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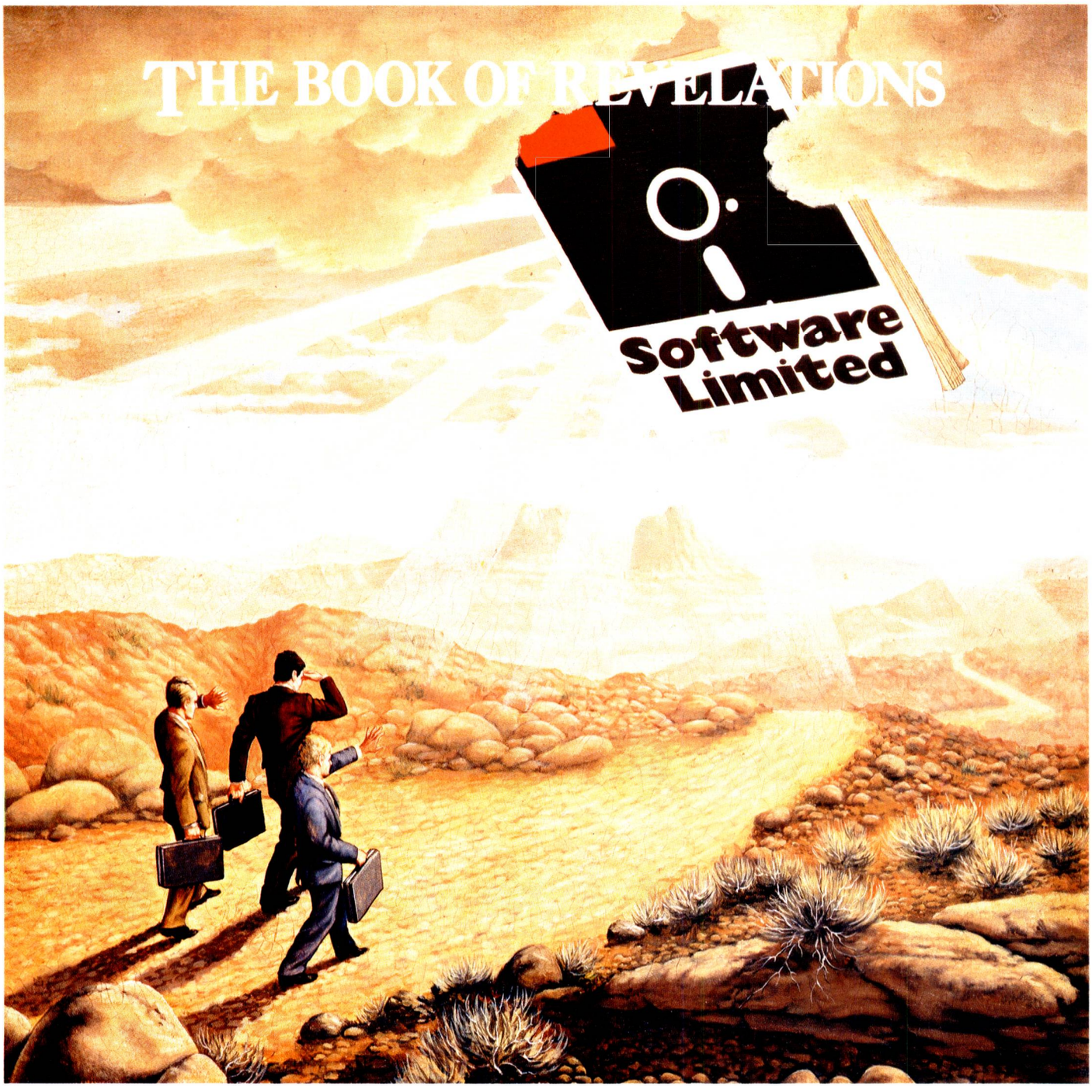

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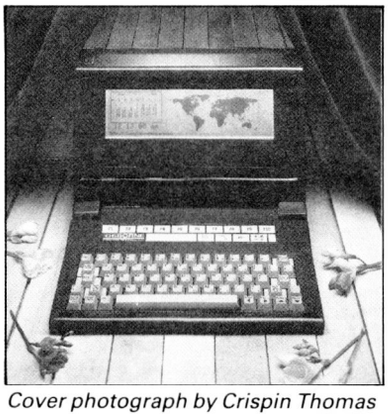

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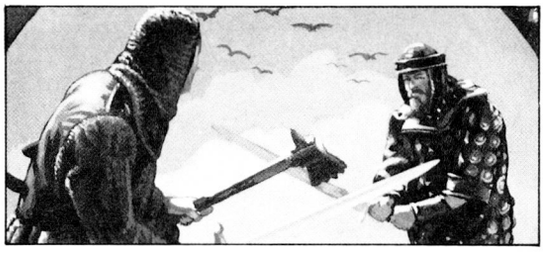

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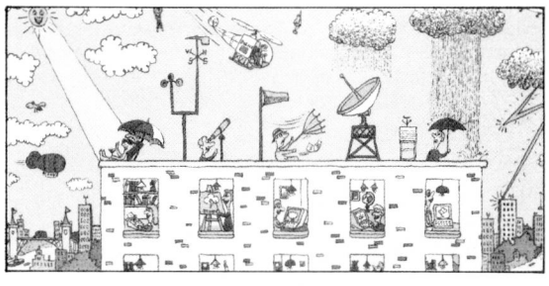

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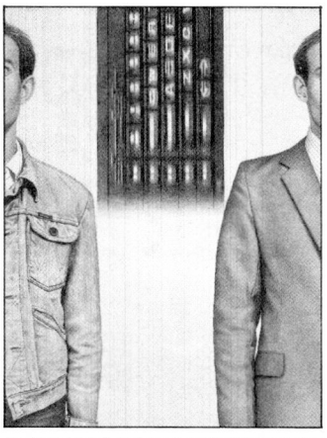

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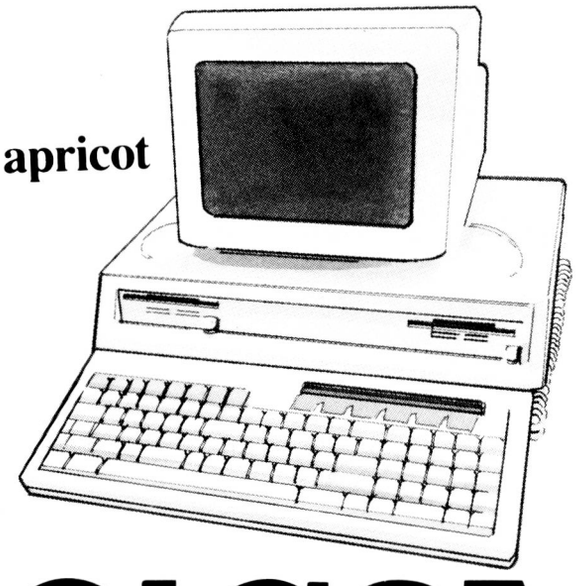

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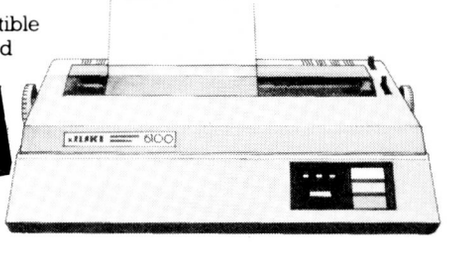

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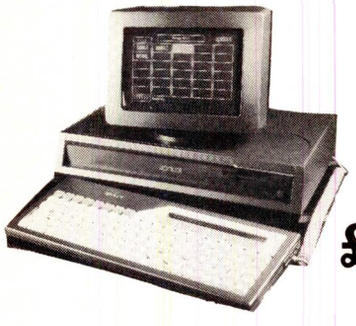

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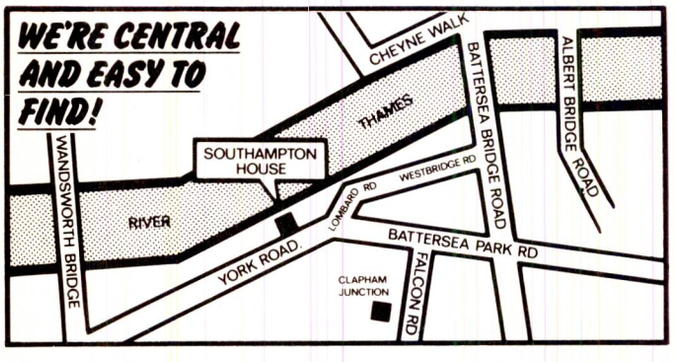

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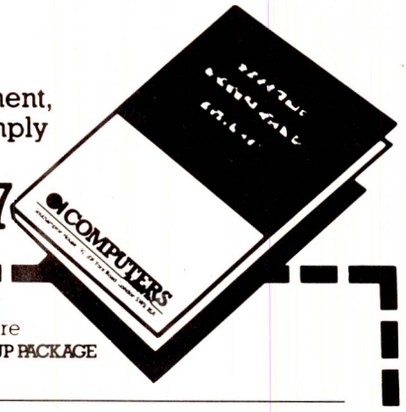

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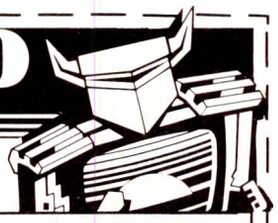

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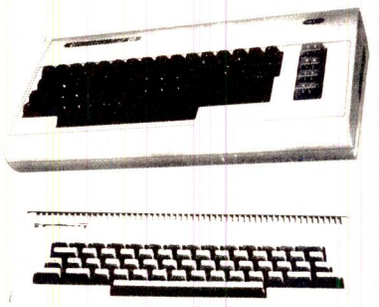

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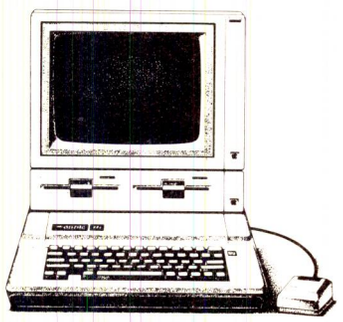

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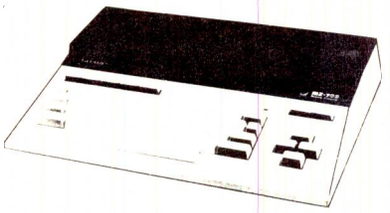

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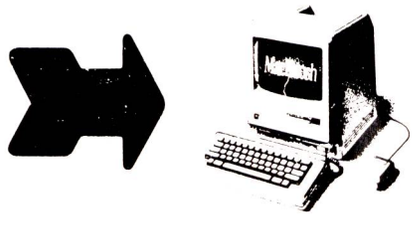

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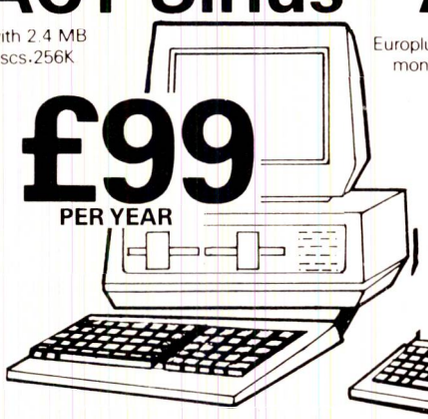

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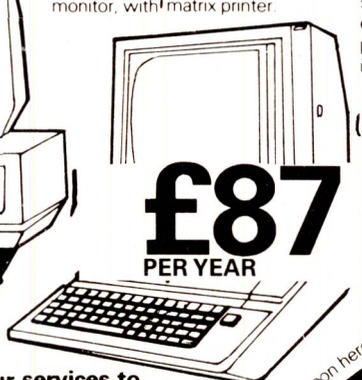

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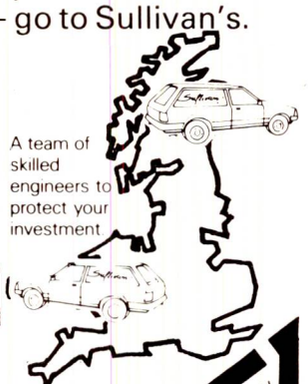

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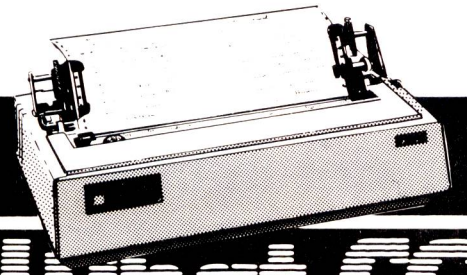

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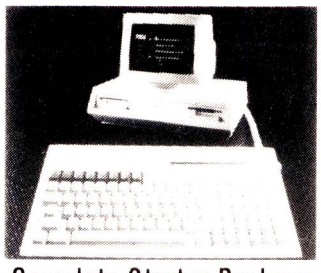

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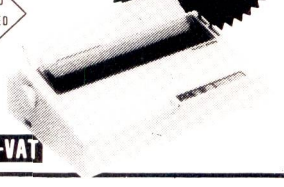

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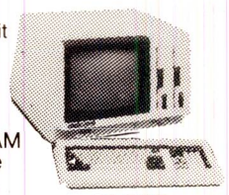

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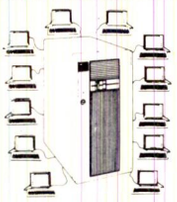

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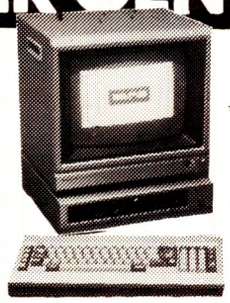

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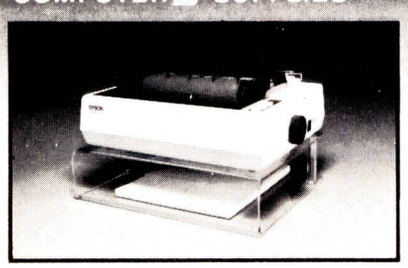

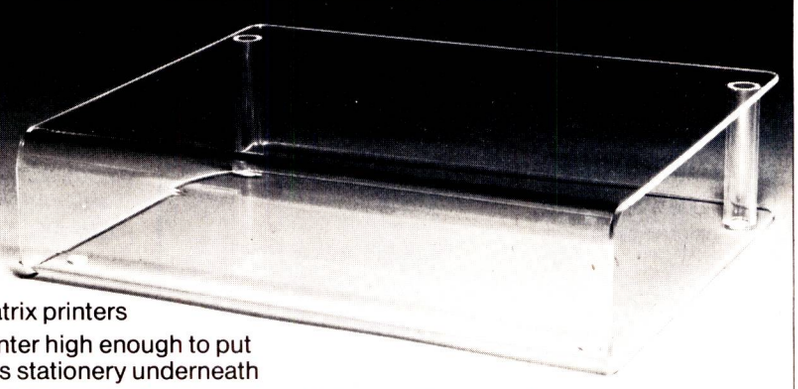

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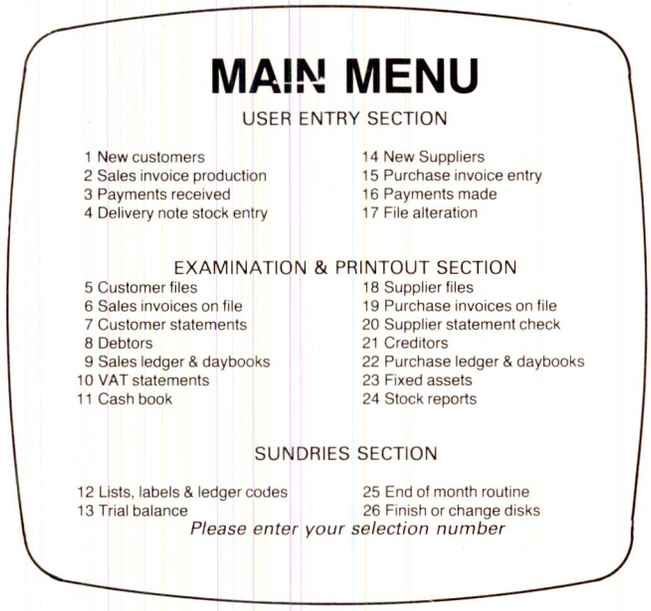

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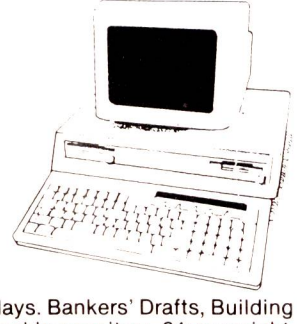

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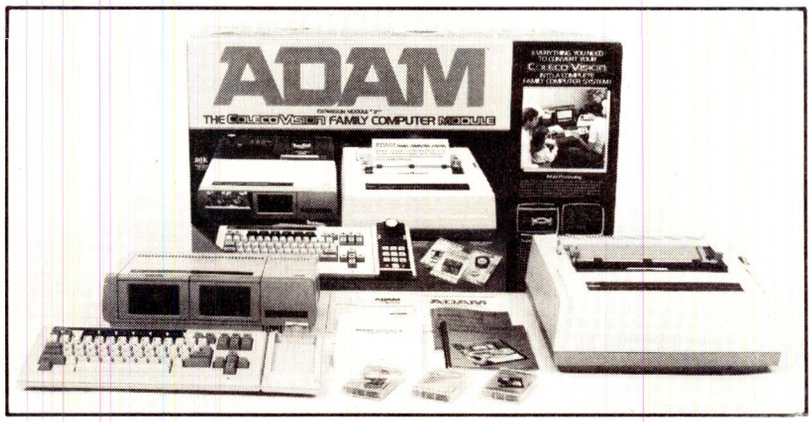

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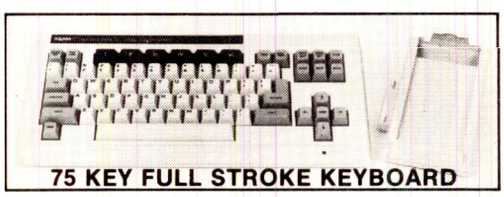

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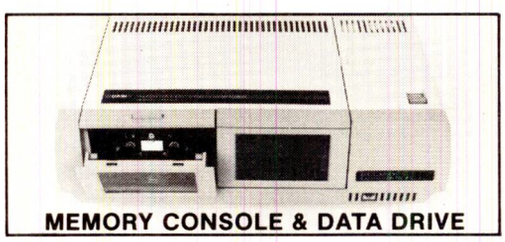
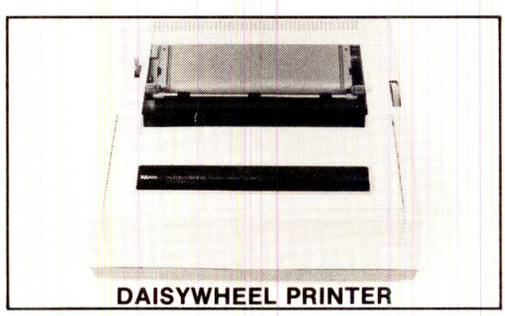
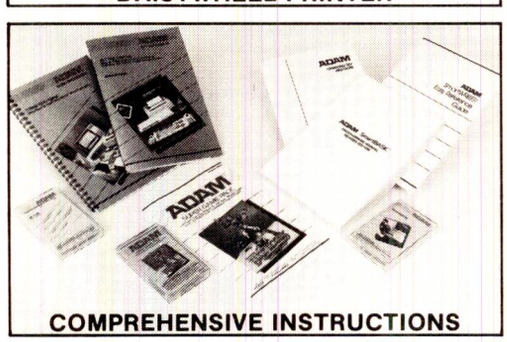


MEMORY CONSOLE & DATA DRIVE



DAISYWHEEL PRINTER



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COLECOVISION GAMES CONSOLE

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If you're looking for real value in a computer system, one which can handle anything from serious Word Processing to enhanced Colecovision style video games such as Buck Rogers, look no further. The Coleco Adam is here with a package which will make you wonder if you're dreaming when we tell you about it. A price breakthrough in computer systems, Adam is comprised of an 80K RAM memory console with a built-in 256K digital data drive; a professional quality, stepped and sculptured 75 key full-stroke keyboard; a letter quality daisywheel printer and a full word processing program built into the Console. Two additional pieces of software, Smart BASIC and also 'Buck Rogers - Planet of Zoom' (the ultimate in advanced video games), are included as well as a blank digital data pack. Adam can be used with any domestic colour Television set.*

MEMORY CONSOLE/DATA DRIVE: *The heart of the Adam system is the 40K ROM and 64K RAM memory console which combines with the 32K ROM and 16K RAM in Colecovision to give you a total of 72K ROM (including 24K cartridge ROM) and 80K RAM (expandable to 144K). Built into the memory console is a digital data drive which accepts Adam's digital data packs, a fast and reliable mass storage medium that is capable of storing 256K of information, that's about 250 pages of double spaced text! The console is also designed to accomodate a second optional digital data drive.

FULL STROKE KEYBOARD: The Adam keyboard has been designed as a professional quality keyboard that combines ease of use with an impressive array of features. It is stepped and sculptured for maximum efficiency and has 75 full stroke keys which include 6 colour coded Smart Keys which are redefined for each new application; 10 command keys which are dedicated to the word processing function, and 5 cursor control keys for easy positioning of the cursor at any point on the screen. You can attach a Colecovision controller to the keyboard to function as a numeric keypad for easy data entry. It can also be held like a calculator, a feature which makes working with numbers particularly easy. The joystick part of the hand controller can be used in the same way as the cursor control keys, to move the cursor around the screen.

LETTER QUALITY PRINTER: The Smart Writer letter quality daisywheel printer is a bi-directional 80 column printer which prints at a rate of 120 words per minute. It uses standard interchangeable daisywheels, so a variety of typestyles are available. The printer has a 9.5 inch wide carriage for either single sheets or continuous fan fold paper and uses standard carbon ribbons. It is comparable to many printers which cost as much as the total Adam package. The printer can be used either with the Adam's Smart Writer word processing program or as a stand alone electronic typewriter.

BUILT-IN WORD PROCESSOR: Adam comes with Smart Writer word processing built-in. This program is so easy to use that you only have to turn the power on and the word processor is on line and ready to go. Detailed instruction books are not necessary as the Computer guides you step by step, working from a series of Menu commands. It enables you to type in text, then completely edit or revise it with the touch of a few keys. Changes are readily made and a series of queries from the computer confirm your intentions, so that you can continuously double check your work as you type.

COMPATIBILITY WITH COLECOVISION: By using high speed interactive microprocessors in each of the modules, the Coleco Adam is designed to take additional advantage of both the 32K ROM and 16K RAM memory capability in the Colecovision. If you do not already own a Colecovision Console (£99 inc VAT), then you will need to purchase this when you initially purchase your Adam Computer package (£499 inc VAT), making a total purchase price of (£598 inc VAT).

WHAT IS COLECOVISION: Colecovision is one of the worlds most powerful video game systems, capable of displaying arcade quality colour graphics of incredible quality on a standard Colour TV set. The console (see picture bottom left) accepts 24K ROM cartridges such as Turbo and Zaxxon and is supplied with the popular Donkey Kong cartridge and a pair of joystick controllers. Colecovision has a range of licenced arcade hits available such as: Gorf, Carnival, Cosmic Avenger, Mouse Trap, Ladybug, Venture, Smurf, Pepper II, Space Panic, Looping, Space Fury, Mr Do, Time Pilot, Wizard of Wor and many others. So there you have it, Adam plus Colecovision the unbeatable combination. Send the coupon below for your FREE copy of our 12 page Colour brochure giving details on the complete Adam system.

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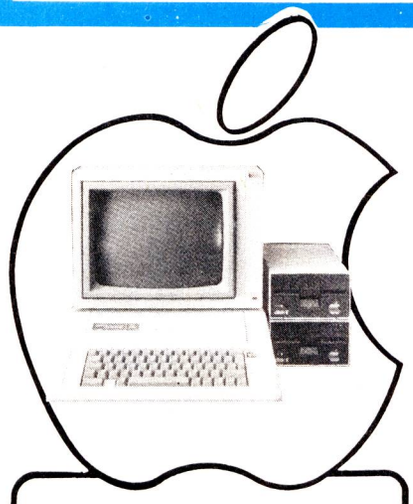

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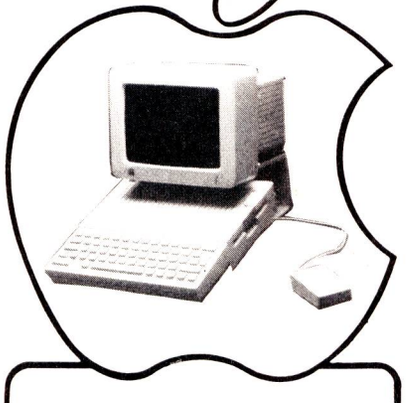

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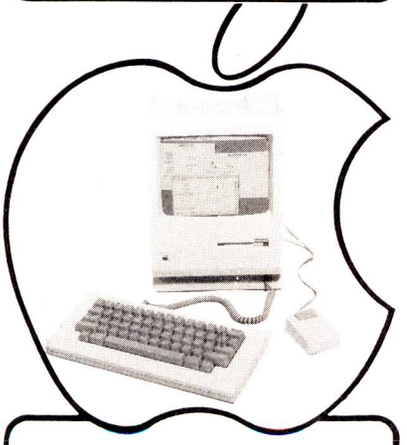

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1DIG-006	Digitek Printmaster (Basic, CP/M, Pascal)	69.00	79.35
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1GRM-001	IPB 16K (serial/parallel & buffer)	122.00	140.50
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1VIS-002	Applewriter II preboot disk (Vision 80)	18.00	20.70
1ELI-003	Ramview 80 IIe	52.55	60.43
1ELI-004	Ramview 80 64K IIe	125.00	143.75
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1UMI-002	Uterm (inc shift mod & front editor)	127.00	146.05
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1VID-024	Ultraterm AW preboot disk	12.30	14.14
1VID-023	Ultraterm VC preboot disk	29.40	33.81
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1VID-010	Videx Inverse Eprom	18.45	21.21
1VID-001	Videx Videoterm	175.00	201.25
1VIS-003	Visicalc preboot disc (gives 80 cols with Vision 80)	39.00	44.85
1VIS-001	Vision-80 (inc softswitch & inverse)	185.00	212.75
1TYT-002	VC-Expand 80	47.00	54.05
1VER-001	Super Expander 80.2	76.00	87.40

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1DIG-004	Digitek Colour card	79.00	90.85
1DMS-004	DMS RGB Colour card	75.00	86.25
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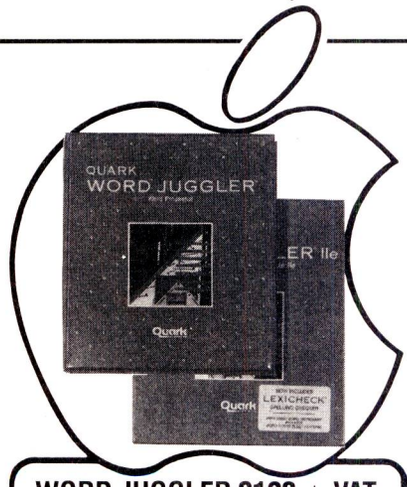

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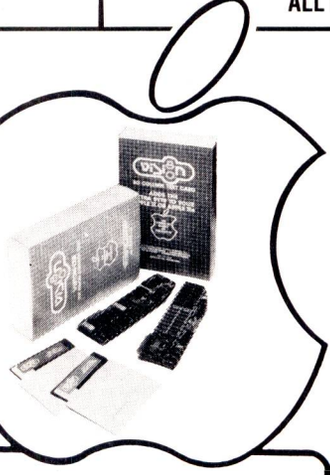

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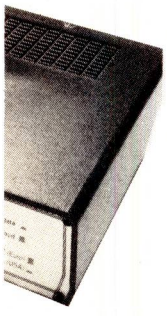

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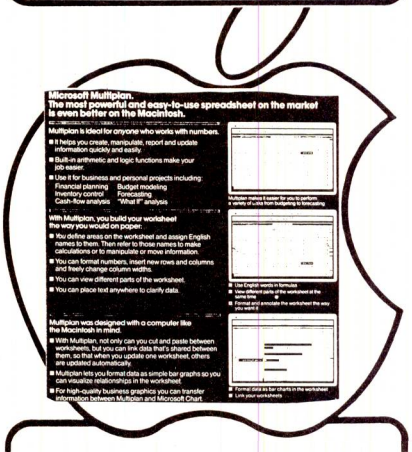

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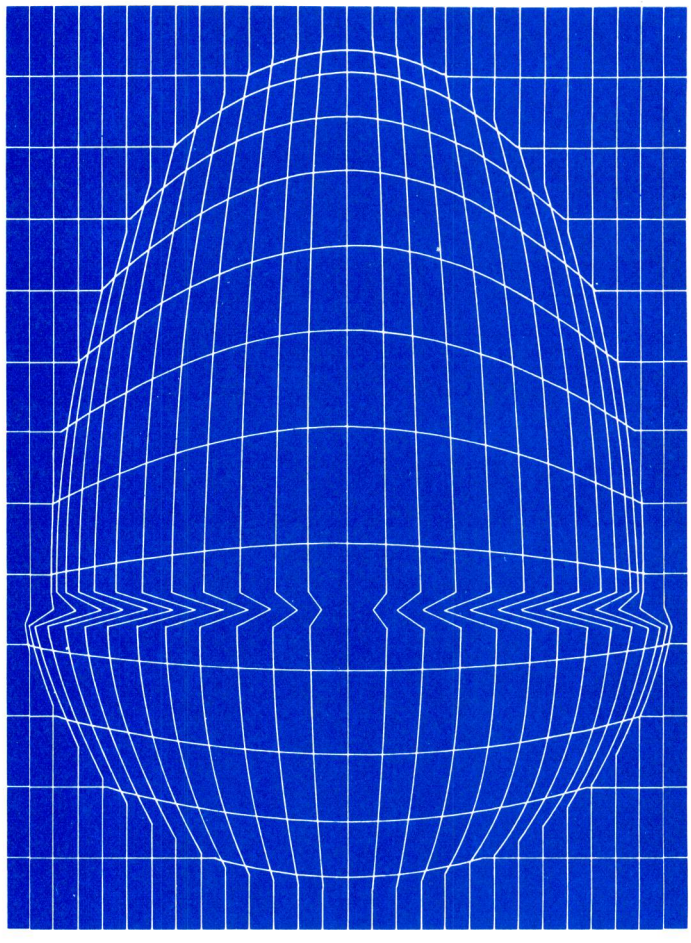
* Please note 10am to 2pm on Thursday 16th is Trade Morning – By invitation only.



