%=R%AND
&FF:X%=X%+1:UNTILR%AND&1000000:?length=X%-1:SECTOR=SECTOR-1
 560IFA$="F"AND?length<>0 THENSECTOR=SECTOR+1:PROCFIND
 570IFA$="R"THENPROCRECOVER
 580IFA$="*"THENINPUTLINE"*"B$:VDU28,2,23,77,7,12:PROCOSCLI(B$):DX=1:GOTO490
 590IFA$="A"THENINPUT"Absolute sector="B$:FDCTRACK=INT(EVALB$/10):SECTOR=EVALB$
MOD10
 600IFA$="\"THENSECTOR=SECTOR+1:FDCTRACK=FDCTRACK-(SECTOR=10):SECTOR=SECTOR MOD
10
 610IFA$="L"ORA$="E"THENPROCCHANGE
 620IFA$="?"THENPROCHELP:DX=1
 630IFASC(A$)>=136ANDASC(A$)<=139ANDDX=0PROCCURSOR
 640IFDX=1GOTO370 ELSEGOTO440
 650END
 660DEFPROCSETUP
 670A%=&7F
 680X%=BLOCK MOD256
 690Y%=BLOCK DIV256
 700BLOCK!1=data
 710BLOCK?5=0
 720PROCASS
 730ENDPROC
 740DEFPROCBYTE(PARAM)
 750BLOCK?(BLOCK?5+6)=PARAM
 760BLOCK?5=BLOCK?5+1
 770ENDPROC
 780DEFPROCSEND(DRIVE)
 790A%=&7F
 800X%=BLOCK MOD256
 810Y%=BLOCK DIV256
```

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PROGRAM FILE

```
820BLOCK?0=DRIVE
830BLOCK?5=BLOCK?5-1
840CALL&FFF1
850E%=BLOCK?(7+BLOCK?5)
860PROCERROR(E%)
870BLOCK?5=0
880ENDPROC
890DEFPROCDATA
900VDU28,7,30,76,8
910ENDPROC
920DEFPROCCOMMAND
930VDU28,12,3,78,3,12
940ENDPROC
950DEFPROCERROR(T%)
960IFT%VDU7
970T%=T%/2
980VDU28,47,5,78,5
990RESTORE(3440+T%*10):READB$
1000PRINT'B$;
1010ENDPROC
1020DEFFNB(T%)
1030=RIGHT$("0"+STR$T%,2)
1040DEFPROCINPUT
1050LOCALV%
1060IFU%=2VDUR%:PRINTTAB((Q%DIV2)*3,P%);~R%:data?(P%*16+Q%DIV2)=R%:Q%=(Q%+2)AND
31:ENDPROC
1070V%=INSTR("0123456789ABCDEF",CHR$R%)
1080IFV%=0ENDPROC
1090VDUR%:data?(P%*16+Q%DIV2)=(data?(P%*16+Q%DIV2)AND(&F*(Q%MOD2*&F+1))OR(V%-1)
*((1-Q%MOD2)*&F+1))
1100V%=data?(P%*16+Q%DIV2) AND127
1110IFV%<32V%=46
1120PRINTTAB(Q%DIV2+50,P%);CHR$V%:Q%=(Q%+1)AND31
1130ENDPROC
1140DEFPROCWRITE(TRACK,SECTOR,DRIVE)
1150PROCBYTE(&B OR&40)
1160PROCBYTE(TRACK)
1170PROCBYTE(SECTOR)
1180PROCBYTE(&21)
1190PROCSEND(DRIVE)
1200ENDPROC
1210DEFPROCREAD(TRACK,SECTOR,DRIVE)
1220PROCBYTE(&13 OR&40)
1230PROCBYTE(TRACK)
1240PROCBYTE(SECTOR)
1250PROCBYTE(&21)
1260PROCSEND(DRIVE)
1270PROCDATA
1280CALLOUTPUT
1290ENDPROC
1300DEFPROCCURSOR
1310PROCDATA
1320T%=3:S%=0:U%=1
1330P%=0
1340Q%=0
1350REPEAT
1360PRINTTAB((Q% DIV2)*T%+S%-(Q%MOD2)*(U%=1),P%);
1370R%=GET
1380IFR%=13PROCCOMMAND:PRINT"Rewrite sector (Y/N)";:P%=GET:IFP%=ASC"Y"THENPROCW
RITE(FDCTRACK,SECTOR,DRIVE)
1390IFR%=13ENDPROC
1400IFR%=127R%=136
1410Q%=(Q%+U%*((R%=136)-(R%=137)))AND31
1420P%=(P%-(R%=138)+(R%=139))AND15
1430IFR%=9T%=4-T%:S%=50-S%:U%=3-U%:Q%=Q%-Q%MOD2
1440IFR%>=32ANDR%<=126PROCINPUT
1450UNTILFALSE
1460ENDPROC
1470DEFPROCASS
1480FORQ%=0TO2STEP2
1490P%=MC
1500[OPTQ%
1510LDX#0
1520.AGAIN
1530LDY#0
1540.LOOP
1550LDA string,Y
1560CMP data,X
1570BEQ MATCH
1580LDY#0
1590.NXTBYT
1600INX
1610BNE LOOP
1620.EXIT
1630CLC
1640RTS
1650.MATCH
1660INY
1670CPY length
1680BNE NXTBYT
1690SEC
1700RTS
1710.PRT
1720PHA
1730LSR A
1740LSR A
1750LSR A
1760LSR A
1770JSR OUT
1780PLA
1790AND#&F
1800JMP OUT
1810.OUT
1820CMP#10
1830BPL AF
1840CLC
1850ADC#&30
1860JMP&FFEE
1870.AF
1880CLC
1890ADC#55
1900JMP&FFEE
1910.OUTPUT
1920LDX#0
1930.RESET
1940LDY#16
1950.AGAIN:LDA data,X
1960JSR PRT
1970LDA#32
1980JSR&FFEE
1990INX
2000DEY
2010BNE AGAIN
```

PROGRAM FILE

```
2020TXA
2030AND#&F0
2040PHA
2050LDX#2
2060LDA#32
2070.SPACE
2080JSR&FFEE
2090DEX
2100BNE SPACE
2110PLA
2120CLC
2130SBC#15
2140TAX
2150LDY#16
2160.ASKII
2170LDA data,X
2180AND#&7F
2190CMP#&7F:BEQ NOK
2200CMP#&20
2210BCS OK
2220.NOK
2230LDA#ASC(".")
2240.OK
2250JSR&FFEE
2260INX
2270DEY
2280BNE ASKII
2290INX
2300JSR&FFE7
2310DEX
2320BNE RESET
2330RTS
23401
2350NEXT
2360ENDPROC
2370DEFPROCFIND
2380VDU23,1,0;0;0;0;0;
2390VDU26:PRINTTAB(9,5);FNB(FDCTRACK);TAB(20,5);FNB(SECTOR);TAB(33,5);RIGHT$("0
00"+STR$~(FDCTRACK*10+SECTOR),3);
2400PROCBYTE(&53)
2410PROCBYTE(FDCTRACK)
2420PROCBYTE(SECTOR)
2430PROCBYTE(&21)
2440PROCSEND(DRIVE)
2450P%=USR(MC)AND&1000000
2460IFP%ENDPROC
2470SECTOR=SECTOR+1
2480IFSECTOR=10THENSECTOR=0:FDCTRACK=FDCTRACK+1
2490GOTO2390
2500ENDPROC
2510DEFPROCRECOVER
2520PROCGETFILE
2530INPUT"Load address for this file:"B$:L%=EVALB$
2540INPUT"Execution address for this file:"B$:R%=EVALB$
2550INPUT"End address for this file (Track,Sector) :"T%,S%
2560LGTH=((T%-FDCTRACK)*10+S%-SECTOR+1)*&100
2570IFLGTH<=0 THENPROCERR("Out of range"):ENDPROC
2580STRT=FDCTRACK*10+SECTOR
2590PROCBYTE(&13 OR&40)
2600PROCBYTE(0)
2610PROCBYTE(0)
2620PROCBYTE(&22)
2630PROCSEND(DRIVE)
2640IFE%THENPROCERR("Fatal disc error"):ENDPROC
2650S%=?&A05
2660IFS%=&F8 THENPROCERR("Catalogue full"):ENDPROC
2670REPEAT
2680S%=S%-8
2690UNTIL(256*(S%?&A06 AND3)+S%?&A07)>STRT OR S%=0
2700S%=S%+8
2710?&A05=?&A05+8
2720FORE%=?&A05-4 TO S% STEP-4
2730E%!&908=E%!&900
2740E%!&A08=E%!&A00
2750NEXT
2760$(&900+S%)=LEFT$(MID$(F$,3)+"          ",7):S%?&907=ASC(F$)
2770S%!&A00=L% AND&FFFF
2780S%!&A02=R% AND&FFFF
2790S%!&A04=LGTH AND&FFFF
2800S%?&A07=STRT AND&FF
2810S%?&A06=(R%AND&30000)DIV&10000*&40+(LGTH AND&30000)DIV&10000*&10+(L% AND&30
000)DIV&10000*4+(STRT AND&300)DIV&100
2820PROCBYTE(&B OR&40)
2830PROCBYTE(0)
2840PROCBYTE(0)
2850PROCBYTE(&22)
2860PROCSEND(DRIVE)
2870IFE%THENPROCERR("Fatal disc error")
2880ENDPROC
2890DEFPROCCHANGE
2900PROCGETFILE
2910$&A80=F$
2920*FX21,0
2930!&A00=&A80
2940A%=5
2950X%=0
2960Y%=10
2970IF(USR&FFDD AND&FF)<>1  THEN PROCERR("File not found"):ENDPROC
2980IFA$="L"THENPROCLOAD
2990IFA$="E"THENPROCEXEC
3000A%=1
3010CALL&FFDD
3020ENDPROC
3030DEFPROCLOAD
3040PRINT"Current load address is ";~!&A02;" - Change to ";
3050INPUT""B$
3060!&A02=EVALB$
3070ENDPROC
3080DEFPROCEXEC
3090PRINT"Current execution address is ";~!&A06;" - Change to ";
3100INPUT""B$
3110!&A06=EVALB$
3120ENDPROC
3130DEFPROCGETFILE
3140PROCCOMMAND
3150REPEATINPUT"Filename:"F$
3160UNTILLEN(F$)<=(7-2*(MID$(F$,2,1)="."))
3170?&A00=0
3180!&A01=&A80
3190!&A05=4
3200!&A09=0
3210X%=0
3220Y%=10
3230A%=6
```


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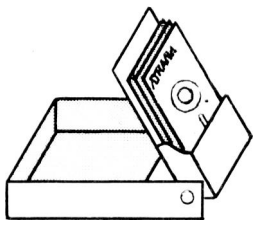

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PROGRAM FILE

```
3240CALL&FFD1
3250IFMID$(F$,2,1)<>"."THENF$=CHR$?&AB3+"."+F$
3260ENDPROC
3270DEFPROCDBL(B%,M%)
3280data'M%=(data'M% AND&FFFF0000)OR(B%AND&FFFF)
3290ENDPROC
3300DEFPROCERR(A$)
3310PROCCOMMAND
3320CLS
3330PRINTA$;" - Press any key";
3340REPEATUNTILGET
3350ENDPROC
3360DEFPROCOSCLI(A$)
3370$&A00=A$
3380X%=0
3390Y%=10
3400CALL&FFF7
3410X%=BLOCK MOD256
3420Y%=BLOCK DIV256
3430ENDPROC
3440DATAO.K.
3450DATAIllegal completion
3460DATAIllegal completion
3470DATAIllegal completion
3480DATAClock error
3490DATAIllegal completion
3500DATAID CRC error
3510DATADATA CRC error
3520DATADrive Not Ready
3530DATAWrite Protected
3540DATATrack 00 not found
3550DATAIllegal completion
3560DATASector not found
3570DATAIllegal completion
3580DATAIllegal completion
3590DATAIllegal completion
3600DEFPROCHELP
3610PROCASSEM
3620VDU28,2,23,78,7,12,23,224,255,0,0,0,0,0,0,0,23,1,0;0;0;0;
3630PROCCENDBL("DISC SECTOR EDITOR")
3640PRINT'TAB(17);STRING$(38,CHR$224)
3650VDU28,2,23,78,10
3660PROCP("  Commands: -")
3670PROCP("           T - Set track")
3680PROCP("           S - Set sector")
3690PROCP("           A - Set absolute sector")
3700PROCP("           \ - Fetch next sector")
3710PROCP("           D - Set drive")
3720PROCSPACE
3730PROCP("  Commands: -")
3740PROCP("           F - Search disc for string")
3750PROCP("           R - Recover a deleted file")
3760PROCP("           L - Change load address")
3770PROCP("           E - Change execution address")
3780PROCP("           * - Use OS command")
3790PROCSPACE
3800PROCP("           Use the cursor keys to move about the sector dump and ""TA
B"" to change between the hex and ASCII dump.Data may then be entered directly a
nd when alterations are complete press ""RETURN"".")
3810PROCSPACE
3820ENDPROC
3830DEFPROCSPACE
3840PROCCENDBL("Press SPACE bar to continue")
3850C%=0
3860REPEAT
3870COLOURC%
3880COLOUR129-C%
3890C%=C%EOR1
3900PRINTTAB(21,VPOS-1);
3910PROCQUAD("SPACE")
3920UNTILINKEY(50)=32
3930COLOUR128:COLOUR1
3940CLS
3950ENDPROC
3960DEFPROCP(A$)
3970REPEAT
3980B%=INSTR(A$," ")
3990B$=LEFT$(A$,B%)
4000A$=MID$(A$,B%+1)
4010PROCOUT
4020UNTILB%=0
4030VDU8,8
4040B$=A$
4050PROCOUT
4060PRINT'
4070ENDPROC
4080DEFPROCOUT
4090IF(POS+2*LENB$)>77 THENPRINT'
4100PROCWORD(B$)
4110ENDPROC
4120DEFPROCSPACE
4130PRINT'
4140PROCCENDBL("Press SPACE bar to continue")
4150REPEATUNTILGET=32
4160ENDPROC
4170DEFPROCWORD(A$)
4180LOCALA%,B%
4190FORB%=1TO LENB$
4200A%=ASC(MID$(A$,B%,1))
4210CALLDOUBLE
4220NEXT
4230ENDPROC
4240DEFPROCCENDBL(A$)
4250PRINTSTRING$(36-LEN(A$),CHR$(9));
4260PROCQUAD(A$)
4270ENDPROC
4280DEFPROCQUAD(A$)
4290LOCALA%,C%
4300FORC%=1TOLEN(A$)
4310A%=ASC(MID$(A$,C%,1))
4320CALL&900
4330NEXT
4340PRINT
4350ENDPROC
4360DEFPROCASSEM
4370FORn%=0TO1
4380P%=&900
4390LOPTn%*2
4400STA&6F
4410LDA#&A
4420LDX#&6F
4430LDY#&0
4440JSR&FFF1
```

```
4470.LOOP
4480LDA&70,X
4490STA&70,Y
4500DEY
4510STA&70,Y
4520DEY
4530DEX
4540BPL LOOP
4550.DBL
4560LDX#0
4570.LOOP3
4580LDY#4
4590.LOOP1
4600ASL&70,X
4610PHP
4620ROL&CE0,X
4630PLP
4640ROL&CE0,X
4650DEY
4660BNE LOOP1
4670LDY#4
4680.LOOP4
4690ASL&70,X
4700PHP
4710ROL&CF0,X
4720PLP
4730ROL&CF0,X
4740DEY
4750BNE LOOP4
4760INX
4770CPX#16
4780BNE LOOP3
4790.01
4800LDA#252
4810JSR&FFEE
4820LDA#254
4830JSR&FFEE
4840LDA#8
4850JSR&FFEE
4860LDA#8
4870JSR&FFEE
4880LDA#10
4890JSR&FFEE
4900LDA#253
4910JSR&FFEE
4920LDA#255
4930JSR&FFEE
4940LDA#11
4950JSR&FFEE
4960RTS
4970.DOUBLE
4980STA&6F
4990LDA#&A
5000LDX#&6F
5010LDY#0
5020JSR&FFF1
5030LDX#7
5040LDA#0
5050.ZERO
5060STA&80,X
5070DEX
5080BPL ZERO
5090JMP DBL
5100J
5110NEXT
5120ENDPROC
```

Amstrad AMSDRAW

by Conrad Chin

This is a multi-featured drawing program for the CPC464, but will work on the CPC664 if the cassette commands are changed for disks. The cursor is displayed as a cross on the screen. Also shown is a flashing dot known as the fixed point (FP); this point is used as a centre for some of the drawing routines. To move it to the cursor position, press ENTER. At the bottom of the screen is a status line which shows the following information:

X — the X coordinate of the cursor.
Y — the Y coordinate of the cursor.
S — the cursor speed (1,2 or 3).
G — gives the graphics print mode (normal, X-or, or, and).
P — current pen number (0-15).
R — gives information on the reference points (up to four). A square in place of any of the numbers indicates that the reference point is in use.

Controls

Cursor keys — move the cursor.
ENTER — moves the FP to the cursor.
S — changes cursor speed.
G — changes graphics print mode.
R & (1,2,3 or 4) — sets a reference point to the cursor position.
DEL & (1,2,3 or 4) — sets a reference point.
1,2,3 & 4 — moves the cursor to the corresponding reference point.
CTRL S — saves screen to tape.
CTRL L — loads in previously-saved screen.
CTRL CLR — clears the screen.
A — abort: used to escape from various routines (for example, the airbrush).
P — replaces the status line with the colour palette. The left/right cursor keys can then be used to select the desired PEN. To change the ink, press C and use the up/down cursor keys to select the ink, followed by ENTER. Pressing R will reset the inks to their initial state. Press ENTER when finished with the palette.
SHIFT — displays the command line. To select a function, position the cursor under the appropriate symbol and press ENTER while still holding down SHIFT.

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PROGRAM FILE

Functions available on command line

Line — draws a line from the FP to the cursor. The FP is also moved to the cursor so that other lines can be drawn from the end of the last one.

Circle — draws a circle with the centre at the FP and the cursor on the circumference. There is an option to draw the circle filled. Press A to abort without drawing anything.

Ellipse — draws an ellipse centred on the FP, such that the cursor lies at the end of the major axis. You must enter the ratio of major-to-minor axis times 100, so that entering 100 will draw a circle. To draw the ellipse filled in, precede the ratio with the letter J. If you only want to draw a section of the ellipse (an arc), enter the ratio as a negative number. You then enter the start and finish angles in degrees; these are measured in an anticlockwise direction from the line joining the FP to the cursor. Entering a ratio of 0 will return without drawing anything.

Arc — this draws an arc from the FP to the cursor over an angle which you enter. A negative angle will draw the arc in the other direction. Entering an angle of 0 will return without drawing anything.

F — fills an enclosed area which contains the cursor. Press A to stop at any time.

T — allows you to put text on the screen until you press ENTER.

R — switches on rubber band mode. A line is dragged around the screen between the cursor and the FP. Pressing ENTER sets the line, while A erases it and returns to normal.

A — calls the airbrush routine. The cursor is now displayed as a square covering the spray area. Use SHIFT and cursor left/right to change the area. ENTER starts/stops spraying. F fills the area with the current pen colour. A returns to normal.

```
10 REM 'Paint'  by Conrad Chin 15/6/85
20 ON ERROR GOTO 4290
30 ON BREAK GOSUB 3570:DEFINT a-z
40 DIM s!(72),c!(72),xr(4),yr(4),r$(4),pal(15),as1(100),as2(100)
50 CALL &BC02:PEN 1:PAPER 0
60 GOSUB 410
70 GOSUB 810
80 GOSUB 2190
90 SPEED KEY 20,8:GOSUB 3970:ok=-1
100 WHILE ok
110 GOSUB 2240
120 IF com THEN GOSUB 2340:k$="":GOTO 320
130 x1=x:y1=y
140 GOSUB 1320
150 ch=((x1-x)OR(y1-y))
160 IF ch AND rb THEN GOSUB 2580:GOSUB 2540
170 IF ch THEN x2=x:y2=y:x=x1:y=y1:GOSUB 2190:x=x2:y=y2:GOSUB 2190:GOSUB 1370:k$
="":
180 IF k$=c$ THEN GOSUB 960
190 IF k$="g" THEN GOSUB 750
200 IF k$="r" THEN GOSUB 2010:k$=""
210 IF k$=CHR$(127) THEN GOSUB 2090:k$=""
220 IF rb THEN GOSUB 350:GOTO 320
230 GOSUB 2240
240 IF k$="p" THEN GOSUB 1130
250 IF k$>"0"AND k$<"5" THEN GOSUB 2190:GOSUB 1970:GOSUB 2190
260 GOSUB 1410
270 IF k$=CHR$(13) THEN SOUND 129,150,10,4:GOSUB 2290
280 IF k$=CHR$(12) THEN GOSUB 3610
290 IF k$=CHR$(19) THEN GOSUB 3800
300 IF k$=CHR$(16) THEN ok=0
310 com=NOT(INKEY(21))AND NOT(rb)
320 WEND
330 CLG 0:col=15:x=320:y=200:fx=x:fy=y
340 GOSUB 1370:GOSUB 810:GOTO 80
350 IF k$="a" THEN GOSUB 2660
360 IF k$=CHR$(13) THEN GOSUB 2690
370 IF k$>"0" AND k$<"5" THEN GOSUB 2190:GOSUB 2580:GOSUB 1970:GOSUB 2540:GOSUB
2190
380 IF k$="p" THEN c1=col:GOSUB 1130:GOSUB 2700
390 RETURN
400 REM       *** INITIALISE ***
410 MODE 0:CLG 0:ref$="1234":r$(1)="1":r$(2)="2":r$(3)="3":r$(4)="4"
420 GOSUB 660
430 POKE 46312,0:DEG:BORDER 0
440 KEY DEF 50,0:KEY DEF 38,0:KEY DEF 9,0:KEY DEF 68,0,221:KEY DEF 16,0,32,32,16
450 RESTORE 460:FOR i=49 TO 52:READ a,b:KEY DEF a,0,i:KEY DEF b,0:NEXT
460 DATA 13,64,14,65,5,57,20,56
470 DEF FNa(f)=INT(RND*2*f)-f:DEF FNacs(f!)=-ATN(f!/SQR(-f!*f!+1))+90
480 ORIGIN 0,16,0,640,400,16
490 u$=CHR$(240):d$=CHR$(241):l$=CHR$(242):r$=CHR$(243):c$="s"
500 x=320:y=200:col=15:wa=15:sz=50:r=1:z=7:fx=x:fy=y
510 RESTORE 520:FOR i=0 TO 7:READ a,b:WINDOW #i,a,b,25,25:NEXT
520 DATA 1,20,2,4,6,8,10,10,14,15,12,12,17,20,19,20
530 FOR i=0 TO 7:PEN #i,15:NEXT
540 i$=CHR$(15)+CHR$(4)+"X   Y   S G P  R    "
550 SYMBOL 241,7,56,64,128,64,56,7,0:SYMBOL 242,224,28,2,1,2,28,224,0
560 SYMBOL 243,24,36,66,66,129,129,129,0:SYMBOL 244,24,36,66,66,66,36,24,0
570 SYMBOL 245,0,0,3,12,48,192,0,0:SYMBOL 246,0,126,66,66,66,66,126,0:SYMBOL 247
,255,129,129,129,129,129,129,255
580 com$=CHR$(15)+CHR$(15)+"  R A T E "+CHR$(243)+" "+CHR$(244)+" "+CHR$(245)+"
"+CHR$(241)+CHR$(242)+"  "
590 spe$="2":gra$="N"
600 col$="15":sp=6:ab=0:rb=0:com=0:mo=0
610 GOSUB 700
620 ul$=CHR$(15)+CHR$(4)+"_":el$=CHR$(15)+CHR$(0)+"_"
630 FOR i=0 TO 15:pal$=pal$+CHR$(14)+CHR$(i)+CHR$(247):NEXT:pal$=CHR$(15)+CHR$(1
5)+pal$+CHR$(14)+CHR$(0)
640 RETURN
650 REM       *** SET UP PALETTE ***
660 RESTORE 670:FOR i=0 TO 15:READ c:INK i,c:pal(i)=c:NEXT
670 DATA 0,1,2,4,6,8,9,10,12,13,14,16,18,20,24,26
680 RETURN
690 REM   *** SET UP TABLES FOR sin , cos and arccos ***
700 DEG:FOR i=0 TO 72:s!(i)=SIN(i*5):c!(i)=COS(i*5):NEXT
710 FOR i=0 TO 99:as1(i)=FNacs(i/100):NEXT
720 FOR i=0 TO 99:as2(i)=FNacs(-i/100):NEXT
730 as1(100)=0:as2(100)=180:RETURN
740 REM *** CHANGE GRAPH. PRNT. MODE ***
750 SOUND 129,150,10,4:mo=mo+1:IF mo=4 THEN mo=0
760 gra$=MID$("NXAO",mo+1,1)
```

PROGRAM FILE