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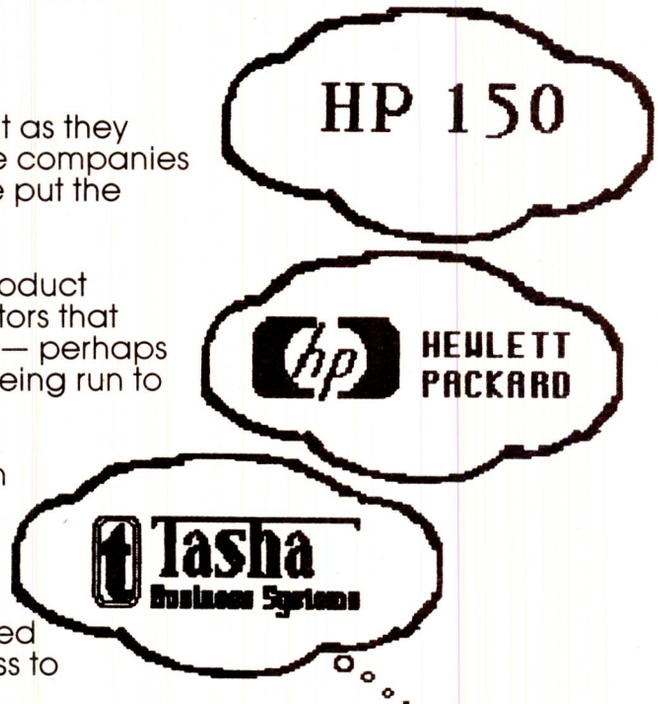

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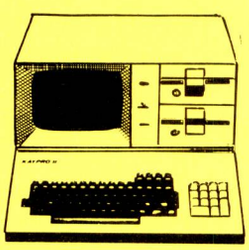

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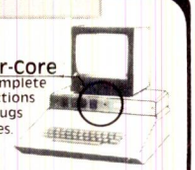

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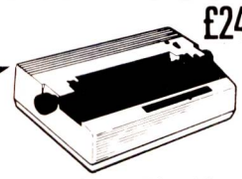

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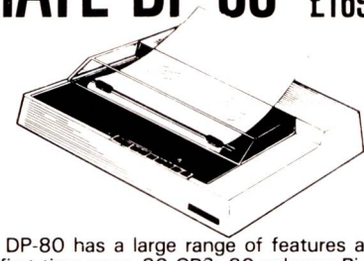

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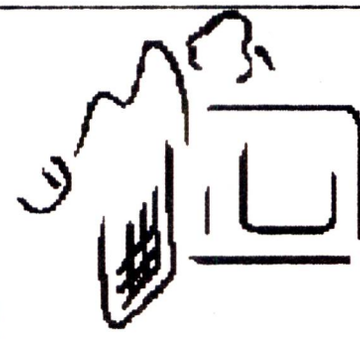

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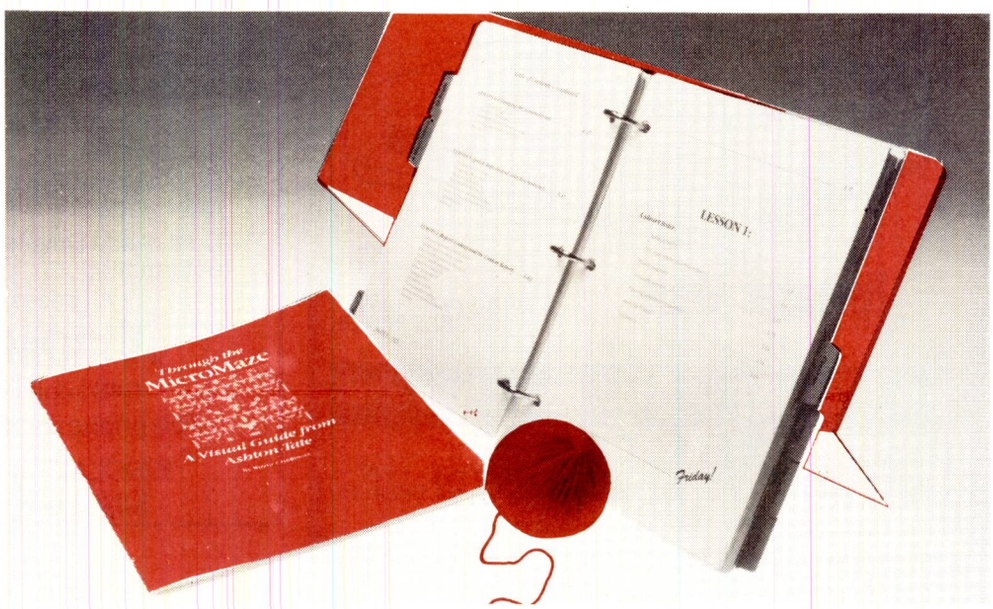

If all Theseus needed to find his way out of the maze was a ball of thread, isn't it time there was something just as simple to navigate the micromaze?

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A dBASE II User Group has been formed. For further details contact User Group Secretariat Caroline Tanner on 0908 568866.

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Available fonts are:

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★**Block**	Small capitals.
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★**Greek**	It's all Greek to me too!
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★**Maths**	A mix of until now unobtainable Mathematical symbols.
★**Miscellaneous**	A few oddities which often are very necessary.
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★**Thin**	Thin text (for MODEs 2&5) which makes modes 2 & 5 much more readable or perhaps "READABLE".
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The ROM has a dump facility which will produce a screen dump of any MODE from 0 to 6 on an Epson, Star printer, CTI CP80 or MT80.

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



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E.H.T.	Minimum 19.5kv Maximum 22.5kv
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DISPLAY	80 characters by 25 lines
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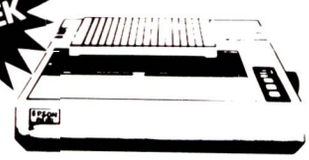

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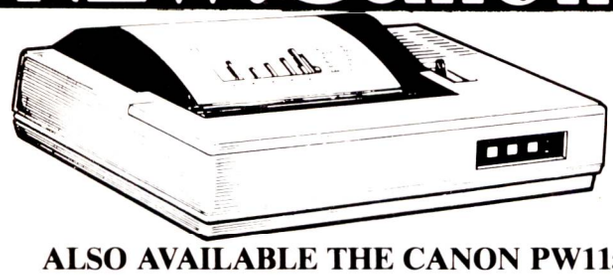

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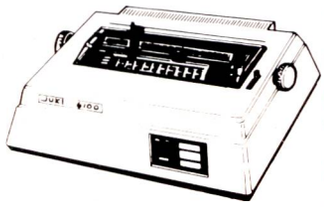

20CPS: Bidirectional & Logic 10, 12, 15 & Proportional Spacing; Wordstar compatable 2K Buffer; 13 inch Platen Underline; backspace & lots more Centronics Interface Standard

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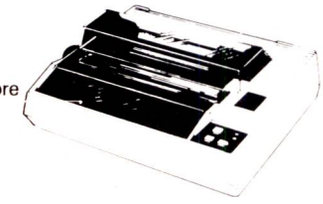

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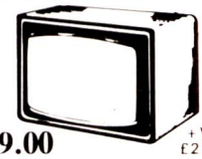

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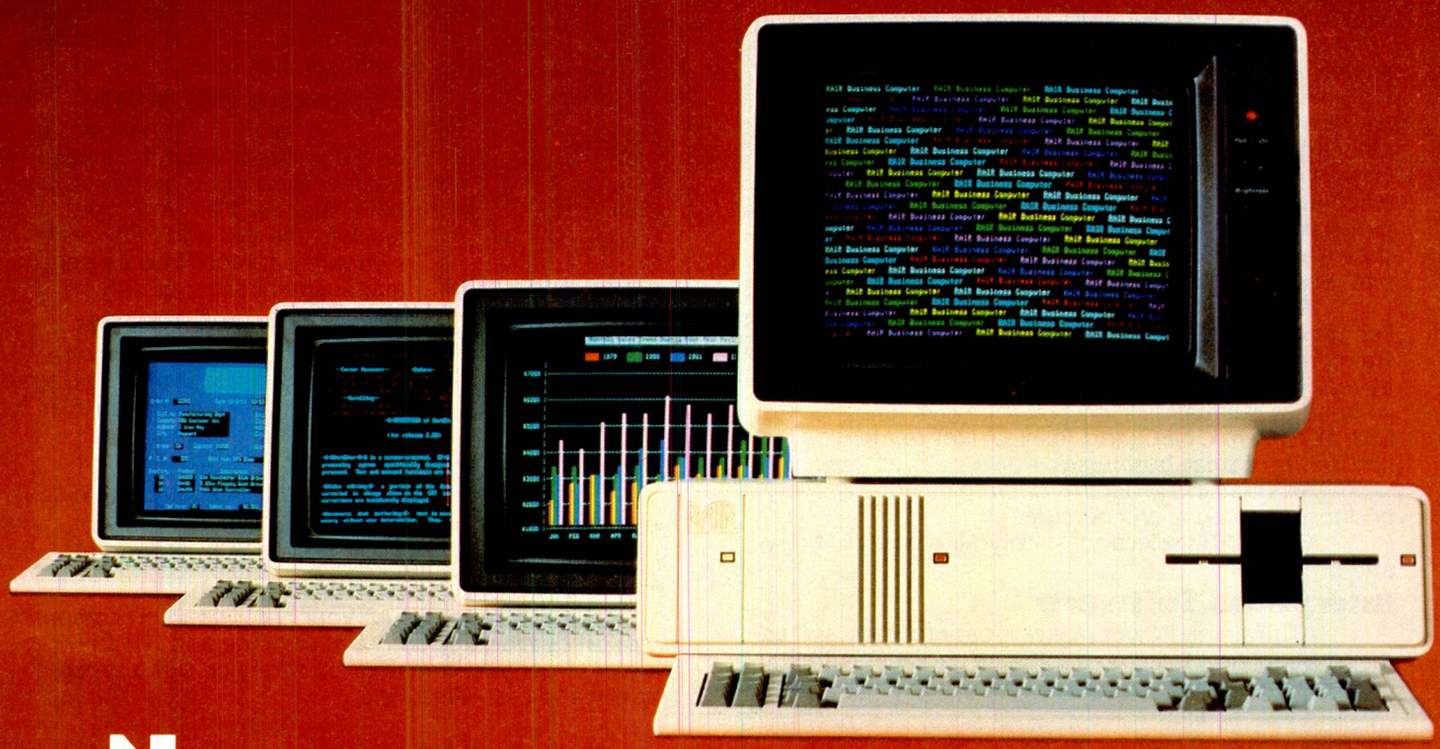

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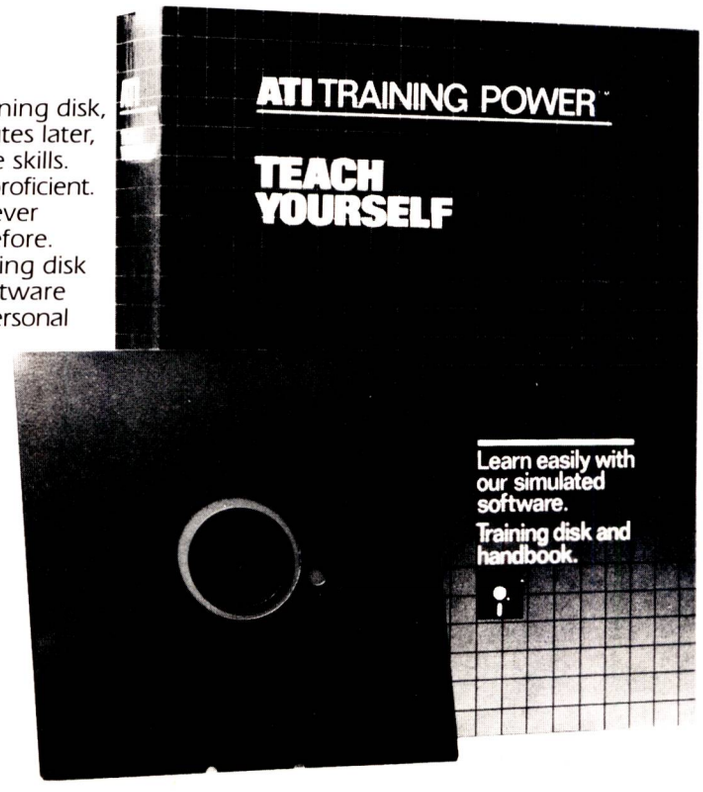

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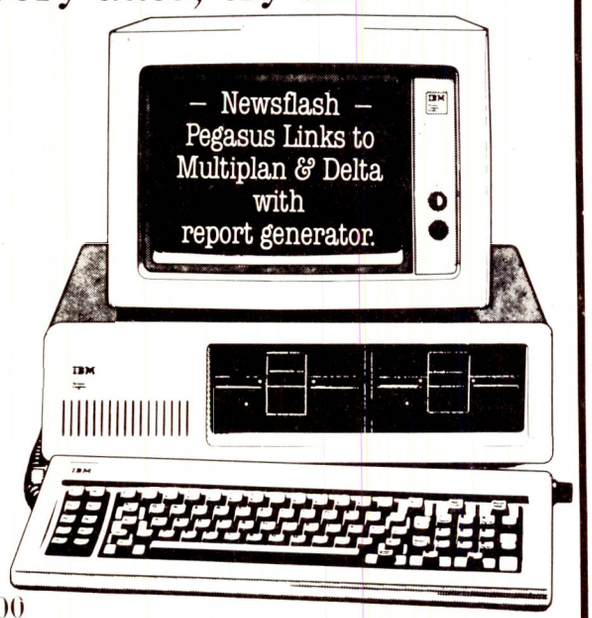

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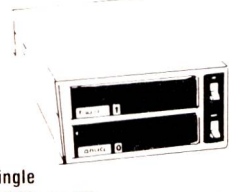

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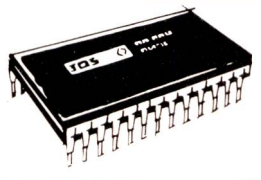

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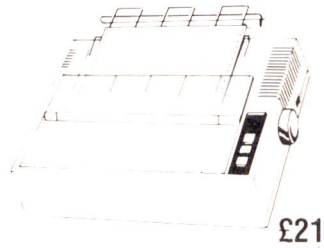

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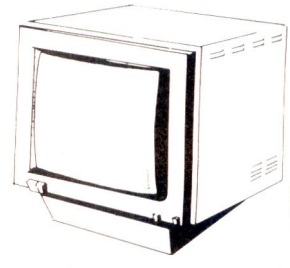

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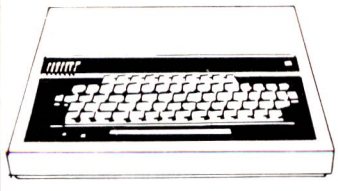

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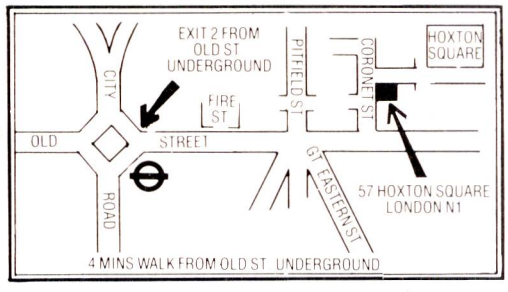

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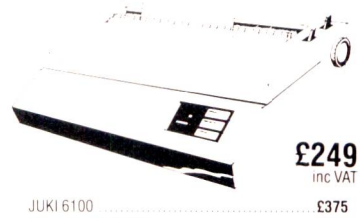

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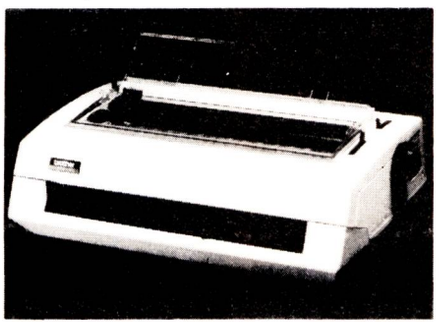

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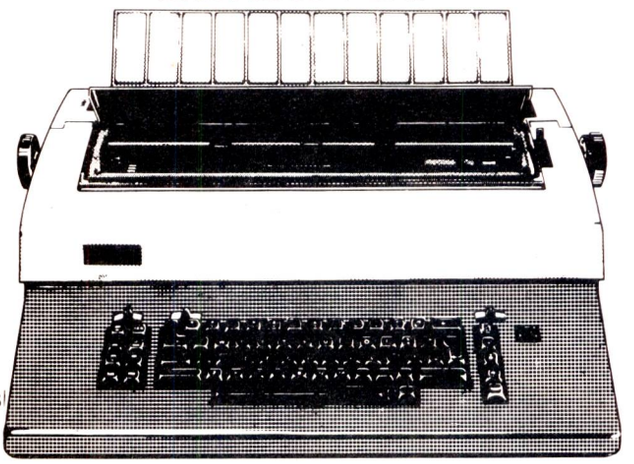

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sinclair

The new Electron from Acorn. Ask any child at school why it's worth £199.

Most British children have one thing in common with the new Electron microcomputer: they speak the same language.

You see, the Electron is the first micro remotely in this price range to use BBC Basic, the computer language that is rapidly becoming the standard in British schools.

But that's not all. Most children will feel at home with the Electron as soon as they lay hands on it.

This is because it has developed out of the Micro that has been chosen by over 80% of schools participating in the Government's current Micros In Schools project. It has a similar keyboard and has most of the functions of this much acclaimed (but naturally, more expensive) machine.



So now children will be able to continue their computer studies at home. They'll be able to use the same educational programs they use at school. And, if asked nicely, they'll be able to help willing adults take their first steps into computing.

All this for only £199.

A micro technology break-through.

And now a few reasons for adults why the Electron is such an exceptional machine at the price.

The Electron is neat and compact. Yet it is fast and powerful. (Full details, for the technically minded, are in the box opposite.)

It produces high quality sound using its own internal speaker.

And it offers a range of facilities many larger more expensive machines just cannot match.

For example the Electron's colour graphics have the highest resolution of any home computer.

This is because the chip that controls the graphics, specially designed by Acorn, is one of the most advanced of its kind. As a result, the Electron delivers twice as many characters across the screen as its closest competitor.

Built to last and to grow.

The Electron has been designed and built to be a permanent part of the family, year in year out.

Particular care has been paid to the keyboard. It is electric typewriter style: robustly constructed with a good, solid 'feel'. It has a space bar, and single entry keys for key commands.

In other words it's comfortable and easy to use, avoiding the need for the manual gymnastics sometimes associated with calculator style keyboards.

And it will grow with you via expansion modules, that Acorn are developing, to take peripheral additions such as printers and disc drives. So as your knowledge, interest and ambitions develop, the Electron can develop with you.

Additionally, to give you all the support you'll need to generate your own applications software, we've established a phone-in service attended by specialists to give advice, encouragement and practical help.

A gentle teacher.

The Electron plugs straight into virtually any TV set and cassette player so you will be



ready to go as soon as you get it home.

It comes not only with a comprehensive user guide, which describes the machine and its functions, but also with a book that takes you step by step through the basic principles of programming.



EXPERTS LIKE 'WHAT MICRO?' AND ME RATE THE ELECTRON HIGHER THAN ANY OF THE COMPETITION.



A free taste of its versatility.

You will also receive an "Introductory" cassette which will put the Electron through its paces showing you a little of what it can do with its 64k of memory (32k ROM, 32k RAM). The cassette will give you a taste of those exceptional colour graphics we mentioned earlier; of its ability to play and notate music, and show you how it might help in home accounting. It will challenge you to a few games and will, if you ask it, do your whole family's biorhythms in a matter of seconds.

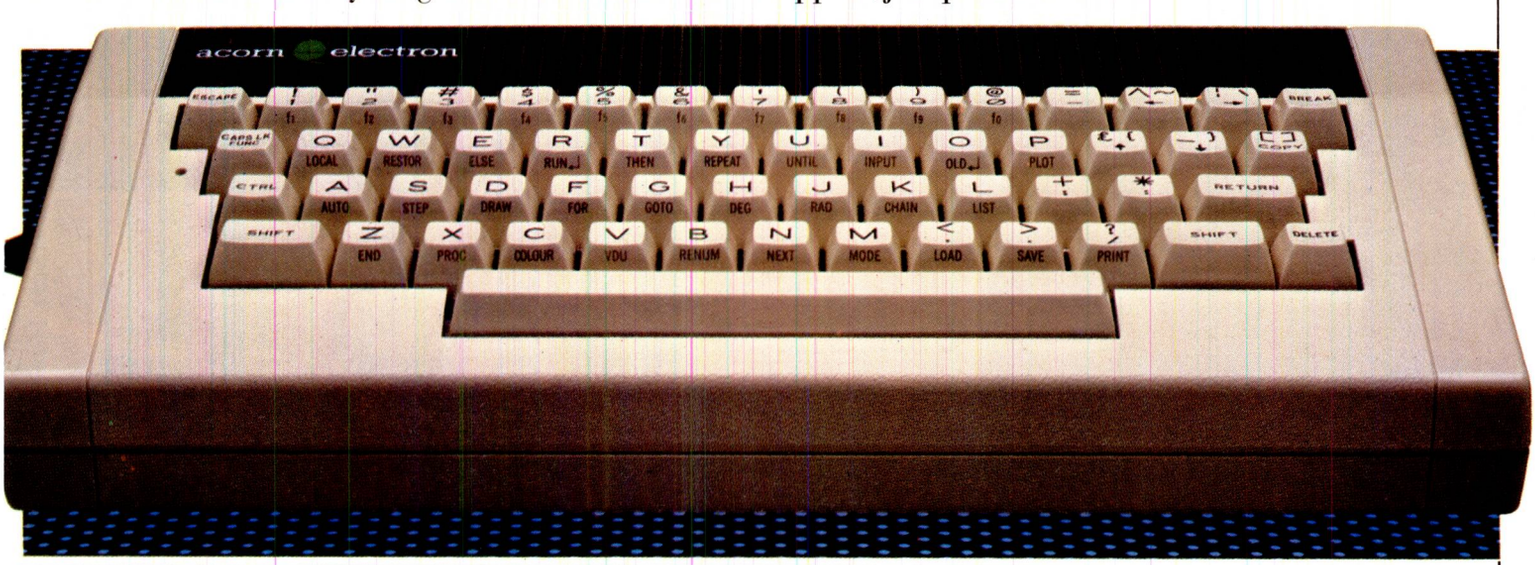
You will in short, through the 15 separate programs it contains, get a glimpse of the Electron's potential. But only a glimpse, for that potential is as limitless as your own interest and imagination.

A widening range of software.

To help you realise some of that potential, Electron software already ranges from "Personal Money Management" through "Starship Command" to "Creative Graphics" (which, incidentally, includes some spectacular three-dimensional rotating shapes). Naturally, with its strong educational links, educational software will be extremely important for the Electron and even now O and A Level revision papers are being processed for Electron users.

How to get your Electron.

The Acorn Electron can be found at local Acorn dealers and major high street stores. However, if you would like to order one with your credit card, or if you would like the address of your nearest supplier, just phone 01-200 0200.



Technical Specifications

Hardware.
2MHz 6502.
32K ROM 32K RAM (64K total).
High resolution graphics 640 x 256 max.
Seven display modes.
8 colours and 8 flashing colours.
1200 baud CUTS tape interface with motor control.
Expansion bus for add-on interface modules.
Internal loudspeaker.
PAL UHF output to colour or black and white domestic TV.
RGB output for colour monitor.
56 key full travel QWERTY keyboard with spacebar.

Software.
BBC BASIC.
Extensions include interger, floating point and string variables, multi dimensional arrays: IF...THEN...ELSE, REPEAT...UNTIL, procedures with local variables.
Operating system allows plot, draw and fill commands.
Event timing.
Built-in assembler.
6502 assembly language can be mixed with BASIC.

The Acorn Electron.

A 16-bit Personal Business Computer for Professionals.

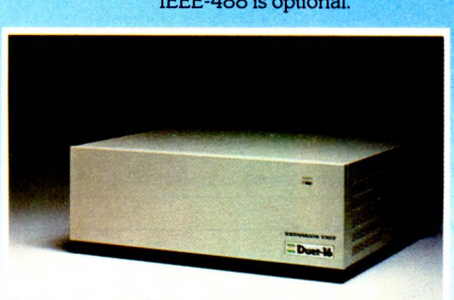
Duet-16



THE TRUE AND HIGHTEC 16 BIT...

... FROM JAPAN'S MOST ADVANCED AND WELL-KNOWN MICRO/MINI COMPUTER MANUFACTURER, **PANAFACOM**, TIED UP WITH **SAKATA**.

Processor	Intel 8086 running at 8 MHz
RAM memory	128 K expandable to 512 K
Operating System	MS-DOS Ver 1.25/2.00 CP/M-86
Display Unit	Super high resolution colour or monochrome, 640 x 400 pixels.
Keyboards	ASCII, UK, French and German. Other local keyboards available on request.
Communication	2-serial port and one Centronics parallel port as standard. IEEE-488 is optional.



System expansion Unit

Disks	2 x 720 Kbyte floppy disk 10 and 20 M byte Winchester disks are optional.

Expansion Unit 5 expansion slots and 10 M byte Winchester disk with Cache memory.



Complete System with Color-Graphic

Integrated Desk Top Micro as well as portable for your business, supported by different application packages.

Fastest speed with excellent colour capability and full range of softwares.

Well designed to meet current and future demand.

Quality micro with reasonable price you have never seen.

Software
BASIC-86, Advanced BASIC, L-II COBOL, FORMS-2, ANIMATOR, Multiplan, WordStar, SpellStar, MailMerge, TSS support program, 1-3270 emulator



IEEE-488 BOARD

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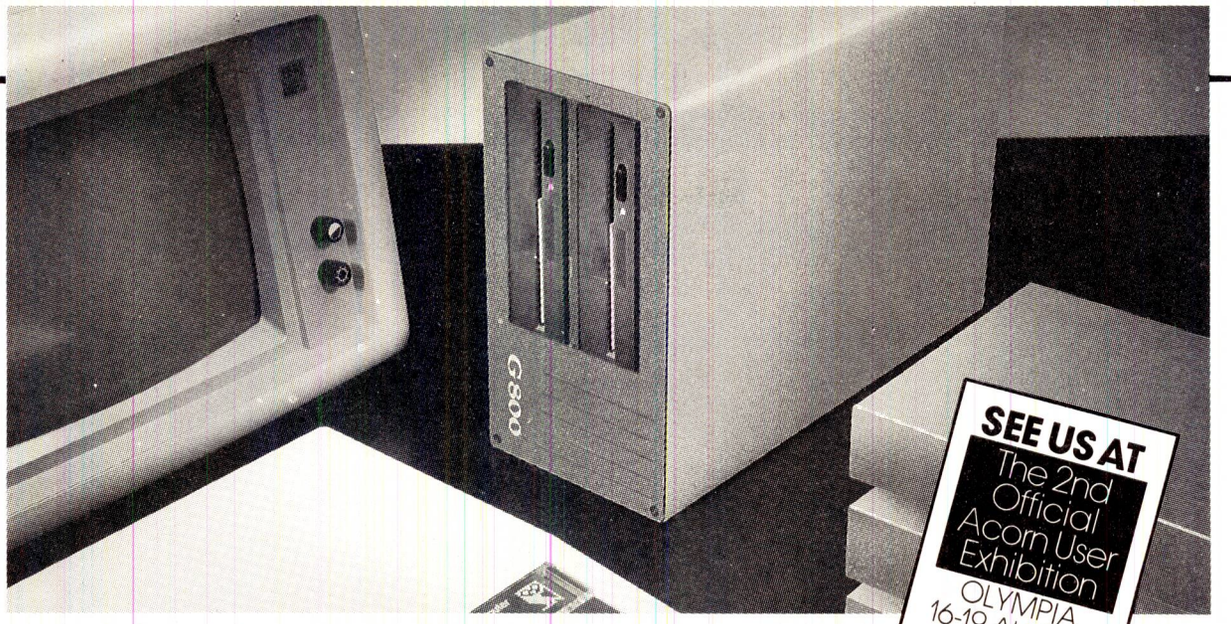

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The Graduate.
The first IBM PC compatible upgrade for the BBC model B micro.

From only £764.00 the new Torch Graduate will upgrade your BBC Model B to a powerful 16 bit business computer.

Disc and hardware compatible with the IBM PC, the Graduate is the latest addition to the Torch range of BBC upgrades. It's MS™-DOS operating system is customised to IBM compatibility allowing exploration of the massive range of IBM compatible business software, programming aids, compilers and languages universally available from most major software houses.

Introduction to MS™-DOS

The Graduate offers two levels of upgrade, the G400 and the G800, both with 128K on board user memory as standard (optionally 256K). This can be increased to 1.2 Mbytes with an IBM compatible expansion board. The G400, contains a single, double sided 320K formatted disc drive and provides the low cost introduction to MS™ -DOS for the user who wants real 16 bit power from his Model B.

TECHNICAL SPECIFICATION

- 8088 16-bit processor running at 5 Mhz
- 128K or 256K RAM
- MS™-DOS operating system customised to IBM compatibility
- Model G400 – Single, double sided, high density disc drive (320K formatted)
- Model G800 – Twin, double sided, high density disc drives (640K formatted)
- Integral stabilised power supply
- 2 IBM PC compatible hardware expansion buses
- Software compatibility allows Lotus 1-2-3 and all popular IBM PC business programs to run without modification, subject to the constraints of the BBC keyboard and display
- Disc interface is not required

Keyboard text and graphics supplied by BBC Model B

• THE GRADUATE •

More data storage

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

Just plug it in

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

The range

Add 256K RAM, 640K disc storage and IBM PC compatibility to the BBC Micro for less than £1,000.

Graduate G400 (128K) £764 inc. VAT
Graduate G400 (256K) £815 inc. VAT
Graduate G800 (128K) £949 inc. VAT
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The Graduate is manufactured by Torch Computers under licence from Data Technologies Ltd.

To: Torch Computers Ltd., Abberley House, Great Shelford Cambridge CB2 5LQ. Telephone (0223) 841000
Please send further information on the Graduate and the address of my nearest dealer.

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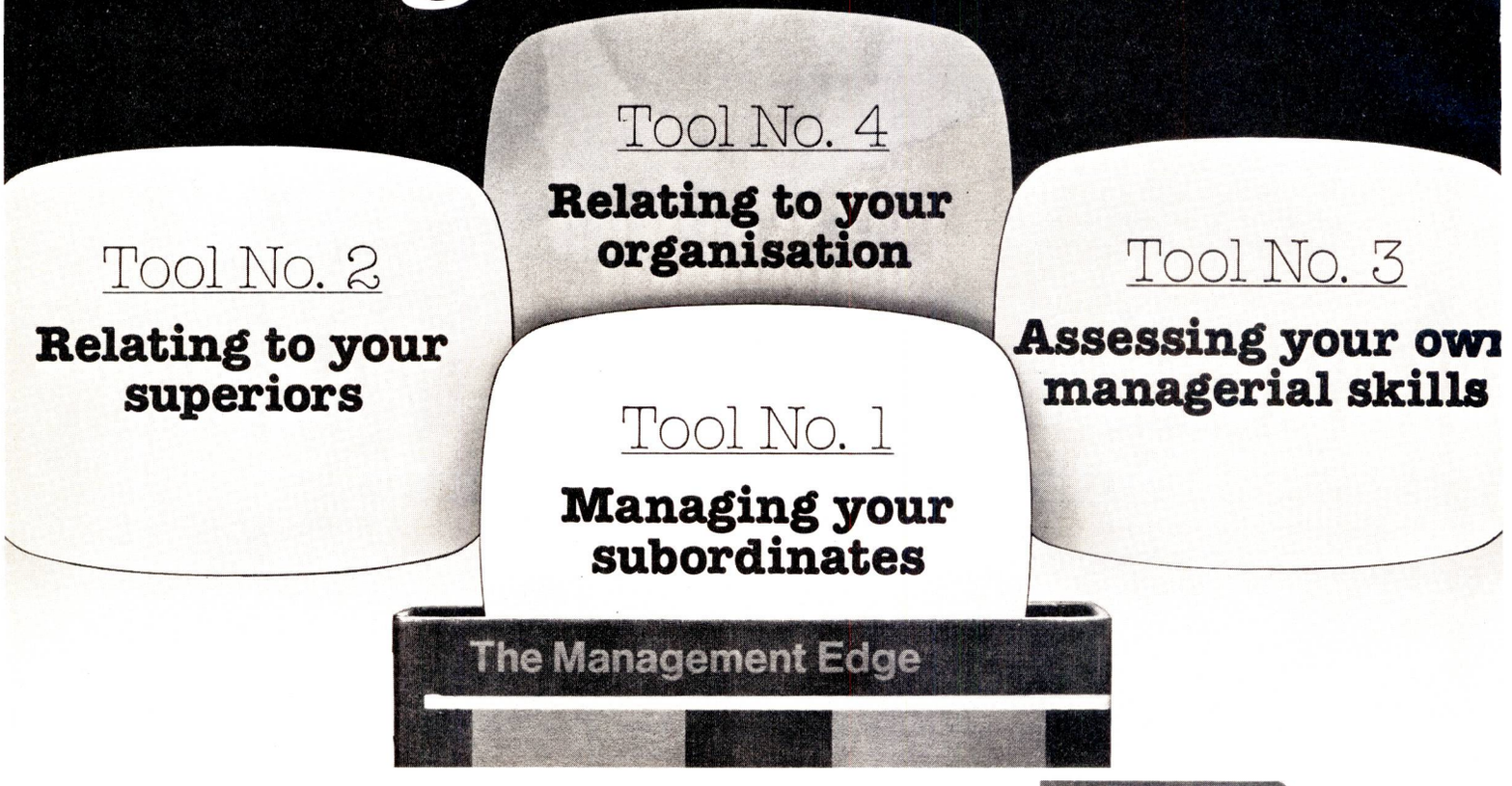
Using this management toolbox, form powerful strategies in minutes



Give your team The Management Edge

Every interaction of your management life involves one constant element – you.

Here is a computer program 'toolbox' with disks and an easy-to-follow manual which recognises that simple fact.

It offers you practical strategies distilled from the top-level experience of prominent specialists and programmed into sets of psychologically balanced assessment questions.

With each 'tool' comes a two stage session where you press 'agree' – 'disagree' keys to on-screen propositions – first to assess yourself, then your subject.

This input takes only minutes. Suppose you were assessing a subordinate.

Feed in the facts You decide on over 80 statements about your own managerial 'persona' – such as – "I am willing to compromise with my employees" – or – "I feel uncomfortable when I'm not in charge."

Now comes your input on the subordinate.

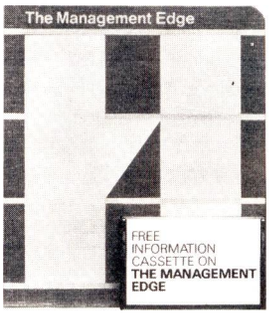
Here are 89 characteristics which you agree/disagree fit his personality – 'Controlling?' 'Striving?' 'Cautious?' 'Status conscious?' 'Meticulous?' 'Self-assured?' 'Autonomous?' 'Narrow-minded?' 'Methodical?' – and so on.

All this you can keep absolutely confidential.

Print out the strategy Now the program mixes and matches your two sets of characteristics and prints out – on average – 300 lines of keenly practical advice under these report headings: Improving Communications, Increasing Performance and Motivation, Effective Discipline, Optimal Placement, Orientation, and Outplacing Counselling.

Each of your management options for this employee is examined and strategised. Each report is unique and anything but bland. One advised: "You tend to take a position without thinking things through ... if you react to Mr S. O. in an inconsistent manner he will be confused and question your certainty about decisions and plans..."

One improvement repays cost Here is a program which not only helps you to understand your management context and improve efficiency, but also increases your self-understanding. The files can be stored confidentially and updated.



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Program: £195 (RRP inc VAT)

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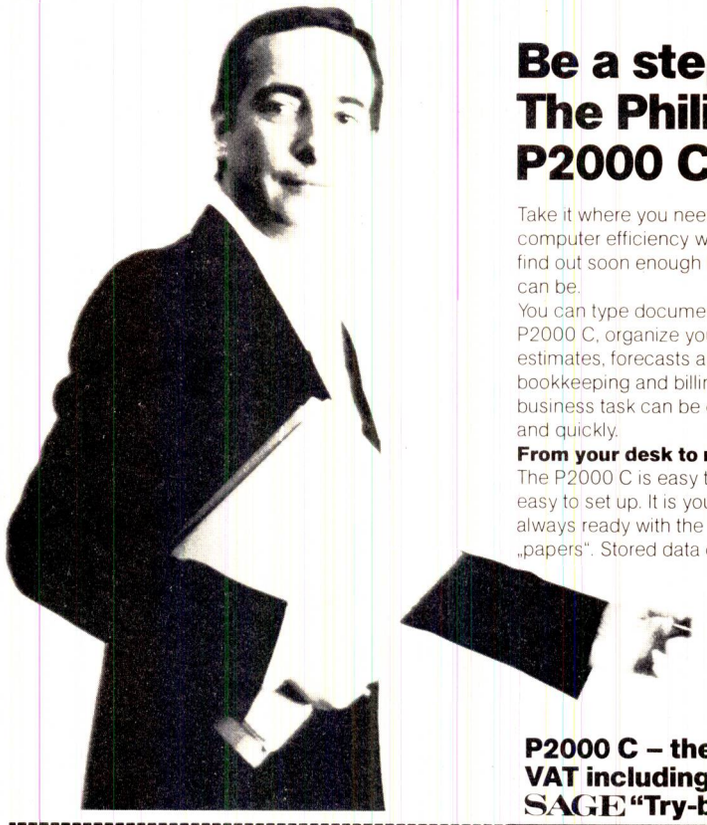

Be a step ahead with The Philips Portable Computer P2000 C

Take it where you need it. You take computer efficiency with you. You will find out soon enough how fruitful this can be.
You can type documents with the P2000 C, organize your records, do estimates, forecasts and projections, bookkeeping and billing. In fact, any business task can be done more easily and quickly.

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The P2000 C is easy to move and easy to set up. It is your assistant, always ready with the relevant „papers". Stored data can be called up on the screen in seconds. Alternative plans can be rapidly surveyed. Time and effort are saved.

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The P2000 C has a convenient carrying strap to help you take it home or on trips. Prepare for meetings, analyze plans, polish up documents with the decisive information literally at your finger tips.

Feature Highlights
1. 9" screen, 24 x 80 display, 32 KB video RAM
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3. Two 5 ¼" floppy drives with up to 640 KB per disk
4. CP/M* and p-System** provide access to a large range of available software
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* CP/M is a trademark of Digital Research Inc.
** p-System is a trademark of Softech Microsystems Inc.

P2000 C – the affordable portable. From £ 1350 plus VAT including CP/M, WordStar, CalcStar and SAGE "Try-before-you-buy" Accounts Packages.





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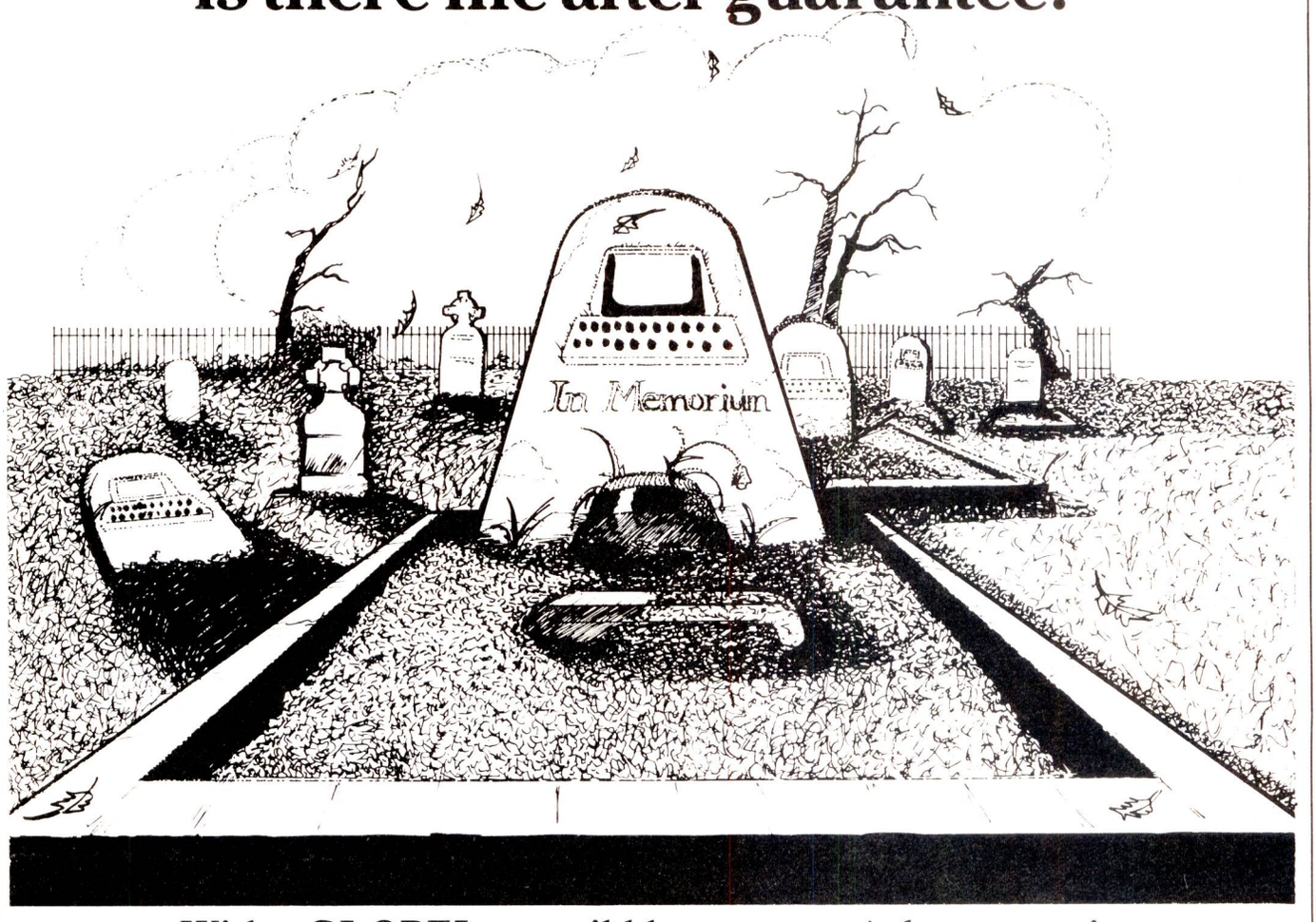

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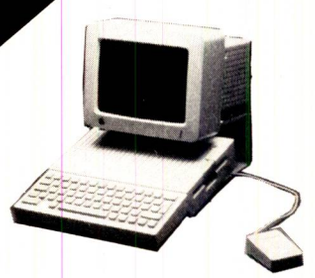

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It was developed by ITT – world leaders in IBM plug compatible workstations.

And it's supplied by STC – which Fortune 500 lists as one of the world's largest industrial corporations.

With over 30,000 employees STC also enjoys its position among the top 10 British electronics companies.

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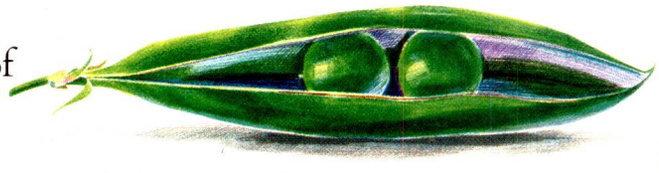

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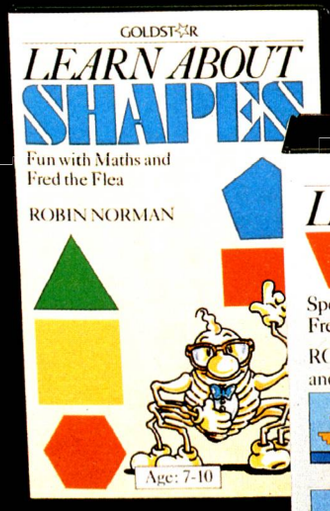

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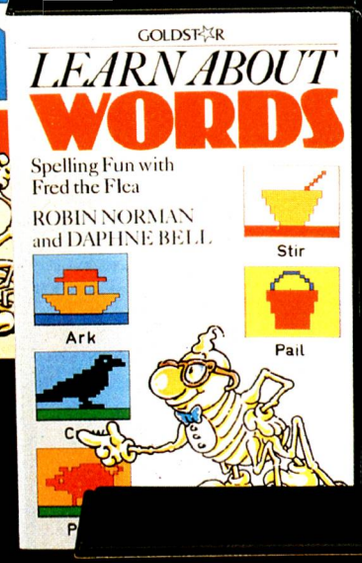
BBC Model B



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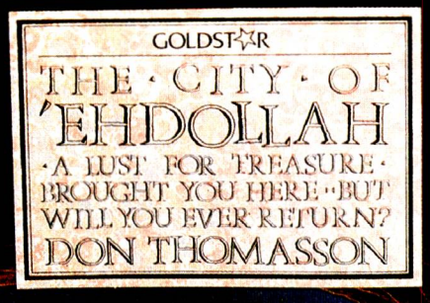

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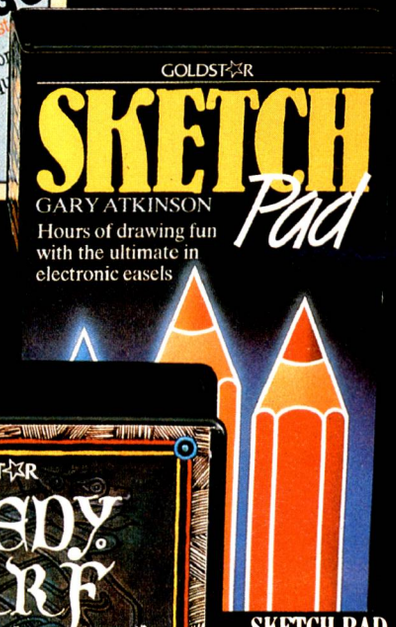

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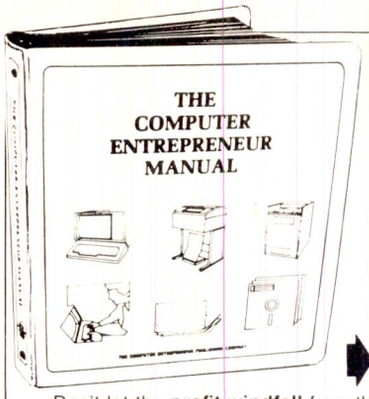

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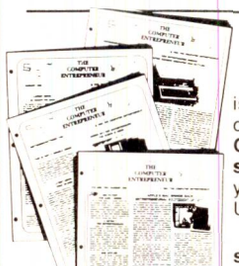

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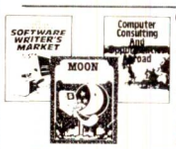

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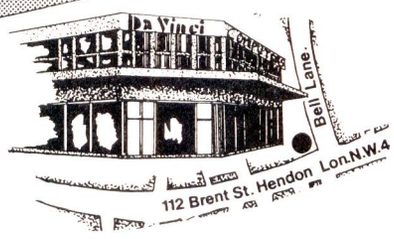

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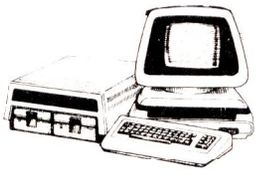

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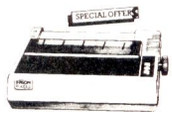

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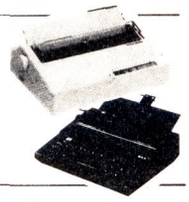

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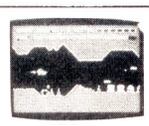



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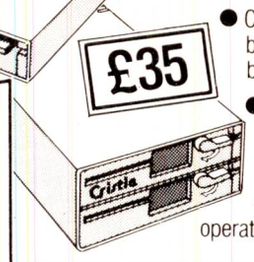

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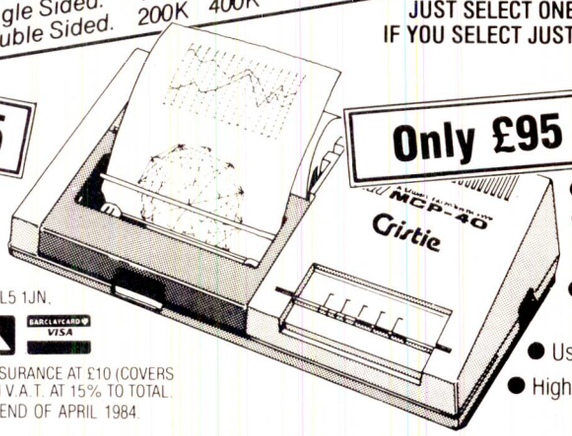

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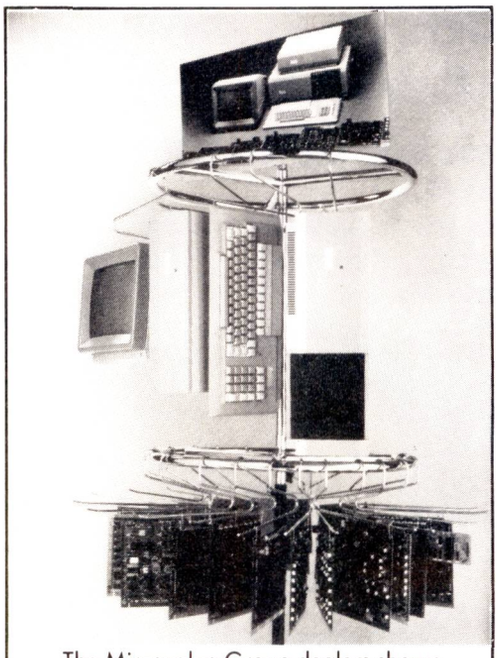

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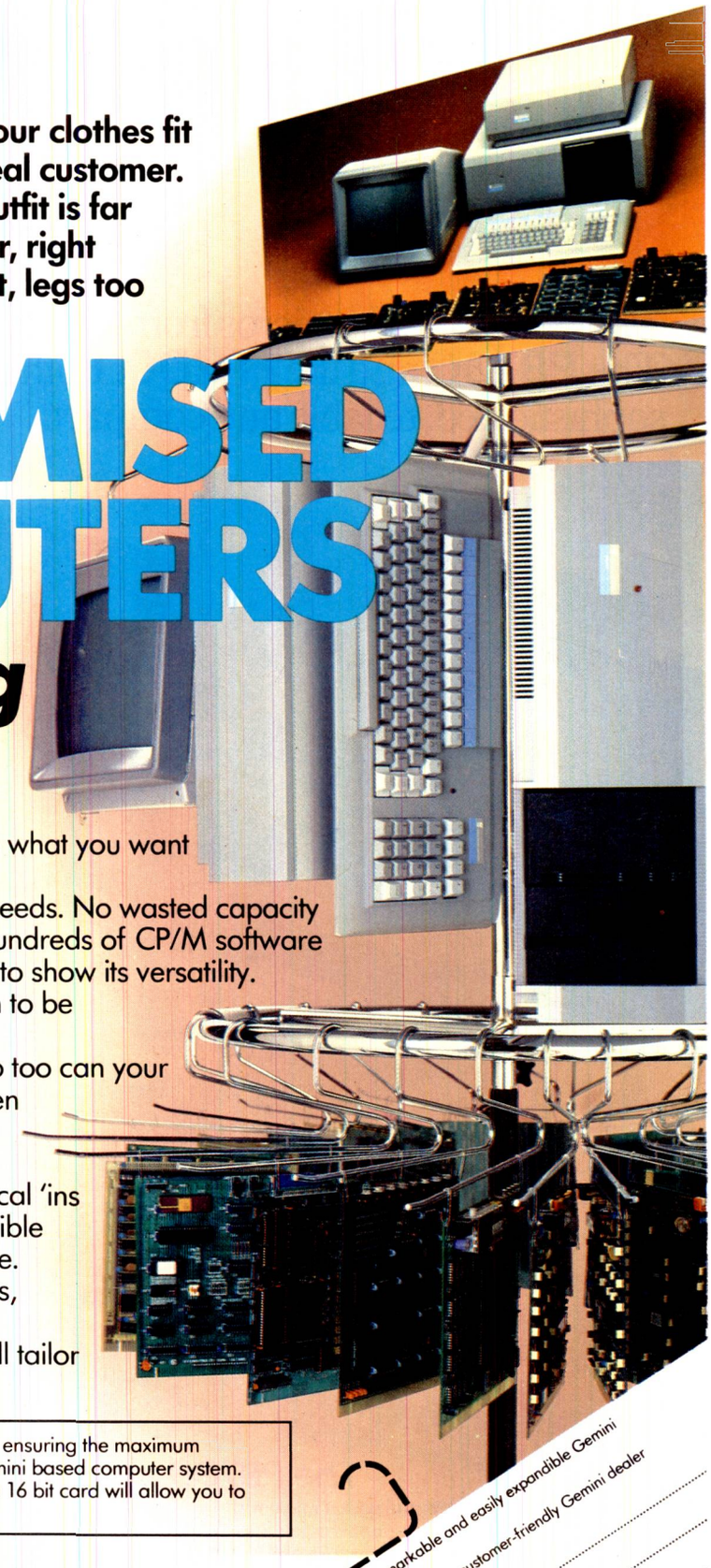

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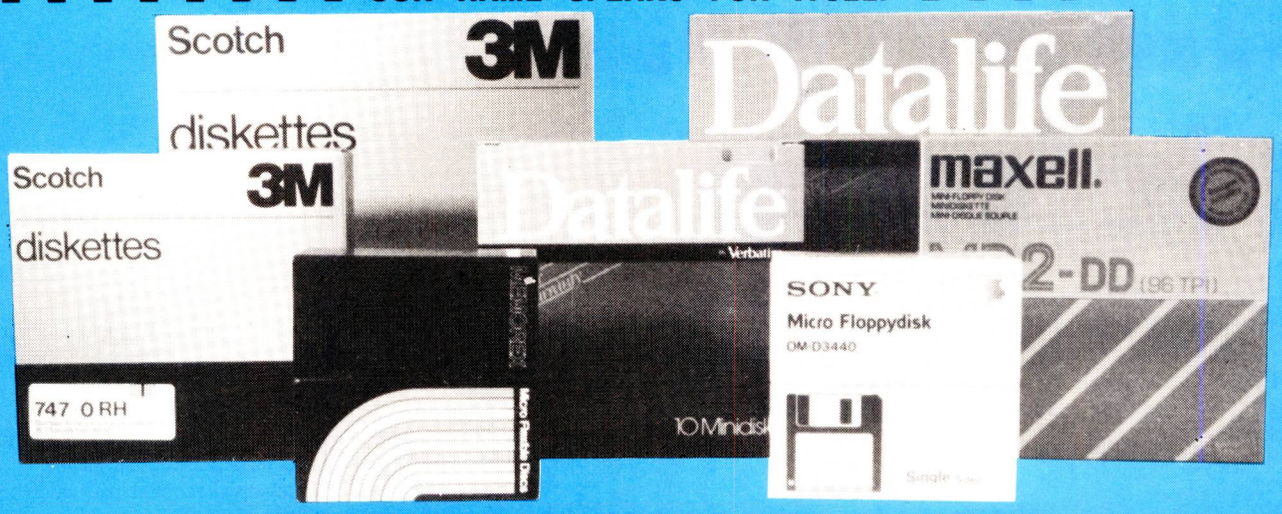

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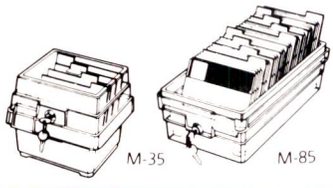

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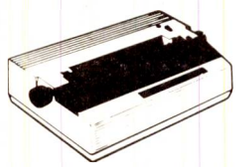

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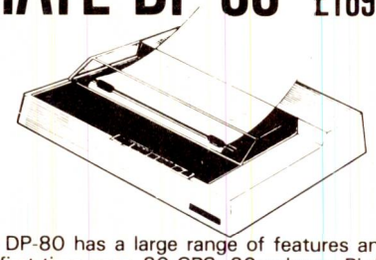

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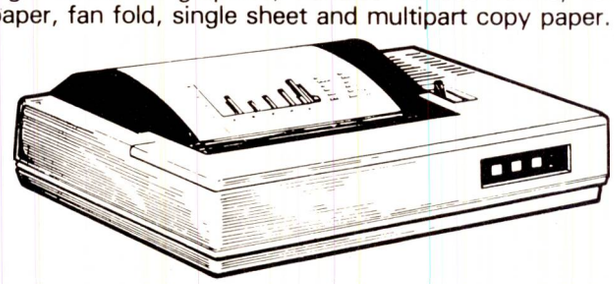

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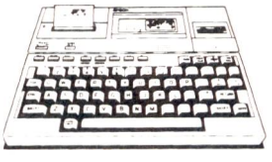

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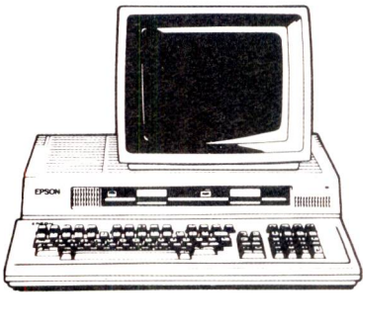

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PCW8/84

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At £299, the Z80 adds 64K of usable RAM to the BBC Micro. And it allows you to use the CP/M 2.2 computer operating system.