```
770 PRINT#5,gra$;
780 GOSUB 3970
790 RETURN
800 REM    *** PRINT INFO LINE ***
810 PRINT i$;
820 PRINT#1,RIGHT$(" "+STR$(x),3);
830 PRINT#2,RIGHT$(" "+STR$(y),3);
840 PRINT#3,spe$;
850 PRINT#4,col$;
860 PRINT#5,gra$;
870 PRINT#6,ref$;
880 RETURN
890 REM   *** DRAW PALETTE ***
900 PRINT
910 PRINT pal$;
920 PRINT#7,MID$(STR$(col),2)
930 LOCATE 18,1:PEN 4:PRINT"P";
940 RETURN
950 REM     *** CHANGE SPEED ***
960 SOUND 129,150,10,4:r=r+1:IF r>2 THEN r=0
970 spe$=MID$("123",r+1,1):PRINT#3,spe$;
980 sp=r*4+2
990 RETURN
1000 REM *** CHANGE INK OF SELECTED PEN ***
1010 SOUND 129,150,10,4:c=pal(col):LOCATE 18,1:PEN#6,4:PRINT#6,CHR$(13)+" I";
1020 PEN 0:LOCATE x1,1:PRINT CHR$(247);
1030 k$="":WHILE k$<>CHR$(13)
1040 PRINT#7,RIGHT$("0"+MID$(STR$(c),2),2);
1050 k$=INKEY$
1060 c=c+(k$=d$)-(k$=u$):IF c>26 THEN c=0
1070 IF c<0 THEN c=26
1080 INK col,c
1090 WEND:k$="":pal(col)=c
1100 LOCATE 18,1:PRINT#6,CHR$(13)+" P";:PEN#6,15:PRINT#7,RIGHT$("0"+MID$(STR$(co
l),2),2);
1110 RETURN
1120 REM      *** SELECT NEW PEN ***
1130 x1=col+1:x2=x1:k$=" ":SPEED KEY 30,5:GOSUB 900:pe=15:inv=15
1140 PRINT CHR$(22)+CHR$(1);
1150 PRINT#7,RIGHT$("0"+MID$(STR$(col),2),2);
1160 WHILE k$<>CHR$(13)
1170 inv=inv XOR 15:pe=pe XOR inv:LOCATE x1,1:PEN pe:PRINT CHR$(247);
1180 k$=INKEY$:x2=x1+(k$=1$)-(k$=r$):IF x2=0 THEN x2=16
1190 IF x2=17 THEN x2=1
1200 IF k$="c" THEN GOSUB 1010
1210 IF k$="r" THEN PRINT CHR$(7);:GOSUB 660
1220 col=x1-1
1230 IF x2<>x1 THEN PEN 15:LOCATE x1,1:PRINT CHR$(247);:PRINT#7,RIGHT$("0"+MID$(
STR$(x2-1),2),2);
1240 x1=x2:WEND
1250 col=x1-1:PRINT CHR$(22)+CHR$(0)
1260 SPEED KEY 20,8
1270 col$=RIGHT$("0"+MID$(STR$(col),2),2)
1280 IF ab=0 THEN PRINT CHR$(23)+CHR$(1);:PLOT fx,fy,wa:PLOT fx,fy,col
1290 GOSUB 3970
1300 wa=col:k$="":GOSUB 810:PRINT CHR$(23)+CHR$(mo);:RETURN
1310 REM *** UPDATE X and Y COORDS ***
1320 k$=INKEY$
1330 x=x+((k$=r$)*sp*2*(x<(640-2*sp)))-((k$=l$)*sp*2*(x>2*sp-4))
1340 y=y+((k$=u$)*sp*(y<(384-sp)))-((k$=d$)*sp*(y>sp-2))
1350 RETURN
1360 REM *** PRINT X and Y COORDS ***
1370 PRINT#1,RIGHT$(" "+STR$(x),3);
1380 PRINT#2,RIGHT$(" "+STR$(y),3);
1390 RETURN
1400 REM       *** AIRBRUSH ROUTINE ***
1410 IF NOT(ab) THEN RETURN ELSE GOSUB 2190:WHILE ab
1420 GOSUB 1520
1430 k$="":WHILE k$<>CHR$(13) AND ab
1440 FOR i=1 TO 5
1450 PLOT x+FNa(sz),y+FNa(sz),col:NEXT
1460 SOUND 129,0,30,3,0,0,1
1470 GOSUB 1320:GOSUB 1370
1480 WEND
1490 SOUND 129,0,0,0:GOSUB 1370
1500 WEND:SPEED KEY 20,8:GOSUB 2190
1510 GOSUB 3970:RETURN
1520 k$="":SPEED KEY 10,2
1530 GOSUB 1680:WHILE k$<>CHR$(13) AND ab
1540 x1=x:y1=y
1550 GOSUB 1320
1560 sz1=sz:sz=sz+((k$=CHR$(&F7))*2*(sz<150))-((k$=CHR$(&F6))*2*(sz>0))
1570 IF x1<>x OR y1<>y OR sz1<>sz THEN x2=x:y2=y:x=x1:y=y1:sz2=sz:sz=sz1:GOSUB 1
680:x=x2:y=y2:sz=sz2:GOSUB 1680:GOSUB 1370
1580 IF k$="p" THEN GOSUB 1130
1590 IF k$="g" THEN GOSUB 750
1600 IF k$="a" THEN ab=0
1610 IF k$>"0" AND k$<"5" THEN GOSUB 1680:GOSUB 1970:GOSUB 1680
1620 IF k$=c$ THEN GOSUB 960
1630 IF k$=CHR$(127) THEN GOSUB 2090:k$=""
1640 IF k$="f" THEN GOSUB 1730
1650 IF k$="r" THEN GOSUB 2010:k$=""
1660 WEND:GOSUB 1680
1670 SPEED KEY 1,1:RETURN
1680 PRINT CHR$(23)+CHR$(1);
1690 MOVE x-sz,y-sz:DRAWR 0,2*sz,15:DRAWR 2*sz,0:DRAWR 0,-2*sz:DRAWR -2*sz,0
1700 PRINT CHR$(23)+CHR$(mo);
1710 RETURN
1720 REM *** FILL IN SQUARE CURSOR ***
1730 GOSUB 1680:SOUND 129,150,10,4:FOR i=(y-sz) TO (y+sz) STEP 2
1740 MOVE (x-sz),i:DRAWR 2*sz,0,col
1750 NEXT:GOSUB 1680
1760 GOSUB 3970
1770 RETURN
1780 REM     *** DRAW FILLED ELLIPSE ***
1790 IF o2=0 THEN aa=0-180*(o1<0):GOTO 1840
1800 IF o1=0 THEN aa=90-180*(o2<0):GOTO 1840
1810 aa=ATN(o2/o1)
1820 IF aa<0 THEN aa=aa+180-180*(o2<0):GOTO 1840
1830 IF aa>0 THEN aa=aa-180*(o1<0)
1840 k=SQR(o1*o1+o2*o2)
1850 y1=0:bb=90+aa
1860 WHILE (y1/k)<1:bb=as1(100*y1/k)+aa
1870 x1=n1*COS(bb)-n2*SIN(bb)+fx:bb=-as1(100*y1/k)+aa:x2=fx+n1*COS(bb)-n2*SIN(bb
)
1880 MOVE x1,y1+fy:DRAW x2,y1+fy,col
1890 y1=y1+2:WEND
1900 y1=-2:bb=90+aa
1910 WHILE (y1/k)>-1:bb=as2(-100*y1/k)+aa
1920 x1=n1*COS(bb)-n2*SIN(bb)+fx:bb=-as2(-100*y1/k)+aa:x2=n1*COS(bb)-n2*SIN(bb)+
fx
1930 MOVE x1,y1+fy:DRAW x2,y1+fy,col
1940 y1=y1-2:WEND
```


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PROGRAM FILE

```
1950 RETURN
1960 REM *** CALL UP REFERENCE POINT ***
1970 k=ASC(k$)-48:IF r$(k)<>CHR$(246) THEN RETURN
1980 x=xr(k):y=yr(k)
1990 GOSUB 3970:RETURN
2000 REM *** SET UP REFERENCE POINT ***
2010 SOUND 129,150,10,4:WHILE (k$<"1" OR k$>"4") AND k$<>"a":k$=LOWER$(INKEY$):W
END
2020 IF k$="a" THEN 2070
2030 k=ASC(k$)-48:IF r$(k)=CHR$(246) THEN RETURN
2040 SOUND 129,150,10,4:xr(k)=x:yr(k)=y:r$(k)=CHR$(246)
2050 ref$=r$(1)+r$(2)+r$(3)+r$(4)
2060 PRINT#6,ref$;
2070 GOSUB 3970:RETURN
2080 REM *** DELETE REFERENCE POINT ***
2090 rr=0:FOR i=1 TO 4:IF r$(i)=CHR$(246) THEN rr=-1
2100 NEXT:IF NOT(rr) THEN 2170
2110 PRINT CHR$(7);:WHILE (k$<"1" OR k$>"4") AND k$<>"a":k$=LOWER$(INKEY$):WEND
2120 IF k$="a" THEN 2170
2130 k=ASC(k$)-48:IF r$(k)<>CHR$(246) THEN RETURN
2140 PRINT CHR$(7);:r$(k)=MID$(STR$(k),2)
2150 ref$=r$(1)+r$(2)+r$(3)+r$(4)
2160 PRINT#6,ref$;
2170 GOSUB 3970:RETURN
2180 REM *** PLOT CURSOR AND F.P. ***
2190 PRINT CHR$(23)+CHR$(1);
2200 MOVE x-8,y:DRAWR 16,0,15:MOVER -8,-8:DRAWR 0,16
2210 PLOT fx,fy,col
2220 PRINT CHR$(23)+CHR$(mo);
2230 RETURN
2240 PRINT CHR$(23)+CHR$(1);
2250 PLOT fx,fy,col
2260 PRINT CHR$(23)+CHR$(mo);
2270 RETURN
2280 REM  *** SET POSITION OF F.P. ***
2290 GOSUB 2190:PRINT CHR$(23)+CHR$(1);
2300 fx=x:fy=y
2310 GOSUB 2190
2320 RETURN
2330 REM *** SELECT COMMAND ***
2340 LOCATE 1,1:sh=-1:z=15:PRINT com$;
2350 PRINT CHR$(22)+CHR$(1);:SPEED KEY 20,10
2360 GOSUB 2240
2370 WHILE sh AND k$<>CHR$(13)
2380 LOCATE z,1:PRINT el$;
2390 k$=INKEY$
2400 z=z+2*(k$=CHR$(&F6)AND z>3)-2*(k$=CHR$(&F7)AND z<17)
2410 LOCATE z,1:PRINT ul$;
2420 sh=NOT(INKEY(21))
2430 WEND
2440 PRINT CHR$(22)+CHR$(0);
2450 GOSUB 2470:com=0:GOSUB 3970
2460 SPEED KEY 10,1:RETURN
2470 IF k$<>CHR$(13) THEN GOSUB 810:RETURN
2480 i=(z-1)/2:ON i GOSUB 2630,2510,3210,4000,3360,2770,2750,2890
2490 GOSUB 810:RETURN
2500 REM  *** SWITCH ON AIRBRUSH ***
2510 ab=-1
2520 RETURN
2530 REM *** ROUTINES FOR DRAWING RUBBER BAND ***
2540 PRINT CHR$(23)+CHR$(1);
2550 MOVE x,y:DRAW fx,fy,col:xa=x:ya=y
2560 PRINT CHR$(23)+CHR$(mo);
2570 RETURN
2580 PRINT CHR$(23)+CHR$(1);
2590 MOVE xa,ya:DRAW fx,fy,col
2600 PRINT CHR$(23)+CHR$(mo);
2610 RETURN
2620 REM *** SWITCH ON RUBBER BAND ***
2630 rb=-1:GOSUB 2190:GOSUB 2540:GOSUB 2190
2640 RETURN
2650 REM *** SWITCH OFF RUBBER BAND ***
2660 rb=0:GOSUB 2190:GOSUB 2580:GOSUB 2190
2670 GOSUB 3970:RETURN
2680 REM *** FIX RUBBER BAND ***
2690 rb=0:GOSUB 2190:GOSUB 2580:MOVE xa,ya:DRAW fx,fy,col:GOSUB 2190:RETURN
2700 GOSUB 2190:MOVE x,y:PRINT CHR$(23)+CHR$(1);
2710 DRAW fx,fy,c1:DRAW x,y,col
2720 GOSUB 2190
2730 RETURN
2740 REM *** LINE ROUTINE ***
2750 GOSUB 2190:MOVE fx,fy:DRAW x,y,col:GOSUB 2190:GOSUB 2290:RETURN
2760 REM *** CIRCLE ROUTINE ***
2770 PRINT"SOLID (Y/N)?";:WHILE k$<>"Y" AND k$<>"N" AND k$<>"A":k$=UPPER$(INKEY$)
:WEND
2780 IF k$="A" THEN RETURN
2790 solid=0:IF k$="Y" THEN solid=-1
2800 GOSUB 2190:dx=fx-x:dy=fy-y
2810 r1=SQR(dx*dx+dy*dy):MOVE fx+r1,fy:IF solid THEN 2840
2820 FOR i=1 TO 72:DRAW fx+r1*c'(i),fy+r1*s'(i),col:NEXT
2830 DRAW fx+r1,fy:GOTO 2870
2840 st=-r1:IF fy+st<0 THEN st=-fy
2850 fin=r1:IF fy+fin>383 THEN fin=383-fy
2860 FOR i=st TO fin STEP 2:x1=SQR(r1*r1-i*i):MOVE fx-x1,fy+i:DRAW fx+x1,fy+i,co
l:NEXT
2870 GOSUB 2190:RETURN
2880 REM *** ELLIPSE ROUTINE ***
2890 PRINT:PEN 15:INPUT:"Ratio";ec$:solid=0
2900 ec$=UPPER$(ec$):k=INSTR(ec$,"S"):IF k>0 THEN ec$=MID$(ec$,2):solid=-1:GOTO
2900
2910 f3=0:ec=VAL(ec$):IF ec<0 THEN ec=ABS(ec):IF NOT(solid) THEN f3=-1
2920 IF ec=0 THEN RETURN
2930 IF ec>999 OR ec<1 THEN RETURN
2940 IF f3 THEN GOSUB 3170 ELSE:sa=0:ea=72
2950 GOSUB 2190
2960 dx=x-fx:dy=y-fy:r1=SQR(dx*dx+dy*dy)
2970 IF dx=0 AND dy=0 THEN GOSUB 2190:RETURN
2980 r2=(ec/100)*r1
2990 IF dx=0 AND dy>0 THEN an=90:GOTO 3060
3000 IF dx=0 AND dy<0 THEN an=270:GOTO 3060
3010 IF dy=0 AND dx>0 THEN an=0:GOTO 3060
3020 IF dy=0 AND dx<0 THEN an=180:GOTO 3060
3030 an=ATN(dy/dx):IF dx<0 AND dy>0 THEN an=180+an:GOTO 3060
3040 IF dx<0 AND dy<0 THEN an=an+180:GOTO 3060
3050 IF dx>0 AND dy<0 THEN an=360+an
3060 n1=r1*COS(an):n2=r2*SIN(an)
3070 o1=r1*SIN(an):o2=r2*COS(an)
3080 IF solid THEN GOSUB 1790:GOTO 3150
3090 x0=n1*c'(sa)-n2*s'(sa)+fx:y0=o1*c'(sa)+o2*s'(sa)+fy
3100 MOVE x0,y0
3110 IF sa>ea THEN ea=ea+72
3120 FOR i=sa TO ea
```

PROGRAM FILE

```
3130 xn=n1*c!(i MOD 72)-n2*s!(i MOD 72)+fx:yn=o1*c!(i MOD 72)+o2*s!(i MOD 72)+fy
3140 DRAW xn,yn,col:NEXT
3150 GOSUB 2190
3160 RETURN
3170 PRINT:INPUT;"Start ";sa:IF sa>359 OR sa<0 THEN 3170
3180 PRINT:INPUT;"Finish ";ea:dif=(sa-ea):IF ea>359 OR ea<0 OR ABS(dif)<10 OR di
f>350 THEN 3180
3190 ea=ea/5:sa=sa/5:RETURN
3200 REM *** PRINT TEXT ROUTINE ***
3210 GOSUB 810:GOSUB 2190:TAG#7
3220 y1=y-16:x1=x:SPEED KEY 30,2:GOSUB 3330
3230 k$="":WHILE k$<>CHR$(13)
3240 k$=INKEY$:IF k$="" THEN 3290
3250 GOSUB 3330:PLOT 700,0,col
3260 k=ASC(k$):IF k>31 AND k<127 AND x1<609 THEN MOVE x1,y:PRINT#7,k$;:x1=x1+32
3270 IF k=127 AND x1>31 THEN x1=x1-32:MOVE x1,y:PRINT#7," ";
3280 GOSUB 3330
3290 WEND
3300 TAGOFF#7:GOSUB 3330:GOSUB 2190
3310 SPEED KEY 20,8:RETURN
3320 REM *** DRAW TEXT CURSOR ***
3330 PRINT CHR$(23)+CHR$(1);:MOVE x1,y1:DRAW x1+32,y1,15:PRINT CHR$(23)+CHR$(mo)
;
3340 RETURN
3350 REM *** DRAW ARC ROUTINE ***
3360 PRINT:PEN 15:INPUT;"Angle ";an
3370 IF an<0 THEN an=ABS(an):f3=-1 ELSE f3=1
3380 IF an<5 OR an>355 THEN RETURN
3390 an=an/2:dx=(x-fx)*f3:dy=(y-fy)*f3:IF dx=0 AND dy=0 THEN RETURN
3400 GOSUB 2190
3410 a2=(SQR(dx*dx+dy*dy))/2
3420 IF an=90 THEN a3=0 ELSE a3=a2/TAN(an)
3430 IF dx=0 THEN a1=90-180*(dy<0):GOTO 3480
3440 IF dy=0 THEN a1=-180*(dx<0):GOTO 3480
3450 a1=ATN(dy/dx)
3460 IF dy<0 THEN a1=a1+180-180*(dx>0)
3470 IF dy>0 THEN a1=a1-180*(dx<0)
3480 r1=SQR(a3*a3+a2*a2)
3490 sa=90+a1-an:ea=90+a1+an
3500 IF f3=1 THEN a=x:b=y:a0=fx:b0=fy ELSE a=fx:b=fy:a0=x:b0=y
3510 x0=a-a2*COS(a1)+a3*SIN(a1)
3520 y0=b-a2*SIN(a1)-a3*COS(a1)
3530 MOVE a,b
3540 FOR i=sa TO ea STEP 5:DRAW x0+r1*COS(i),y0+r1*SIN(i),col:NEXT:DRAW a0,b0,co
l
3550 GOSUB 2190
3560 RETURN
3570 MODE 1:CALL &BC02:PEN 1:PAPER 0:CLS
3580 WINDOW 1,40,1,25
3590 KEY DEF 16,1,16,16,16:KEY DEF 9,1:CLS:SPEED KEY 35,2:PRINT" ":END
3600 REM *** LOAD IN NEW PICTURE ***
3610 PRINT:PRINT"<L>-LOAD , <A>-ABORT";
3620 WHILE INKEY$<>"":WEND
3630 k$="":WHILE k$<>"L" AND k$<>"A":k$=UPPER$(INKEY$):WEND
3640 IF k$="A" THEN 3780
3650 PRINT:GOSUB 2190
3660 LOAD"!"
3670 OPENIN"!pal"
3680 FOR i=0 TO 15
3690 INPUT#9,pal(i)
3700 NEXT
3710 FOR i=1 TO 4
3720 INPUT#9,xr(i),yr(i),r$(i)
3730 NEXT
3740 CLOSEIN
3750 FOR i=0 TO 15:INK i,pal(i):NEXT
3760 ref$=r$(1)+r$(2)+r$(3)+r$(4)
3770 GOSUB 2190
3780 GOSUB 3970:GOSUB 810:RETURN
3790 REM *** SAVE CURRENT PICTURE ***
3800 PRINT:PRINT"<S>-SAVE , <A>-ABORT";
3810 WHILE INKEY$<>"":WEND
3820 k$="":WHILE k$<>"S" AND k$<>"A":k$=UPPER$(INKEY$):WEND
3830 IF k$="A" THEN 3960
3840 PRINT:SPEED WRITE 1:GOSUB 2190
3850 PRINT:PRINT"     ** SAVING **";
3860 SAVE"!screen",b,49152,16384
3870 OPENOUT "!pal"
3880 FOR i=0 TO 15
3890 PRINT#9,pal(i)
3900 NEXT
3910 FOR i=1 TO 4
3920 PRINT#9,xr(i),yr(i),r$(i)
3930 NEXT
3940 CLOSEOUT
3950 GOSUB 2190
3960 GOSUB 3970:GOSUB 810
3970 WHILE INKEY$<>"":WEND:k$=""
3980 RETURN
3990 REM *** INFILL ROUTINE ***
4000 DIM x1(15),x2(15),y(15),d(15)
4010 GOSUB 2190
4020 sx=x:sy=y
4030 bg=TEST(x,y):d=2
4040 WHILE TESTR(-4,0)=bg AND XPOS>=0:WEND:x1=XPOS
4050 MOVE x,y:WHILE TESTR(4,0)=bg AND XPOS<640:WEND:x2=XPOS
4060 s=1:x1(1)=x1:x2(1)=x2:y(1)=y-d:d(1)=-d
4070 MOVE x1,y:k$=INKEY$:IF k$="a" THEN s=0:GOTO 4150
4080 WHILE TESTR(4,0)<>bg AND XPOS<x2:WEND:x3=XPOS-4:IF x3=x1 THEN MOVE x1+4,y:W
HILE TESTR(-4,0)=bg AND XPOS>=0:WEND:x3=XPOS
4090 IF (x1-x3)>4 THEN GOSUB 4180
4100 x1=x3:IF (x2-x1)<5 THEN 4150
4110 x3=x1
4120 MOVE x3,y:WHILE TESTR(4,0)=bg AND XPOS<640:WEND:x3=XPOS:MOVE x1+4,y:DRAW x3
-4,y,col
4130 IF ABS(x3-x2)>4 THEN GOSUB 4230
4140 x2=x3:y=y+d:IF y<0 OR y>383 THEN 4150 ELSE 4070
4150 IF s=0 THEN ERASE x1,x2,y,d:x=sx:y=sy:GOSUB 2190:RETURN
4160 x1=x1(s):x2=x2(s):y=y(s):d=d(s):s=s-1:GOTO 4070
4170 RETURN
4180 y1=y-d:MOVE x1,y1
4190 WHILE TESTR(-4,0)<>bg AND XPOS>x3:WEND:x4=XPOS
4200 IF x4=x3 THEN RETURN
4210 IF s<15 THEN s=s+1:x1(s)=x3:x2(s)=x4+4:y(s)=y1:d(s)=-d
4220 RETURN
4230 IF SGN(x3-x2)=1 THEN x4=x2:x5=x3:y1=y-d ELSE x4=x3:x5=x2:y1=y
4240 MOVE x4-4,y1:WHILE TESTR(4,0)<>bg AND XPOS<x5:WEND:x4=XPOS
4250 IF x4=x5 THEN RETURN
4260 IF s<15 THEN s=s+1:x1(s)=x4-4:x2(s)=x5:y(s)=y1:d(s)=SGN(x2-x3)*d
4270 RETURN
4280 REM *** ERROR HANDLING ROUTINE ***
4290 IF ERR=7 THEN mem=FRE(""):PRINT CHR$(7);:RESUME
```


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PROGRAM FILE

```
4300 IF ERR=25 THEN PRINT"INCORRECT FILE"CHR$(7);:FOR i=1 TO 2000:NEXT:RESUME 37
70
4310 MODE 1:CALL &BC02:PEN 1:PAPER 0:CLS
4320 WINDOW 1,40,1,25
4330 KEY DEF 16,1,16,16,16:KEY DEF 9,1:CLS:SPEED KEY 30,2
4340 PRINT"ERROR NUMBER "ERR" IN LINE "ERL
4350 END
```

Commodore 64 White Christmas

by Andrew Clarke

This program is a simple, animated Christmas card, and is written entirely in Commodore 64 Basic using multi-coloured sprites and standard keyboard graphics. Type it in, save it, and run it when all the family are watching. Turn up the volume and enjoy!

```
0 REM**************************
1 REM***  WHITE CHRISTMAS  ****
2 REM***  PROGRAMMED BY    ****
3 REM***  ANDY CLARKE 1985 ****
4 REM**************************
5 GOSUB2000
6 READA:IFA=-1THENB=B+1:IFB=4THEN10
7 GOTO6
10 FORS=223TO241:FORT=0TO62
12 READA:POKES*64+T,A:NEXT:NEXT
50 RESTORE:FORC=54272TO54296:POKEC,0:NEXT
52 HF=54273:LF=54272:WA=54276
53 AT=54277:SU=54278:VO=54296
54 POKEAT,32:POKESU,255:POKEWA,65
56 POKELF+3,8:POKEAT+7,160:POKESU+7,243
57 POKELF+17,8:POKEAT+14,160:POKESU+14,243
58 POKEWA+7,33:POKEVO,15:GOTO5000
60 READA,B,C,D:IFA=-1THENFORC=54272TO54296:POKEC,0:NEXT:GOTO300
61 IFA=32ANDB=94THENPOKEHF+14,A:POKELF+14,B:POKEWA+14,65
62 POKEHF,A:POKELF,B:POKEWA+7,33
64 POKEHF+7,C:POKELF+7,D
66 FORT=1TO100:NEXT:POKEWA+7,32
68 POKEWA+14,64:RETURN
100 PRINT"■■■
```

PROGRAM FILE

```
1106 DATA68,149,11,114,68,149,22,227
1108 DATA68,149,11,114,0,0,22,227
1112 DATA34,75,0,0,38,126,0,0
1114 DATA43,52,0,0
1116 DATA43,52,17,37,0,0,34,75
1118 DATA43,52,12,216,0,0,34,75
1120 DATA57,172,9,159,32,94,38,126
1122 DATA32,94,12,216,32,94,25,177
1124 DATA34,75,17,37,34,75,34,75
1126 DATA34,75,12,216,34,75,34,75
1128 DATA0,0,34,75
1199 DATA-1,-1,-1,-1
2000 POKE53281,0:POKE53280,0
2002 PRINT"■■■■■■■";
2004 PRINT"■■■■■■■
```

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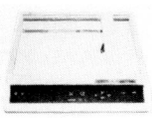

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PROGRAM FILE

```
30031 DATA0,0,0,0,0,0,42
30032 DATA130,168,10,170,160,2,170
30033 DATA128,0,85,0,2,170,128
30034 DATA2,170,128,10,170,160,10
30035 DATA170,160,63,170,168,46,174
30036 DATA212,45,94,216,45,159,212
30037 DATA45,90,228,42,175,212,10
30038 DATA170,160,10,170,160,2,170
30039 DATA128,2,170,128,0,170,0
30040 REM****SLEDGE
30041 DATA0,0,0,0,0,0,0
30042 DATA0,0,0,0,0,0,0
30043 DATA0,0,0,0,0,0,0
30044 DATA0,0,1,0,0,3,0
30045 DATA0,3,0,0,31,252,0
30046 DATA241,102,3,145,63,255,255
30047 DATA31,255,255,96,128,32,48
30048 DATA128,38,31,255,252,0,0
30049 DATA0,0,0,0,0,0,0
30050 REM****SANTA FRONT #1
30051 DATA0,40,0,0,170,0,2
30052 DATA170,128,1,85,148,1,253
30053 DATA20,1,49,0,1,205,12
30054 DATA1,85,8,0,84,40,10
30055 DATA86,160,42,154,128,162,170
30056 DATA0,130,170,0,194,170,0
30057 DATA2,170,0,1,85,0,130
30058 DATA170,0,138,10,0,170,10
30059 DATA0,168,10,128,0,10,160
30060 REM****SANTA FRONT #2
30061 DATA0,40,0,0,170,0,2
30062 DATA170,128,1,85,148,1,253
30063 DATA20,1,49,0,1,205,0
30064 DATA1,85,0,0,84,0,10
30065 DATA86,128,42,154,160,162,170
30066 DATA40,130,170,8,194,170,12
30067 DATA2,170,0,1,85,0,2
30068 DATA170,0,2,138,0,2,138
30069 DATA0,10,138,128,42,138,160
30070 REM****SANTA FRONT #3
30071 DATA0,40,0,0,170,0,2
30072 DATA170,128,1,85,148,1,253
30073 DATA20,1,49,0,193,205,0
30074 DATA129,85,0,160,84,0,42
30075 DATA86,128,10,154,160,2,170
30076 DATA40,2,170,8,2,170,12
30077 DATA2,170,0,1,85,0,2
30078 DATA170,8,2,138,136,2,130
30079 DATA168,10,128,168,42,128,0
30080 REM****SANTA SIDE L#1
30081 DATA0,10,0,0,42,0,0
30082 DATA170,128,0,90,128,0,246
30083 DATA144,0,54,80,0,245,0
30084 DATA0,85,172,0,90,128,0
30085 DATA106,0,58,170,0,0,170
30086 DATA0,0,170,0,0,170,0
30087 DATA0,170,0,0,85,0,0
30088 DATA42,0,0,42,0,0,10
30089 DATA0,0,10,0,0,170,0
30090 REM****SANTA SIDE L#2
30091 DATA0,10,0,0,42,0,0
30092 DATA170,128,0,90,128,0,246
30093 DATA144,0,54,80,0,245,0
30094 DATA0,85,0,0,90,0,0
30095 DATA106,0,0,170,0,0,170
30096 DATA0,0,170,0,0,174,0
30097 DATA0,170,0,0,85,0,0
30098 DATA42,0,0,42,0,0,10
30099 DATA0,0,10,0,0,170,0
30100 REM****SANTA SIDE L#3
30101 DATA0,10,0,0,42,0,0
30102 DATA170,128,0,90,128,0,246
30103 DATA144,0,54,80,0,245,0
30104 DATA58,85,0,2,90,0,0
30105 DATA106,0,0,170,128,0,170
30106 DATA172,0,170,0,0,170,0
30107 DATA0,170,0,0,85,0,0
30108 DATA42,0,0,42,0,0,10
30109 DATA0,0,10,0,0,170,0
30110 REM****SANTA BACK #1
30111 DATA0,40,0,0,170,0,10
30112 DATA170,0,90,170,0,81,85
30113 DATA0,1,85,0,1,85,12
30114 DATA1,85,8,0,168,40,10
30115 DATA170,160,42,170,128,162,170
30116 DATA0,130,170,0,194,170
30117 DATA0,2,170,0,1,85,0
30118 DATA130,170,0,138,10,0,170
30119 DATA10,0,168,10,128,0,10,160
30120 REM****SANTA BACK #2
30121 DATA0,40,0,0,170,0,10
30122 DATA170,0,90,170,0,81
30123 DATA85,0,1,85,0,1,85
30124 DATA0,1,85,0,0,168,0
30125 DATA10,170,128,42,170,160,162
30126 DATA170,40,130,170,8,194,170
30127 DATA12,2,170,0,1,85,0
30128 DATA2,170,0,2,138,0,2
30129 DATA138,0,10,138,128,42,138,160
30130 REM****SANTA BACK #3
30131 DATA0,40,0,0,170,0,10
30132 DATA170,0,90,170,0,81,85
30133 DATA0,1,85,0,193,85,0
30134 DATA129,85,0,160,168,0,42
30135 DATA170,128,10,170,160,2,170
30136 DATA40,2,170,8,2,170,12
30137 DATA2,170,0,1,85,0,2
30138 DATA170,8,2,138,136,2,130
30139 DATA168,10,128,168,42,128,0
30140 REM****SANTA SIDE R#1
30141 DATA0,160,0,0,168,0,2
30142 DATA170,0,2,165,0,6,159
30143 DATA0,5,156,0,0,95,0
30144 DATA0,85,172,0,165,128,0
30145 DATA169,0,2,170,0,58,170
30146 DATA0,0,170,0,0,170,0
30147 DATA0,170,0,0,85,0,0
30148 DATA168,0,0,168,0,0,160
30149 DATA0,0,160,0,0,170,0
30150 REM****SANTA SIDE R#2
30151 DATA0,160,0,0,168,0,2
30152 DATA170,0,2,165,0,6,159
```

```
30153 DATA0,5,156,0,0,95,0
30154 DATA0,85,0,0,165,0,0
30155 DATA169,0,0,170,0,0,170
30156 DATA0,0,170,0,0,186,0
30157 DATA0,170,0,0,85,0,0
30158 DATA168,0,0,168,0,0,160
30159 DATA0,0,160,0,0,170,0
30160 REM****SANTA SIDE R#3
30161 DATA0,160,0,0,168,0,2
30162 DATA170,0,2,165,0,6,159
30163 DATA0,5,156,0,0,95,0
30164 DATA58,85,0,2,165,0,0
30165 DATA169,0,0,170,172,0,170
30166 DATA0,0,170,0,0,170,0
30167 DATA0,170,0,0,85,0,0
30168 DATA168,0,0,168,0,0,160
30169 DATA0,0,160,0,0,170,0
30170 REM****MOON
30171 DATA0,0,0,0,0,0,0
30172 DATA255,0,3,255,192,7,255
30173 DATA224,15,255,240,31,126,248
30174 DATA62,60,124,63,126,252,63
30175 DATA255,252,63,231,252,62,255
30176 DATA124,31,126,248,15,189,240
30177 DATA7,195,224,3,255,192,0
30178 DATA255,0,0,0,0,0,0
30179 DATA0,0,0,0,0,0,0
30180 REM****REINDEER
30181 DATA65,0,0,99,0,0,62
30182 DATA0,0,8,0,0,8,0
30183 DATA0,60,0,0,254,0,0
30184 DATA127,0,0,15,128,0,7
30185 DATA192,0,7,224,0,7,255
30186 DATA252,7,255,252,3,255,248
30187 DATA3,255,240,3,255,224,3
30188 DATA128,240,3,0,96,3,0
30189 DATA96,3,0,96,3,0,96

READY.
```

BBC Despace

by Tony Morris

This machine code utility compacts Basic program files, thereby saving memory within the computer and space on disk. Despace works with the 1982 Basic version, so should work with later ones, too.

It removes the spaces from a program given at any page in memory. The listing as shown is held in memory at location &COO, but will fit into any free 256k block in memory if you change line 170. When the program has been run and the machine code stored away, it can be deleted and then used by typing CALL &COO. Despaced programs can be run or saved as usual.

To use it; load it in, run it, delete it, load in the program you want to despace, and type CALL &COO. Save the despaced program as usual. Remember to save the program initially when you have typed it in.

```
 10REM ****************************
 20REM ***   BASIC   PROGRAM    ***
 30REM ***   D E S P A C E R    ***
 40REM ***COPYRIGHT TONY MORRIS***
 50REM ***         28 JUNE      ***
 60REM ***         1 9 8 5      ***
 70REM ****************************
 80RMFLG=&76
 90QOTFLG=&77
100PROG=&78
110DUMP=&7A
120DUMPY=&7C
130TEMPY=&7D
140BRAKFG=&7E
150YSTORE=&7F
160FORI%=0TO3STEP3
170P%=&C00
180[OPTI%
190\SET UP POINTERS
200LDA &18\SET TO VALUE OF CURRENT PAGE
210STA PROG+1\WHEN REDUCING,DUMP &PROG CAN BE EQUAL
220STA DUMP+1
230LDA #1
240STA DUMP
250STA PROG
260\POINTERS NOW HAVE VALUE = PAGE+1
270LDA #0
280STA BRAKFG
290.NEWLIN LDA #0
300TAY\RESET FLAGS ON NEW LINE
310STA QOTFLG
320STA RMFLG
330LDA(PROG),Y
340JSR STORE1
350CMP #&FF\END OF PROGRAM IF TRUE
360BNE MORE
370.ENDROT LDA #138\PERFORM 'OLD' TO RESET TOP ETC
380LDX #0
390LDY #ASC"O"
400JSR &FFF4
410LDY #ASC"."
420JSR &FFF4
430LDY #13
440JSR &FFF4
450BRK\USE OS INTERUPT ROUTINE TO PRINT MESSAGE
460EQUB 45
470EQUS"Despaced"
480BRK
490.MORE INY
```


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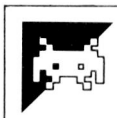
PROGRAM FILE

```
500STA &2B\PUT INTO IACC.
510LDA(PROG),Y
520JSR STORE1
530STA &2A\PRINT LINE NUMBER
540TYA
550PHA
560JSR &9923
570PLA
580TAY
590INY
600LDA(PROG),Y
610STA YSTORE\STORE OLD LINE LENGHTH
620LDA #3
630STA DUMPY
640.FIRSPC INY\REMOVE PRETEXT SPACES
650LDA(PROG),Y
660CMP #&20
670BEQ FIRSPC
680DEY
690.TEXT INY\GO THRU TEXT OF LINE
700LDA(PROG),Y
710CMP #&0D
720BNE DITT
730.STR JSR STORE
740BNE NEEW
750.DITT CMP #&22\IS IT "
760BNE DITTO
770PHA\IFIT IS" THEN FLIP FLAG
780EOR QOTFLG
790STA QOTFLG
800PLA
810.DITTO LDX QOTFLG
820CPX #0
830BNE STR2\INSIDE QUOTE SO TRANSFER
840CMP #ASC("\")\ARE WE INSIDE SOURCE CODE COMMENTS?
850BEQ SETRMF
860CMP #&DC\ARE WE INSIDE DATA
870BEQ SETRMF
880CMP #&F4\ARE WE INSIDE A REM STATEMENT
890BNE RMF
900.SETRMF STA RMFLG
910.RMF LDX RMFLG
920BNE STR2
930CMP #ASC("[")\ARE WE INSIDE SOURCE CODE LISTING
940BEQ FLOP
950CMP #ASC("]")\HAS THE SOURCE CODE ENDED YET
960BNE BRAKCK
970.FLOP PHA
980LDA #1
990EOR BRAKFG
1000STA BRAKFG
1010PLA
1020.BRAKCK LDX BRAKFG
1030CPX #0
1040BNE STR2
1050CMP #&20\IS THIS AN UNWANTED SPACE
1060BEQ TEXT
1070.STR2 JSR STORE\THIS CHARACTER IS WANTED SO SAVE IT
1080BNE TEXT
1090BRK
1100.STORE1 STY DUMPY\MAIN CHR STORAGE ROUTINE
1110.STORE STY TEMPY
1120LDY DUMPY
1130STA(DUMP),Y
1140INC DUMPY
1150LDY TEMPY
1160RTS
1170.NEEW LDY #2\SET POINTERS TO COPE WITH NEXT LINE
1180LDA YSTORE
1190CLC
1200ADC PROG
1210STA PROG
1220LDA #0
1230ADC PROG+1
1240STA PROG+1
1250LDA DUMPY
1260STA(DUMP),Y
1270CLC
1280ADC DUMP
1290STA DUMP
1300LDA #0
1310ADC DUMP+1
1320STA DUMP+1
1330JMP NEWLIN\GO TO NEXT LINE OF PROGRAM
13401
1350NEXT
```



Atari Cricket

by Ian Danbury

This game allows you to play a single innings match with any number of overs, or unlimited overs. It is intended to be played by two players. You are asked to enter two teams, which must include six bowlers, or use the default teams (England and Australia test sides). You select a bowler for the opening over by pressing his number.

The positioning of the field may be changed between any two overs by pressing ESC and moving the chosen fielder with the arrow keys. Press the space bar to move another fielder, or ESC to return to the game. Whenever a batsman hits the ball, the batting side must decide whether to run. At the end of each over, you must choose a new bowler (not the same bowler as in the previous over).

When one side is out, the statistics for the innings are displayed and the other side goes in. To play again at the end, press SYSTEM RESET.

PROGRAM FILE