It's extremely fast.

And besides giving you access to a vast new area of software, it enables you to use GSX graphics-based programs, the perfect complement to the BBC Micro's own superb graphics.

Free software and languages.

The Z80 second processor comes complete with five CP/M business programs.

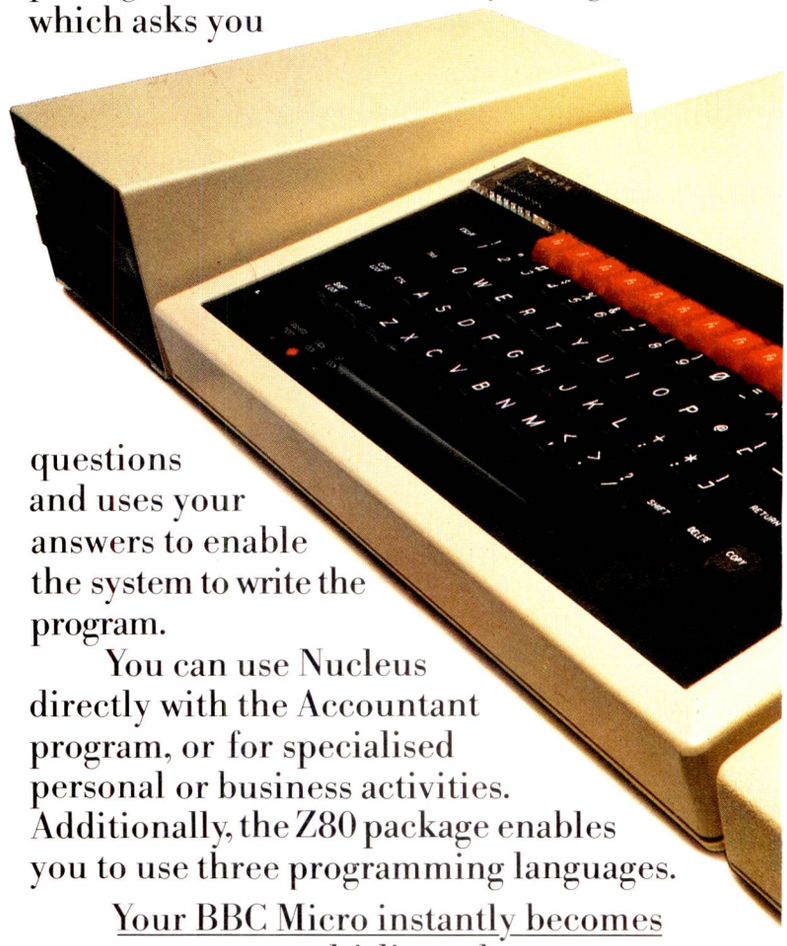
To handle your word processing, there's MemoPlan. It's a program with some highly sophisticated features, such as a safeguard against data loss through power cuts and the ability to show two documents simultaneously on the screen.

To form your CP/M personal database, there's FilePlan. It stores names, addresses, telephone numbers, stock listings and more. And if you use it with MemoPlan, you can generate personalised letters, labels and mail shots.

To produce forecasts and analyse groups of figures diagramatically, simply use the GraphPlan program. This is incredibly helpful in working out vital business calculations, converting them into graphs and charts.

Meanwhile, in the book-keeping department, there's the Accountant program. Use it to enter day-to-day transactions into the computer. Then, at any time, you can ask the computer to produce lists, summaries, reports, audit trails and trial balances. You can readily expand this package to a fully ledger based system, complete with payroll and more.

Finally, to help you to develop your own programs without having specialised experience, the Z80 comes with another software package called Nucleus. It's a system generator which asks you questions and uses your answers to enable the system to write the program.



You can use Nucleus directly with the Accountant program, or for specialised personal or business activities. Additionally, the Z80 package enables you to use three programming languages.

Your BBC Micro instantly becomes multi-lingual.

To simplify writing your own software with the Z80, there's BBC BASIC.

For running professionally written business programs, there's Professional BASIC.

And then there's CIS COBOL, the leading microcomputer version of COBOL, the language used in mainframe computer applications throughout commerce and industry.

With CIS COBOL, the Z80 also gives you two sophisticated programming aids.

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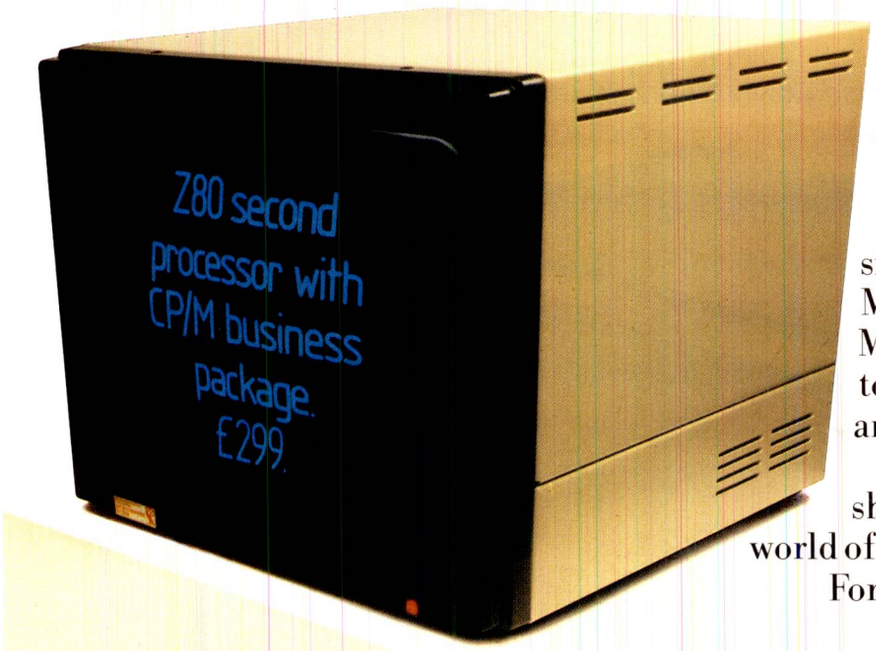
Macro.

One is Animator, an award winning debugging tool which enables you to identify programming errors quickly and easily.

The other is FORMS 2, which helps you to write your own interactive programs in COBOL.

With all these sophisticated features, the Z80 package is exceptional value for money. Indeed, bought separately the programs and languages could cost as much as £3,000.



<u>See the Z80 at work.</u>

The Z80 second processor is designed to be used with the BBC Micro Model B incorporating a Series 1.2 Machine Operating System and linked to a dual 80-track disc drive, a printer and monitor.

Ask your BBC Micro dealer to show you just how far it can go in the world of serious business computing.

For your nearest dealer, ring 01-200 0200.

<u>Technical specification.</u>

The Z80 has a 64K Random Access Memory, running CP/M 2.2 which provides approximately 55K bytes of RAM for user programs.

It operates at a clock rate of 6MHz.

Power supply is integral. Height, 70mm. Width, 210mm. Depth, 350mm.



The BBC Microcomputer System.

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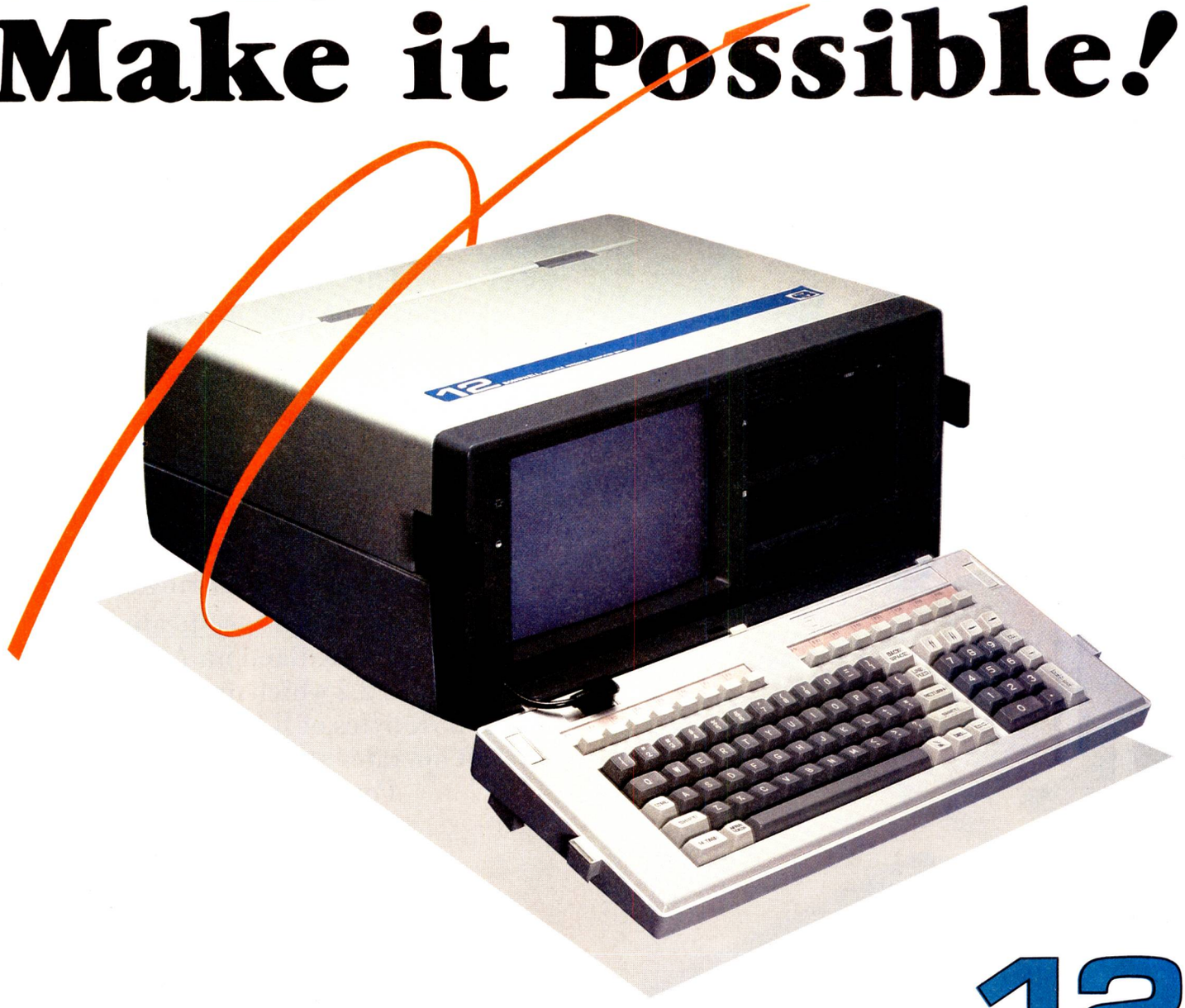

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The comprehensive features of the Bondwell 12 makes it an ideal assistant to improve productivity and efficiency.

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SPECIFICATIONS — MODEL 12

Microprocessor:
Z80A CPU/4MHz

Operating System:
CP/M 2.2

User Memory:
64K bytes user RAM
4K ROM with self test boot & monitor programs

Display:
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External video signal output port
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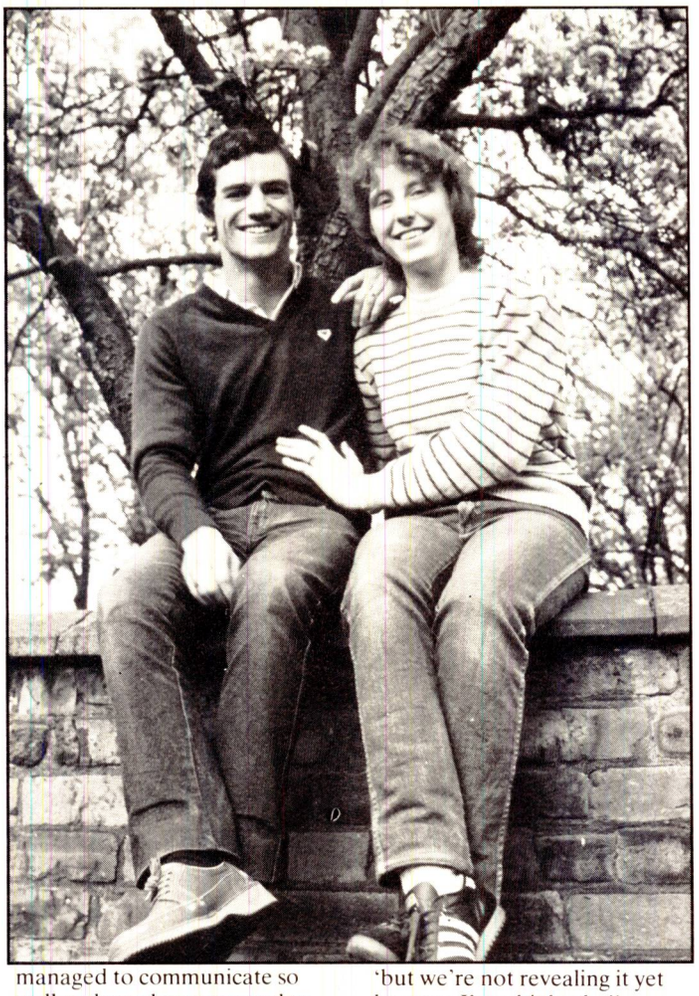
GIRLS STARTED RINGING HIM!

Most of us form friendships and relationships through the people we meet at work. So what do you do if you have a job which never brings you into contact with the opposite sex?



Susan Griffiths, a 22-year old machinist from Manchester, joined Dateline Computer Dating, and soon met John Hook, also 22, a radio design engineer from Oldham.

Having left her parents' home, Susan found that life was rather lonely. She did go to discos — mostly in the company of married friends, but she never met anyone she liked. 'In the end, one of my friends who was using Dateline recommended I should try it,' said Susan. 'He said it would do me good to meet new people, and I agreed.'

Recommended by a friend

John's circumstances were very similar. 'I just wasn't meeting anyone,' he said. One day he read a Dateline ad, and being very fed up with a social life which consisted of drinking with his friends in the evenings, he sent off to Dateline for a free computer test. He joined straight away — some months before Susan — and quickly got his first list of six names. It was then that his courage deserted him a little, and he just could not bring himself to telephone any of the girls on the list. Fortunately, girls started ringing him!

'It began from there,' he said. 'Once girls started contacting me, I was able to telephone the ones who appeared on my list. I was nervous, of course, but when I started talking I got on fine.'

'If they sound nice, they look nice....'

Susan, in the meantime, had joined Dateline. 'I met one man but that first date wasn't too successful, so I moved on to the next name on my list which was John's.' 'When I spoke to him he sounded really nice,' she said. 'To me, if they sound nice, they look nice!'

Susan and John agreed to meet and the following week he picked her up from her flat and they went out to a local pub. 'It was a very enjoyable evening,' said John. 'We couldn't stop talking, and we haven't stopped since!'

After her initial shyness, Susan too began to enjoy herself. 'I liked John as soon as I saw him,' she said. 'He looked just the type I wanted — he spoke nicely, he had good manners and a good personality.' The couple decided they very much wanted to see each other again and in fact arranged to the meet the following evening. 'I asked if it would be all right if I came to see her tomorrow and she said 'Any time you want to'. Since then we have seen each other virtually every night!'

Susan knew almost immediately that she liked John a lot. 'But within two weeks I knew he was the one for me,' she said, smiling. John took a little longer — about five weeks! 'Really we clicked almost straightaway. We managed to communicate so well and we always seemed to know what the other was thinking.'

Within two months John had proposed to Susan and she accepted without hesitation. Their formal engagement and marriage will take place later in the year. 'We've got a date in mind for the wedding,' admitted John, 'but we're not revealing it yet because I'm a bit broke!'

And how is that friend of Susan's, who originally recommended her to Dateline, getting on with his membership? 'When he first found out about the engagement I think he was a bit jealous,' she said, 'but he's now met someone through Dateline and they're getting engaged as well!'

If you would like to be one of the many thousands of people nationwide who have been enjoying a new social life, and finding love and happiness through Dateline, complete the simple questionnaire below. We will send you confidentially and completely free, full details about Dateline and how it works, and details of just one of the Dateline members who are compatible with you. Send to:
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- ☐ Intellectual

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- ☐ Classical music
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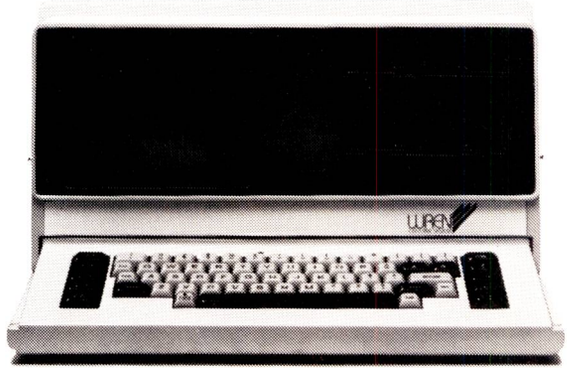

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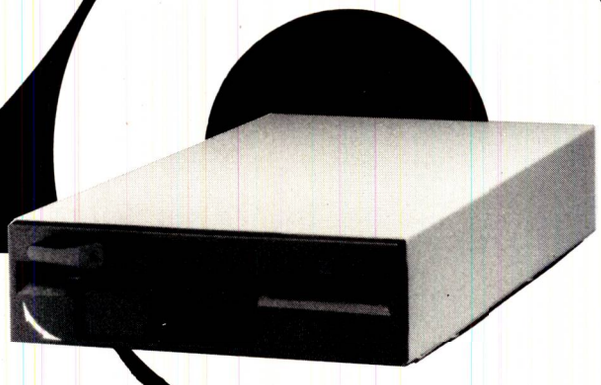

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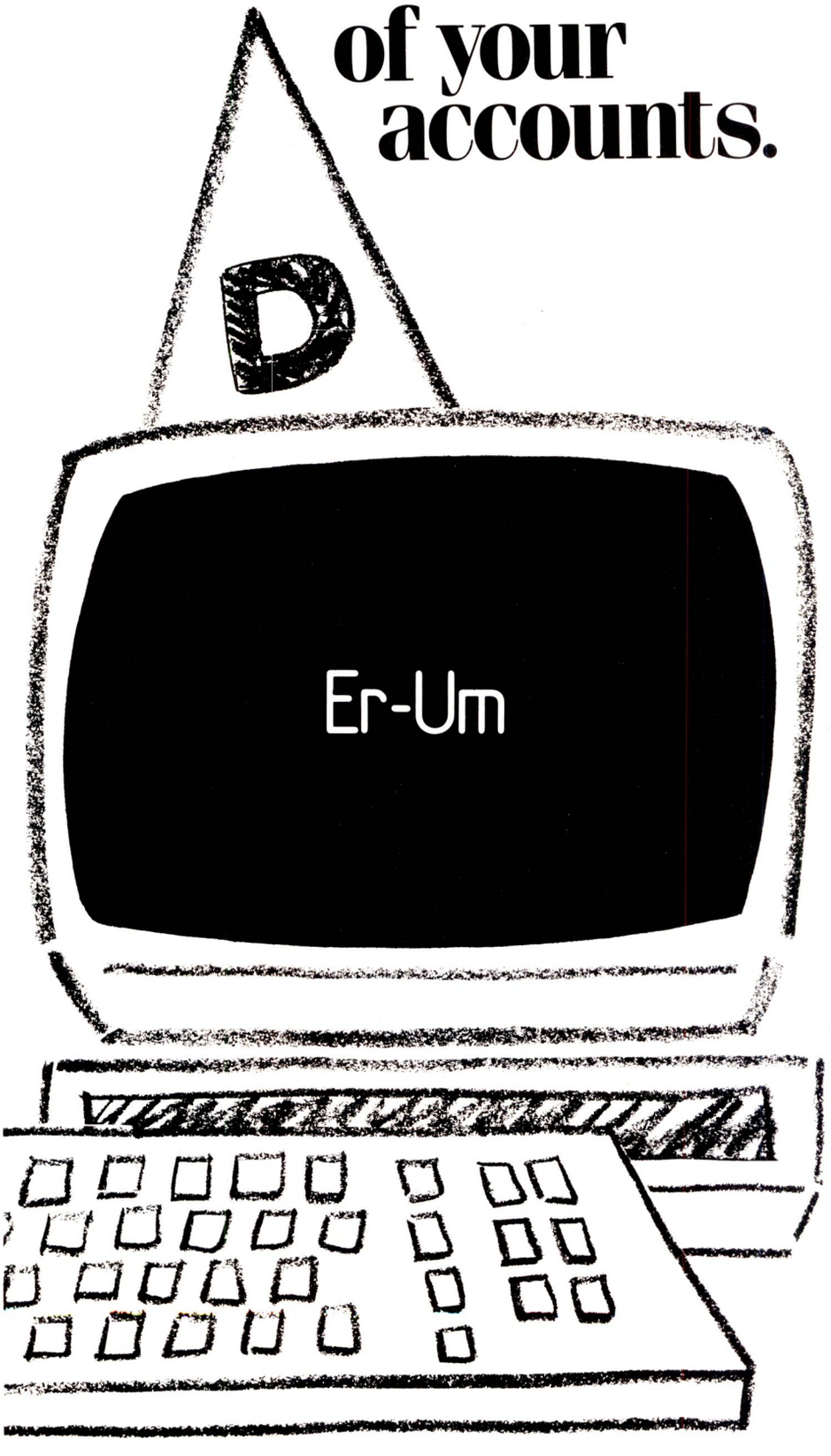



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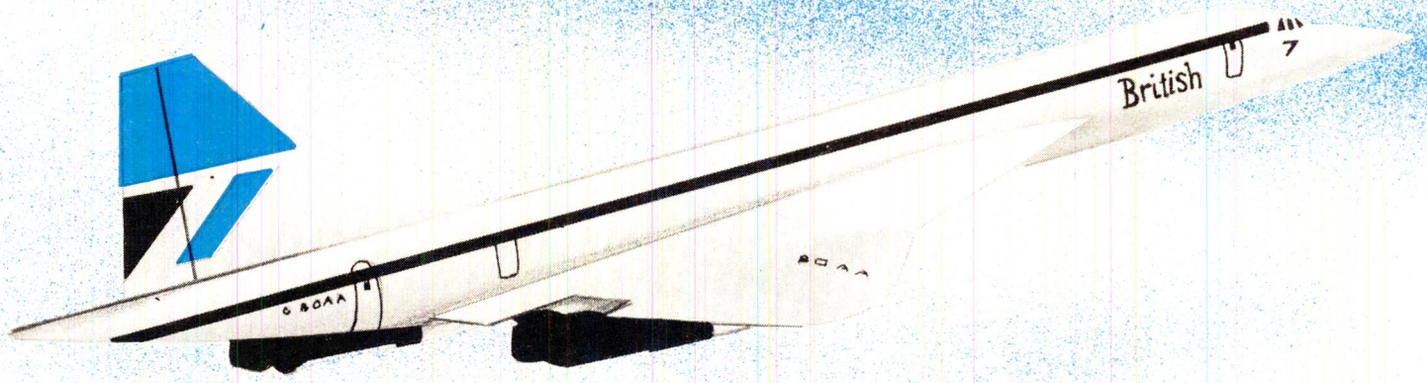



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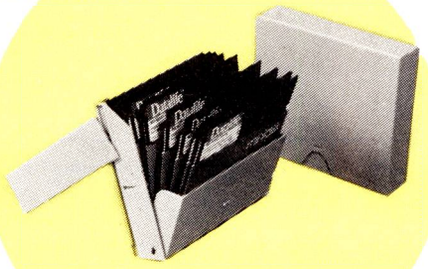
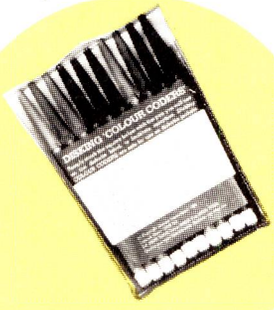
We ship the worlds' best diskettes FASTER than anybody. We ALWAYS enclose a VAT invoice and current price list. It's not "Yes sir we're expecting delivery in 4-6 weeks" or "Please allow 28 days for delivery" – What rubbish we put up with in the U.K.?! Just ring another company in this magazine – we did. We purchased a modem advertised on another page – two months later we've still no modem OR explanation, AND we can't leave a message they've no answering machine! EVERTHING you see in this ad. is ON THE SHELF NOW. We despatch within FOUR working hours or we'll ship FREE!! Write or call (24 hrs) for our general price list. Coming soon:- The new Microdisk SEE 10 library box **PLUS** Disking Business Diskettes – They'll blow your mind.