```
CLR :GRAPHICS 0:POKE 752,1:POSITION 14,6:? "ATARI CRICKET"
20 POSITION 15,14:? "PLEASE WAIT"
30 FOR T=0 TO 10:READ A:POKE 1536+T,A:NEXT T:DATA 72,169,50,141,10,212,141,24,20
8,104,64
40 ST=PEEK(742)*256-1024:OLD=PEEK(756)*256
50 IF PEEK(ST+10)=24 THEN 90
60 FOR L=0 TO 1024:A=PEEK(OLD+L):POKE ST+L,A:NEXT L
70 RESTORE 2380
80 FOR L=39432 TO 39624:READ A:POKE L,A:NEXT L
90 GRAPHICS 0:POKE 710,0:POKE 709,12:POKE 82,0:POKE 752,1:POKE 756,INT(ST/256)
100 OPEN £1,4,0,"K:"
110 RESTORE 130:DIM FX(11),FY(11):FOR T=1 TO 11:READ A:READ B:FX(T)=A:FY(T)=B:NE
XT T
120 DIM SP$(40):SP$="                                        "
130 DATA 11,11,26,10,16,8,26,15,24,5,8,4,12,14,19,20,5,18,5,10,35,8
140 DIM N1$(20),N2$(20),T1$(165),T2$(165),B1$(90),B2$(90),TE$(12),TP$(12)
150 DIM F(11),U(3),A$(1),BW(4,6),BT(3,11),TAB1(11),TAB2(11),BP1(6),BP2(6)
160 FOR T=1 TO 4:FOR H=1 TO 6:BW(T,H)=0:NEXT H:NEXT T:FOR T=1 TO 2:FOR H=1 TO 11
:BT(T,H)=0:NEXT H:NEXT T
170 BW=1:RNS=0:CA=1:CB=2:S1=0:S2=0:OUT=0:BT(1,1)=1:BT(1,2)=1:INN=0:O1=0:O2=0:OT=
0:EX=0:ZZ=1:PP=0
180 GOSUB 1180:IF A=89 OR A=121 THEN 300
190 N1$="ENGLAND":N2$="AUSTRALIA"
200 T1$="G.GOOCH-T.ROBINSON-D.GOWER-M.GATTING-A.LAMB-I.BOTHAM-A.KNOTT-R.ELLISON-
J.EMBUREY-P.EDMONDS-P.ALLOTT"
210 TAB1(0)=7:TAB1(1)=18:TAB1(2)=26:TAB1(3)=36:TAB1(4)=43:TAB1(5)=52:TAB1(6)=60:
TAB1(7)=70:TAB1(8)=80
220 TAB1(9)=90:TAB1(10)=99
230 T2$="A.HILDITCH-K.WESSELS-A.BORDER-D.BOON-G.RITCHIE-W.PHILLIPS-S.ODONNEL-G.M
ATTHEWS-G.LAWSON-C.MCDERMOT"
235 T2$(LEN(T2$)+1)="-B.HOLLAND"
240 TAB2(0)=10:TAB2(1)=20:TAB2(2)=29:TAB2(3)=36:TAB2(4)=46:TAB2(5)=57:TAB2(6)=67
:TAB2(7)=78:TAB2(8)=87
250 TAB2(9)=98:TAB2(10)=108
260 B1$="ALLOTT-BOTHAM-ELLISON-EMBUREY-EDMONDS-GOOCH"
270 BP1(0)=6:BP1(1)=13:BP1(2)=21:BP1(3)=29:BP1(4)=37:BP1(5)=43:BP1(6)=60
280 B2$="LAWSON-MCDERMOTT-O'DONNEL-HOLLAND-MATTHEWS-BORDER"
290 BP2(0)=6:BP2(1)=16:BP2(2)=25:BP2(3)=33:BP2(4)=42:BP2(5)=49:BP2(6)=55:GOTO 44
0
300 IF ZZ>=LEN(T1$) THEN TAB1(PP)=ZZ:GOTO 330
310 IF T1$(ZZ,ZZ)<>"-" THEN ZZ=ZZ+1:GOTO 300
320 TAB1(PP)=ZZ-1:ZZ=ZZ+1:PP=PP+1:GOTO 300
330 ZZ=1:PP=0
340 IF ZZ>=LEN(T2$) THEN TAB2(PP)=ZZ:ZZ=1:PP=0:GOTO 370
350 IF T2$(ZZ,ZZ)<>"-" THEN ZZ=ZZ+1:GOTO 340
360 TAB2(PP)=ZZ-1:PP=PP+1:ZZ=ZZ+1:GOTO 340
370 IF ZZ>=LEN(B1$) THEN BP1(PP)=LEN(B1$):GOTO 400
380 IF B1$(ZZ,ZZ)<>"-" THEN ZZ=ZZ+1:GOTO 370
390 BP1(PP)=ZZ-1:ZZ=ZZ+1:PP=PP+1:GOTO 370
400 ZZ=1:PP=0
410 IF ZZ>=LEN(B2$) THEN BP2(PP)=LEN(B2$):GOTO 440
420 IF B2$(ZZ,ZZ)<>"-" THEN ZZ=ZZ+1:GOTO 410
430 BP2(PP)=ZZ-1:ZZ=ZZ+1:PP=PP+1:GOTO 410
440 ? CHR$(125):POSITION 13,0:? "GAMES OPTIONS"
450 ? :? :? " 1) UNLIMITED OVERS."
460 ? :? :? " 2) ONE DAY INTERNATIONAL 55 OVERS."
470 ? :? :? " 3) JOHN PLAYER LEAGUE 40 OVERS."
480 ? :? :? " 4) VILLAGE GAME 20 OVERS."
490 ? :? :? " 5) PICK YOUR OWN AMOUNT OF OVERS."
500 GET £1,A:A=A-48:IF A<1 OR A>5 THEN 440
510 IF A=1 THEN MO=500:TYPE=1:MAX=500
520 IF A=2 THEN MO=55:TYPE=2:MAX=350
530 IF A=3 THEN MO=40:TYPE=3:MAX=250
540 IF A=4 THEN MO=20:TYPE=4:MAX=200
550 IF A=5 THEN ? :? :? "HOW MANY OVERS min 2 >";:INPUT MO:TYPE=5:MAX=INT(RND(1)
*300)+200
560 IF TYPE=5 AND MO<2 THEN GOTO 440
570 ? CHR$(125):IN=INT(RND(1)*2)+1
580 IF IN=1 THEN ? N1$;" WON THE TOSS"
590 IF IN=2 THEN ? N2$;" WON THE TOSS"
600 ? "1.BAT OR 2.FIELD":GET £1,A:A=A-48
610 IF A<1 OR A>2 THEN 600
620 IF IN=1 AND A=1 THEN BAT=1
630 IF IN=1 AND A=2 THEN BAT=2
640 IF IN=2 AND A=1 THEN BAT=2
650 IF IN=2 AND A=2 THEN BAT=1
660 ? CHR$(125):STA=BAT
670 FOR OVER=0 TO MO-1
680 ? CHR$(125):POSITION 15,0
690 Z=1:BALL=0
700 IF BAT=2 THEN GOSUB 3290:GOSUB 3860
710 IF BAT=1 THEN GOSUB 3460:GOSUB 3630
720 Z=0:MAID=1
730 FOR BALL=1 TO 6
740 GO=0:GOSUB 1330
750 IF OUT=10 THEN 820
760 IF S1>S2 AND STA=2 THEN 920
770 IF S2>S1 AND STA=1 THEN 920
780 NEXT BALL
790 BW(1,BOW)=BW(1,BOW)+1:BW(4,BOW)=BW(4,BOW)+MAID
800 CC=CA:CA=CB:CB=CC
810 NEXT OVER
820 GOSUB 4100
830 IF BAT=1 THEN O1=OUT
840 IF BAT=2 THEN O2=OUT
850 IF INN=1 THEN GOTO 920
860 IF BAT=1 THEN BAT=2:GOTO 880
870 IF BAT=2 THEN BAT=1
880 FOR I=0 TO 11:FOR J=0 TO 3:BT(J,I)=0:NEXT J:NEXT I
890 FOR I=0 TO 6:FOR J=0 TO 4:BW(J,I)=0:NEXT J:NEXT I
900 INN=1:OUT=0:CA=1:CB=2:BT(1,CA)=1:BT(1,CB)=1:EX=0:BOW=0
910 GOTO 670
920 GOSUB 4090:GRAPHICS 1+16:? £6;"FINAL SCORE":? £6:? £6:O2=OUT
930 IF STA=2 THEN 1010
940 ? £6;N1$;" ";S1;
950 IF O1=10 THEN ? £6;" ALL OUT"
960 IF O1<>10 THEN ? £6;" FOR ";O1
970 ? £6:? £6:? £6:? £6;N2$;" ";S2;
980 IF O2=10 THEN ? £6;" ALL OUT"
990 IF O2<>10 THEN ? £6;" FOR ";O2
1000 GOTO 1070
1010 ? £6;N2$;" ";S2;
1020 IF O2=10 THEN ? £6;" ALL OUT"
1030 IF O2<>10 THEN ? £6;" FOR ";O2
1040 ? £6:? £6:? £6:? £6;N1$;" ";S1;
1050 IF O1=10 THEN ? £6;" ALL OUT"
1060 IF O1<>10 THEN ? £6;" FOR ";O1
1065 ? £6:? £6:? £6
1070 IF S1=S2 THEN ? £6;"THE MATCH WAS DRAWN":GOTO 1130
1080 ? £6:? £6;"THE WINNERS ARE....."
1090 IF S2>S1 AND STA=1 THEN ? £6;N2$;" BY ";10-O2:? £6;"       WICKETS.":GOTO 11
30
1100 IF S2>S1 AND STA=2 THEN ? £6;N2$;" BY ";S2-S1;" RUNS.":GOTO 1130
1110 IF S1>S2 AND STA=1 THEN ? £6;N1$;" BY ";S1-S2;" RUNS.":GOTO 1130
```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PROGRAM FILE

```
1120 IF S1>S2 AND STA=2 THEN ? £6;N1$;" BY ";10-01:? £6;"       WICKETS."
1130 X=USR(ADR(FSH$),100):RUN
1140 IF INN=0 THEN RETURN
1150 IF BAT=1 AND S1>S2 THEN 920
1160 IF BAT=2 AND S2>S1 THEN 920
1170 RETURN
1180 ? CHR$(125):? "  DO YOU WANT TO INPUT YOUR OWN TEAM ";:GET £1,A
1190 IF A<>89 AND A<>121 THEN RETURN
1200 ? CHR$(125):? "HOME TEAMS NAME >";:INPUT N1$
1210 FOR T=1 TO 11:? "PLAYER £";T;" (MAX 10 CHARS) >";:INPUT TP$
1220 T1$(LEN(T1$)+1)=TP$:T1$(LEN(T1$)+1)="-":NEXT T:T1$(LEN(T1$))=""
1230 ? "NOW TYPE IN THE NUMBERS OF THE BOWLERS":
1240 ? :FOR T=1 TO 6:? "BOWLER NUMER ";T;" >";:INPUT TP$
1250 B1$(LEN(B1$)+1)=TP$:B1$(LEN(B1$)+1)="-":NEXT T:B1$(LEN(B1$))=""
1260 ? CHR$(125):? "AWAY TEAMS NAME >";:INPUT N2$
1270 FOR T=1 TO 11:? "PLAYER £";T;" (MAX 10 CHARS) >";:INPUT TP$
1280 T2$(LEN(T2$)+1)=TP$:T2$(LEN(T2$)+1)="-":NEXT T:T2$(LEN(T2$))=""
1290 ? "NOW TYPE IN THE NAMES OF THE BOWLERS"
1300 ? :FOR T=1 TO 6:? "BOWLER NUMER ";T;" >";:INPUT TP$
1310 B2$(LEN(B2$)+1)=TP$:B2$(LEN(B2$)+1)="-":NEXT T:B2$(LEN(B2$))=""
1320 RETURN
1330 GOSUB 2910
1340 IF BAT=1 AND CA=1 THEN TE$=T1$(1,TAB1(0)):TP$=SP$(40-LEN(STR$(S1))):GOTO 13
80
1350 IF BAT=1 THEN TE$=T1$(TAB1(CA-2)+2,TAB1(CA-1)):TP$=SP$(40-LEN(STR$(S1))):GO
TO 1380
1360 IF BAT=2 AND CA=1 THEN TE$=T2$(1,TAB2(0)):TP$=SP$(40-LEN(STR$(S2))):GOTO 13
80
1370 IF BAT=2 THEN TE$=T2$(TAB2(CA-2)+2,TAB2(CA-1)):TP$=SP$(40-LEN(STR$(S2)))
1380 POSITION 1,22:? "OVERS BOWLED:";OVER;;TP$;"   FACING:";TE$
1390 IF BAT=1 AND BOW=1 THEN TE$=B2$(1,BP2(0)):TO=S1:GOTO 1430
1400 IF BAT=1 THEN TE$=B2$(BP2(BOW-2)+2,BP2(BOW-1)):TO=S1:GOTO 1430
1410 IF BAT=2 AND BOW=1 THEN TE$=B1$(1,BP1(0)):TO=S2:GOTO 1430
1420 IF BAT=2 THEN TE$=B1$(BP1(BOW-2)+2,BP1(BOW-1)):TO=S2
1430 POSITION 1,23:? "BALL £";BALL;"  TOTAL:";TO;SP$(40-LEN(STR$(OVER)));" BOWLE
R:";TE$:
1440 FOR T=31 TO 29 STEP -1:POSITION T,10:? CHR$(12);CHR$(32):PZ=5:GOSUB 3250:NE
XT T:POSITION 28,10:? CHR$(1);CHR$(32):PZ=10:GOSUB 3250
1450 POSITION 27,10:? CHR$(2);CHR$(32):PZ=5:GOSUB 3250:POSITION 26,10:? CHR$(4);
CHR$(32)
1460 FOR T=24 TO 20 STEP -1:POSITION T,10:? CHR$(16);CHR$(32):PZ=5:GOSUB 3250:NE
XT T
1470 POSITION 20,10:? "  ":FOR T=19 TO 18 STEP -1:POSITION T,11:?CHR$(16);CHR$(3
2):PZ=5:GOSUB 3250:NEXT T
1480 POSITION 16,11:? ".  "
1490 POSITION 15,11:? CHR$(16);CHR$(32)
1500 POSITION 14,11:? CHR$(11);CHR$(32)
1510 GJ=INT(RND(1)*300)+1:X=15:Y=11
1520 IF GJ<130 THEN POSITION 0,22:? SP$:SP$;:POSITION 4,23:? "BALL GOES THROUGH
TO THE KEEPER";:PZ=100:GOSUB 3250:RETURN
1530 IF GJ=86 OR GJ=99 THEN 2430
1540 IF GJ=52 OR GJ=77 THEN 2380
1550 IF GJ=73 THEN 2400
1560 IF GJ=48 OR GJ=64 THEN 2670
1570 IF GJ=74 OR GJ=102 THEN 2720
1580 BX=INT(RND(1)*40)+INT(RND(1)+6)-INT(RND(1)*6):SOUND 1,10,14,7:SOUND 1,0,0,0
1590 BY=INT(RND(1)*22)+INT(RND(1)*5)-INT(RND(1)*5)
1600 SD=INT(RND(1)*5)+2:0=BX-14:P=BY-11:X=14:Y=11:01=0/SD:P1=P/SD
1610 FOR T=1 TO SD
1620 IF T>SD THEN 1750
1630 X=X+01:Y=Y+P1:IF X<1 OR X>37 OR Y<1 OR Y>20 THEN 1700
1640 LOCATE X,Y,W
1650 IF W=15 OR W=4 THEN LO=0:GOTO 2330
1660 IF W=13 AND X=13 THEN 2380
1670 IF W=13 AND X<>13 THEN POSITION 26,11:? CHR$(13)
1680 IF W=10 THEN POSITION X,Y:? CHR$(10)
1690 GOTO 1720
1700 SF=INT(RND(1)*5)+1:IF SF=3 THEN 2620
1710 GOTO 2570
1720 IF INT(X)=13 AND INT(Y)=9 THEN 2380
1730 POSITION X,Y:? CHR$(16):PZ=10:GOSUB 3250:POSITION X,Y:? CHR$(W)
1740 NEXT T
1750 POSITION X,Y:? CHR$(16)
1760 AL=1000
1770 FOR T=1 TO 11
1780 TX=ABS(BX-FX(T)):TY=ABS(BY-FY(T)):F(T)=TX+TY
1790 IF F(T)<AL THEN F1=FX(T):F2=FY(T):AL=F(T):LO=T
1800 NEXT T
1810 POSITION F1,F2:? CHR$(143):FOR T=1 TO 3:U(T)=0:NEXT T
1820 POSITION 0,22:? SP$:SP$;
1830 POSITION 12,23:? "   RUN (Y/N)  ";
1840 GET £1,A
1850 IF A<>89 AND A<>121 AND A<>78 AND A<>110 THEN GOTO 1840
1860 POSITION 0,22:? SP$:SP$;
1870 POSITION 25,11:? " ":POSITION 14,12:? " "
1880 IF A<>89 AND A<>121 AND GO=0 THEN RETURN
1890 IF A<>89 AND A<>121 AND GO<>0 THEN RETURN
1900 U(1)=0:U(2)=0:AL=1000:B1=14:B2=11:B3=25:B4=12:L=0:SE=INT(RND(1)*9)+5:GO=GO+
1
1910 IF BX>19 THEN T1=26:T2=11
1920 IF BX<=19 THEN T1=13:T2=11
1930 IF U(3)=0 THEN GOTO 2040
1940 POSITION F1,F2:? CHR$(15)
1950 Q=T1-BX:01=Q/SE
1960 P=T2-BY:P1=P/SE
1970 POSITION BX,BY:? " "
1980 BX=BX+01:BY=BY+P1
1990 IF L>3 THEN BX=BX+01:BY=BY+P1
2000 POSITION BX,BY:? CHR$(16)
2010 IF ABS(BX-T1)+ABS(BY-T2)<0.8 THEN POSITION T1,T2:? CHR$(14):GOTO 2470
2020 L=L+1
2030 GOTO 2110
2040 IF SGN(BX-F1)=-1 THEN A$=CHR$(12)
2050 IF SGN(BX-F1)=1 THEN A$=CHR$(3)
2060 IF SGN(BX-F1)=0 THEN A$=CHR$(15)
2070 POSITION F1,F2:? " "
2080 F1=F1+(SGN(BX-F1)/2):F2=F2+(SGN(BY-F2)/2)
2090 POSITION F1,F2:? A$
2100 IF INT(F1)=INT(BX) AND INT(F2)=INT(BY) THEN U(3)=1
2110 IF U(1)=1 THEN GOTO 2140
2120 POSITION B1,B2:? " ":B1=B1+1:POSITION B1,B2:? CHR$(7)
2130 IF B1=25 THEN U(1)=1
2140 IF U(2)=1 THEN GOTO 2180
2150 POSITION B3,B4:? " ":B3=B3-1:POSITION B3,B4:? CHR$(8)
2160 IF B3=14 THEN U(2)=1
2170 GOTO 1930
2180 BT(2,CA)=BT(2,CA)+1:BW(3,BOW)=BW(3,BOW)+1:MAID=0:CC=CA:CA=CB:CB=CC
2190 IF BAT=1 THEN S1=S1+1:MAID=0
2200 IF BAT=2 THEN S2=S2+1:MAID=0
2210 GOSUB 1140
2220 GOTO 1830
2230 FOR T=1 TO 11:IF T<>LO THEN POSITION FX(T),FY(T)
2240 IF T<>LO THEN ? CHR$(6)
2250 NEXT T:POSITION 0,22:? SP$;:SP$;:POSITION 13,23:? "** HOWZAT **";:GOSUB 227
```

PROGRAM FILE

```
0
2260 FOR T=1 TO 150 STEP 10:SOUND 0,T,6,15-(T/10):SOUND 1,T,8,15-(T/10):NEXT T:S
OUND 0,0,0,0:SOUND 1,0,0,0:RETURN
2270 IO=INT(RND(1)*10)+1:RETURN
2280 IF OUT=10 THEN RETURN
2290 CA=OUT+2:BT(1,CA)=1:IF BAT=1 THEN GOTO 3630
2300 IF BAT=2 THEN GOTO 3860
2310 IO=INT(RND(0)*19)+1:POSITION 0,23:? SP$;:RETURN
2320 IF A=27 THEN GOTO 3020
2330 GOSUB 2230:GOSUB 2270:GOSUB 2310
2340 IF IO=3 THEN GOSUB 2310:POSITION 17,23:? "DROPPED";:PZ=100:GOTO 3250
2350 BT(1,CA)=2:BW(2,BOW)=BW(2,BOW)+1:OUT=OUT+1:BT(3,CA)=BOW-1
2360 POSITION 17,23:? "CAUGHT";:PZ=100:GOSUB 3250
2370 GOTO 2280
2380 POSITION X,Y:? " ":POSITION 13,11:? CHR$(14):GOSUB 2230:GOSUB 2310:BT(1,CA)
=3:BW(2,BOW)=BW(2,BOW)+1:OUT=OUT+1:BT(3,CA)=BOW-1
2390 POSITION 17,23:? "BOWLED";:PZ=100:GOSUB 3250:GOTO 2280
2400 POSITION 10,11:? CHR$(32);CHR$(5);CHR$(14);"  ";CHR$(11):GOSUB 2230:GOSUB 2
310
2410 IF IO<5 THEN POSITION 16,23:? "NOT OUT";:PZ=100:GOTO 3250
2420 BT(1,CA)=4:BT(3,CA)=BOW-1:BW(2,BOW)=BW(2,BOW)+1:OUT=OUT+1:POSITION 16,23:?
"STUMPED";:PZ=100:GOSUB 3250:GOTO 2280
2430 GOSUB 2230:GOSUB 2310
2440 IF IO<10 THEN POSITION 16,23:? "NOT OUT";:PZ=100:GOSUB 3250:RETURN
2450 BT(1,CA)=6:BW(2,BOW)=BW(2,BOW)+1:OUT=OUT+1:BT(3,CA)=BOW-1
2460 POSITION 18,23:? "L.B.W";:PZ=100:GOSUB 3250:GOTO 2280
2470 GOSUB 2230:GOSUB 2310:IF OUT=10 THEN 2520
2480 IF GO=1 OR GO=3 OR GO=5 AND T1=13 THEN OT=CB:CB=OUT+3:GOTO 2520
2490 IF GO=2 OR GO=4 AND T1=26 THEN OT=CB:CB=OUT+3:GOTO 2520
2500 IF GO=1 OR GO=3 OR GO=5 AND T1=26 THEN OT=CA:CA=OUT+3:GOTO 2520
2510 IF GO=2 OR GO=4 AND T1=13 THEN OT=CA:CA=OUT+3:GOTO 2520
2520 BT(1,OT)=5:OUT=OUT+1:POSITION 16,23:? "RUN OUT";:PZ=100:GOSUB 3250
2530 IF OUT=10 THEN RETURN
2540 BT(1,OUT+2)=1
2550 IF BAT=1 THEN GOTO 3630
2560 IF BAT=2 THEN GOTO 3860
2570 BT(2,CA)=BT(2,CA)+4:BW(3,BOW)=BW(3,BOW)+4:MAID=0
2580 IF BAT=1 THEN S1=S1+4:MAID=0
2590 IF BAT=2 THEN S2=S2+4:MAID=0
2600 GOSUB 2310:POSITION 1,22:? "************************************"
2610 POSITION 1,23:? "**************  FOUR  ***************";:PZ=100:GOSUB 3250
:RETURN
2620 BT(2,CA)=BT(2,CA)+6:BW(3,BOW)=BW(3,BOW)+6:MAID=0
2630 IF BAT=1 THEN S1=S1+6:MAID=0
2640 IF BAT=2 THEN S2=S2+6:MAID=0
2650 GOSUB 2310:POSITION 1,22:? "************************************"
2660 POSITION 1,23:? "**************  SIX  ***************";:PZ=100:GOSUB 3250
:RETURN
2670 GOSUB 2310:POSITION 0,22:? SP$;SP$;:POSITION 10,23:? "  W I D E  "
;:PZ=100:GOSUB 3250
2680 BALL=BALL-1:BW(3,BOW)=BW(3,BOW)+1:EX=EX+1
2690 IF BAT=1 THEN S1=S1+1
2700 IF BAT=2 THEN S2=S2+1
2710 RETURN
2720 GOSUB 2310:POSITION 0,22:? SP$;SP$;:POSITION 10,23:? "  N O  B A L L  "
;:PZ=100:GOSUB 3250
2730 BALL=BALL-1:BW(3,BOW)=BW(3,BOW)+1:EX=EX+1
2740 IF BAT=1 THEN S1=S1+1
2750 IF BAT=2 THEN S2=S2+1
2760 RETURN
2770 REM CHARACTER DATA
2780 DATA 0,24,152,125,58,56,72,132,8,52,52,28,28,28,36,66
2790 DATA 0,24,24,122,188,56,228,66,0,48,48,28,60,92,82,17
2800 DATA 1,26,28,120,184,56,72,72,129,153,90,60,60,60,36,36
2810 DATA 24,24,124,186,121,37,195,2,24,24,62,93,156,164,195,64
2820 DATA 12,12,156,92,62,18,18,18,48,48,56,120,184,168,168,36
2830 DATA 24,25,58,60,56,40,40,72,0,48,48,188,122,56,69,130
2840 DATA 0,0,124,84,84,84,84,84,0,50,1,84,84,92,92,84
2850 DATA 24,24,126,189,189,36,36,36,0,0,24,24,0,0,0
2860 DATA 255,255,192,192,192,192,192,192,255,255,0,0,0,0,0,0
2870 DATA 255,255,3,3,3,3,3,3,192,192,192,192,192,192,255,255
2880 DATA 0,0,0,0,0,0,255,255,3,3,3,3,3,255,255
2890 DATA 192,192,192,192,192,192,192,192,3,3,3,3,3,3,3,3
2900 DATA 66,121,32,32,65,68,65,77,32,76,65,84,84,69,82,46
2910 ? CHR$(125):POKE 710,194:POKE 712,194:POKE 709,12:POKE 752,1:POSITION 1,0:?
 CHR$(17):COLOR 18:PLOT 2,0:DRAWTO 38,0
2920 POSITION 38,0:? CHR$(19):COLOR 23:PLOT 1,1:DRAWTO 1,21:COLOR 24:PLOT 38,1:D
RAWTO 38,21
2930 POSITION 1,21:? CHR$(20):COLOR 21:PLOT 2,21:DRAWTO 38,21:POSITION 38,21:? C
HR$(22)
2940 POSITION 13,11:? CHR$(13):POSITION 26,11:? CHR$(13)
2950 POSITION 14,11:? CHR$(9):POSITION 25,12:? CHR$(10)
2960 POSITION 32,10:? CHR$(15)
2970 FOR T=1 TO 11
2980 IF T=2 THEN NEXT T
2990 POSITION FX(T),FY(T):? CHR$(15):NEXT T
3000 DL=PEEK(560)+256*PEEK(561):POKE DL+26,130:POKE 512,0:POKE 513,6:POKE 54286,
192
3010 RETURN
3020 POKE 752,1:GOSUB 2910:FOR T=3 TO 11:POSITION FX(T)+1,FY(T):? T-2:NEXT T
3030 POSITION 1,0:? "CHANGE THE POSITION OF FIELDER NUMBER ";:POKE 764,255:GET £
1,A
3040 IF A=27 THEN GOTO 3230
3050 A=A-48:IF A<1 OR A>9 THEN 3020
3060 GOSUB 2910:POSITION 1,0:? "PLACE THE FIELDER USING THE ARROW KEYS"
3070 XT=FX(A+2):YT=FY(A+2)
3080 P=PEEK(764):IF P<>15 AND P<>14 AND P<>7 AND P<>6 AND P<>33 AND P<>28 THEN 3
080
3090 POSITION XT,YT:? " ":IF FL=1 THEN GOSUB 2910:POSITION 1,0:? "PLACE THE FIEL
DER USING THE ARROW KEYS":FL=0
3100 XT=XT+(P=7)-(P=6)
3110 YT=YT+(P=15)-(P=14)
3120 IF XT<2 THEN XT=37
3130 IF XT>37 THEN XT=2
3140 IF YT<2 THEN YT=20
3150 IF YT>20 THEN YT=2
3160 FX(A+2)=XT:FY(A+2)=YT:LOCATE XT,YT,Z:IF Z<>32 THEN FL=1
3170 POSITION XT,YT:? CHR$(143)
3180 IF P=33 OR P=28 THEN 3220
3190 POKE 764,255:GOTO 3080
3200 GOSUB 2910:POSITION 1,0:? "PLACE THE FIELDER USING THE ARROW KEYS"
3210 FX(A+2)=XT:FY(A+2)=YT
3220 IF P<>28 THEN GOTO 3020
3230 IF BAT=2 THEN GOTO 3290
3240 GOTO 3460
3250 FOR LP=1 TO PZ:NEXT LP:RETURN
3260 DATA 255,255,3,3,3,3,3,3,192,192,192,192,192,192,255,255
3270 DATA 0,0,0,0,0,0,0,255,255,3,3,3,3,3,3,255,255
3280 DATA 192,192,192,192,192,192,192,192,3,3,3,3,3,3,3,3
3290 POKE 82,0:? :? CHR$(125):POKE 710,130:POKE 712,130:POKE 709,12:? N1$:? :POK
E 752,1:POKE DL+26,2
3300 ZZ=1:FOR WW=0 TO 5:POSITION 0,WW+3:? WW+1;")":POSITION 4,WW+3:? B1$(ZZ,BP1(
WW)):ZZ=BP1(WW)+2:NEXT WW
3310 POSITION 18,1:? "OVERS":POKE 82,20:? :FOR T=1 TO 6:? BW(1,T):NEXT T
```


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PROGRAM FILE

```
3320 POSITION 27,1:? "M":POKE 82,27:? :FOR T=1 TO 6:? BW(4,T):NEXT T
3330 POSITION 31,1:? "R":POKE 82,31:?
3340 FOR T=1 TO 6:? BW(3,T):NEXT T
3350 POSITION 35,1:? "W":POKE 82,35:?
3360 FOR T=1 TO 6:? BW(2,T):NEXT T
3370 POSITION 0,18:? "     PRESS ESCAPE TO MOVE THE FIELD     "
3380 POSITION 13,13:? "  NEW BOWLER  ":POKE 764,255:GET £1,A:IF A=27 THEN GOTO 3
020
3390 A=A-48:IF A<1 OR A>6 THEN POKE 82,0:? :GOTO 3290
3400 IF A=BOW THEN GOTO 3290
3410 POKE 82,2:?
3420 IF TYPE=2 AND BW(1,A)+1>11 THEN ? "MAX 11 PER BOWLER":GET £1,A:GOTO 3290
3430 IF TYPE=3 AND BW(1,A)+1>8 THEN ? "MAX 8 PER BOWLER":GET £1,A:GOTO 3290
3440 IF TYPE=4 AND BW(1,A)+1>4 THEN ? "MAX 4 OVERS PER BOWLER":GET £1,A:GOTO 329
0
3450 POKE 82,0:BOW=A:? :RETURN
3460 POKE 82,0:? :? CHR$(125):POKE 710,130:POKE 712,130:POKE 709,12:? N2$:? :POK
E 752,1:POKE DL+26,2
3470 ZZ=1:FOR WW=0 TO 5:POSITION 0,WW+3:? WW+1;")":POSITION 4,WW+3:? B2$(ZZ,BP2(
WW)):ZZ=BP2(WW)+2:NEXT WW
3480 POSITION 18,1:? "OVERS":POKE 82,20:? :FOR T=1 TO 6:? BW(1,T):NEXT T
3490 POSITION 27,1:? "M":POKE 82,27:? :FOR T=1 TO 6:? BW(4,T):NEXT T
3500 POSITION 31,1:? "R":POKE 82,31:?
3510 FOR T=1 TO 6:? BW(3,T):NEXT T
3520 POSITION 35,1:? "W":POKE 82,35:?
3530 FOR T=1 TO 6:? BW(2,T):NEXT T
3540 POSITION 0,18:? "     PRESS ESCAPE TO MOVE THE FIELD     "
3550 POSITION 13,13:? "  NEW BOWLER  ":POKE 764,255:GET £1,A:IF A=27 THEN GOTO 3
020
3560 A=A-48:IF A<1 OR A>6 AND A<>-21 THEN POKE 82,0:? :GOTO 3460
3570 IF A=BOW THEN GOTO 3460
3580 POKE 82,2:?
3590 IF TYPE=2 AND BW(1,A)+1>11 THEN ? "MAX 11 PER BOWLER":GET £1,A:GOTO 3460
3600 IF TYPE=3 AND BW(1,A)+1>8 THEN ? "MAX 8 PER BOWLER":GET £1,A:GOTO 3460
3610 IF TYPE=4 AND BW(1,A)+1>4 THEN ? "MAX 4 OVERS PER BOWLER":GET £1,A:GOTO 346
0
3620 POKE 82,0:BOW=A:? :RETURN
3630 POKE DL+26,2:IF OUT=10 THEN POP :RETURN
3640 ? CHR$(125):POKE 82,0:? :POKE 709,0:POKE 710,136:POKE 712,136:? N1$:? :POKE
 752,1
3650 T=1:P=1
3660 ZZ=1:FOR WW=0 TO 10:POSITION 0,WW+4:? WW+1;")":POSITION 4,WW+4:? T1$(ZZ,TAB
1(WW)):ZZ=TAB1(WW)+2:NEXT WW
3670 POKE 82,15:POSITION 15,2:? "HOW OUT":?
3680 FOR T=1 TO 11:IF BT(1,T)=1 THEN ? "NOT OUT":POSITION 3,T+3:? "*":POSITION 1
5,T+4:GOTO 3760
3690 IF BT(1,T)<>0 AND BT(3,T)=0 THEN TE$=B2$(1,BP2(0))
3700 IF BT(1,T)<>0 AND BT(3,T)<>0 THEN TE$=B2$(BP2(BT(3,T)-1)+2,BP2(BT(3,T)))
3710 IF BT(1,T)=2 THEN ? "CAUGHT  b.";TE$
3720 IF BT(1,T)=3 THEN ? "BOWLED    ";TE$
3730 IF BT(1,T)=4 THEN ? "STUMPED b.";TE$
3740 IF BT(1,T)=5 THEN ? "RUN OUT"
3750 IF BT(1,T)=6 THEN ? "L.B.W   b.";TE$
3760 NEXT T
3770 POKE 82,36:POSITION 35,2:? "RUNS":?
3780 FOR T=1 TO OUT+2:? BT(2,T):NEXT T
3790 POSITION 17,16:? "EXTRAS:";EX
3800 POKE 82,0:IF Z=0 THEN POSITION 2,18:? :? "          NEW BATSMAN IS NUMBER ";O
UT+2
3810 POSITION 10,19:?
3820 ? ;"          ";S1;" FOR ";OUT;" FROM ";OVER;".";BALL;" OVERS.";
3830 IF INN=1 THEN POSITION 4,22:? N1$;" REQUIRE ";S2-S1+1;" RUNS TO WIN"
3840 GET £1,A
3850 RETURN
3860 POKE DL+26,2:IF OUT=10 THEN POP :RETURN
3870 ? CHR$(125):POKE 82,0:? :POKE 710,136:POKE 712,136:POKE 709,0:? N2$:? :POKE
 752,1
3880 T=1:P=1
3890 ZZ=1:FOR WW=0 TO 10:POSITION 0,WW+4:? WW+1;")":POSITION 4,WW+4:? T2$(ZZ,TAB
2(WW)):ZZ=TAB2(WW)+2:NEXT WW
3900 POKE 82,15:POSITION 15,2:? "HOW OUT":?
3910 FOR T=1 TO 11:IF BT(1,T)=1 THEN ? "NOT OUT":POSITION 3,T+3:? "*":POSITION 1
5,T+4:GOTO 3990
3920 IF BT(1,T)<>0 AND BT(3,T)=0 THEN TE$=B1$(1,BP1(0))
3930 IF BT(1,T)<>0 AND BT(3,T)<>0 THEN TE$=B1$(BP1(BT(3,T)-1)+2,BP1(BT(3,T)))
3940 IF BT(1,T)=2 THEN ? "CAUGHT  b.";TE$
3950 IF BT(1,T)=3 THEN ? "BOWLED    ";TE$
3960 IF BT(1,T)=4 THEN ? "STUMPED b.";TE$
3970 IF BT(1,T)=5 THEN ? "RUN OUT"
3980 IF BT(1,T)=6 THEN ? "L.B.W   b.";TE$
3990 NEXT T
4000 POKE 82,36:POSITION 35,2:? "RUNS":?
4010 FOR T=1 TO OUT+2:? BT(2,T):NEXT T
4020 POSITION 17,16:? "EXTRAS:";EX
4030 POKE 82,0:IF Z=0 THEN POSITION 2,18:? :? "          NEW BATSMAN IS NUMBER ";O
UT+2
4040 POSITION 10,19:?
4050 ? ;"          ";S2;" FOR ";OUT;" FROM ";OVER;".";BALL;" OVERS.";
4060 IF INN=1 THEN POSITION 4,22:? N2$;" REQUIRE ";S1-S2+1;" RUNS TO WIN"
4070 GET £1,A
4080 RETURN
4090 DIM FSH$(32):FSH$="":RETURN
4100 ? CHR$(125):POKE 712,50:POKE 710,50:POKE 709,12:POKE DL+26,2
4105 IF BALL=7 THEN BALL=0
4106 IF BALL=6 THEN BW(1,BOW)=BW(1,BOW)+1:BALL=0
4110 IF BAT=2 THEN GOTO 4140
4120 ZZ=1:FOR WW=0 TO 10:POSITION 0,WW+4:? WW+1;")":POSITION 4,WW+4:? T1$(ZZ,TAB
1(WW)):ZZ=TAB1(WW)+2:NEXT WW
4130 GOTO 4150
4140 ZZ=1:FOR WW=0 TO 10:POSITION 0,WW+4:? WW+1;")":POSITION 4,WW+4:? T2$(ZZ,TAB
2(WW)):ZZ=TAB2(WW)+2:NEXT WW
4150 POKE 82,15:POSITION 15,2:? "HOW OUT":?
4160 FOR T=1 TO 11:IF BT(1,T)=1 THEN ? "NOT OUT":GOTO 4260
4170 IF BT(1,T)<>0 AND BT(3,T)=0 AND BAT=1 THEN TE$=B2$(1,BP2(0))
4180 IF BT(1,T)<>0 AND BT(3,T)=0 AND BAT=2 THEN TE$=B1$(1,BP1(0))
4190 IF BT(1,T)<>0 AND BT(3,T)<>0 AND BAT=1 THEN TE$=B2$(BP2(BT(3,T)-1)+2,BP2(BT
(3,T)))
4200 IF BT(1,T)<>0 AND BT(3,T)<>0 AND BAT=2 THEN TE$=B1$(BP1(BT(3,T)-1)+2,BP1(BT
(3,T)))
4210 IF BT(1,T)=2 THEN ? "CAUGHT  b.";TE$
4220 IF BT(1,T)=3 THEN ? "BOWLED    ";TE$
4230 IF BT(1,T)=4 THEN ? "STUMPED b.";TE$
4240 IF BT(1,T)=5 THEN ? "RUN OUT"
4250 IF BT(1,T)=6 THEN ? "L.B.W   b.";TE$
4260 NEXT T
4270 POKE 82,36:POSITION 35,2:? "RUNS":?
4280 FOR T=1 TO 11:? BT(2,T):NEXT T
4290 POKE 82,2:?
4300 POSITION 17,16:? "EXTRAS:";EX:TE$=N1$:SC=S1
4310 IF BAT=2 THEN TE$=N2$:SC=S2
4320 ? :? TE$;" WERE ";SC;
4330 IF OUT=10 THEN ? " ALL OUT ":GOTO 4350
4340 ? " FOR ";OUT;" WICKETS"
4350 ? "       FROM ";OVER;".";BALL;" OVERS.";
```

PROGRAM FILE

```
4360 POSITION 0,22:? "   PRESS ANY KEY FOR BOWLING ANALYSIS    ";
4370 GET £1,A
4380 POKE 82,0:? :? CHR$(125):POKE 710,68:POKE 712,68:POKE 709,12:POKE 752,1:? :
TE$=N1$
4390 IF BAT=1 THEN TE$=N2$
4400 POSITION 5,14:? "BOWLING ANALYSIS FOR ";TE$
4410 IF BAT=1 THEN 4440
4420 ZZ=1:FOR WW=0 TO 5:POSITION 0,WW+3:? WW+1;")":POSITION 4,WW+3:? B1$(ZZ,BP1(
WW)):ZZ=BP1(WW)+2:NEXT WW
4430 GOTO 4450
4440 ZZ=1:FOR WW=0 TO 5:POSITION 0,WW+3:? WW+1;")":POSITION 4,WW+3:? B2$(ZZ,BP2(
WW)):ZZ=BP2(WW)+2:NEXT WW
4450 POSITION 18,1:? "OVERS":POKE 82,20:? :FOR T=1 TO 6:? BW(1,T);:IF T=BOW AND
BALL<>0 THEN ? ".";BALL;
4460 ? :NEXT T
4470 POSITION 27,1:? "M":POKE 82,27:? :FOR T=1 TO 6:? BW(4,T):NEXT T
4480 POSITION 31,1:? "R":POKE 82,31:?
4490 FOR T=1 TO 6:? BW(3,T):NEXT T
4500 POSITION 35,1:? "W":POKE 82,35:? N)$"4510 FOR T=1 TO 6:? BW(2,T):NEXT T(<45
20 POKE 82,0:? $F?4530 POSITION 0,20:? "        PRESS ANY KEY TO CONTINUE
4510 FOR T=1 TO 6:? BW(2,T):NEXT T
4520 POKE 82,0:?
4530 POSITION 0,20:? "        PRESS ANY KEY TO CONTINUE        ";
4540 GET £1,A:RETURN


NOTES ON LISTING
----------------

ALL CHARACTERS IN THE PRINT STATEMENTS IN
LINES: 440,550,1180,1200,1230,1260,1290,2360,2390,2460,2600,2610,2650,2660,
       3030,3060,3200,3370,3380,3540,3550,4360,4530
SHOULD BE TYPED IN INVERSE VIDEO.

LINE 4090 :FSH$="hhhH[INV "]9[INV SPC][CTRL ,][INV -][CTRL ,][INV R]e[CTRL T][IN
V CTRL M][CTRL V][INV P][INV CTRL M]
                [CTRL J][INV T][INV CTRL H][INV P][INV r][INV J][INV P][INV m]H
8[INV i][CTRL A][INV P][INV d][CTRL .]"


ALL £ SIGNS IN THE LISTING SHOULD BE TYPED AS [SHIFT 3] i.e THE HASH SYMBOL
```



Comet Halley

by N Cabric

Observations of comets, when they are far from the sun and of low brightness, can be a tricky problem. The ephemeris data are often given with a large time step, while the comet moves on the starry background with an amazing speed. The interpolation of data of comet position on the sky, and afterwards the recalculation of these positions for a given place on the Earth, is a difficult mathematical problem which requires a good knowledge of spherical trigonometry.

This program enables you to calculate all relevant data about Comet Halley at a given moment and at any location on our planet. The program is written in Hu-Basic for the Sharp MZ-700, which is well-suited for such problems due to its accuracy (17 significant digits). Only the most common instructions of the Basic are used, so the program should be adaptable to almost any other personal computer. In principle, any computer with a 10-digit Basic should give correct results.

The mathematical function LOG in Hu-Basic gives the natural (and not the decimal) logarithm of a number.

Some Basics do not have the instruction PRINTUSING, which is often used in this program. This problem can easily be solved by a simple replacement of this instruction and format string with the common PRINT. For example, the line 530 should be written as PRINT IS;JM.

The orbital elements of Comet Halley are given in lines 230-270. It is possible to determine the position of any other comet by putting in its orbital elements. The symbols have the following meanings: DQ — perihelion distance in AU (one AU is about 150 million kilometers); DEC — eccentricity; DW — argument of perihelion (in degrees); DO — longitude of ascending node (in degrees); DI — inclination (in degrees); and DEPOCH — epoch: that is, the moment of perihelion passage of the comet in Julian days. The quantity DEG converts degrees into radians and is defined in line 100.

If the orbital elements of other comets, asteroids or planets are inserted, the program will give their positions. In the case of a planet or an asteroid, it would be necessary to use other formulae to calculate the brightness of the objects, instead of those given in lines 1690 and 1700.

The position of the observer is entered into the program in line 180. The listing already contains the geographical position of London. Here we have: DLA — geographical longitude (in hours); DFI — geographical latitude (in degrees); and IZO — the time zone number, or the time difference between the place of the observation and Universal Time (the time of the Greenwich meridian). Fig 1 contains this data for 10 cities around the world.

Strictly speaking, this program gives exact positions of comets three-four months before and after the perihelion passage (for Comet Halley, this will happen on 9 February 1986). The motion of comets is strongly perturbed by the great planets, especially Jupiter. These influences have not been taken into account in this program.

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PROGRAM FILE

City	DLA	DFI	IZO
London	0.0056	51.5	0
Madrid	0.2467	40.45	0
Moscow	−2.5111	55.8333	3
Munich	−0.7667	48.15	1
New York	4.9333	40.75	−5
Rio de Janeiro	2.88	−22.0833	−3
Rome	−0.8367	41.8833	1
San Francisco	8.1611	37.6667	−8
Sydney	−10.08	−33.9167	10
Tokyo	−9.3167	35.8	9

Fig 1