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



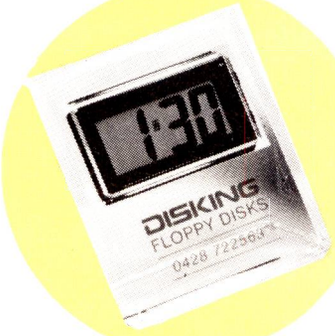
The award winning device for storing and displaying ten diskettes. Available individually at £2.50 exc VAT see under 'Diskette Storage'.

PLUS
DISKING COLOUR CODERS



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

DISKING SUPER PROMOTION FREE CLOCK VALUE £8.95

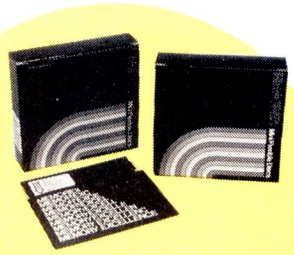


With every TWO Ten-Packs* of ANY 3½", 5¼" or 8" disks by Verbatim, Memorex, Dysan or Maxell purchased at these prices, we will pack a Super Disking Calendar Clock worth £8.95 absolutely FREE.

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

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

MEMOREX



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

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Certified for single OR double density and with hub ring reinforcement

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3491	D/S	48	tpi	27.90	26.90	25.90
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48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation
10 and 16 Hard Sector available at same prices

MEMOREX 3½" MICRODISKS – HERE AT LAST!

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

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

FREE



To celebrate three successful years with Memorex we are giving away a Memorex C-90 cassette tape with **every** ten-pack of Memorex floppies. This offer does not affect any of our other promotions, and is in adition to them.

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D.S.L.B. – £17.90
buy 3 and get fourth one free. Post & Packing at 4 unit rate.

SEE 10 LIBRARY BOX Free with every pack of ten diskettes this superb storage device keeps dust out, yet enables instant selection.



Part No.	Description	Price
SEE 10	Library Box	2.50
LB8	Library Box (not SEE 10 design)	3.00

ABA Lockable diskette storage come in two sizes for each of the minidisks and 8" disks. They hold either 40 or 80 diskettes.

Part No	Description	Price
M35	40 minidisk capacity	14.90
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F40	40 8" diskette capacity	18.90

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'PERFECT DATA' CLEANING KIT

The one that really works well in ALL drives – get it now before the gremlins strike.



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CK5	For 5¼" disk drives	14.90
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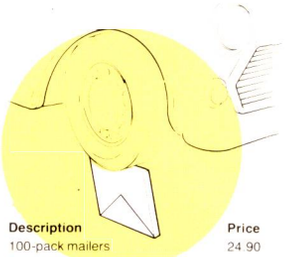
5¼" DISKING SUPERMAILERS

Very rigid copyright design, takes up to 4 disks.



Part No	Description	Price
DSM	100-pack mailers	24.90

DISKING DISKWRITERS

Packed in 25's and sold in 50's, these superb blue or black pens are 100% safe for use on diskette labels. Please state ink colour when ordering.



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1-2 packs each pack at 95p
3-5 packs each pack at 75p
6-9 packs each pack at 60p
10+ packs POST FREE

5¼" CLEANING KITS
same as 5¼" diskettes

5¼" SEE 10 LIBRARY BOXES
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8" DISKETTES
1-2 packs each pack at 1.60
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8" CLEANING KITS
same as 8" diskettes

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DISKING SUPERMAILERS
100-pack 3.00

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1 off 2.00 each
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DISKING DISKWRITERS
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5¼ INCH DISKETTES

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

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

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

8 INCH DISKETTES

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

32 Hard Sector available at same prices

maxell



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

5¼ INCH DISKETTES

Certified for Single OR Double Density. All with Hub Ring reinforcement

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MD1-D	S/S	48	tpi	24.90	23.90	22.90
MD2-D	D/S	48	tpi	32.90	31.90	30.90
MD1-DD	S/S	96	tpi	32.90	31.90	30.90
MD2-DD	D/S	96	tpi	42.90	41.90	40.90
MD2-HD	D/S	1.6MByte		59.00	56.00	53.00

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

8 INCH DISKETTES

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

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MD550	D/S	48	tpi	29.90	28.90	27.90
MD577	S/S	96	tpi	28.90	27.90	26.90
MD557	D/S	96	tpi	36.90	35.90	34.90

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

8 INCH DISKETTES

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

32 Hard Sector available at same price

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	5-MB	10-MB	15-MB	20-MB
Part No:	DS505	DS510	DS515	DS520
Prices exc VAT				
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SIRIUS/VICT.	1190.00	1290.00	1390.00	1490.00
EPSON QX10	1190.00	1290.00	1390.00	1490.00
DEC LSI 11	1390.00	1490.00	1590.00	1690.00
Z80 System	1190.00	1290.00	1390.00	1490.00
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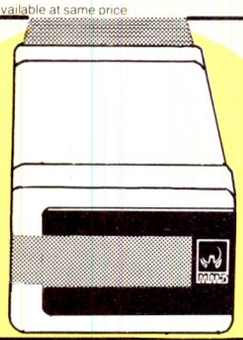
Complete with intelligent controller, host adaptor, power supply unit, fan, cabling, software and User Manual. Free delivery in the UK.



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

FIRST CLASS RATES

EXC VAT	5¼"	8"
First Ten-Pack	2.00	2.50
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Don't keep sitting there in front of your VDU, get outside and fly our aeroplane. Just call and ask for your flier, and we'll send you our latest trade pack with prices, special offers and sample unlabelled diskette and mailer. We'll also enclose a DPC application form telling you how to buy at our 10,000 prices yet order only in 50's.

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5¼" SUPERLUXE DISK LIBRARIES

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5¼" DISKETTES

Supplied in a FREE SEE 10 library box

PRICES EXC VAT				10-40	50-90	100+
S/S	48	tpi	Diskettes	13.90	12.90	11.90
D/S	48	tpi	Diskettes	20.90	19.90	18.90

Don't be fooled – these diskettes are brand new and come with our normal full money-back guarantee. They are mostly non hub ring labelled or unlabelled BASF, Dysan, Rhone Poulenc, Memorex etc. where the boxes have had the cellophane removed. We are even supplying them in a FREE SEE 10 library box!! At these prices you can't lose – Hurry!

To: DISKING, FREEPOST, Liphook, Hants, GU30 7BR, U.K

Qty	Description	Price exc VAT

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There's much more to show. So this summer we go to a new home – to give us much more room to show it all!



Alexandra Palace, London, Thursday to Sunday, July 19 to 22

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VOUCHER WORTH £1

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Electron & BBC Micro User Show

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10am - 6pm, Friday, 20 July
10am - 6pm, Saturday, 21 July
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There's a Kaypro computer to suit you!

Choose from our range of portable personal micros which all offer a unique 'value-for-money' package plus at least £1,500-worth of bundled software **FREE.** Just take away your Kaypro and start teaching yourself with our **FREE** ATI training package loan scheme.

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Simon makes it Simple!

Simple for you to buy quality British boards at excitingly low prices, with guaranteed fast delivery, backed by a full years warranty.

New for Apricot!

NEW

256K RAM CARD EXPANDABLE TO 640K

Not just another ordinary RAM card, but one that has unique expandibility. This latest addition to our growing SimonCard range can be used with either 64K or 256K dynamic RAM chips at the flick of a switch, which means you will only need to use up one precious slot in your Apricot for all your memory requirements, since our SimonCard starts at 256K and expands up to 640K, giving the maximum available system memory on Apricot of 896K. To upgrade from 256K to 640K is easy! 16 of the 64K chips are replaced by 256K chips and and if you send your SimonCard back to us for the upgrade we will part exchange your redundant 64K chips for the 256K chips. Prices start at £299 for the 256K version. MS-DOS RAM disk software available.

IBM PC & XT

RAM boards with asynchronous serial port

All boards expandable to 256K

64K + £180 **128K + £225**

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MS-DOS RAM disc software available

All boards expandable to 384K

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TIMEKEEPER/ CLOCKBOARD WITH BACK-UP BATTERY £99

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Interfaces complete 4ft cable & connector

Graphics Interface £69
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All of the above boards are of the highest quality made with the very best components. They come with comprehensive manuals for easy and safe installation.

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DESIGNERS AND SUPPLIERS OF QUALITY MICROCOMPUTER BOARDS

Getting the right computer

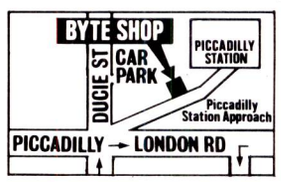
At the Byteshops we've helped countless companies of all sizes improve their efficiency by the introduction of microcomputers. Generally these are required to perform routine business tasks – but, however similar the application, we invariably find that no two customers have *exactly* the same requirements. When you come to the Byteshop, you'll find that we are far more interested in finding out what jobs you require the computer to do both now and in the future. We then tailor a complete system including not only the hardware but the software, and the peripherals to meet your individual needs. We believe this is the only sensible way to sell computers. Many people talk about providing solutions, but it's often painfully evident that the customers problems only begin with a visit to his/her local computer supplier. We don't subscribe to the view that our role ends when we've made a sale or completed an installation. We're totally committed to after sales service and we're always happy to advise you on all aspects of running your systems. We can even help with staff training for example and provide a range of sensible maintenance plans to ensure your systems keep working. On this spread you'll find a number of "Typical Ready To Run" systems which will serve to give you an idea of comparative costs. However we won't sell one to you – unless you force us – without asking a few questions first!

HOW NABISCO REAPED THE BENEFIT WITH IBM PC's.



Ritz Crackers, Shredded Wheat, Jacob's Club and Cream Crackers are just some of the brands that have made Nabisco one of the world's celebrated producers of biscuits and breakfast cereals. Nabisco (Liverpool) were keen to show that the IBM PC could be used to support certain functions and contacted Byteshop Manchester as the leading IBM Authorised Dealer in the area. In conjunction with Byteshop staff, Nabisco were able to evaluate a number of leading software packages on the PC including Lotus 1. 2. 3. – Integrated Spreadsheet & Information Management package, dBASE II – Database Management and Multi-Mate – Word Processing. Applications covered include factory information systems, budgeting, financial planning and both expenditure monitoring, and micro appreciation for the company's training programmes. Initially time savings were not dramatic as the staff had to be trained and become familiar with the new technology, but now the benefits are being reaped and functions are being tackled that would have been far too time consuming without computers. Nabisco rated the advice they received from Byteshop as ". . . excellent".

SPOTLIGHT MANCHESTER



Train commuters to Manchester will probably be aware of the location of the Byteshop Manchester already, but for those not in that category, our store can be found on the Approach to Piccadilly Station. The Byteshop has been in Manchester for the past five years and Manager Robin Pimlott has gathered around him a highly experienced team of DP Professionals. They will be pleased to arrange a demonstration from the wide range of micros in stock. Give them a call on 061-236 4737.

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

microserve

An integral part of the Byteshops, **Microserve** provides a complete range of servicing and maintenance plans nationwide for computers such as the IBM PC and Communicator plus peripherals from Epson, Anadex, Qume, Wyse and Volkercraig. **'Microsure'** – our speedy nationwide on site maintenance contract for a 'once only' annual fee.

'Microswap' – component exchange service. **'Micromend'** – workshop repair and up grades. **'Microcall'** – on site maintenance and repair charged on a time and materials basis. **'Microtrain'** – runs product training courses for your own service engineers. Call into your local Byteshop for further details or 'phone **0480 215005** for a Microserve Information Pack.



At a glance Computer Checklist

	BBC Model B	Act Apricot	IBM PC/XT	Comart Communicator
Colour graphics	●		●	
Multi-user				●
Hard disk storage		●	●	●
Upgradeable				●
Expandable			●	●
Communications	●	●	●	●
Transportable	●	●		
Networking	●		●	●

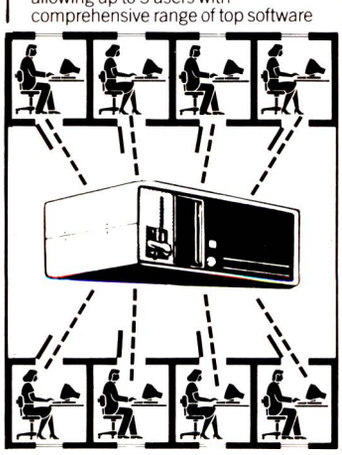
THE BYTE SHOPS-W ON GETTING THE R

COMART COMMUNICATOR

Comart Communicator multi-user systems have expandability built in and are the most cost-effective way of sharing computer power amongst your staff. You can start with a Communicator system to suit your current requirements – up to nine people can share – and simply add new terminals as you grow. A considerable saving over buying a complete new computer each time. The Communicator's modularity also means you can add-in extra capacity and add-on storage back-up units to keep pace with your future needs. The Communicator now offers the superb BOS operating system ensuring access to a wide range of top quality Commercial, Accounting and Office software. You can also specify versions featuring DR's very latest operating system, Concurrent CP/M, which allows full multi-tasking facilities for up to four different functions supporting up to eight work stations.

COMMUNICATOR MULTI-USER BUSINESS SYSTEM

Communicator CP1525M 16 bit 512Kb RAM, 1×179Kb floppy disk drive & 1×20Mb hard disk, with MBOS multi-user operating system allowing up to 5 users with comprehensive range of top software available inc. BOS Accounting and Office applications....**5495.00** ex. VAT.



COMMUNICATOR 5-USER SYSTEM

COMPLETE SYSTEM FROM £2119 PER USER

Communicator CP1525M as above plus 5×WY50 Display Terminals, Anadex 9625B dot matrix printer, inc. all cables. **10595.00** ex. VAT

5-USER COMMUNICATOR MULTI-PROCESSING/ MULTI-USER SYSTEM

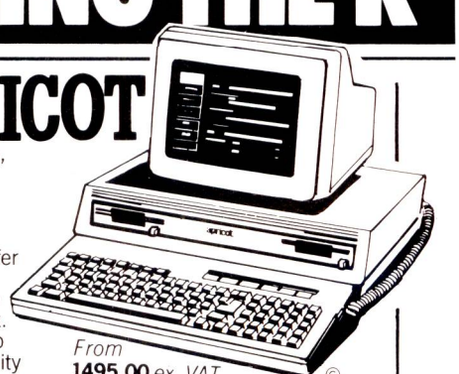
COMPLETE SYSTEM FROM £1800 PER USER*

This allows each user to have their own dedicated Z80A processor and 64K b of memory while sharing printer facilities and data from common disk storage. So two users, for example, could be running word processing, one accessing databases, one updating a sales ledger, while the fifth is preparing budgets using a financial planning package.

Communicator CP520 MP 5-user Multi-Processing System .....**5995.00** ex. VAT

* To include 5 × WY50 Display Terminals and all cables.....**9,095.00** ex. VAT

ACT APRICOT



Already an outstanding success, the transportable Apricot offers a comprehensive specification at very low cost, making it a perfect system for the small businessman. The Xi models offer the advantages of Winchester disks in their most compact size yet – the revolutionary 3½" disk. Benefits include faster access to information and less susceptibility of damage to disk & data. Features include a 'mouse trap', 256K byte memory expandable to 768K b and Sony 3.5" disk drives offering 315Kb of storage each plus Apricots' unique 'Microscreen' facility. New 12" screen is an optional extra for all models at a cost of £100. Included in the price are three operating systems MS/DOS 2.0, CP/M-86+, Concurrent CP/M-86 together with Microsoft and Personal BASIC, Supercalc, Superplanner and Asynchronous File Transfer Software.*

From **1495.00** *ex. VAT* ©

1495.00 ex. VAT
1795.00 c/w twin 315Kb floppy disk drives & 9" monitor ex. VAT
1995.00 c/w twin 720 Kb floppy disk drives & 9" monitor ex. VAT
2695.00 c/w 5Mb hard disk & 315Kb floppy disk drive & monitor ex. VAT.
2995.00 c/w 10Mb hard disk & 315Kb floppy disk drive & monitor ex. VAT.

* Subject to availability

APRICOT BUSINESS SYSTEMS

Financial Planning
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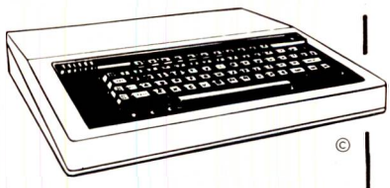

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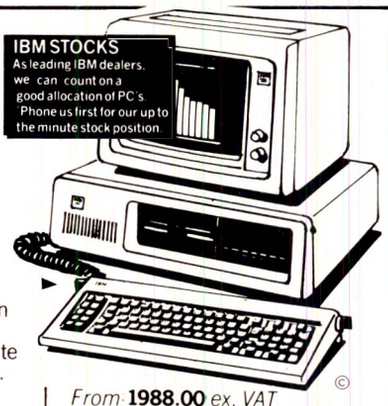

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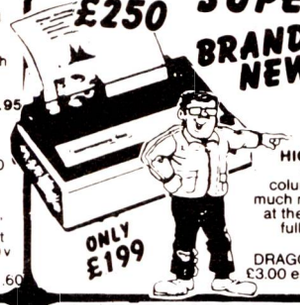

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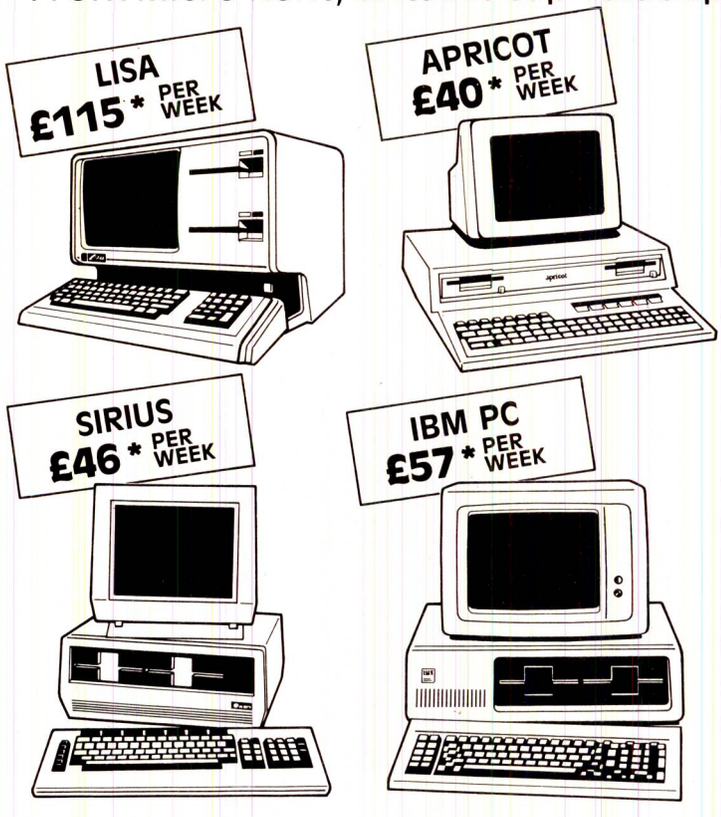

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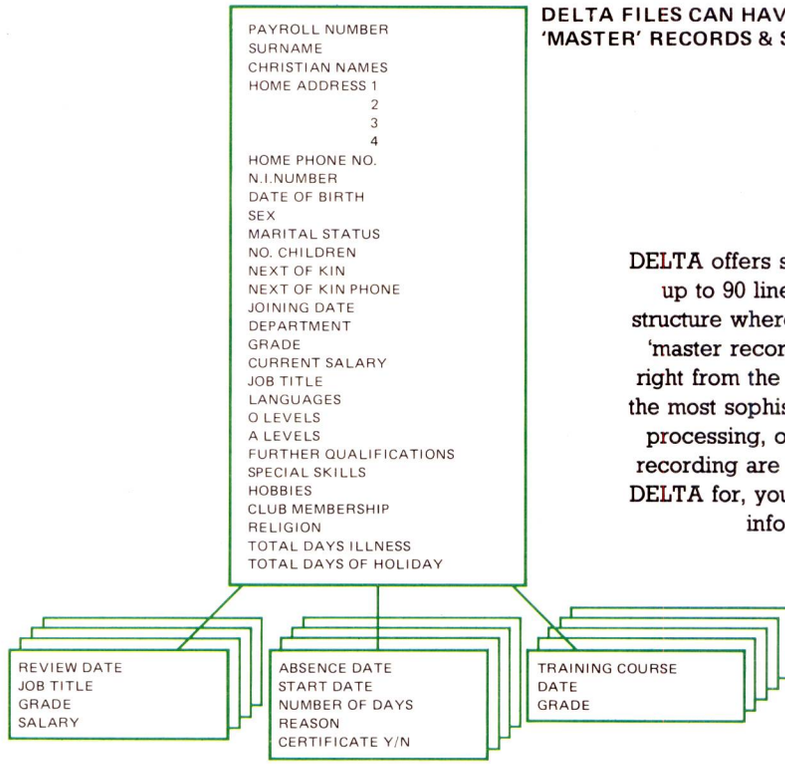

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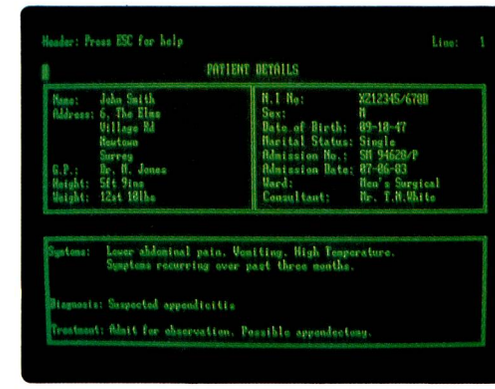

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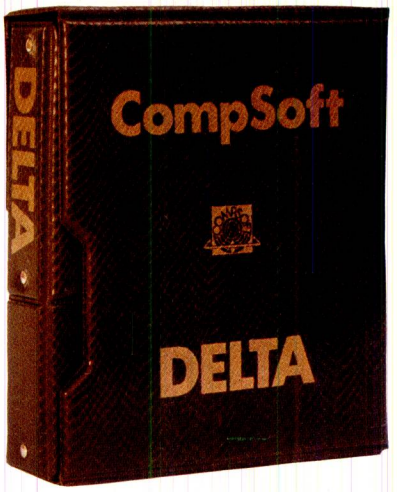

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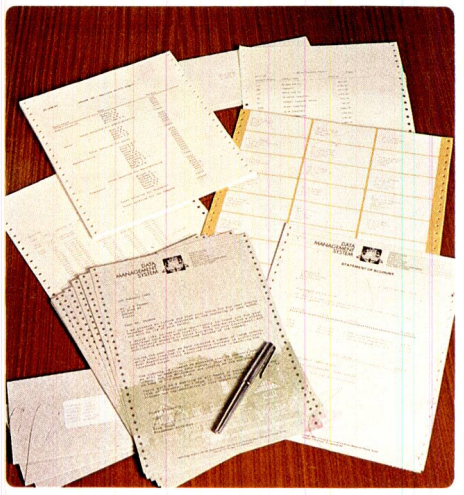

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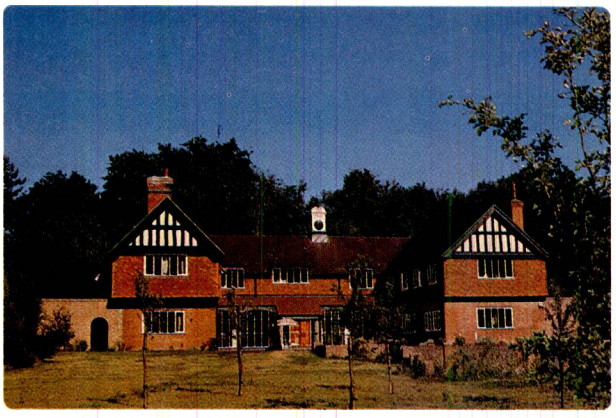

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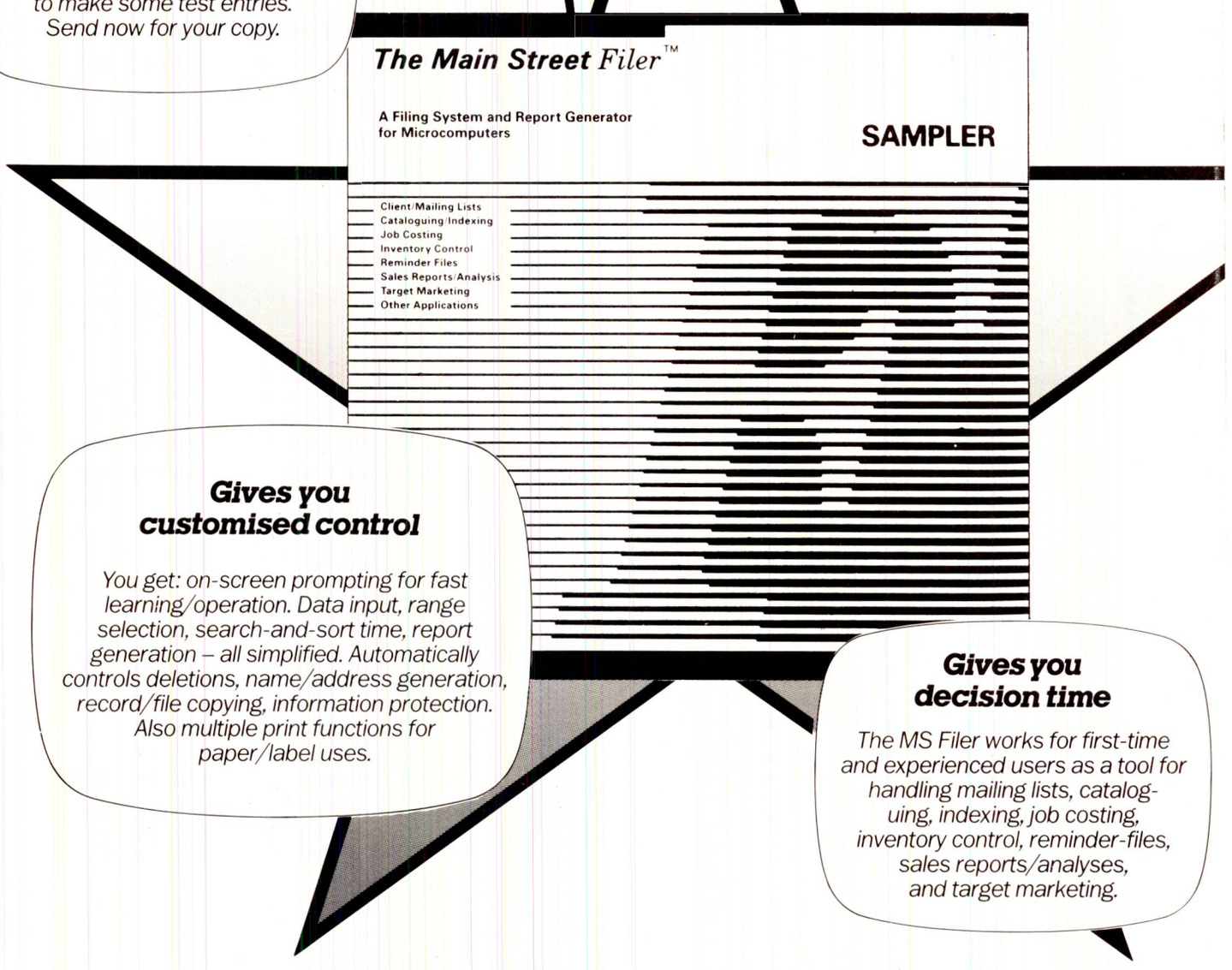

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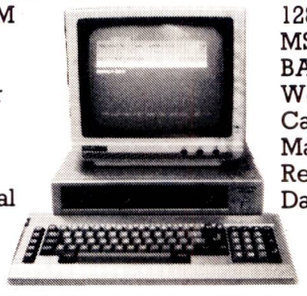

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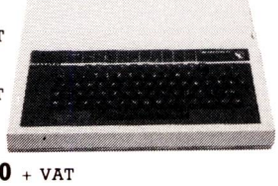

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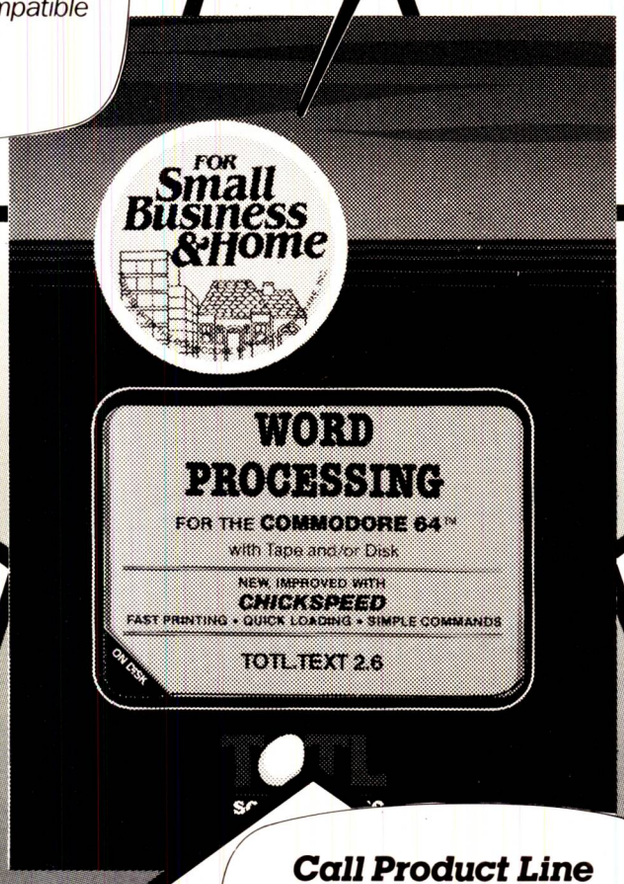

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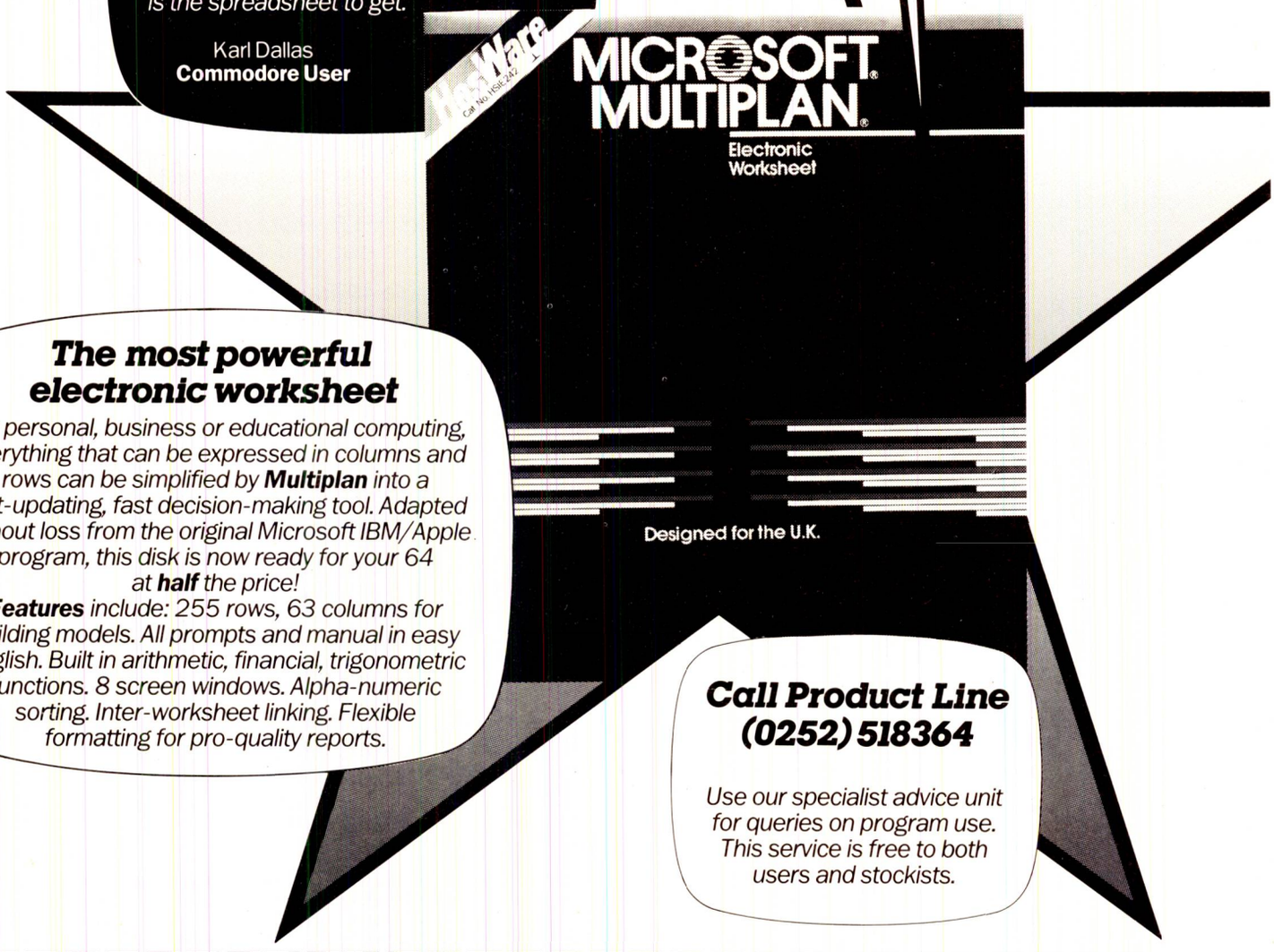

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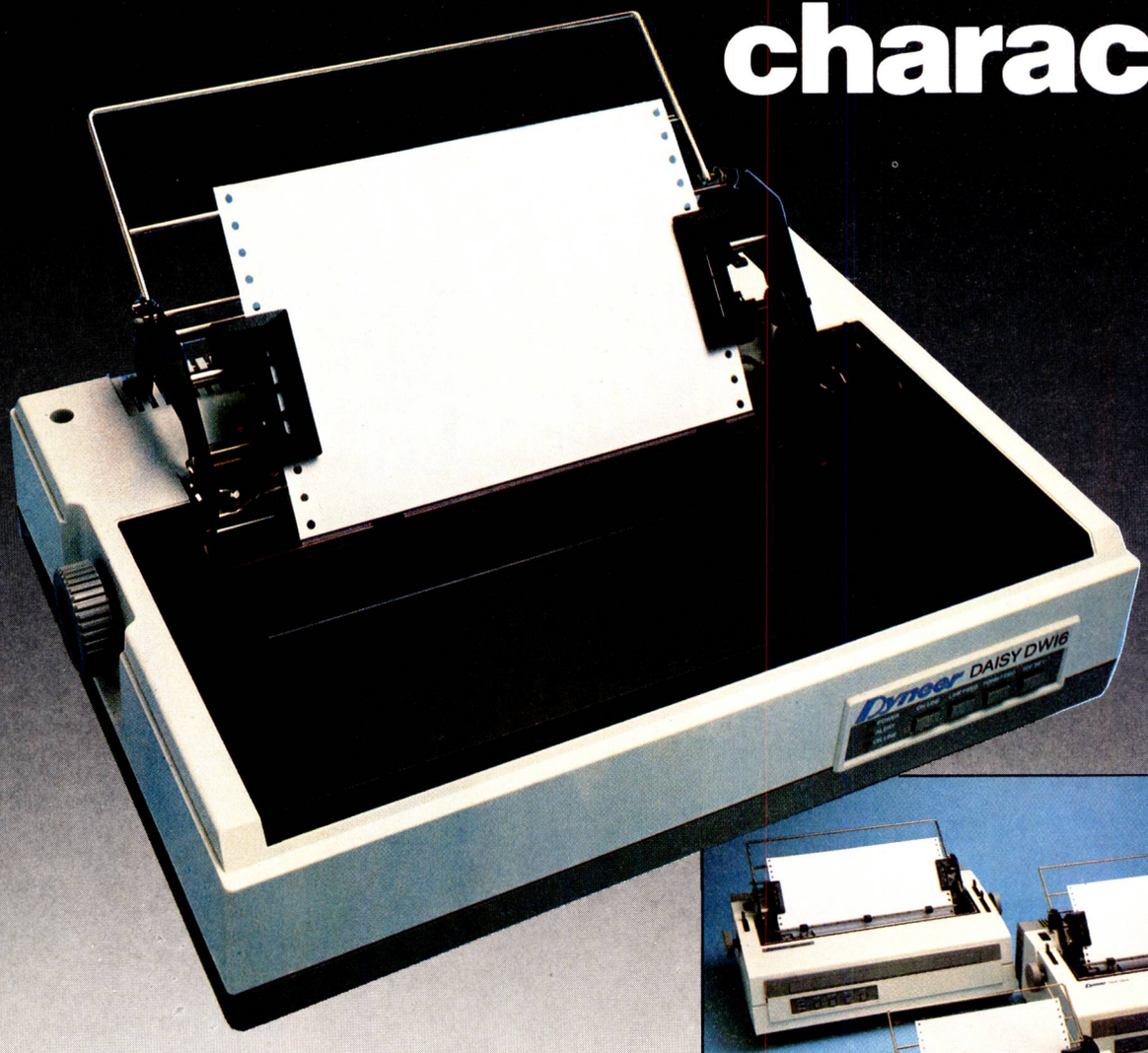

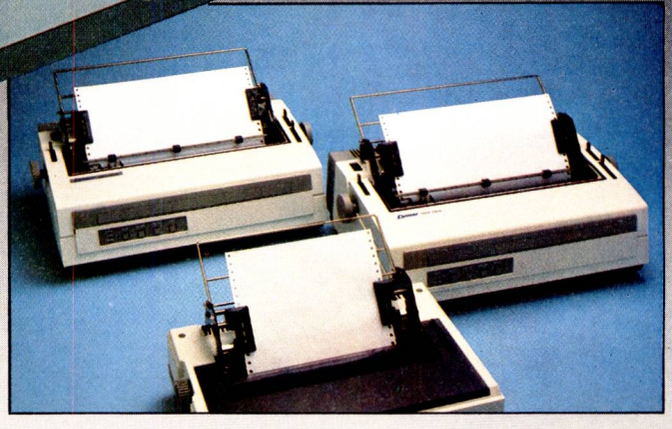

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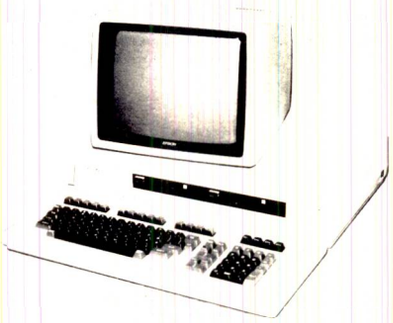

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Guy Kewney looks at the new ACT machine, the Comdex Show and 'finds' another guilty party in the software piracy debate.

'Lovable' Rascals mark beginning of the end for Sirius

The two new ACT micros (see STOP PRESS . . . page 102) probably mark the beginning of the end of the Sirius in the British market.

The alternatives open to ACT were to produce cheaper machines that were IBM-like, or Sirius-like. (The idea of going IBM isn't as improbable as it seems, since ACT makes quite a bit of its revenue out of selling IBM software.)

However, there is a fundamental difference between the nature of the two families.

Both machines are built around an Intel 8086 family chip, and both run MS-DOS or CP/M as their standard operating systems. And on the face of it, there are more alternatives facing the IBM family user than the Sirius family user. There are operating systems like DesQ, integrated software packages like 1-2-3, Symphony, Ovation, and so on—which tend to be available later on the Sirius family, and in some cases, not at all.

What attracts UK software designers to the Sirius family, however, is the essentially 'soft' nature of the hardware. You can make the screen change its whole nature under software control, and little of this flexibility is lost in the Rascals. In the IBM family, the decision to use Greek characters is a serious one—in the Sirius family, you can do it while running WordStar.

The Rascals have one small (Sony 3½in) diskette drive (like the Apricot). We can expect many other people to follow the Sony line—not least, IBM itself, which is within months of an announcement.

Another new feature which is not a gamble in itself is colour graphics, and the IBM colour graphic standard is not only far from ideal but expensive too.

It must be seen as a gamble, all the same, and only time will show whether ACT has made the right decisions.

One decision I do wonder about is the fact that both these small portables are necessarily mains-powered.

There are other lap-size machines with the same design feature. You can use them on a desktop, but not in a bus; on the other hand, their weight makes them pretty portable.

The theory is that few people find the lightest portables really satisfactory, and few people find the really satisfactory portables light.

I must say I'd like a compromise. I'd like a reasonably adequate, very light portable keyboard with storage and rudimentary editing ability, which would plug into my disk drive and full-page screen at the office, and turn into an Apricot.

In fact, an Apricot with a Tandy 100 as the keyboard would be very close to the ideal, and shouldn't cost a thousand pounds more than the Rascal—in fact, it shouldn't cost £400 more, with today's technology.

As time goes by, we will probably find more and more things to like about the Rascals.

The new machines are noticeably cheaper than the Apricot, and that must mean they are limited in some way.

The shroud of secrecy surrounding the launch was penetrable only by the strangest cloak-and-dagger operations I can remember.

My source assured me that his post within the company would end if I revealed his name. And if I reported the tantrum which the official spokesman threw when I threatened to reveal that there were two, not just one, Rascals, then not only would you disbelieve me, but you would think I'd gone potty.

ACT got so paranoid that a reporter on *The Times* was called back into the publicity offices and forced to sign a non-disclosure agreement, just in case *The Times* told me, and I told *The Mail On Sunday* . . .

Microsoft changes its tune

Microsoft appears to have changed its mind about how many programs we want to run at once. Secretly, quietly, and avoiding publicity, Microsoft has decided to release a new version of its operating system, MS-DOS. It does networking, and multi-tasking.

The latest version isn't available to customers yet, and isn't likely to be for some time. But the people who will supply it have been given samples to test, so that they can tell Microsoft what the problems are.

What is really interesting about the (very little) information that has filtered out from this well-shielded cage of activity, is the fact that Microsoft was not talking about anything like as ambitious last time it stood up in public to lecture. By Microsoft, I mean the chairman, bonny Bill Gates.

Gates tells people these days that he isn't giving interviews, because he wants to get back to programming. This has given rise, in uninformed circles, to the suggestion that he is really preparing his company for a launch onto the public stock market, a rumour which I have finally been brought to believe



Just when you'd finally given up on the Epson HX-20 and decided to get the PX-8 instead, the company finally wakes up and gives the thing the word processing/comms package it should have had from day one.

The software is now permanently plugged in—in ROM form, too.

The Intext word processor is nice, the keyboard is very good indeed, and the comms software lets you dial up things like Telecom Gold.

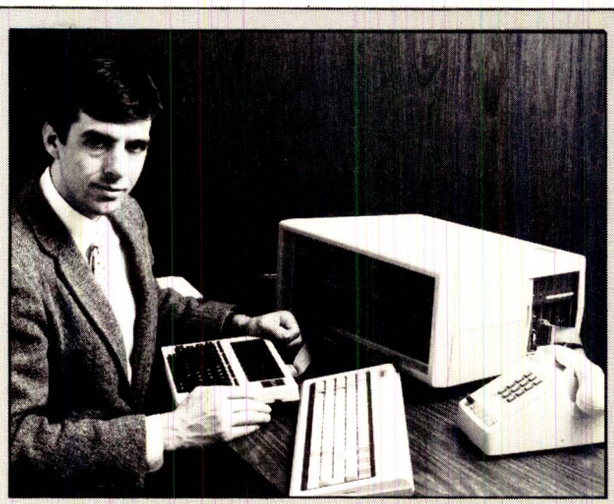
The display is unusably small (four lines of 20 columns).

Before you rush off to buy the PX-8, I must add, however, that a colleague who uses one all the time has discovered an irritating little 'feature'—the diary cleans itself out every time you have a problem with any other program.

I can't imagine that anybody who buys the PX-8, which has enormous memory and WordStar, would do so only to get the diary, but here is what happens, just in case:

WordStar on the PX-8 is very nice, and includes a command (unknown in other WordStars) to 'transmit a file'—very nice, too. However, it only seems to work if you transmit it to another Epson (a QX-10, probably) and if you don't, it won't stop without somebody pressing RESET.

At that point, all your diary dates are completely erased!



Transferring files from a lap-held computer to a bench-top machine is essential, mainly because the lap-helds don't have big disks—but, normally, it takes place as slowly as if there were a telephone exchange in-between.

News reaches me from Dallas of a program to speed up comms between Tandy model 100s and a very wide range of bench-top micros, from IBM through Apple, Olivetti and TRS-80 models, including some CP/M machines.

It is called Disk+, and is from Portable Computer Support Group. It transfers files so fast you don't know they're going and are even being checked for errors on the way. Or so I'm assured.

Details on (214) 351 0564.

is premature.

But in the days when he was buying the drinks at conferences and speaking his mind at parties, he used to argue that: 'Concurrency is not what the user wants,' and suggested that what was needed was the ability to switch from one program to another, fast, putting the first one on 'hold' temporarily.

Word is that the test versions of multi-tasking DOS 2.0 are not quite so limited in their ambition. They include facilities for two programs to pass information between each other, while they are both running on the same system.

And what is really fascinating is that that 'system' can involve two or more computers, linked by a network.

This thinking conflicts with what a lot of traditional computer people are saying. They argue that Unix, an operating system which allows several people to use the same computer and work on the same data files, will more than meet requirements for multi-tasking, and that networking will never work.

Microsoft is the largest supplier of Unix-type software, with its Xenix product. For Microsoft to produce a multi-tasking MS-DOS is going to be seen as less than an act of blind faith in Unix as the saviour of the future.

I don't doubt that Unix does all the things its fans say it does. It's the things it doesn't do which will hold back the industry for 10 years, and the industry must move forward, or die.

D-day for Apricot micro

Apricot's great impression on the US market at the November launch seems to be keeping up. The pressure at this show came from its new distributor, Micro D—one of the big three US soft/hardware distributors to the shopkeepers.

The manufacturer, ACT, has probably found the optimum outlet for this machine, and the drawback of this, of course, is that now there can be no excuses. If the Apricot doesn't sell well in the US, it can't be because of distribution problems, and the company will have to rethink.

It appears not to anticipate problems. Chris Buckham has returned from the hills of California, where he was running the show, and is handling the launch of the smaller Rascal in the UK.

Ready-to-wear goods

First there were women, then there were computers, now there is Women's Ware (TM).

My quote is from Neon Software Company, where 'woman' apparently means somebody who hasn't time to spend learning complicated software. Dwight Norwood, head of the company, says that his wide range of stuff is aimed at 'today's on-the-go, two-career woman, who doesn't want to make computing a full time hobby.'

The subjects covered are 'in almost every area that is of interest to modern women—fashion, sports, diet and nutrition, investments, certain hobbies, and so on,' said Norwood.

The products are packaged on coat-hangers. I don't know what the world's coming to.

Details on (203) 346 6322.

Commodore posing a threat to IBM?

Having spent two years ignoring the business market, Commodore now reckons that by adopting a modified Canadian portable, it's going to put paid to IBM's overweening ambition.

The machine on which Commodore is staking so much hot air is a nice enough one: it started out life as the Bytec Hyperion. The board from inside that machine has been taken over by Commodore, under a large deal with Bytec, and with a few alterations, it will be sold as a Commodore product.

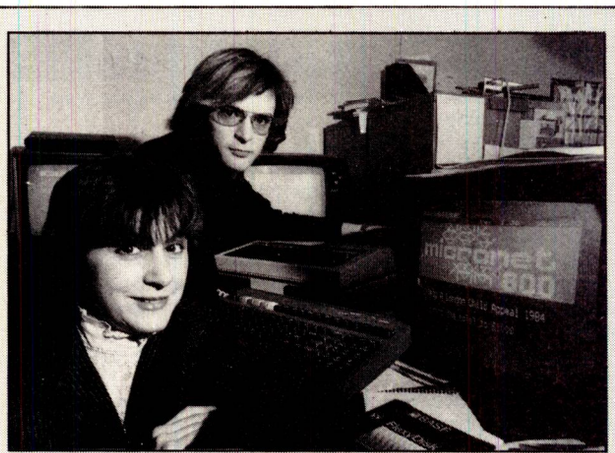
The idea is that, this time, it will be available when the company says. This time, it will really be an IBM compatible product and will be available through lots of dealers.

Commodore's high opinion of its own chances in this market isn't totally developed in-house. The company quoted an article by Gartner group's Doug Cayne, an analyst of the IBM scene, in *PCW*'s sister paper *PC UK*—Cayne reckons that within one or two years, Commodore will be the leading maker of imitation IBM machines.

I'm sorry, but I don't believe it. Commodore has a lot of home computer dealers, who are not suited to the job of selling a business system. It used to have a lot of business system suppliers, too. But their experiences of promises, delaying tactics, mushroom treatment (kept in the dark, fed on bull) have meant that all but a few, hard-core enthusiasts, like David Whitehead of Adda and Kobra, have either diversified (sell mainly ACT equipment) or dropped Commodore altogether (sell only ACT equipment).

Over the next two years, anything is theoretically possible. One of those theoretical possibilities could be Commodore mending bridges with its old dealers, getting a whole lot of new ones who have become disillusioned with IBM itself, and taking over the country.

More probable is that the Macintosh will appear in its half-megabyte form soon after Christmas. The IBM will come out with a 3½in Sony drive and speeded-up process, and a different card cage. Portable IBMs like the Osborne Encore



To my utter disbelief and astonishment, the Thames TV program* Database *(for which I must confess in the interests of impartiality, I work) got over 1500 responses to a request for micro users to send messages through Prestel.

I found, equally amazing, the news that Micronet 800's charity appeal over London's* Capital Radio *raised £1000.

The charity news is very gratifying, of course (the charity was Help a London Child) but what really interested me was the high level of interest in logging on the Prestel, even with all its faults and failings.

Micronet's Denise Semuel (left) and Adam Denning were at Capital with their equipment to receive the donations and David Babsky, editor of Micronet, tells me that Micronet enthusiasts pledged contributions 16 times the average pledge of other listeners.

and the HP 110 will be available for less than the Commodore Hyperion design. ACT and one other UK supplier will produce something in this market, and a new market for 68000 stand-alone systems will emerge.

As for the Hyperion, it was a lovely machine a year ago. Since then, the times have advanced. Its dealers have strangled each other, and even now, to get an admission that the Gulfstream company (which Bytec set up to sell it) has closed down is like getting Texas Instruments to admit a mistake somewhere in the planning of the 99/4—it's obvious, but nobody is going on the record to admit it.

And the Anderson Jacobson Ajile has been dropped, and Anderson Jacobson is now selling the identical Hyperion, as sole UK distributor.

Meanwhile the leading IBM portable (the Compaq) has arrived with the unshakeable reputation of being genuinely compatible (it wasn't here when Gulfstream was wasting its time wrangling) and IBM itself has launched a portable PC.

In this circus atmosphere, the appearance of a weird statement from Bytec itself has been just one more noodle in the soup.

It has written sternly to all editors to 'put the record straight' about 'rumours circulating in the industry' that Commodore will sell the Hyperion anywhere in the world.

After watching Bytec shoot itself in the same bullet-hole in the foot so many times over Anderson Jacobson, this shouldn't seem surprising. Anybody else would actually welcome the chance to announce a 'second source' for its product: Bytec has to deny it. It's a bit like watching somebody win a race by heroic struggles, and then insist on disqualifying themselves on a technicality . . .

Just to put the record as straight as it can be, for this week, the Commodore PC will be a Hyperion, except for the box, the screen, and one or two small extras, including the name. But Commodore will be a distributor of genuine Hyperion boxes, with smaller screens, and the original name on the box.



A network for IBM micros has been launched by start-up Cambridge company Torus.

It is the firm's first product.

The network is called Icon, and what distinguishes it from most networks (as far as users are concerned) is the fact that it looks different on the screen. It uses Macintosh (or Lisa) style icons, hence the name.

On the specification sheet, it doesn't look vastly surprising as local nets go. It links users, gives them a system of internal electronic mail, links to external electronic mail (big deal!) and shifts files around.

Oddly enough, it's also supposed to act as a sort of dumb switchboard operator—dialling numbers from a list of names, and giving the person talking a screenful of data about the person on the other end of the line.

What is surprising, however, is that although Torus is in Cambridge, and although the inventor of the Cambridge Ring method of networking micros is a director of Acorn, the Icon net uses Ethernet as its electronics.

Torus has picked up Intel's specialist chip for this, and reckons that up to 100 IBMs or XTs (the hard disk version of the IBM) can be linked. The desktop machines require at least 256 kbytes each, and at least dual, double-sided diskette drives—but that applies to most IBM installations these days.

To the Torus directors, the distinguishing fact of Icon is that it is a 'graphics-based network,' capable of working with both mono and colour displays.

Cost per station is under £1000 on a 'typical' network, they say.

Details from publicity agents Quantin Bell on (01) 240 8751.

Editorial scoop!

A daily newspaper, weighing two pounds, personally delivered to 20,000 people before breakfast, covering not just one industry, but just one show in that one industry, takes some believing. But there is one: it's the *Comdex Show Daily*, published by the organisers of America's biggest computer show.

To call Comdex 'big' is to concentrate on its drawback, at the expense of its real value. Its real value is that this is the show where the big manufacturers are talking directly to their biggest customers, the distributors, who are also there, talking to their biggest customers, the dealers, and everybody is surrounded by the biggest corporate buyers, the top managers of the big companies which buy micros in bulk for their executives.

Nonetheless, before reporting on the products and announcements which I found at the last show, it's worth trying to give some idea of its size. It occurred to me that a simple way of doing this would be to interview its newspaper, via the editor, Vic Farmer.

Farmer used to be a senior editor on America's giant computer paper, *Computerworld*. One day, he was assigned to cover the growing National Computer Conference for his paper, at a time when the computer industry was just turning into the sort of monster that we now take for granted.

'It was like running a big, daily newspaper,' Farmer said. 'There were all these conferences, all these parties, all these exhibition stands, all these people, and, to cope, we had to set up a team. And filing reports back to the office was exactly like running a live newspaper.'

A few years later, Farmer had got into the routine of doing these big shows, and had a good idea of what sort of things went on, what sort of reporting costs (manpower, materials) would be involved in doing a report to be printed at the show. He started doing this, for *Computerworld*, and really was a bit surprised (a couple of years after that) that his face no longer fitted, and he was looking for a job.

Eventually, his search for employment led him to Sheldon Adelson, boss of The Interface Group, the enterprise behind Comdex. Comdex was becoming enormous, and Farmer managed to convince Adelson that it was big enough to take over the running of the show newsletter, and Farmer got the job of preparing *The Official Show Daily*.

For the four days of Comdex Spring in Atlanta each year (see Show Report on page 100), and the four days of Comdex Fall in Las Vegas, six months later, Adelson's team moves into high gear.

Four full-time editors and three artists bring the skeleton of four daily papers down from Massachusetts, and publish the first edition to be ready for delegates the day before the conference starts.

It includes most of the information prepared for the conference organisers by exhibitors. Some of that comes in months before the show, and much of it is empty puff of the: 'Once again, Best Computers will be demonstrating its extraordinary range of diskette hole-punch equipment'—but much of it is really new.

Farmer's team is in an enviable position: not working on regular monthly or weekly magazines, it can be safely entrusted with commercial secrets, and can research stories in depth, well in



BY NEXT YEAR, EVEN IBM MIGHT HAVE ONE.

This is the Sanyo MBC 555.

The first high performance business machine of its kind to offer the compatibility and versatility of a true 16-Bit business micro for less than £1,000 + VAT.*

A revolutionary price for a revolutionary machine because with 128K RAM expandable to 256K RAM, both the twin drive MBC 555 and the single drive MBC 550 have an 8 colour graphics capability (640 x 200 dot resolution), an 8088 CPU for high-speed processing, a Centronics parallel printer interface and free bundled software.

Add to this the support of a compatible range of peripheral equipment, a comprehensive selection of software and a price tag of less than £1,000 + VAT (MBC 550 £749 + VAT) and you'll probably understand why this package is so attractive.

But the real beauty of the MBC 555/550 series is that you don't have to wait until next year for them.

If you want to see these two innovative machines from Sanyo's proven range of Micros phone LOGITEK on 0257 426644 or STC on 0279 26777 or ICARUS on 01-485 5574 or clip the coupon and we'll show you how to stay one step ahead.

*EXCLUDING MONITOR.