```
10 REM ************************************
20 REM *                                  *
30 REM *    C O M E T   H A L L E Y       *
40 REM *                                  *
50 REM *         N. Cabric 1985.          *
60 REM *                                  *
70 REM ************************************
80 CLS:DEFDBL D:DEFINT I-N
90 D8=-1D-30:DLN=1/LOG(10#)
100 DEG=57.2957795131#:DN=.99726956642354#
110 DPI=3.14159265358979311#:DPI2=2#DPI
120 DEF FNH(DX)=DX-24#INT(DX/24)
130 DEF FND(DX)=DX-DPI2#INT(DX/DPI2)
140 REM ------------------------------
150 REM    GEOGRAPHICAL COORDINATES
160 REM          AND  TIME ZONE
170 REM ------------------------------
180       DLA=.0056:DFI=51.5/DEG :IZO=0
190 REM ------------------------------
200 REM         ORBITAL  ELEMENTS
210 REM          OF COMET HALLEY
220 REM ------------------------------
230 DQ=.5871023#:DEC=.9672751#
240 DW=111.84694#/DEG:DO=58.14416#/DEG
250 DI=162.23933#/DEG:DEPOCH=2446470.94629#
260 DAC=DQ/(1-DEC)
270 DNC=.01720212218731#/DAC/SQR(DAC)
280 REM ------------------------------
290 REM           I  N  P  U  T
300 REM ------------------------------
310 CURSOR0,0:PRINT"   COMET HALLEY "
320 CURSOR0,2:PRINT"INPUT DATE & TIME:"
330 INPUT"   YEAR   :";MY
340 INPUT"   MONTH  :";M
350 INPUT"   DAY    :";MD
360 INPUT"   HOUR   :";MH
370 INPUT"   MINUTE :";MI
380 REM ------------------------------
390 REM     M A I N   P R O G R A M
400 REM ------------------------------
410 DL=MH+MI/60:GOSUB 1150:PRINT
420 DL=FNH(DL):DTU=DL-IZO
430 GOSUB 1870:D4=DL:D5=0:GOSUB 900
440 PRINT"DATE :";:PRINTUSING"##.";MD;M;
450 PRINTUSING"####.";MY;
460 PRINTTAB(20);"TIME :";
470 PRINTUSING"###";IH;IM:PRINT
480 DJ=DJ-IZO/24#:DL=0
490 GOSUB 1220:D4=DA:D5=DD:GOSUB 900
500 PRINT"RIGHT ASCENSION   (h min):";
510 PRINTUSING"###";IH;IM
520 PRINT"DECLINATION         (o '):";
530 PRINTUSING"###";IS;JM
540 PRINT"GEOCENTRIC DISTANCE  (AU):";
550 PRINTUSING"###.##";D6
560 PRINT"HELIOCENTIC DISTANCE (AU):";
570 PRINTUSING"###.##";DS
580 PRINT"TOTAL MAGNITUDE           :";
590 PRINTUSING"###.#";DM1
600 PRINT"NUCLEAR MAGNITUDE         :";
610 PRINTUSING"###.#";DM2
620 PRINT"SUN-EARTH-COMET ANGLE (o):";
630 PRINTUSING"####";DPSI
640 DJ=DJ-DTU/24#:GOSUB 1080
650 GOSUB 1750
660 PRINT"ALTITUDE              (o):";
670 PRINTUSING"####";AL
680 PRINT"AZIMUTH               (o):";
690 PRINTUSING"####";AZ
700 DJ=DJ+IZO/24#
710 IF ABS(DJ-D8)<.0001 GOTO 840
720 GOSUB 1220
730 PRINT:PRINT"RISING              (h min):";
740 GOSUB 1970
750 IF K=1 THEN TR=0:TS=24
760 IF K=2 THEN TR=-1:TS=-1
770 IF TR<0 THEN PRINT" -- -- ":GOTO 800
780 D4=TR:D5=0:GOSUB 900
790 PRINTUSING"###";IH;IM
800 PRINT"SETTING           (h min):";
810 IF TS<0 THEN PRINT" -- -- ":GOTO 840
820 D4=TS:D5=0:GOSUB 900
830 PRINTUSING"###";IH;IM
840 D8=DJ:GOTO 310
850 REM ------------------------------
860 REM       TRANSFORMATION INTO
870 REM        HOURS & MINUTES AND
880 REM     DEGREES & MINUTES OF ARC
890 REM ------------------------------
900 IH=INT(D4):IM=(D4-IH)*60
910 IF IM=60 THEN IM=0:IH=IH+1
920 IZ=SGN(D5):D=ABS(D5*DEG)
930 IS=INT(D):JM=(D-IS)*60
940 IF JM=60 THEN JM=0:IS=IS+1
950 IS=IZ*IS:RETURN
960 REM ------------------------------
970 REM        EQUATION OF KEPLER
980 REM ------------------------------
990 D=DM
1000 DU=D+(DM-D+DE*SIN(D))/(1-DE*COS(D))
1010 IF ABS(DU-D)>.00001 THEN D=DU:GOTO 1000
1020 DV=2*ATN(SQR((1+DE)/(1-DE))*TAN(DU/2))
1030 RETURN
1040 REM ------------------------------
1050 REM    SIDERAL TIME AT GREENWICH
1060 REM           AT 0h UT
1070 REM ------------------------------
1080 DT=(DJ-2415020#)/36525#
1090 D=(.000001075#*DT+100.0021359#)*DT
1100 D=D+.27691938#:S0=24*(D-INT(D))
1110 RETURN
1120 REM ------------------------------
1130 REM         JULIAN DAY NUMBER
1140 REM ------------------------------
1150 IF M<3 THEN MY=MY-1:M=M+12
1160 DJ=1720981.5#+INT(365.25#*MY)
1170 DJ=DJ+INT(30.6001#*(M+1))+DL/24+MD
1180 RETURN
1190 REM ------------------------------
1200 REM           S  U  N
1210 REM ------------------------------
1220 D9=DJ-DL/24#:DT=(D9-2415020')/36525'
1230 D=(.000005279621#*DT+628.331950904#)*DT
1240 DLS=FND(D+4.881627972896974#)
1250 D=-(.0000000057596#*DT+.000002617994#)*DT
1260 DM=FND((D+628.30194573#)*DT+6.2565835#)
1270 D=(.00000000878#*DT-.0000000286234#)*DT
1280 DEP=(D-.000227111#)*DT+.40931974744571#
1290 D=-.000000126#*DT
1300 DE=(D+.0000418#)*DT+.01675104#
1310 GOSUB 990
1320 D=FND(DLS+DV-DM)
1330 DRS=1.000000021#*(1-DE*COS(DU))
1340 DXS=DRS*COS(D):D=DRS*SIN(D)
1350 DYS=D*COS(DEP):DZS=D*SIN(DEP)
1360 REM ------------------------------
1370 REM           C O M E T
1380 REM ------------------------------
1390 DF=COS(DO):DG=SIN(DO)*COS(DEP)
1400 DH=SIN(DO)*SIN(DEP)
1410 DP=-SIN(DO)*COS(DI)
1420 D=COS(DO)*COS(DI)*COS(DEP)
1430 DQ=D-SIN(DI)*SIN(DEP)
1440 D=COS(DO)*COS(DI)*SIN(DEP)
1450 DR=D+SIN(DI)*COS(DEP)
1460 DA2=SQR(DF*DF+DP*DP)
1470 DB2=SQR(DG*DG+DQ*DQ)
1480 DC2=SQR(DH*DH+DR*DR):SD=SGN(SIN(DO))
1490 DA1=ATN(DF/DP):DB1=ATN(DG/DQ)
1500 DC1=ATN(DH/DR)
1510 IF COS(DO)<0 THEN DA1=DPI-DA1
1520 IF SD*DB1<0 THEN DB1=DB1+DPI
1530 IF SD*DC1<0 THEN DC1=DC1+DPI
1540 DM=DNC*(D9-DEPOCH)
1550 DE=DEC:GOSUB 990
1560 DS=DAC*(1-DEC*COS(DU)):DPC=DW+DV
1570 DX=DS*DA2*SIN(DA1+DPC)
1580 DY=DS*DB2*SIN(DB1+DPC)
1590 DZ=DS*DC2*SIN(DC1+DPC)
1600 D1=DXS+DX:D2=DYS+DY:D3=DZS+DZ
1610 DG=SQR(D1*D1+D2*D2+D3*D3)
1620 DA=DEG/15*ATN(D2/D1)
1630 D=D3/DG:DD=ATN(D/SQR(1-D*D))
1640 IF D1<0 THEN DA=DA+12:GOTO 1660
1650 IF D2<0 THEN DA=DA+24
1660 D=.5*(DRS*DRS+DG*DG-DS*DS)/DRS/DG
1670 DPSI=DEG*ATN(SQR(1-D*D)/D)
1680 IF DPSI<0 THEN DPSI=DPSI+180
1690 DM1=5+(5*LOG(DG)+13.1*LOG(DS))*DLN
1700 DM2=7.5+(5*LOG(DG)+10*LOG(DS))*DLN
1710 RETURN
1720 REM ------------------------------
1730 REM      HORIZONTAL COORDINATES
1740 REM ------------------------------
1750 Z=15/DEG*FNH(S0+DTU/DN-DLA-DA)
1760 D=COS(DFI)*COS(DD)*COS(Z)
```

PROGRAM FILE

```
1770 D=D+SIN(DFI)*SIN(DD)
1780 AL=DEG*ATN(D/SQR(1-D*D))
1790 X=COS(Z)*SIN(DFI)-TAN(DD)*COS(DFI)
1800 Y=SIN(Z):AZ=DEG*ATN(Y/X)
1810 IF X<0 THEN AZ=AZ+180:GOTO 1830
1820 IF Y<0 THEN AZ=AZ+360
1830 RETURN
1840 REM ------------------------------
1850 REM  CALENDAR DATA FROM JULIAN DAY
1860 REM ------------------------------
1870 D=INT(DJ+.5):A=INT((D/36524.3)-51.1226)
1880 A=D+1+A-INT(A/4):B=A+1524
1890 C=INT((B/365.25)-.3343):S=INT(365.25*C)
1900 E=INT((B-S)/30.61):MD=B-S-INT(30.61*E)
1910 M=E-1:MY=C-4716:IF M>12 THEN M=M-12
1920 IF M<3 THEN MY=MY+1
1930 RETURN
1940 REM ------------------------------
1950 REM   TIME OF RISING AND SETTING
1960 REM ------------------------------
1970 TK=-99:D7=DA:D6=DD
1980 GOSUB 2170:IF K>0 GOTO 2120
1990 T=DN*FNH(DA-TT-S0+DLA+IZ0)
2000 DT=ABS(T-TK)
2010 IF TK>0 AND DT>22 THEN T=-1:GOTO 2040
2020 IF DT<.01# THEN GOTO 2040
2030 DL=T:GOSUB 1220:TK=T:GOTO 1980
2040 TR=T:TK=-99:DA=D7:DD=D6
2050 GOSUB 2170:IF K>0 GOTO 2120
2060 T=DN*FNH(DA+TT-S0+DLA+IZ0)
2070 DT=ABS(T-TK)
2080 IF TK>0 AND DT>22 THEN T=-1:GOTO 2110
2090 IF DT<.01# THEN GOTO 2110
2100 DL=T:GOSUB 1220:TK=T:GOTO 2050
2110 TS=T
2120 RETURN
2130 REM ------------------------------
2140 REM  THE HOUR ANGLE CORRESPONDING
2150 REM   TO THE TIME OF RISE OR SET
2160 REM ------------------------------
2170 CT=-.01018091142#-SIN(DD)*SIN(DFI)
2180 CT=CT/COS(DD)/COS(DFI):K=0
2190 IF CT>1 THEN K=2:RETURN
2200 IF CT<-1 THEN K=1:RETURN
2210 TT=DEG/15*ATN(SQR(1-CT*CT)/CT)
2220 IF CT<0 THEN TT=TT+12
2230 RETURN
```

```
Example No:1
DATE :27.11.1985.   TIME : 21 15

RIGHT ASCENSION   (h min):  1 37
DECLINATION        (o '): 15 51
GEOCENTRIC DISTANCE  (AU):  0.62
HELIOCENTIC DISTANCE (AU):  1.53
TOTAL MAGNITUDE          :  6.4
NUCLEAR MAGNITUDE        :  8.3
SUN-EARTH-COMET ANGLE (o): 142
ALTITUDE              (o):  54
AZIMUTH               (o):   2

RISING             (h min): 13 53
SETTING            (h min):  4 57

Example No:2
DATE :15. 1.1986.   TIME : 17 30

RIGHT ASCENSION   (h min): 21 46
DECLINATION        (o '): -5 27
GEOCENTRIC DISTANCE  (AU):  1.42
HELIOCENTIC DISTANCE (AU):  0.79
TOTAL MAGNITUDE          :  4.4
NUCLEAR MAGNITUDE        :  7.2
SUN-EARTH-COMET ANGLE (o):  32
ALTITUDE              (o):  18
AZIMUTH               (o):  54

RISING             (h min):  8 33
SETTING            (h min): 19 47

Example No:3
DATE :11. 4.1986.   TIME :  0  0

RIGHT ASCENSION   (h min): 14 49
DECLINATION        (o '):-46 59
GEOCENTRIC DISTANCE  (AU):  0.41
HELIOCENTIC DISTANCE (AU):  1.33
TOTAL MAGNITUDE          :  4.7
NUCLEAR MAGNITUDE        :  6.8
SUN-EARTH-COMET ANGLE (o): 136
ALTITUDE              (o): -10
AZIMUTH               (o): 344

RISING             (h min): -- --
SETTING            (h min): -- --
```

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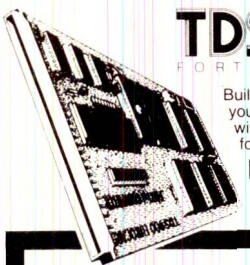

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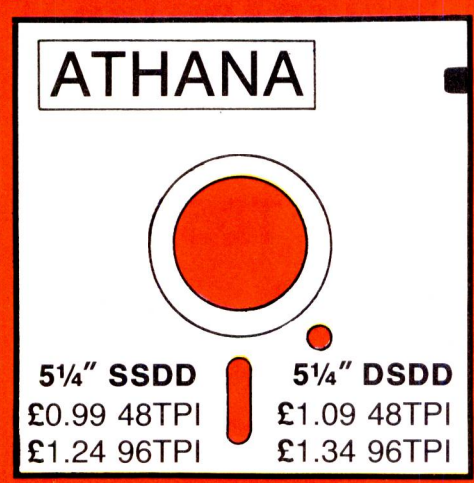

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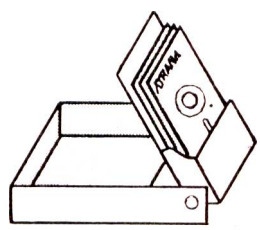

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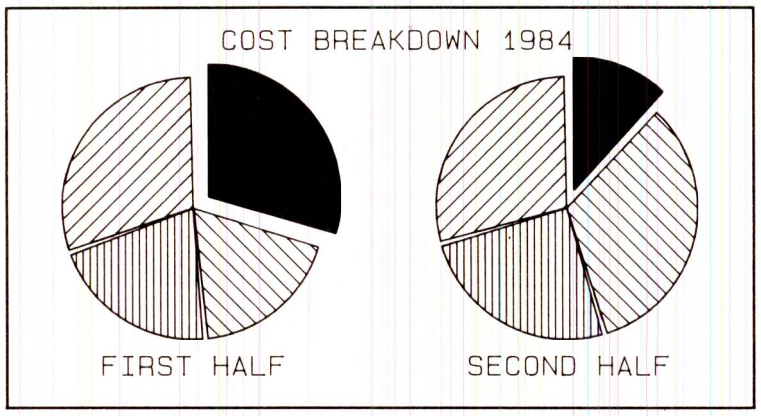

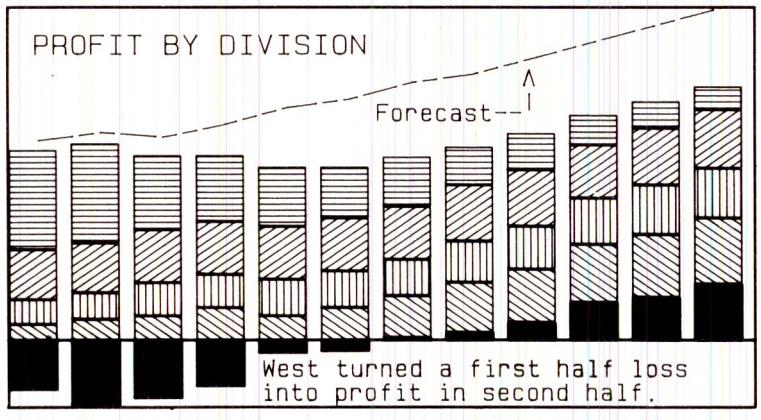

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Acorn	ABC310	April85
ACT	Apricot	Oct83
ACT	Apricot F1	Oct84
ACT	Apricot F10	Sept85
Advance	86	July 84
Amstrad	PCW 8256	Oct 85
Apple	Apple III	May82
Apple	Lisa	July83
Apple	Macintosh	March84
Atari	520ST	June85
British Micro	Mimi 801	July82
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Canon	AS-100	Dec83
Canon	CH-1	Nov82
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Casio	fx-900p	Feb83
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Compudata	Tulipsystem 1	Oct83
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Future	FH20	Oct83
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Hewlett-Packard	HP-125	March82
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Olivetti	M24	Sept84
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Philips	:Yes	Oct85
Research Machines	Nimbus	April85
Sage	Sage II	Feb83
Sanyo	550-2	Jan85
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SMT	Goupil-3	Dec83
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Texas Instruments	Professional	May83
Torch Computers	Torch	Jan83
Victor	Sirius 1	Feb82
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Canon	H-07	March84
Casio	602p	May82
Casio	Fx-820p	March85
Casio	PB-100	May83
Hewlett-Packard	15C & 16C	Sept82
Hewlett-Packard	HP-75C	Nov82
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Sharp	PC-1350	March85
Sharp	PC1251	Feb83
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Computers	Lynx	March83
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IBM	PC Junior	March84
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Memotech	Memotech RS 128	Oct84
Multitech	Micro-Professor II	Sept83
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Sharp	MZ-700	Feb84
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Sinclair	ZH Spectrum	June82
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Spectravideo	SV-318 & SV-328	March84
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Ashton Technology	Crystal	July84
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Fortune	Fortune 32:16	Aug83
IBM	PC AT	Dec84
Kaypro	286i	Aug85
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TDI	Pinnacle	Jan85

SOFTWARE

PROGRAM	SUPPLIER	ISSUE
Accountancy		
Accountancy Round-up	Various	June83
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Microtax	Tax Planning	July83
Sage 400	Sage	Oct83
Communications		
Datatalk	Datasoft	Jan85
Perfect Link	Perfect Software	July84
Vicom	AM Technology	Sept85
Database		
1983 Database Round-up	Various	Dec83
1984 Database Round-up	Various	Jan84
Aquila	Kent Barlow Assocs	Sept82
Aspect	Microft Technology	Oct84
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Busipost	Busipost	Feb83
Cardbox	Caxton Software	Aug82
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Condor Database	Condor Corp	Nov82
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Tomorrow's Office	Stage One Software	June83
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QED +	Quantec	March85
Sidekick	Borland	March85
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Entertainment		
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Music Master	Supersoft	Jan 85
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ES/P Advisor	Expert Systems	Sept 84
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BCPL (QL)	Metacomco	June 85
C (Spectrum)	Hi Soft	Nov 84
MT+86	Digital Research	Nov 85
Lisp (QL)	Metacomco	Feb 85
Logo (BBC)	Acornsoft	Feb 85
Logo (BBC)	Logotron	Feb 85
Logo (BBC)	Open University	Feb 85
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Pascal (Amstrad)	Amsoft	Feb 85
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Pascal, ISO (BBC)	Acornsoft	Feb 85
Pascal, ISO (QL)	Metacomco	July 85
Pascal, Turbo (PC)	Borland	April 85
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Brainstorm	Caxton Software	Feb 84
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Desq	Quarterdeck	Dec 83
GEM	Digital Research	Feb 85
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MS-DOS	Microsoft	Oct 82
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Spreadsheet		
1-2-3	Lotus	Nov 83
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E40	Keel Codes	Sept 82
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Word processor		
Homeword	Sierra On-Line	Feb 84
HP41C Text Editor	Hesselberg	Nov 82
Micropen	Intelligence Ireland	May 83
Microscript	Intelligence Ireland	May 85
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QX Text	QX Software	July 84
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Scred	Stable Software	Aug 83
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Word Handler II	Sillicon Valley	March 83
Wordspell	Griffin Software	March 84
Wordstar 2000	MicroPro	Feb 85
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Knowledge Index	Dialog	Sept 85
Modems	Various	Oct 85
Portman modem	Interlekt	Oct 84
Teletext adapter	Vector Marketing	April 84
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Expansion		
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Koala Pad	Audiogenic	Jan 85
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AMS drive	AMS	Jan 84
Discovery 1	Opus Supplies	May 85
Hobbit	Ikon	Jan 84
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TCCR530	Tandberg	July 84
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HR-5	Brother	Sept 84
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TC6000	Brother	April 85
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Acorn speech system	Acorn	Jan 84
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Amstrad SSA-1	Amstrad	Sept 85
BBC Speech Chips	Acorn	April 83
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Microspeech	Currah	Jan 84
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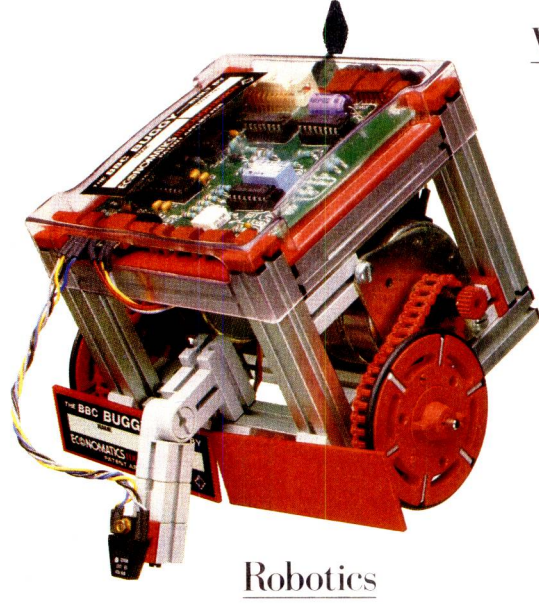

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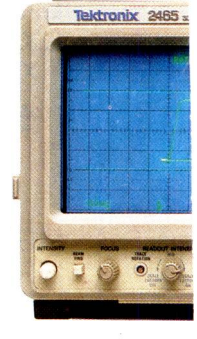

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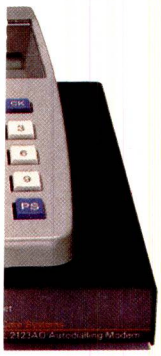

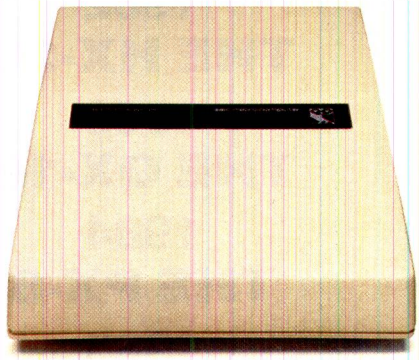

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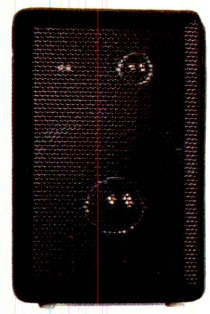

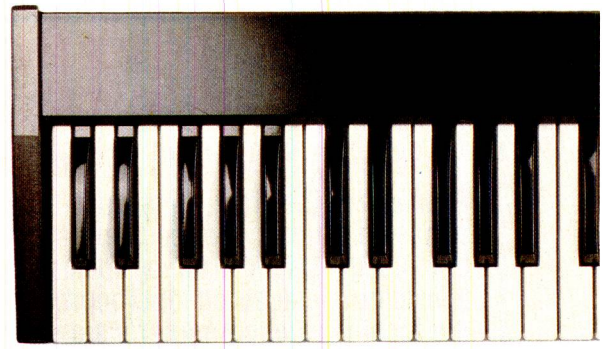

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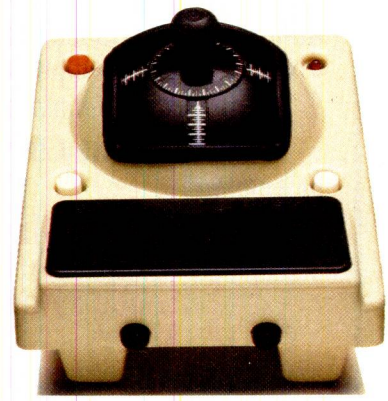

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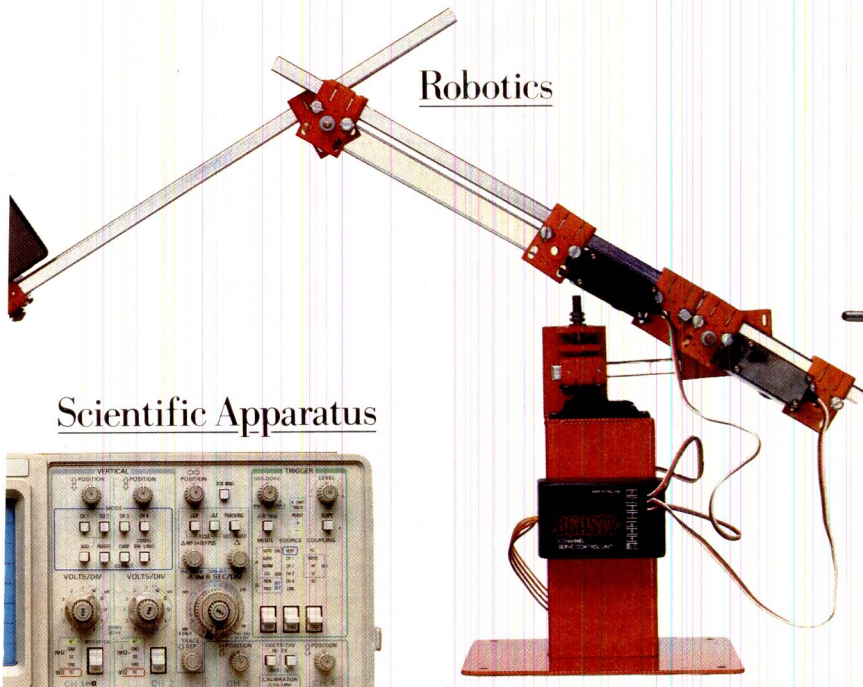
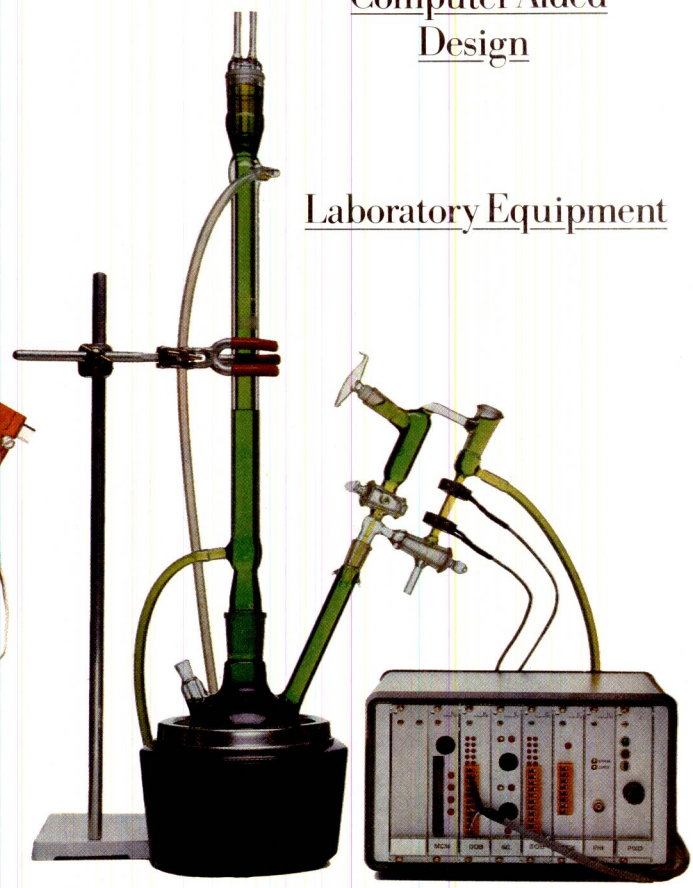


Laboratory Equipment



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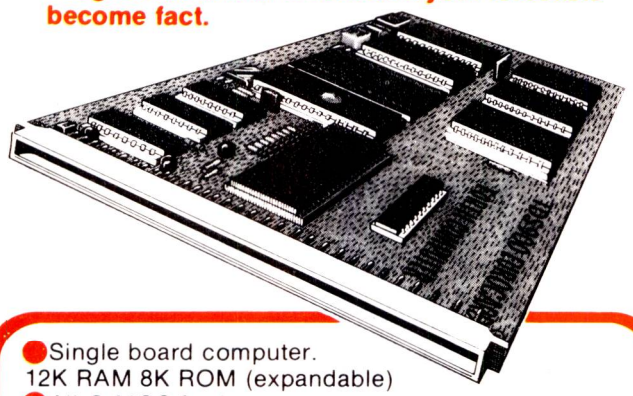

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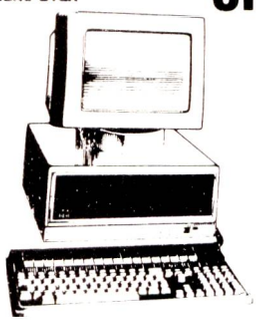

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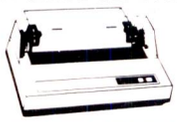

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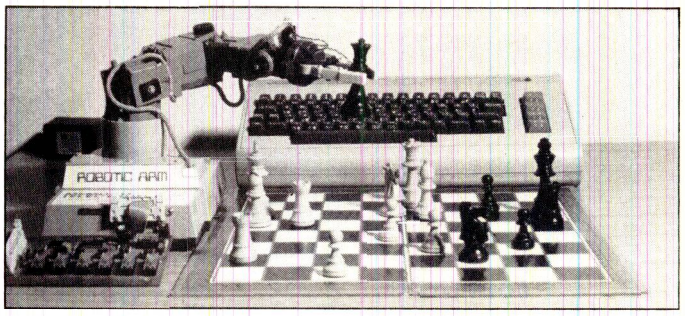

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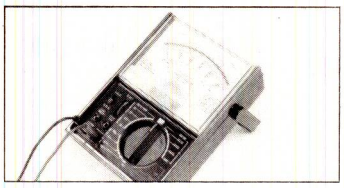

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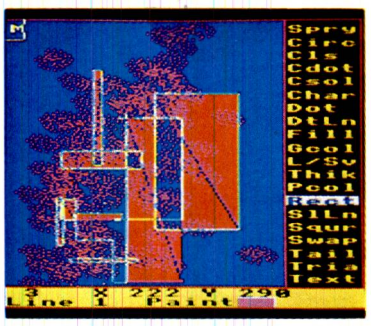

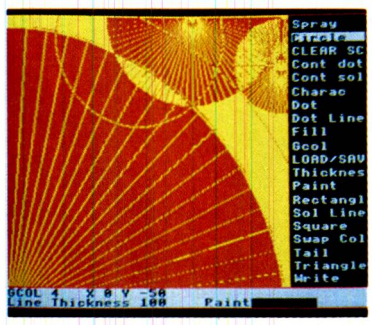

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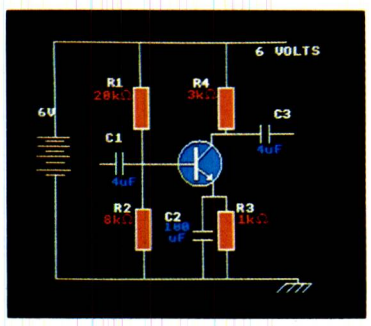

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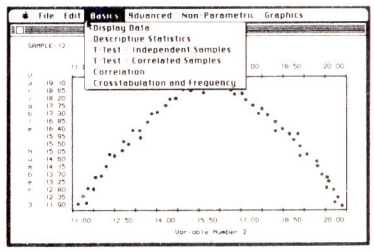

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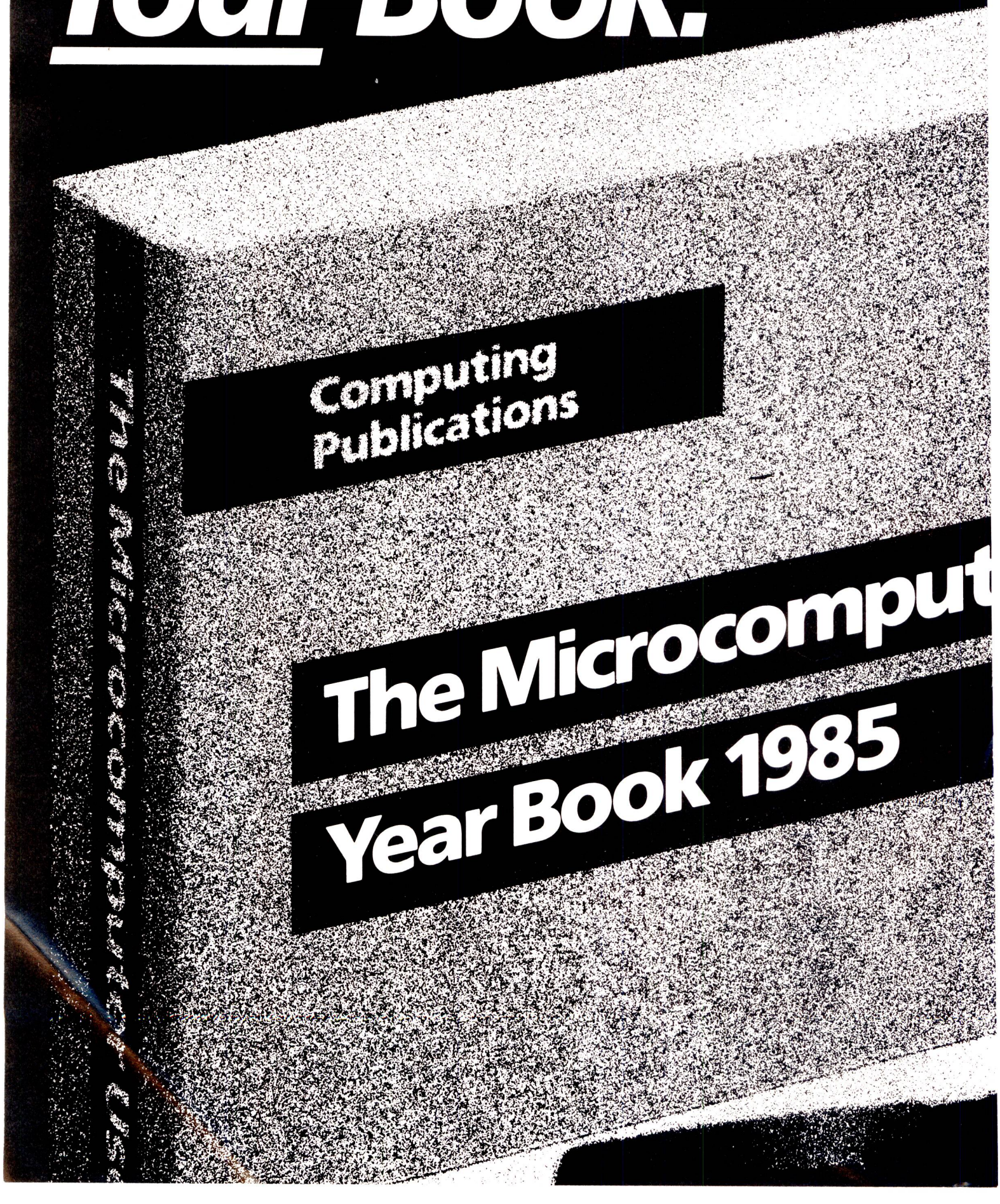

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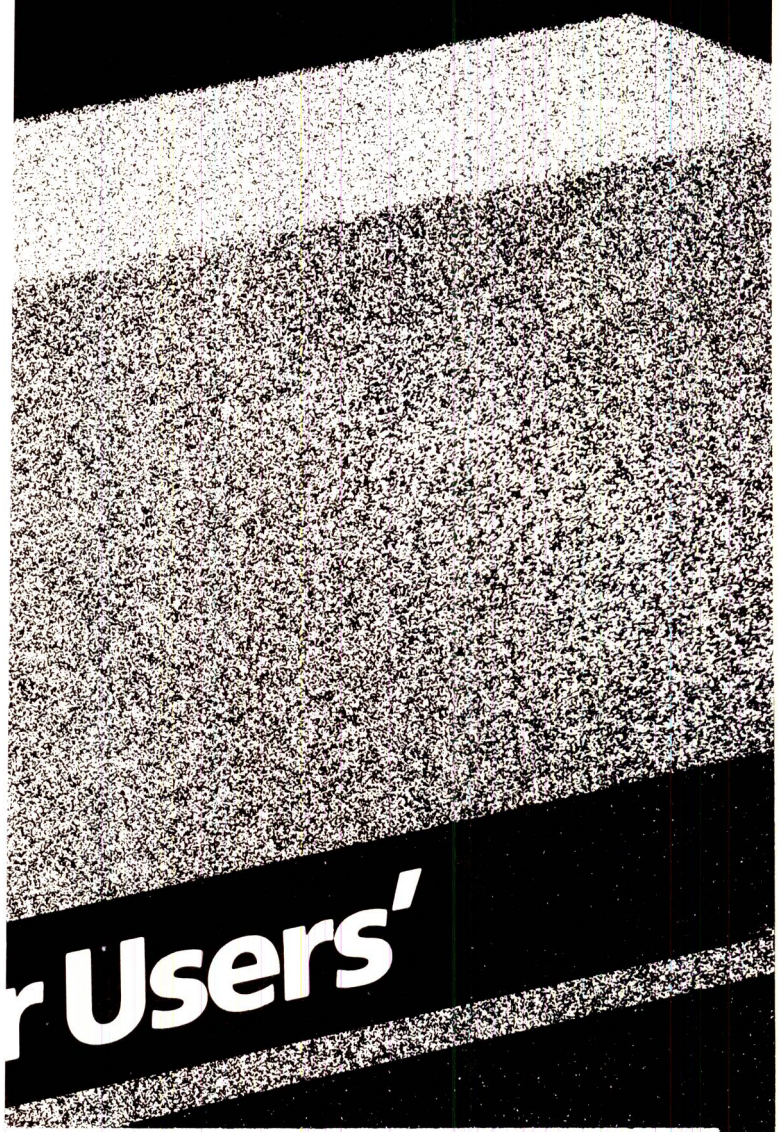

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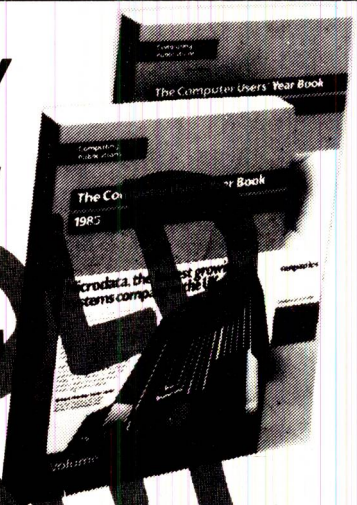

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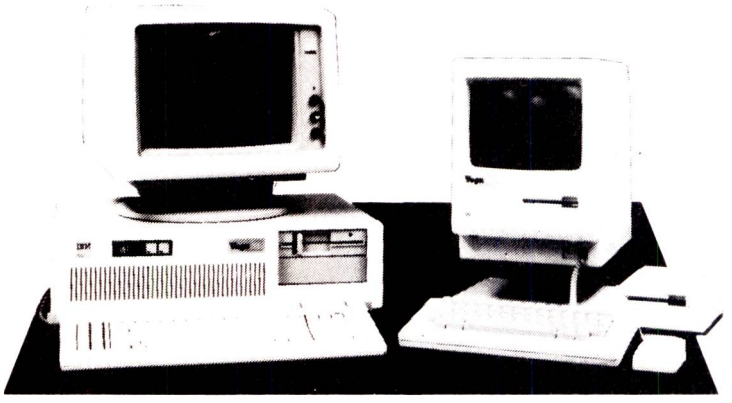

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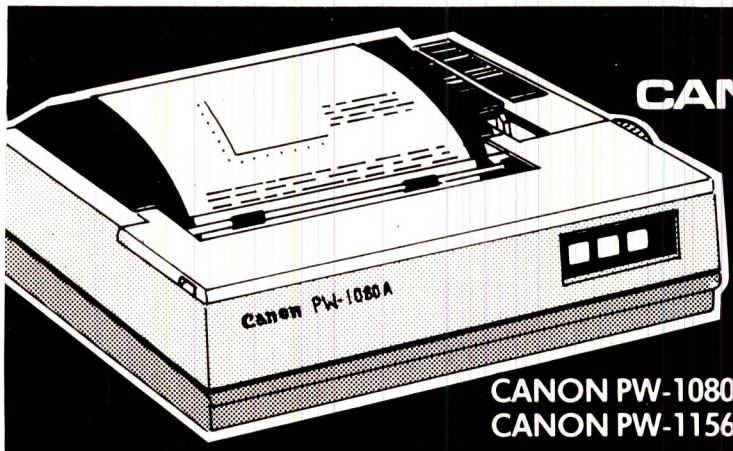

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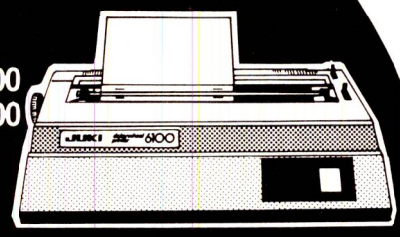

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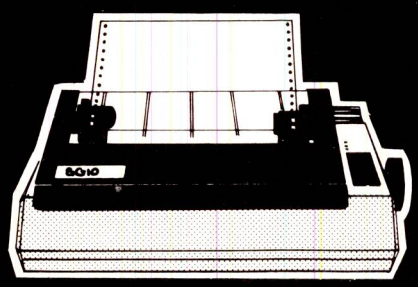

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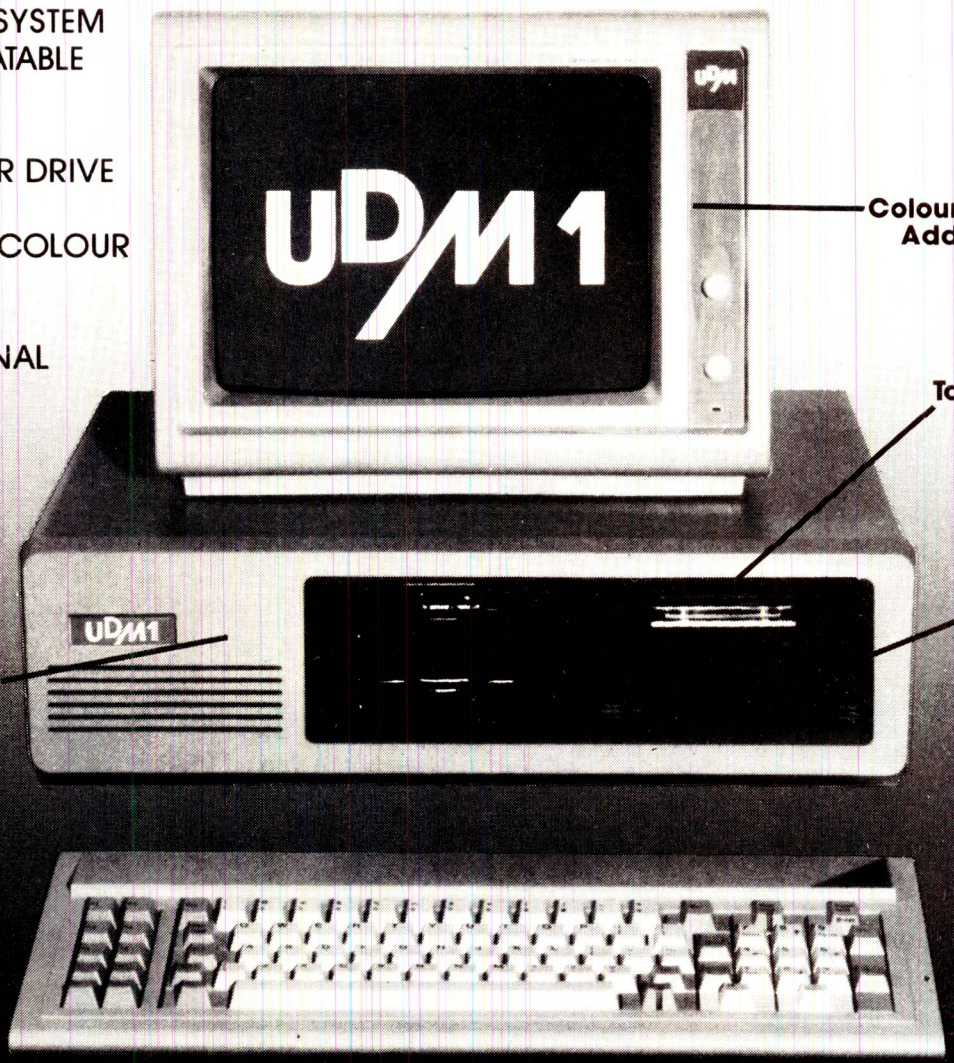

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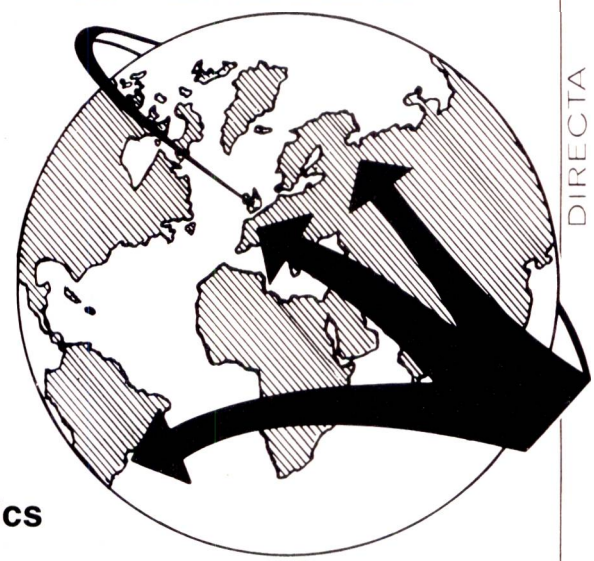

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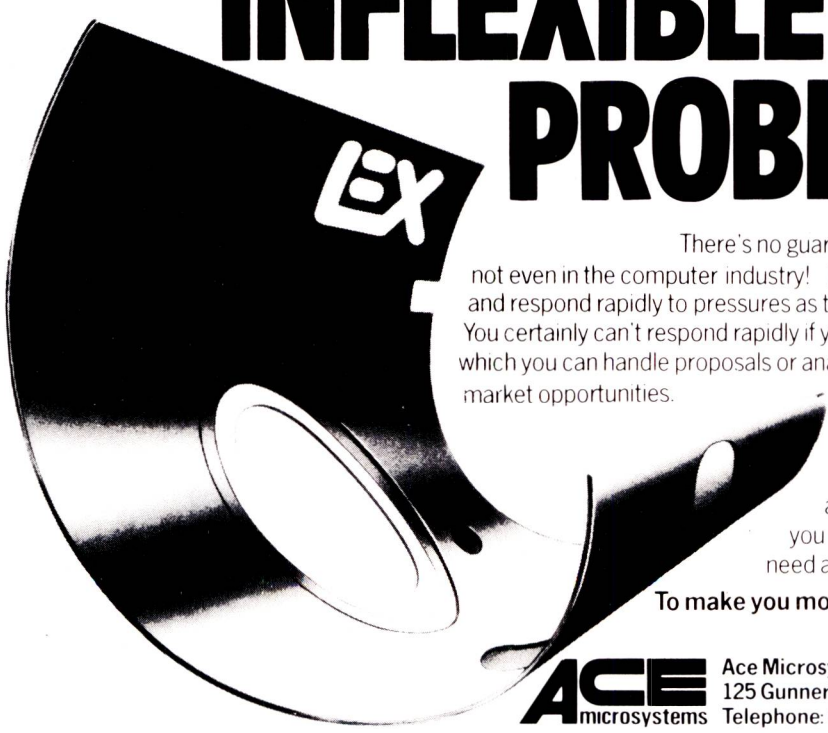

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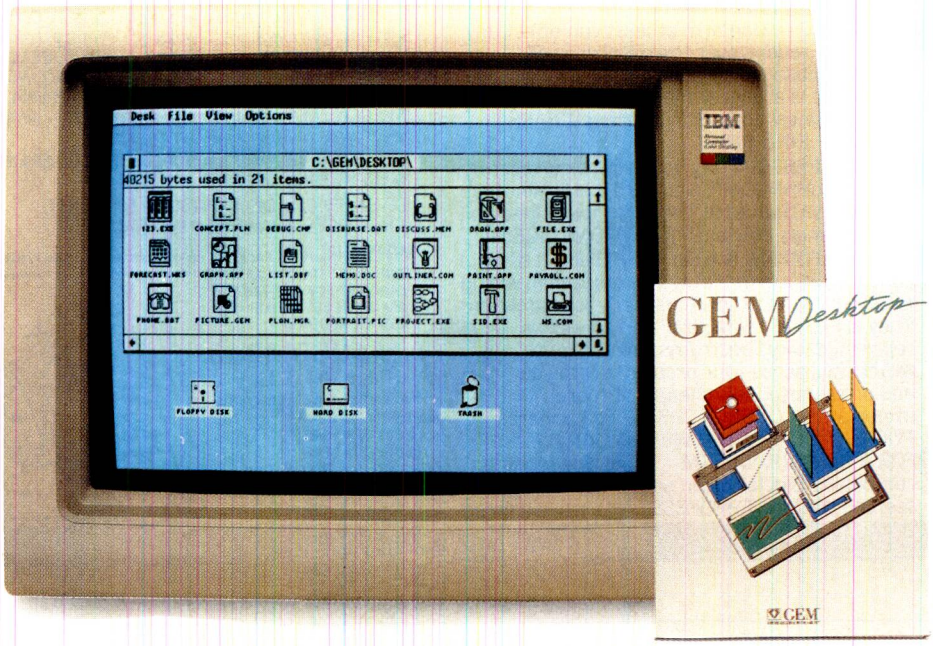

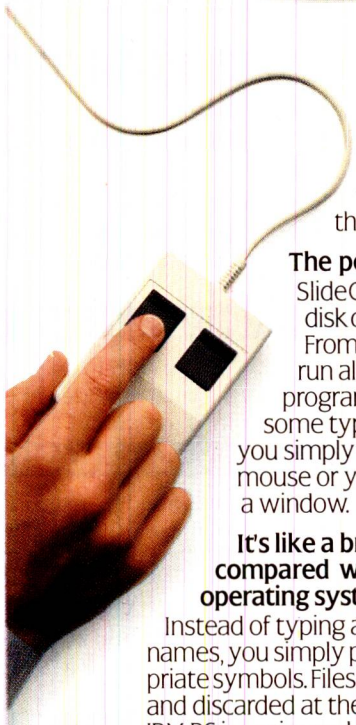

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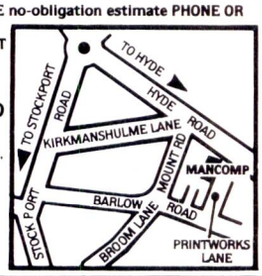

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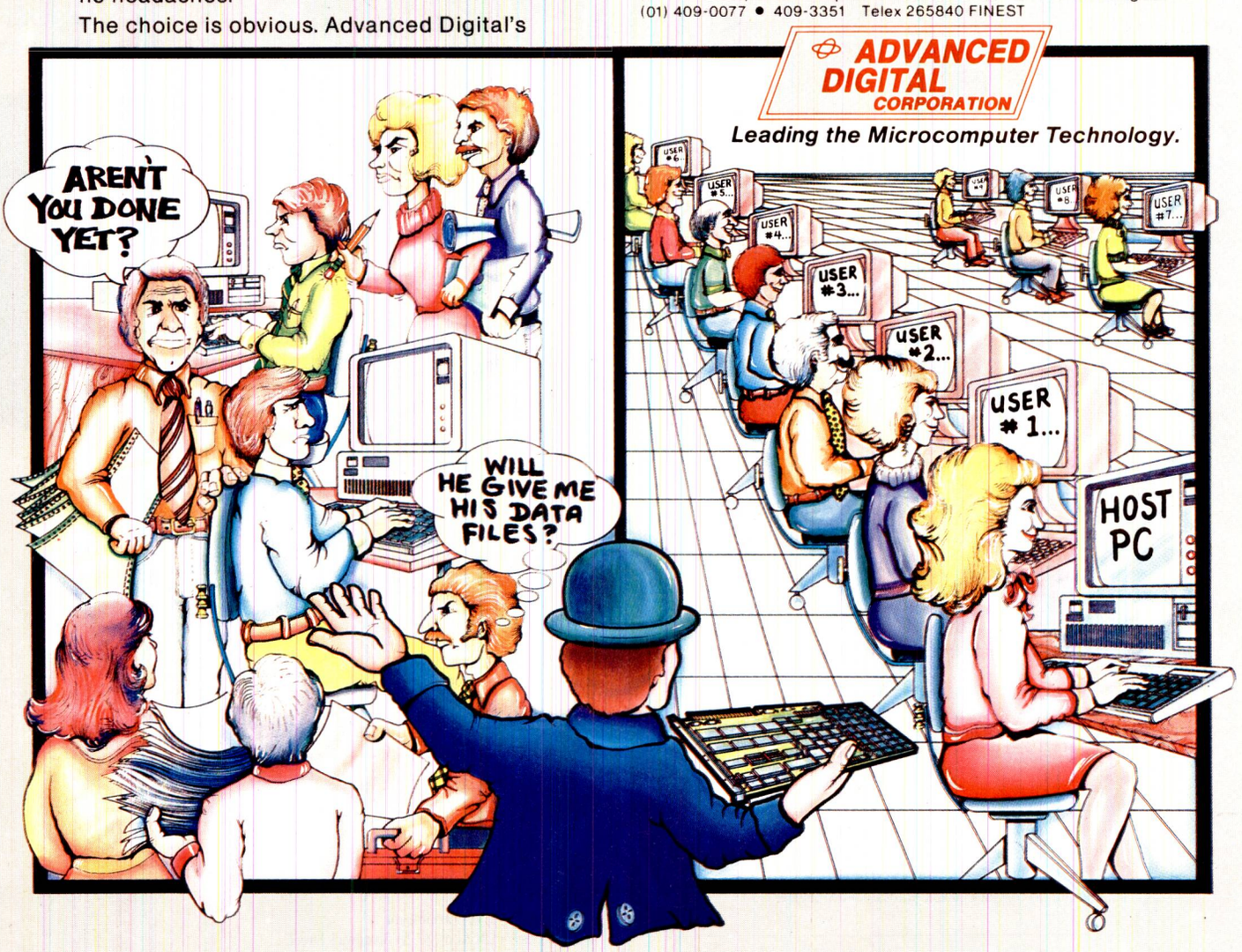

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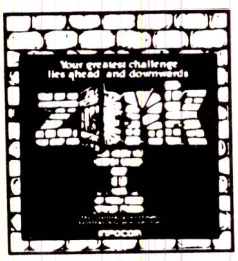

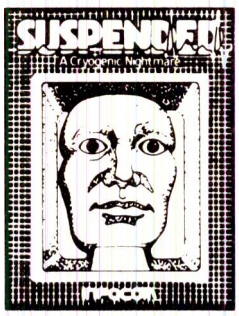

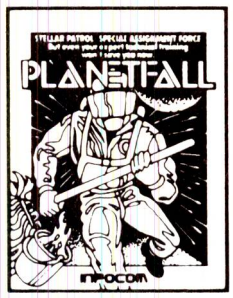

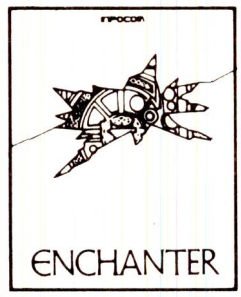

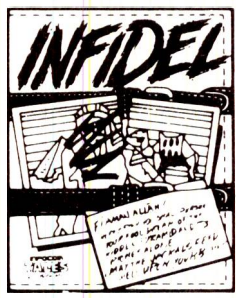

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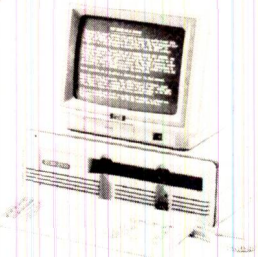

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THE C LANGUAGE

Several new libraries, a few version changes on compilers, and many lower prices notably RUN/C & Microsoft C.

C COMPILERS

8-bit	Aztec C Personal v1.06	£150
	Aztec Commercial v1.06	£250
	BDS C v1.50a	£110
	Toolworks C/80 v3.1	£ 45
	Eco-C v3.1	£140
16-bit	Aztec C86 Personal v3.2	£150
	Aztec C86 Commercl.v3.2	£325
	CI Optimizing C86 v2.3	£270
	C-Systems C v2.0	£210
	De Smet C88 v2.4	£145
	Digital Research C v1.1	£270
	Lattice C v2.15	£325
	Mark Williams MWC86 2.0	£360
	Microsoft C v3.0	£325
	Toolworks C/86 v3.1	£ 45
	Wizard C v2.1	£350

C INTERPRETERS

	Instant-C v1.27	£375
	RUN/C v1.1	£ 99
	C-terp	£250
	Introducing C	£125

C LIBRARIES

Data base	C-tree (source)	£295
	Multikey	£170
	db-VISTA (source)	£375
	Btrieve	£245
	C-to-dBase (source)	£120
	SoftFocus Btree(source)	£ 70
	Softfocus ISAM (source)	£ 40
	dBC (dBASE III)	£195
Graphics	Multi-HALO	£195
	GraphiC v2.1	£225
	MetaWINDOWS	£140
Screen	Panel	£245
	Lattice Windows	£195
	Windows for C	£185
	C Power Windows	£ 95
Misc	Greenleaf Functions,sce	£155
	C Food Smorgasbord	£120
	Plink-86	£295
	Pfix Plus	£295
	C Helper, source	£135
	C Refiner	£145
	Basic C	£150
	Bastoc	£295

More libraries not listed here.

DISK COPYING SERVICE

Moving data and program files from one machine to another is often made difficult because different manufacturers have adopted different disk format standards.

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Our charge is £10.00 + disk + VAT. Special prices for quantities.

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FORTRAN COMPILERS

A new version 3.3 from Microsoft this month. We also stock a variety of Fortran subroutine libraries.

8-bit	Nevada Fortran	£ 35
	Pro-Fortran	£199
	Microsoft Fortran	£335
16-bit	Microsoft Fortran v3.2	£ 95
	Microsoft Fortran v3.3	£235
	DR Fortran 77	£270
	Pro-Fortran	£290
	Lahey Fortran F77L	£435
	RM/FORTRAN 77	£450

For advice or information call us.

HIGH-LEVEL LANGUAGES

If you need more than a conventional 'procedural' language to solve your problem then we can advise which of these languages might suit you.

PROLOG

8-bit	micro-PROLOG	£ 75
	PROLOG-1	£225
16-bit	PROLOG-86	£135
	micro-PROLOG v3.1	£150
	micro-PROLOG Prof.	£265
	PROLOG-1	£299

LISP

8-bit	Toolworks LISP/80	£ 45
	iLisp	£ 75
	Waltz Lisp	£165
16-bit	Toolworks LISP/86	£ 45
	IQ Lisp	£195
	muLisp-86	£240
	Gold Common Lisp	£550
	Waltz Lisp	£165
	TLC Lisp	£225

NIAL, SNOBOL, muMATH

muMath/muSimp	£200
Q'Nial (IBM PC)	£350
SNOBOL4+	£115

EXPERT SYSTEM SHELLS

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APES	£150
ES/P ADVISOR	£595
Insight 1	£ 80
Insight 2	£395

SMALLTALK

Methods (PC-DOS)	£195

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PRICES & DELIVERY

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We have many other programming tools for which there is no space here.

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MODULA-2 & ADA

Janus C-Pack is a bargain and the Zurich compiler is gaining friends.