Name

Company

Position in Company

Address

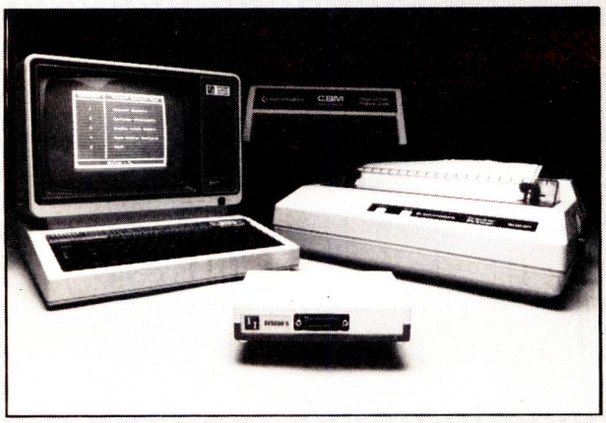
Tel. no P.C.W.3

Return to: Marketing Dept., Sanyo Marubeni (UK) Limited, Sanyo House, 8 Greycaine Road, Watford, Herts.



SEE SANYO, THEN DECIDE

SANYO



I've been told of a way of using disks on a BBC Micro, without buying the disk filing system (DFS).

It involves using Commodore peripherals.

It's possible that a lot of people who used to have Commodore machines (the big ones, not the toys) still have their old 8040 diskette drives, but nowadays spend a lot of time using BBC Micros, instead.

There's no knowing how many exist, but Intelligent Interfaces reckons that it is enough to warrant releasing a £165 (plus VAT) interface to link an Acorn micro with Commodore diskettes.

The models with which it works include 2040, 3040, 4040 and 8050. It also drives Commodore printers.

It seems clear from the limited information available that programs written for the BBC, which assume a BBC disk, are not just going to start working with the Commodore drives: however, the designers of this interface claim that 'it offers commands equivalent to all Acorn DFS commands,' and also that it 'fully supports sequential and random access filing from BBC Basic.'

The advantage of Commodore drives (apart from their presumed availability) is simple — they are very big, giving around a megabyte on a two-drive system.

Details on (0789) 296879.

advance of the launch date (while the rest of us have to try and make sense of it on the day of the launch).

Also pre-organised will be many background articles which range from hints and tips for keeping your feet in working condition while walking round the five to eight miles of exhibition carpet, health suggestions for avoiding strain and tension, eat-out hints for the strange town you're in, and other simple bodily requirements, right through to in-depth analyses of new trends in the industry — five new portable micros, for instance, where each company contributing information about a new design thought it was unique, and was going to be the star of the show; or new deals being set up between manufacturers and distributors.

At the show, an add-on team of local freelancers — photographers and writers — joins in the hunt for news.

There are reports from the conference sessions, interviews with prominent industry figures attending the show, photographs of new products and publicity stunts, and round-ups of developments during the day.

At the end of each day, they sit down in front of a battery of computers — six Eagle PC machines (equivalent to IBMs) connected direct to the printworks.

'We do it with diskettes,' said Farmer, 'with one of the machines being connected to a modem, and everybody putting their copy onto diskettes for transmission. It's easier than a network.'

At Las Vegas, the bigger of the two Comdex shows, the issues run to 200 pages, printing 50,000 copies a day.

All this effort, and the biggest audience of American micro buyers in the world, and where's the British micro industry? A half dozen enterprising people on the Trade and Industry stalls, another half dozen of the big guys who are already wise to the trick, and that's it!

If I have to endure one more complacent British software 'expert' telling me how much better UK software is than US, how much more innovative, and imaginative, and on and on and on, I may lose my temper. If we're so wonderful what's wrong with taking the stuff to those poor, deprived Yanks?

Stamping out piracy — 'crooked' distributors at fault?

The myopia of software houses is unabated. Latest example of blinkered vision is a threat from PSS, CRL, Anirog, Silversoft, Interceptor, Microdeal and Visions, to *PCW* — that if we print advertisements for tape or disk copiers, these people will all withhold their advertising.

In the back of dozens of seedy video hire shops, dubious merchants with ghetto blaster copiers are churning out hundreds of commercial copies of their programs, and stealing money which we (the buyers) are paying.

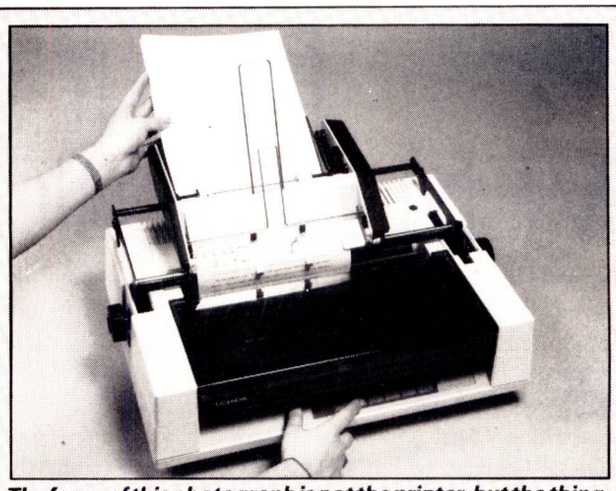
But these upright folk don't see any point chasing them. Instead they are trying to get schoolkids to pay for all the programs they have copied, by making it impossible to copy — by suppressing tape copying programs. This will automatically mean that (since all schoolkids actually have a C90 tape with around 200 programs on it) that schoolkids will suddenly find well over £1000 pocket money each year, instead of £1 a week, and will spend it all on buying tapes and disks. Point by point: most of us would never pay good money for some of the rubbish we are given. If tape and disk copiers are suppressed only by the cancelling of advertising in trade mags, people will not stop buying them, or using them. If copying becomes impossible, people will stop buying quite a lot of the programs they actually do buy, because they share the cost between several.

I don't approve of copying instead of buying. I don't do it, and it's short-sighted and stupid to make a habit of taking what you can't afford to pay for.

But software producers should concentrate on getting their money out of the hands of the counterfeiters. And one of the most important things they could do would be to stop distributors — big, 'reputable' distributors — from buying large quantities of tapes from criminal gangs at half price, instead of from the software houses.

If home copying were the reason that people didn't buy tapes, then they wouldn't buy the counterfeit tapes, either. And if people didn't buy counterfeits, the gangs wouldn't copy them, would they? So I think we can assume that there are people out there parting with money in exchange for software.

As for calling this advertising threat 'one of the first major



The focus of this photograph is not the printer, but the thing that feeds paper into it one sheet at a time — because this sheet feeder costs £240.

It will work, say the suppliers, with Epson, Uchida (illustrated), Oki Microline, Silver Reed, Juki, Star, Mannesman Tally, Towa, Dyneer, NEC 510, Qume 12/20, TEC 8600 and Daisystep 2000 — a list which includes three names I'd never even heard of. I'm not saying which.

Details from WBM Business Supplies on Woking (04862) 66444.

One way or another, you can have a computer in your pocket.

No, we're not exaggerating.

Thanks to the Psion Organiser (that's the one on the right), you can now walk around quite comfortably with a computer in your pocket. You can travel on a bus without taking up two seats. Or stroll through a revolving door with confidence.

In fact, you'll be carrying an expandable computer system with a microprocessor that's significantly more advanced than those commonly found in micros costing 20 times as much.

Unlike some of its larger counterparts, however, the Organiser's simple language and command structures make it very easy to operate. Even for the computer novice.

An extremely efficient filing system in your pocket.

The Psion Organiser comes complete with a plug-in datapak which can permanently store over 10,000 characters. Allowing you to enter such day-to-day information as diary engagements, telephone numbers, addresses, train times and exchange rates. To name but a few applications.

You can type in information and "SAVE" it in any form you want and retrieve it quickly and simply with the "FIND" key.

So you'll no longer have to juggle with diaries, notebooks and backs of old envelopes to keep yourself organised.

All entries can be simply amended by using the Organiser's editing facility. And since all data is permanently stored in the datapak, you'll never lose it, even if the battery is disconnected.

Carry out complex calculations – simply and swiftly.

Without plugging in any additional software, the Organiser can carry out calculations involving up to 200 characters and two levels of brackets.

Entries are typed in and displayed the way you would write them.

Moreover, you can go back and edit both data and formulae, even after the calculation has been carried out.

So it's simple to correct entry mistakes and perform "what if" calculations.

In addition, the time and date are displayed at the touch of a button.

Expand your Organiser, but not your pocket.

On receiving your Organiser you will find that it has two unique 'solid state drives concealed under its protective sliding case.

These matchbox-sized units are key to the open-ended power of the Organiser, allowing you to create and use an infinitely large personal and permanent information base on 8K and 16K datapaks.

Two 16K datapaks together give a total storage of over 40,000 instantly accessible characters.

Additionally, either size of datapak can be used in conjunction with any program pack to produce unbeatable processing power in your pocket.

Comprehensive software programs.

Available immediately are three plug-in 16K program packs for financial, science and maths applications, the beginning of a software library.

So whether you're involved in management, engineering, technology, sales or accountancy, there's a program pack containing all the software you'll need for standard computations and a lot more besides.

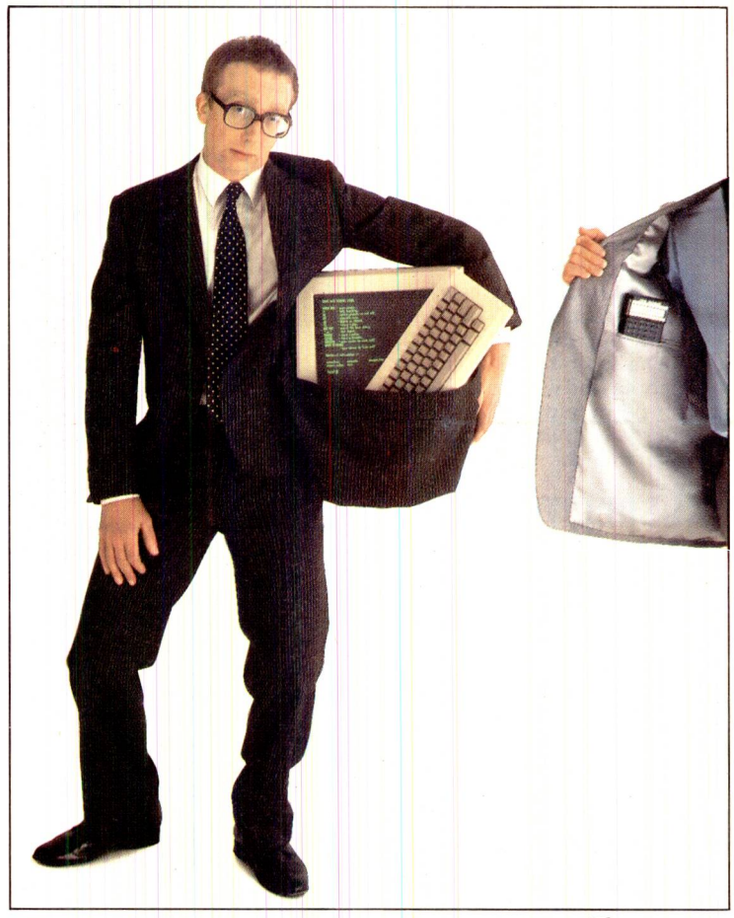
Each program pack incorporates a database containing essential specialist facts, figures and formulae, plus (more importantly) a simple-to-understand programming language. Enabling you to write your own software programs (up to 16K long) and run them off a datapak whenever needed.

In short, the Psion Organiser is as functional as systems 200 times its size.

It's a computer with screen, keyboard, operating system and twin solid drives for data and program storage.

But, at £99.95, it's a lot less strain on your pocket.

Psion Ltd., 22 Dorset Square, London NW1 6QG.





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Please send me by registered mail:

	QUANTITY	PRICE	P+P	TOTAL
Psion Organiser with 8K datapak		£99.95	+£2.50	
Science Program Pack		£29.95	+£1.50	
Maths Program Pack		£29.95	+£1.50	
Financial Program Pack		£29.95	+£1.50	
16K datapak		£19.95	+£1.25	
8K datapak		£12.95	+£1.25	

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Psion Ltd., Reg No. 1520131 England. Orders can only be accepted for delivery within the UK. Please allow 14 days for delivery.

If for any reason you are not completely satisfied with your Psion Organiser, return it in good condition within seven days and we'll return your money in full and without question.

PSION

steps to be taken in the obliteration of piracy,' the notion is laughable.

I end on an entertaining note. One particular software house is widely believed to be owned by a prominent gangland figure. It came to his attention that copies of his best-seller were on sale at prices which made him reasonably suspicious that a rival was profiting at his expense.

His technique was to pay a visit to the distributor, whom he offered the alternative of amending his trading practice, or undergoing surgery on his kneecaps with a ballistic weapon.

Out to lunch!

My old friend Mike Lunch, having failed to convince me of the merits of the Texas 99/4, then of the vastly greater merits of the Aquarius, moved to software company TABS, with rumours of 'amazing things about to happen' some time in the last New Year.

These amazing things turn out to be hardware.

TABS has started selling the Olivetti version of the IBM micro, because of the shortage of originals. It is also trying to sell the original, and the Apricot and Sirius, and the Future and the Octopus.

The group has established some 50 TABS Business Centres, which sell not only hardware and TABS accounting software, but also distribute other business software. First outside product is from IBIS: an incomplete records package.

So naturally, I tried to contact the former computer manager of Texas, and the former managing director of Mattel; and found that he has moved on. No longer will I be hearing from my old friend Mike Lunch, for he has joined IBM, and people who work for IBM are not permitted to have journalists numbered among their friends.

User group for Adam

A new user group — this time for the Adam (Benchtested in April): the strange two-diskette box that attaches to Coleco video games boxes.

Perhaps there are some Adam users in this country, after all, because somebody called David Winnet reckons that he will attract like minds if we publish his address.

I have my doubts, but the address is 20 Wordsworth Close, Towcester, Northamptonshire NN12 7UJ.



Thorn EMI has got into the IBM-lookalike business by adopting the Televideo Tele-PC. It's a very elegant system, and, what is more, it is available on demand, unlike the original, claims Pat Harvey, managing director of the Computeraid branch of Thorn.

Look for a portable version this month, from the same source (and other importers, of course) — details on Weybridge 52939.



You can tell at once from David Canter's scraggy, honest face that he is a psychologist (he's professor of Applied Psychology at the University of Surrey).

And from that, of course, you will at once deduce that he is going to make a vast difference to the software supplied by Compsoft.

Canter has been taken on as a director of Compsoft. 'Psychology and software,' the company raves,'. . . the perfect combination!' Details on (0483) 898545.

Burned by Dragon

Dragon Data Ltd's decision to call in the receiver has had a strange side effect. Sales soared in the panic that followed as retailers tried to clear their stock. Bargain hunters were able to pick up a Dragon 32 for as little as £59.

Although Salamander Software's Paul Kuczora was nostalgic about the Dragon 32 (Dragon started up at about the same time as Salamander) he is now negotiating with Tandy to license some of its titles for use with the Color Computer, which like the Dragon is based on Motorola's sophisticated 8-bit 6908 processor.

John Symes of Microdeal agreed that around Christmas 1982, the Dragon 32 was the right machine at the right time and sold for the right price — unlike the 64k version. Symes also cites Dragon's early runaway success as a factor in the company's eventual collapse: 'Everyone at Dragon was too busy to talk to us.'

Later, when sales slowed, Microdeal found Dragon technical staff hard to reach or unhelpful. 'I don't think they appreciated the need for third party software,' said Symes. Microdeal, too, is exploiting the Tandy connection by importing American Color Computer programs for use on the Dragon.

Soft Solution's Shaun Fensom echoed the frustrations of dealing with Dragon: 'It was notoriously difficult to get information about the 32 from the company.' Bad documentation, especially about writing machine code, slowed the time it took for Dragon programs to reach the market-place. 'It was as though Dragon didn't know its own machine,' said Fensom. Almost by accident, Soft Solution discovered a facility — &H — to translate decimal numbers into hexadecimals, which wasn't mentioned in Dragon's manual.

Premier Micro Systems' Delta Disk package was on the market for almost six months before Dragon released its own disk system. Dragon may have gone bust, but Premier's Mike Bedford still sees a lucrative customer base.

'There are 200,000 Dragon users out there,' said Bedford. 'That's a large potential market. They aren't going to go out and chuck their computers in the bin just because the company has gone bankrupt.'

Meanwhile the receiver would be happy to sell you a computer — up to £6m worth of stock is languishing in Dragon warehouses as several interested parties, including GEC and Tandy, bid for the company's remains.

John Stokdyk

screen when it is ready.

Both Sharp and Hitachi are busy trying to manufacture these 25-line displays (Apple, ACT, IBM, Tandy and who knows who else are also in the market for them). The 16-line screen has a reasonably pleasing typeface, and the contrast is neither better nor worse than that of the Epson PX-8 (you need good strong frontal illumination for both). A contrast control thumb-wheel is situated at the left-hand side of the case.

One thing that is certain is that this LCD has a much faster refresh rate than any I've seen to date. Whereas all the lap-helds update their display with a very noticeable lag, the Encore screen was not noticeably slower than a cathode ray tube.

Power (15 volts DC) on the prototype was supplied by a small, boxed power-supply connected to a large step-down transformer giving US 110 volts. The final version will have a similar box operating at European voltages for the UK market.

A compartment next to the power switch will hold a NiCad pack to supply battery power for up to five hours — though extensive use of twin disk drives and modem will cut that down considerably. The battery pack is the same sort used in portable video camera/recorders.

Keyboard

The keyboard is a simple switch-matrix type, not an 'intelligent' unit with its own processor — as on the IBM PC. The 63 keys are proper typewriter ones with concave tops, quite similar to those on the Tandy Model 100; they have a light but not unpleasant feel.

A four way cursor group sits to the right of the space bar and all the IBM special keys are present, but in different arrangement because the Encore has no dedicated numeric keypad. The Home, End, PgUp and PgDn keys are the shifts of the cursor keys, while Scroll Lock and Caps Lock sit outboard of ALT at the left of the space bar. Vadem has wisely moved that damnable '/' key outboard of the left-hand Shift key so that the bottom row is standard qwerty rather than IBM. Next to the right-hand Shift key was a key — unmarked on the prototype — which functions as an IBM DEL key, and can be used to reboot the machine by CTRL ALT DEL. The key actually marked Del on the keyboard is conventional backspace delete (like the original Osborne 1's, it sometimes only backspaces, depending on the application).

Above the keyboard proper is a block of function keys which are implemented as a ZX81-style membrane keyboard (though you can clearly feel mechanical microswitches underneath the plastic sheet). Ten of these correspond to the IBM function keys while four below them are marked with 'icon'-style symbols and perform special Encore functions (of which more below).

The whole keyboard swings upwards to become a lid, covering the screen and locking two latches with release buttons on top of the case.

The case on the prototype was hand-made in paint-sprayed perspex. The production version will be in injection-moulded, self-coloured ABS. There is no carrying handle at the top of the case; instead sockets are provided at the sides for a nylon shoulder strap. Several commentators (myself included) have suggested that a suitcase-type handle would be more useful for short moves, and one may find its way onto the production version.

The overall feel of the package is excellent; it's not too heavy to carry around town on foot, yet it sits on a desktop like a proper computer, with the screen right there where you want it in front of your face. This is definitely not a lap-held machine as its whole shape and balance militate against perching it on your knees.

The back of the case contains D25 connectors for a Centronics parallel printer and RS232 (300 to 19,200 baud). A small empty window reveals where the separate connector for the auto-dial/auto-answer modem will sit. Approval is currently being sought for this unit, which on European models will be CCITT standard 300 baud only. The US versions will have a different — Bell standard — unit, so frequent Atlantic hoppers will need to buy a separate modem and hang it off the RS232 to cover both territories.

Removal of four screws allows the back of the case to be opened and



New design 5¼in disk drives; the second disk drive is an optional extra

undersold all the desktop manufacturers in a highly embarrassing fashion, and bundled a heap of industry standard software to boot (regrettable pun intended).

Having sold somewhere in the region of 150,000 Osborne 1s worldwide, the kamikaze pricing policy finally came unstuck, and Osborne, in July 1983, filed for protection under America's 'Chapter 11', roughly the equivalent of a voluntary liquidation. The causes of the Osborne collapse were quite complex, but a big factor was that the Osborne 1 suffered from being the first in a new market.

The Osborne 1 had a very small screen and a limited disk capacity of 90k. As rivals came out with bigger screens and disks, Osborne had to offer matching options and each took longer to emerge than the buoyant market could bear. Finally came the big one; the move to 16-bits and IBM-compatibility. An IBM-compatible Osborne was announced, but was delayed in production, and Osborne 1 sales slumped as potential customers waited instead for the new machine. The ensuing cash-flow crisis almost proved fatal.

The word 'almost' is crucial, because Osborne is back in business. The company has reorganised, made arrangements to clear up its debts (it will be discharged from Chapter 11 soon) and announced . . . a fully portable, IBM-compatible computer called the 'Encore'.

The lessons have been learnt, and the new-look Osborne company will steer clear of manufacturing; it will market the Osborne Encore in Europe and the rest of the world. The machine is designed by a silicon valley firm called Vadem, set up by ex-Osborne employees and manufactured under contract by Selectron of Santa Clara. The machine will be sold in the US, not by Osborne but by Morrow Designs, as the Morrow 'Pivot'.

Like the Osborne 1, the Encore has a completely new shape, and opens a new sector of the computer market. Whereas the Osborne 1 and its successors (from Kaypro through to 16-bit Compaq), are 'transportables' which require mains power, the Encore is fully portable with battery back-up and a weight of around 10lbs. But, unlike lap-helds such as the Epson PX-8, the Encore will have the full specification of a desktop 16-bit computer, complete with 80 × 25 LCD display. The still secret offerings from ACT and Tandy will almost certainly follow into this new sector.

I said 'will have' above because both Hitachi and Sharp — the manufacturers of 80 × 25 screens — have run into production problems which are delaying delivery, and rather than wait, Vadem/Osborne have decided to launch and ship an interim version of the machine with an 80 × 16 LCD screen.

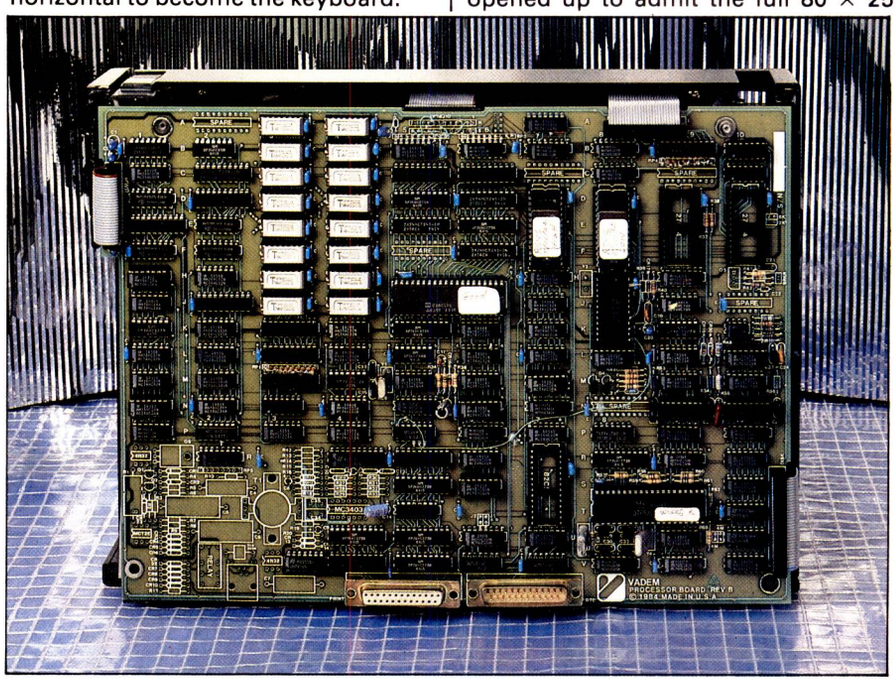
The machine tested in this review was a pre-production prototype which lacked, in addition to the 25 line screen, the battery pack and the built-in modem. Some aspects of the operating software were also incomplete. To make matters even more exciting for me, the machine was only available for 24 hours on its way through London, and it had been dropped, smashing the perspex mock-up case but not affecting the electronics (one of the directors did it so no-one got fired!). A second machine was flown in specially for photographs and benchmarking.

Hardware

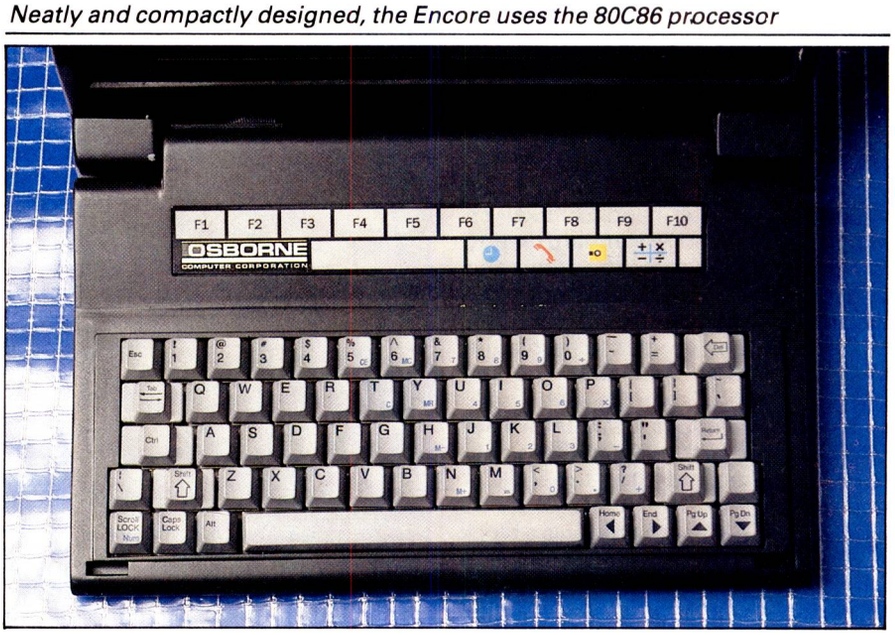
The Encore has that same obviously new and obviously right look about it that the Osborne 1 had; obvious in hindsight that is. An upright flat case about the size of a medium-sized cassette/radio holds the drives and screen, and the front 'lid' folds down horizontal to become the keyboard.

The test machine had twin 5¼in drives (each holding 360k) in the recess at the right-hand side. These are a new ⅓rd height design, a little over 1in thick, of Japanese manufacture. The standard Encore will in fact only have a single drive, the second being an optional extra. The drive doors are opened by pressing on a ribbed area, which both releases the door and partly ejects the diskette. Fiddling around at the side of the machine, out of eyesight, was awkward at first — especially with the two slim drives so close together. It became quite natural after a few hours, but it would be better if the red disk warning lights could be moved to, or repeated on, the front of the machine.

An 80 × 16 LCD screen sits in a window in the front of the case, and this will be the unit fitted on the machines shipped in September; however, the window in the case has a moulded groove at the bottom so that it can be opened up to admit the full 80 × 25



Neatly and compactly designed, the Encore uses the 80C86 processor



63 proper typewriter keys; note the four brightly coloured icon-style function keys

Osborne Encore

Osborne has learnt its lesson the hard way, but despite financial difficulties the company's out to prove it's still alive and kicking. The Encore is fully portable, IBM-compatible and built to a desktop specification. Will it be competition for the lap-helds? Dick Pountain finds out.



Three years ago Adam Osborne changed the face of microcomputing. It was not only the shape of the Osborne 1 which was novel, though it set the style for a swarm of imitators (its almost military functionalism still looks better to my eye than its smoother rivals). What was more important was the fact that you could for the first time carry around a fully functional CP/M computer in one lump.

To be safe you still needed mains power (the battery pack never did quite materialise), and its weight, at around 30lbs, provided a good way of developing biceps. But it worked, and a lot of people I know still use it as their breadwinner, humping it around in the back seat of the car on occasion, but mainly using it as a desktop word processing machine. For the most important thing of all was that Osborne, far from charging a premium for the benefits of transportability, actually



Illustration by David McAllister: The London Agency

directors, playing MUD is free.

MUD runs on a DEC-10 mainframe (too big for your Christmas stocking) in Essex University, and is such a large and complex program that it can only run after about 2am or at weekends — otherwise the university students wouldn't be able to run their projects!