MODULA-2 COMPILERS

Modula Corp	(MS-DOS)	£120
Zurich Compiler	(Z80 CPM)	£140
Volition	(various)	from £265
Logitech	(MS-DOS,CP/M-86)	£380
Interface SDS-XP	(PC-DOS)	£195
Interface SDS	(PC-DOS)	£ 99

ADA (subset) COMPILERS

Augusta	(CP/M-80)	£ 80
Supersoft	(CP/M-80)	£250
Janus D-Pack	(CP/M-86,MS-DOS)	£750
Janus C-Pack	(CP/M-86,MS-DOS)	£ 99

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THE BASIC LANGUAGE

New is multi-tasking MTBASIC, and price changes both up and down.

8-bit	CBASIC	£125
	CBASIC Compiler	£385
	MBASIC Interpreter	£ 80
	MBASIC Compiler(BASCOM)	£260
	BBC BASIC Interpreter	£ 95
	S-BASIC Compiler	£185
	ALCOR multi-BASIC	£ 95
	MTBASIC v2.6a	£ 65
16-bit	GW-BASIC 2.0 Interpreter	£ 95
	GW-BASIC Compiler	£125
	MS-BASIC Interpreter	£235
	MS-BASIC Compiler	£260
	MS Bus.Basic Compiler	£325
	CBASIC	£250
	CBASIC Compiler	£450
	Applications BASIC	£395
	Better BASIC	£195
	MEGABASIC	£375
	Professional BASIC	£ 99
	ALCOR Multi-BASIC	£ 95
	MTBASIC v2.6b	£ 65

For advice or information call us.

PASCAL COMPILERS

The new version from Microsoft is in stock and some new libraries.

8-bit	Turbo Pascal v3.0	£ 55
	DR Pascal/MT+	£ 99
	Pro Pascal	£199
16-bit	Turbo Pascal v3.0	£ 55
	Microsoft Pascal 3.2	£ 95
	Microsoft Pascal 3.3	£195
	SBB Personal	£160
	SBB Professional	£395
	Practical Pascal	£145
	Pro Pascal	£290
	DR Pascal/MT+86	£295

PASCAL LIBRARIES

Turbo Toolbox	Turbo Graphix
Paragon Supertools	Blaise Tools
Turbo Tutor	Asynch Manager
Btrieve	Shark
MetaWINDOWS	Multi-Halo
Prospect	Panel
View Manager	Turbo Screen

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Each of the programs are inter-active and together they form the most accomplished graphics toolkit you will find on the market today.

But you can also use each of them separately, as each are self-contained and cover a specific area of graphics programming.

With Print 'n' Plotter's 'GRAPHICS SUITE', everything is made so simple you won't believe it.



Just a few of the things you can do...

PAINTPLUS (GRAPHICS SUITE 1)

If you want to produce fantastic screen graphics or UDG's on your Spectrum, then you will find PAINTPLUS not only a complete graphics toolkit . . . but also the simplest to use at every level.

Facilities include: DRAW, PLOT, ARC, CIRCLE, FILL IN SOLID OR PATTERNS, FILL IN OVER MODE, DRAW RADIALLY, ARC RADIALLY, ENLARGE TO EDIT, PAPER WASH, BOX DRAW and so on . . .

As well as drawing, PAINTPLUS has a tremendous UDG section. It also has UDG "grabbing" from screen as well as full facilities for defining, saving and loading UDG sets.

The Organiser section of the program enables you to automatically store multiple screen graphics or multiple UDG banks.

PAINTPLUS comes with a demo of screens, animation and alternative character sets, plus a copy of Print 'n' Plotter PICTURE BOOK – 100 pages of instructions, hints, tips, listings and related graphics information.

SCREEN MACHINE (GRAPHICS SUITE 2)

SCREEN MACHINE is *the* graphics manipulator.

Use it when you want to take your graphics and turn them into professional machine coded data for use in BASIC or M/Code programs.

For instance:

SCREEN MACHINE will compress the memory consumption of your graphics to cram even more into the computer's memory –

As well as memory compression, SCREEN MACHINE allows you to put your graphics through a series of highly-sophisticated graphics manipulations.

These include ENLARGE, REDUCE, RELOCATE TO OTHER PARTS OF THE SCREEN, STEP AND REPEAT, BLEND SCREENS TOGETHER, RECOLOUR SELECTIVELY OR GLOBALLY, FLIP SCREEN, etc.

And SCREEN MACHINE also has a dedicated Text Compiler – ideal for anyone who uses lots of text for instructions or menus on screen.

SCREEN MACHINE also comes with a copy of PICTURE BOOK and a demo that's so good you can't believe it.

ART-O-MATIC (GRAPHICS SUITE 3)

Ever wanted to produce screen graphics for Adventure Games, Educational, Training, or Scientific programs and run out of memory because the graphics handling consumed too much memory?

If so, you need ART-O-MATIC, Print 'n' Plotter's great new graphics compiler.

With ART-O-MATIC you can draw, define and store an incredible number of screens or parts of screen in your programs as compiled instant machine code which is usable from BASIC or M/C.

The exact amount of compression possible depends on your graphics, but up to 99% is possible and an average of 85%-90% is usual.

ART-O-MATIC is a complete graphics drawing program, so you can produce your works of art and compile at the same time.

The instruction book and demo that comes with the program show you *everything* you need to know about cramming great graphics into your Spectrum.

SPRITE MACHINE (GRAPHICS SUITE 4)

There have been a number of programs called Sprite Generators. Most of these are self-contained and not a great deal of use to people who want to use Sprites in their own programs.

SPRITE MACHINE is different. This program was written with *you* in mind – whether you are a professional, amateur or beginner.

There's never been a simpler Sprite program to use. All you have to do is draw your Sprite and then choose from a fantastic range of options to get it doing what *you* want.

You can: animate your Sprites, choose any direction and starting position, adjust speed, adjust height, choose running time, decide on edge actions such as bounce, wraparound, reflect or stop, make intelligent decisions like strike and collision actions, colour your Sprites or take colour from the screen, trace or non-trace, etc.

The program comes complete with a cursor-operated Sprite drawing board and catalogue/store function.

Instruction booklet and demo are included with the program.

Now *you* can have professional Sprites in *every* program you write.

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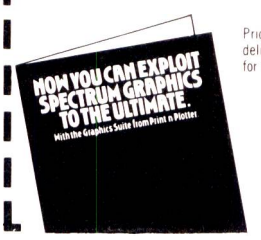

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AB31

CHIP CHAT



In a last-ditch attempt to get his picture into* PCW, *Virgin Games supremo Nick Alexander dressed himself and three hapless members of the staff from Branson's high-tech Lubyianka in rabbit suits, and had them crouch in a field.

Naturally, this publicity-crazed person will not get his heart's desire, but he looks very, very unpleasantly silly in that outfit. About as silly as he will look selling Rabbit's exhumed games catalogue, which was the supposed point of the whole sordid exercise.

Chatting over the wall: The Microsoft MSX symposium in Berlin must have been a riot. There was Frank Lech, last seen here as UK head of ComputerLand, now ensconced at Philips in Eindhoven. There was Masao Morita of Sony, surely some relation to founder Akio. And there were the MSX maestros themselves, Microsoft's Bill Gates and ASCII's Kay Nishi. Lech, according to a transcript of his speech, said that 'MSX is one of the borderstone in standardsetting', while the German announcement simply said that '150 Softwareentwickler und Fachjournalisten' had heard about 'interaktive Heimelectronik auf MSX-Basis'.

And yes, this is another of those pieces making fun of foreigners.

★ ★ ★

Age before beauty: The somewhat . . . well, stodgy British Computer Society has woken up to a bright new era. Gone are the days of simple salary surveys, big dinners with dull lectures, and pages of *Computing* to fill with reports of salary surveys, big dinners and dull lectures.

Enter the Association of Young Computer Enthusiasts (AYCE, geddit?), with its own newspaper featuring that well-known young computer enthusiast, Michael Rodd, reminiscing about the Leo computer of the 1950s. AYCE is 'an initiative' by the BCS, complete with a prize carrot dangled before early members: a visit to the computerised Epcot in Florida's Disney World.

AYCE News is no *Just Seventeen*, although the pastel pinks and greens show that a designer looked at it once. And it may find that the picture on the front page of AYCE's new chairman, who may just have been a young computer enthusiast a quarter of a century ago, is more of a hindrance than a help.

Back to the big dinners, please.

Memo from Marketing

To: Sales Manager, United Kingdom Personal Computers (Sales) Plc

Re: New thrust into corporate markets, and so on

AS CONFIDENTIAL AS YOU CAN GET

Well, yes, it's all very fine for you to get up onto the chairman's knee, figuratively speaking thank God, and talk the poor old soul into backing a direct sales force.

The cost in Cavaliers and jacket-hangers for the rear windows of same is bad enough, but let that pass. The old man has been a car buff since Mercedes and Benz were boys, so that was bound to go through on the nod.

But selling to the Times 1000, assuming that that is some Murdoch-style list of cash-rich corporations? Do you realise what your brand-new, Brut-sodden sales force is going to find when it carries its luxurious Slithertex attache case over the threshold? At least three crew-cutted IBM clones ensconced in reception, all spec sheets and co-respondent shoes, queuing up to give the board the sales pitch. And behind them in the queue will be the freshly-polished Gummer lookalikes who pass for Compaq salesmen these days, not to mention the sharkskin suits and fedoras of the Olivetti heavies, all aiming at department heads that the IBM boys couldn't be bothered to devour.

There may even be some poor sod from the local Apricot dealer trying to talk the receptionist into a lift pass and pretending that the Apricot Portable under his arm is a computer, honestly.

And all of them, as far as the direct sales pecking order goes, could woodpecker your YOP graduates deep into the parquet.

You, me, the world and his wife, and even the chairman in his lucid intervals know that the chinless sloanes on the boards and the power-crazed mainframe milkers in the DP departments of our 'leaner, fitter, great companies' (© Leon Brittan, ad infinitum) would not touch our machines with the proverbial. The same cast of characters knows that the UKPC line is faster, has prettier pictures on the screen, and runs IBM PC software that IBM hasn't even heard of. Or so, at least, those loonies in R&D inform me.

So why aren't the money-men in their thousands swarming all over us with eyeballs and cheque books akimbo? Honestly, old chap, only the terminally naive would even bring up that question at a board meeting — and that the chairman did just proves that our share price has nothing to do with business acumen. What these big-company bozos require is a nice, simple checksheet from the same IBM salesman who has been doorstepping them for the last nine months, spectacles gleaming in the corporate floodlights. You know the kind of thing: Please leave one mainframe (large), three of those office automation system thingies (batteries included), forty-eight typewriters (various), and perhaps a couple of dozen of those personal computer things (networked).

The DP manager just ticks the boxes, the chairman's hand is lifted limply to place his thumbprint on the dotted line, and the form is stuck in a milk bottle outside HQ. Next thing, the whole damn shooting match is an IBM closed shop and another little red flag goes into the battle map at Baltic House.

Now, fighting IBM at its own game — particularly when it is throwing PCs in with its office systems, and making the milk-bottle scenario easier by putting the clapped out things in the same division as typewriters — is a fast route to the knacker's, as ICL has recently almost shown. The Putney Pygmy is now reduced to saying that its five-year-old PC design beats IBM because it is multi-user, as long as you don't get* too *multi.

So, although the pain may be intense, we have to stick with those hundreds of price-cutting cowboys you appointed as dealers last year, and hope they can stay awake long enough to con the small businessman into sticking a UKPC on his blotter, next to the bailiff's dunning letters and the well-thumbed copy of the* Sun *with the hard words underlined.

It's hard, God knows, to depend on this simian crew for our BMWs and BUPA this year, but the Cavalier Armada would have us all back on Tebbit's two wheels before the quarter is out.

Will you be at the boardroom cocktail soiree? Before the chairman's ambulance comes to take him home, we must discuss this further.

Yours on four wheels, just.

James

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