There *is* an advantage to playing at these unsociable hours (apart from cheaper telephone bills): the computer department at Essex has its doors locked at midnight so students (called 'internals') can only play at weekends.

This may sound like a disadvantage, as MUD is at its best with many players, but when you consider that internals play at the DEC's own terminals running at 9600 baud while anyone playing over the telephone network ('externals') are at 1200/75 baud, then an external *vs* an internal is an ill-matched contest.

There are quite a few externals playing the game already, some as far afield as South Wales, Scotland and even one player from Japan! So, if you're looking for something a little bit different from run-of-the-mill adventure games, MUD might be just the thing.

Details on connecting up to the DEC-10 and more information on MUD can be obtained from: Richard Bartle, Department of Computer Science, University of Essex, Wivenhoe Park, Colchester, Essex CO4 3SQ. END

Real, live MUD!

Essex University has opened its portcullis to adventure games addicts in the form of MUD, running on its DEC-10 mainframe. The equivalent of 'CB radio in fantasyland', undergraduate Susan Thomas (alias Endora the Witch) guarantees an infinite number of surprises.

In these days of computer enlightenment, mention the word 'Adventure' and most people will know what you are talking about. Ask them for the name of the best and most exciting adventure, and many will talk of the Crowther-Woods original, while others will hold their breath in awe and whisper of the infamous Zork. Thousands of micro users have played these on various machines, but the best adventure game this side of the milky way is played by very few people, is not advertised in the computer press and is not available in any form on any microcomputer — it is called, simply, MUD.

MUD stands for Multi-User Dungeon, which is just what it is. Imagine you are playing an adventure. Let's say you're in a room of a house, you have found some treasure, and are now a bit stumped as to how to get it past the bookcase, which you can't shift but which you're certain conceals a secret passage. You have tried all sorts of commands to no avail, and are about to give up when up on your screen comes the message: 'Tom has just arrived.'

Real-time interaction

This is where MUD leaves other adventures for dead because 'Tom' starts talking to you! Tom is not part of the program, but a real, live person, sitting possibly hundreds of miles away and exploring the same land as you are. You can chat with him, ask him questions, follow him — he may even decide to steal some of your hard-earned treasure! You try to talk him into helping you move the bookcase . . .

MUD is similar to most adventures in that you have to explore, find and collect treasure, and fight monsters. Indeed, if you are the only player in the game then it's like a giant 'Colossal Cave', only with far better descriptions and more fiendish puzzles.

Locations range from a gravedigger's cottage, a pine forest, a wrecked off-shore galleon and the time-forgotten island, to the dark and dangerous mines, halls and citadel of the feared Dwarfen Realm.

Puzzles are many, varied, and often humorous, like the Pythonesque 'Kick the beggar' (which results in 'The beggar moans as your foot smashes into his face'), or the cat which you must kill nine times ('The cat tries to get out of your way but you graunch its head in').

When you play for the first time, you select a name and sex for your 'persona', then enter the game as a 'Novice' with average stamina, strength and dexterity.

Experience points are gained by collecting treasure and dropping it in the swamp — a swamp, because the treasure then sinks into oblivion and this stops other players finding it again. Initial treasures are relatively easy to find as they are mainly above ground; it is these treasures which you use to build up your experience so that you have sufficient magical power to go for the big stuff!

Sounds easy so far, doesn't it? The fun and challenge really begin when you realise that there are others after the same booty, and they may not be as inexperienced as you!

There are 10 levels in all, from Novice through Warrior, Hero, Champion, Superhero, Enchanter, Sorcerer, Necromancer and Legend until you reach the ultimate level and goal, the all-powerful and immortal Wizard (or Witch).

Anyone can attempt to use magical spells in MUD, but the higher the level, the more potent are your magical powers and the greater your chance of success — failure often sends you to sleep, not a tenable position to be in if you are attacked.

More experience also gives you a better chance of winning a fight. Fighting, be it with another player, a horrifying Zombie or whatever, drains your stamina and you then need to find a quiet place to sleep to build it up again. Some denizens of the land are pretty nasty: for example, the dragon which roams the arcane forest has a stamina of 800 while the most you can have is 100! This calls for a bit of teamwork — the intrepid adventurer rounds up a gang of players and they set off to duff the dragon up a treat using their combined strength and stamina; then it's time to reward your fellow conquerers . . .

It is a fact of MUD that you will die many times. Eventually though, you will know the game well enough and have enough points and magical power to sweep through the land zapping friend and foe, collecting treasure and avoiding the many pitfalls. In other words you could say the adventure is 'solved'.

Surprises

At this point, an average adventure would be over. MUD, however, is not an average adventure. While you play, your points slowly accrue until, one day, wearily dropping your last piece of treasure into the swamp you get the message: 'Your level of experience is now Wizard.' And here begins the real fun.

Basically, Wizards are go-anywhere, do-anything-to-anybody, immortal beings. They 'rule' the game and to become one is the player's ultimate goal. They have additional powers to those available to other players. Any object can be picked up by them, wherever it is, without their having to move from their location. Even monsters which roam the land are under their control.

Some of the commands available to Wizards (you'll have to find them out for yourself!) include the opportunity to look at a copy of any player's screen — in other words, a Wizard can see *exactly* what you are doing without your knowledge.

A Wizard can force you to do anything he desires: try the same to them and you are curtly informed: 'Not to a Wizard you don't!' If you make a nuisance of yourself and generally annoy other players with inane remarks then you may find yourself transported to a room with no exits, where you are left to cool off — if you are lucky. Go too far and you will be informed that a Finger Of Death by a wizard has terminated you, and your character is dead — permanently.

How to play

All you need to play MUD is a micro with an RS232 port, a modem and communication software (if you already subscribe to Micronet then you just need the software), then simply apply to British Telecom for a PSS ('Packet Switch Stream') dial-up account. The cost is £25 for a network user identity plus around £25 per year *in addition to* telephone charges — most PSS calls are local though; otherwise, thanks to the generosity of Essex University's

punches your nose in, or if you wish to use the system while drunk or very tired, all of which will alter your vocal delivery. There's nothing to stop you having a separate disk file for each contingency, such as KNACKERED .VOC or LEGLESS.VOC. Of course each different user of the machine will have to have their own voice-print file.

In addition, the results of the first training need to be 'tweaked' a little as you go; certain words that you pronounce inconsistently will be frequently misrecognised. It's possible to update the training for single words like this without having to go through the whole lot again (which takes around 10 minutes).

Success

How well does it work? I was quite surprised to discover how effective it is. After a training session using five iterations I found that I could control Scratchpad with around one word in five having to be repeated.

Occasionally it would get into a hopeless mess and appear to be guessing at random, but it always responded to 'cancel', which aborts the current operation and lets you start it again. Scratchpad's ordinary keyboard commands are all retained so it can be used without VoiceDrive.

The vocabulary selected for use with Scratchpad includes all the Roman numerals, the (upper case) alphabet in international phonetic form (Alpha,Bravo,Charlie,Delta . . .), all the arithmetic operators, and 50 of Scratchpad's own commands. 'OK' is used instead of the carriage-return key to enter the input.

Voice input doesn't go straight into the program; instead the recognised words are printed on the input line so they can be checked visually before you say OK. Saying 'back' backspaces and deletes in case of error. At this point sanity hangs on a thread as you crouch in the gloom shouting 'back,back,back, you dog! . . . . .

A typical spreadsheet session might sound so:
'right down down enter three decimal two four OK left string alpha sierra sierra echo tango sierra OK . . . . . .' It really is still slightly uncanny to watch the cursor obey your commands and to see the spoken characters appearing on the screen. Only a slight pause is required between words (about a quarter second) in order for the machine to separate them.

I had no trouble, in the relative quiet of my study, with the cheap Tandy microphone supplied for the review, but the importers suggest a decent Shure directional mike if you're going to use the system where there will be background noise.

Experience

I found that the 'hit rate' or accuracy of the system improved with experience. This is partly a result of training the computer and part of training the human. As I became used to the system's limitations I developed a more relaxed way of talking to it.

At first one is inclined to speak too loudly and with exaggerated emphasis (the way some people talk to children); as this is not natural, it's also difficult to keep consistent, and thus gives poor results. In similar fashion, one must learn not to 'snap' at it when it gets a word wrong ; that alters your pronunciation too and leads to a vicious circle which is only terminated by bursting a blood vessel.

The vocabulary is flexible enough to allow the whole operation of the spreadsheet to be carried out by voice without touching the keyboard, but as Supersoft wisely points out this is not very efficient. It is much quicker to type 1.23456 or 'PERCENTAGE PROFIT' than to speak them out one character at a time.

The most effective way of using VoiceDrive is to type the data and speak the commands, which are far easier to remember when you say them. A microphone fixing point may become a standard fitting on micros of the future.

As the voice prints are quite decoupled from the ASCII strings in the vocabulary, it's very easy to change any command to suit. If you prefer 'Do it!' rather than 'OK', then merely retrain the system and say 'Do it!' every time it asks for 'OK'. This could get confusing, so ideally you would use a text editor to change the string 'OK' in the supplied vocabulary file to match.

Scratchpad itself is a nice enough spreadsheet, with virtual memory to allow large sheets (up to 25,000 cells), split screen windows and extensive Help facilities.

Conclusion

Is it actually useful or just a gimmick? I can't honestly say that it's much use to me; as a touch-typist I can enter stuff much more quickly through the keyboard. It may find some buyers among bone-idle executives who refuse to type (and it's a tremendous status symbol). For anyone with disabled hands, and that includes not only amputees but arthritis sufferers, then it could be very liberating indeed, allowing access to hitherto unavailable technology

Its potential importance is much more widespread, however. This is only the beginning. In a few years the technology will have improved enormously and I suspect that it will start to give the qwerty keyboard a hard time; after all why should people have to be able to type to use a computer? They don't have to be able to play the piano to use a record player.

It doesn't take much imagination to extrapolate from this system to one which uses a mouse or touch screen for pointing and voice input for data and command entry. One particular application fascinates me and that is in the field of portable computing; with voice input, one of the final size constraints (namely that there must be room for a keyboard) is removed.

Supersoft is to be congratulated on a product which works very well considering the infant state of the technology. The product is distributed in the UK by Microtechnology Ltd of Tunbridge Wells, tel: (0892) 42949. The package including the software and the Tecmar board costs £995 and requires an IBM PC with 128k memory (and not more than 256k to avoid memory overlap with the card's RAM). END

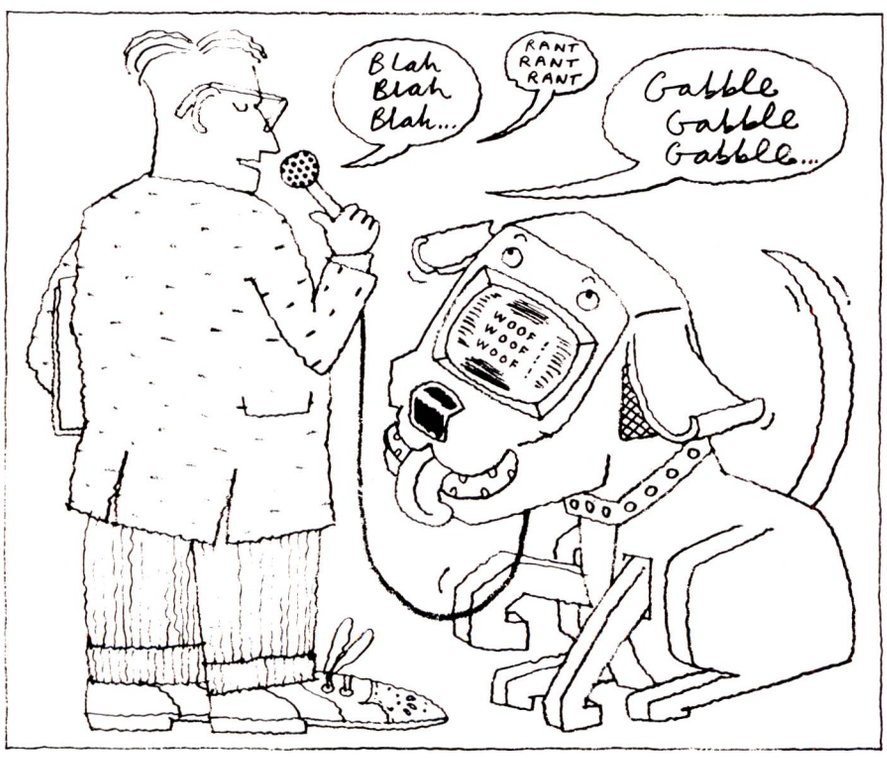
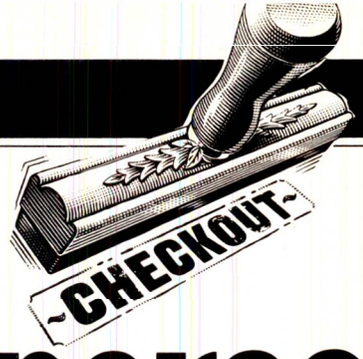


Illustration by Chris Winn



Supersoft's VoiceDrive

Voice recognition systems are still in their infancy but as the technology develops they may well be of practical benefit to people unwilling or unable to use a micro keyboard. Dick Pountain looks at one such system, Supersoft's VoiceDrive, which has been skilfully adapted for use with a financial modelling package.

Just when you think you're completely jaded, and the miracle of the micro can no longer move you, along comes a product that has you playing like a 10-year-old with a trainset and calling the neighbours in to watch.

The product to which I refer is the VoiceDrive version of Supersoft's Scratchpad. Alone, Scratchpad is a conventional spreadsheet which has been available for over a year for CP/M systems and the IBM PC. VoiceDrive means just what it says; the spreadsheet is controlled by talking to it in English through a microphone.

Voice recognition

Voice recognition has been the subject of intensive research for decades and working systems, albeit of fairly limited capabilities, are on the go in various commercial and military applications. Among the findings of the research so far are that:

(a) voice recognition is very difficult; and

(b) it requires large amounts of memory and processing power, which up till now has meant mainframe or large mini-computer hosts.

Recently, however, several US manufacturers, including VMC and Tecmar, have produced voice recognition boards that can be run from microcomputers.

VoiceDrive Scratchpad can be configured to work with a variety of speech boards, but Supersoft has chosen to run with the Tecmar PC-Mate Voice Recognition card and can supply a package of hardware and software.

The Tecmar board contains its own CMOS 68B03 processor and 8k of RAM for storing speech 'templates' (patterns of digital data representing a spoken word sound); this allows a vocabulary of 100 words. In brief, it accepts audio input from a conventional microphone, pre-amplifies and equalises it, then passes it through a pre-processor which separates it into 16 different frequency bands. One band at a time is sent to an Analogue-to-Digital convertor which, by rapid sampling of the voltage, produces a stream of bytes for the CPU. The CPU compares this data with the 100 word templates currently stored in RAM and decides which is closest to the word just input.

This comparison is done in a 'fuzzy' way, and the CPU returns to the user program the number of the 'winning' word, an estimate of how close the match was, and the number of the next best matching 'runner up' word. The user program can then make whatever use it wants of this information.

The Tecmar board is rather smarter than most in that it allows a specified subset of the full vocabulary to be searched. In an application such as a spreadsheet (or a programming language) with very restricted syntax, it's possible to know what commands can legally follow any given one and thus avoid having to search the whole vocabulary. This improves response time dramatically.

One important point to grasp is that the voice recognition processor has no truck whatsoever with ASCII representations of words. All that is returned to the host computer is a number between 1 and 100 indicating which stored voice-print comes closest to the recently uttered word. It's the user program on the host computer that must maintain an array of ASCII strings representing the words, and keep them in one-to-one correspondence with the voice-prints. In other words, there's no attempt to infer the pronunciation of words from their spelling, or vice versa, which are tasks well beyond current technology.

Training

How do the voice-print templates get into RAM in the first place? By a process of training. In common with all currently practical voice recognition systems, the Tecmar has to be trained to the voice of each individual user. This is done in a preliminary session, in which the 100 words chosen to be included in the vocabulary are printed in turn on the screen, and the user must speak them into the microphone.

This process must be repeated at least three times; up to a point the recognition will increase in accuracy with the number of iterations used in training. The data extracted in this way can be stored on disk and then loaded at will into the VR card's RAM, so you don't need to go through training every time you use the system.

Your brain is effectively being used as a co-processor to perform the task of recognising a written word and pronouncing it; it's the same sort of compromise that expert systems employ to get around the tasks which are still much too difficult for a machine.

In practice retraining may be necessary if you have a cold, or someone

NETWORKS

Modem Operating Frequencies

Modem Type	Speed (Bit/s)	Duplex	Transmit Frequency 0 Hz	Transmit Frequency 1 Hz	Receive Frequency 0 Hz	Receive Frequency 1 Hz	Answer Tone Freq Hz
CCITT V.21 Orig	≤300	Full	1180	980	1850	1650	—
CCITT V.21 Ans	≤300	Full	1850	1650	1180	980	2100
CCITT V.23 Mode 1	600	Half	1700	1300	1700	1300	2100
CCITT V.23 Mode 2	1200	Half	2100	1300	2100	1300	2100
CCITT V.23 Back	75	—	450	390	450	390	—
Bell 103 Orig	≤300	Full	1070	1270	2025	2225	—
Bell 103 Ans	≤300	Full	2025	2225	1070	1270	2225
Bell 202*	1200	Half	2200	1200	2200	1200	2025

**** Bell 202 has no back channel as such, only a 5 bit/sec on/off signal (387Hz = on, no signal = off) used for handshaking. (CCITT V22 & Bell 212A do not use single frequencies like these and cannot be simply included in such a table.)***

Liverpool Mailbox . . . Tel: (051) 428 8924. Electronic mail, down-loading, TRS-80 information. Hours: 24 hours daily.

TBBS, London . . . Tel: (01) 348 9400. Hours: daily 9am-7am.

BASUG . . . Tel: (0742) 667983. Hours: 24 hours daily.

Computer Answers . . . Tel: (01) 631 3076. Hours: 24 hours daily.

CBBS Surrey . . . Tel: (04862) 25174. Hours: 24 hours daily.

Blandford Board . . . Tel: (0258) 54494. Hours: 24 hours daily.

NBBBS-North Birmingham . . . Tel: (0827) 28 810

TBBS Southampton . . . Tel: (0703) 437 200 (ring-back)

Stoke ITeC (Information Technology Centre) (Remote CP/M) . . . Tel: (0782) 265 078. Hours: 24 hours daily.

Zurich ZZV . . . Tel: (01041) 1 312 2267. Hours: 7am-9pm daily, and all day Sundays.

Mailbox-84, W Midlands. Tel: (01) 631 3076. Hours: 24 hours daily. TBBS. 300 (V21) and 1200/75 (V23) modes.

UK systems run by commercial organisations, which are free at least in part:

DISTEL. Tel: (01) 679 1888. Run by Display Electronics (new and surplus electronic and computer equipment, components, etc). The system provides information about stock lines, credit card sales, and some message facilities. 300 baud only at present. Cost: free. 24 hours.

REWTEL. Tel: (0272) 236628. Run by *Radio and Electronics World*, the publishing side of Ambit (electronics components suppliers). Information on stock lines, some message facilities,

Business users: £15 per quarter and 5p/minute up to credit card sales; the latter only for subscribers. 300 baud only at present. Cost: limited areas free, remainder £10 pa. 24 hours.

MAPTEL. Tel: (0702) 552941. Run by Maplin (electronic components and micro-computers). Provides information on stock levels, credit card sales to existing

ESTELLE. Tel: (0279) 443511 V21 (Datel 200); (0279) 441188 (Datel 600); (0279) 441222 (Datel 1200). For customers of STC Electronic Services. Office hours only.

Subscriber commercial systems in the UK:

PRESTEL. Subscribers only: Prestel consists of a database made up of individual pages provided by many different organisations (not by Prestel itself). 1200/75 baud service at local call rates for a large percentage of potential users. 300 baud service on London telephone number only, at present. Cost: domestic subscribers £5 per quarter and no time charges outside peak periods, 80 per cent of pages are free. 6pm and Saturday mornings, no time charges outside these hours (time charges also apply to domestic users). Information: tel: Freefone 2296.

MICRONET 800. An organisation providing information within the Prestel database specifically aimed at microcomputer users. Service details as Prestel. Cost: £50-£75 joining fee (covers acoustic coupler and software—for a limited range of machines at present) and £8 per quarter on top of normal Prestel charges. Information: Micronet 800, 8 Herbal Hill, London EC1R 5JB. Tel: (01) 837 3699.

Subscriber business systems in the UK:

Commercial systems aimed at business users:

TELECOM GOLD. Info from: Julie Ireland, 42 Weston Street, London SE1 3QD. Tel: (01) 403 6777.

COMET. Message handling system giving user facilities for leaving and retrieving messages: costs £30 per month. Info from: John Douglas, BL Systems Limited, Grosvenor House, Prospect Hill, Redditch, Worcs. Tel: (0527) 28515.

*RING-BACK SYSTEM—dial the number, let phone ring once and then ring back.

American/Canadian networks

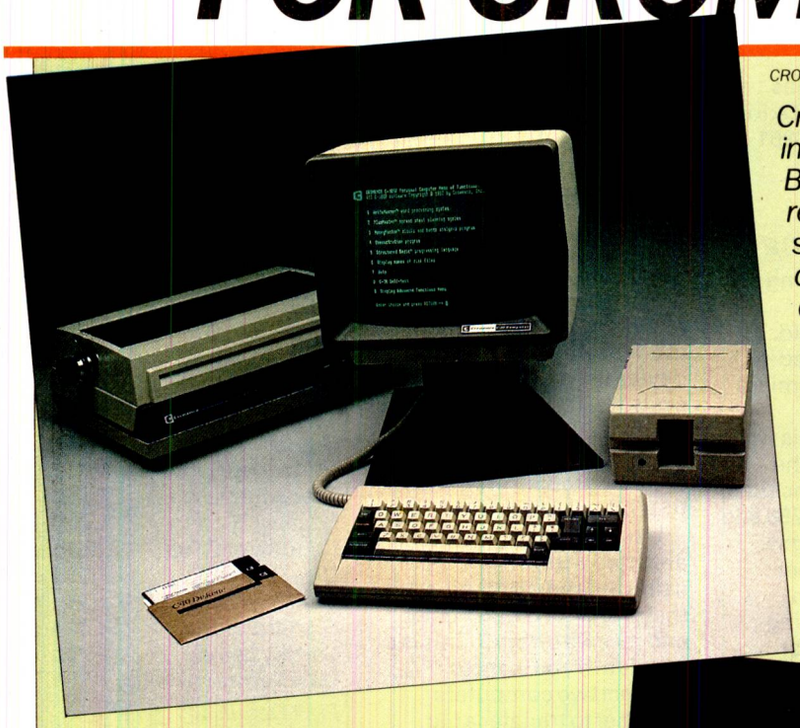
TYPE	SYSTEM NAME	NUMBER	NOTES
Forum 80	HQ System	0101.816-861 7040	
CBBS	HQ System	0101.312-545 8086	
FBBS	HQ System	0101.312-677 8514	
ABBS	Ottowa, Ontario	0101.613-725 2243	
ABBS	HQ system	0101.703-255 2192	
MABBS	Fort Walton Beach	0101.904-862 1072	
Bull-80	Alabama	0101.205-492 0373	
Conn-80	Colour Computer	0101.212-441 3755	colour graphics for TRS-80 Colour

European networks

ELFA	ABC-MONITOR Sweden	010.468 730 0706	Half duplex
ABC-Banken	Halmstadt, Sweden	010.463 5110771	
ABC-MONITOR	ABC Club of Sweden	010.468 801523	Passwords required
CBBS	Gothenburg, Sweden*	010.463 1292160	75/1200 baud
		010.463 1690754	300 baud
	Helsinki	010.358 0722272	

*After receiving the tone and connecting your modem, either type <C/R> or type: <COM C/R>. The system then asks for a password which is: 'cbbs' *in small letters*!! If you only get '>' when you dial up, the system needs resetting and you type <I> C/R.

CALL MICROCENTRE FOR CROMEMCO



CROMEMCO C-10MP

Cromemco's C-10 personal computer includes a Z-80A microprocessor with 64K Bytes RAM, 24K Bytes ROM, high resolution 12" green phosphor 25 x 80 screen, detached keyboard, 5" floppy disk drive with 390K Bytes capacity, communications and printer ports, terminal emulation, graphical characters, CDOS operating system and 32K Structured Basic.

In the C-10MP we add a software "Super Pak": a full screen editor, WordStar, MailMerge, Writemaster, CalcStar and PlanMaster spreadsheet programs, Chess game, MoneyMaster financial analysis and InfoStar data base management system.

The System One Hard Disk computer, with an integral 21 Megabyte Winchester hard disk, includes Cromemco's dual 68000/Z-80A DPU processor (featured below), with 256K Bytes of RAM and 390K Bytes of floppy disk storage.

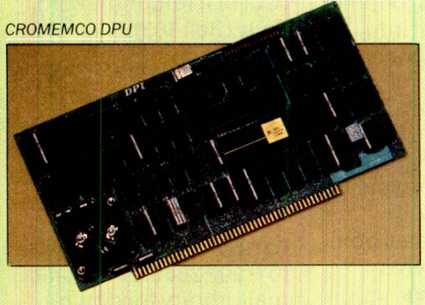
The S-100 bus has eight card slots, sufficient for expansion utilising Cromemco's range of interface cards for high resolution colour graphics, process control, analogue-digital data conversion and telecommunications.

A choice of operating systems includes CDOS, CP/M and CROMIX.



CROMEMCO CS-1HD2

CROMEMCO DPU



Cromemco's Dual Processor Unit is the ultimate professional micro-computer. It combines the flexibility of Z-80A 8-bit systems with the speed and versatility of 68000 16-bit technology and an address space of up to 16 Megabytes of RAM.

The DPU can be installed in several Cromenco computers, including the CS-1 featured above. For larger applications we recommend the CS-2, with up to 4 floppy disk drives, each of 390K Bytes capacity, an optional 21 Megabyte Winchester hard disk, screen and printer interfaces plus a 21 slot S-100 bus – sufficient capacity to cope with the most demanding industrial or laboratory requirements.

With over 5 years experience of Cromemco systems, we are Cromemco's leading British distributors.

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30 Dundas Street, Edinburgh. 031-556 7354 / 207 Bath Street, Glasgow. 041-248 2767

NETWORKS

Over to Peter Tootill for an explanation of null modems, and gossip on what's happening in the networking world.

Remote CP/M bulletin boards

Remote CP/M systems are a bit different from normal bulletin board systems ('BBS'). The latter keep you very much at a distance from the computer's operating system and provide menus and sub-menus for you from which to choose options.

Remote CP/M, however, is just as the name implies. It's like sitting at the keyboard of a CP/M system. After an introductory message and the log on sequence, if any, you are invited to type in commands. These commands are normal CP/M commands.

The features of the BBS are provided by a set of programs that you can run by typing in their names. You can type DIR to see what programs are available; 'B:' to change the drive you are working from, and so on.

If you are not familiar with CP/M, 'Help' programs are available to assist you to use the system. One thing to remember is that 'control C' will normally get you out of your present action, and back to the main system prompt.

CP/M file transfer program

Merlin Microcomputers Ltd has introduced a file transfer program for CP/M systems called 'TR'. It's cheap (around £50) and easy to install on almost any CP/M system addressing the RS232 port as the 'reader', 'list' or 'punch' devices. It's also available ready installed on a variety of systems from the Superbrain to the BBC/Torch Z80 Pack combination.

All handshaking is done in software, and files of any length (including '.COM') files can be transferred between micros using a simple 3-wire circuit. A directory of the machine at either end can be obtained.

For more information contact: Merlin Microcomputer Systems, 6 Wesley House Cottages, New Inns Hall Street, Oxford OX1 2DW. Tel: (0865) 251 255.

Prestel Microcomputing

There's been something of a revolution in the Prestel/Micronet world. Prestel has now started its own service aimed at micro users, called 'Prestel Microcomputing'. This will encompass much of the material previously included in Micronet, Viewfax 258 and ACC Clubspot 800 pages.

Subscriptions (£8 per quarter) will now be to Prestel Microcomputing rather than to Micronet. Much of the database now on public access will only be available to subscribers—which is a pity. (Perhaps the reason is that there's plenty of information to interest micro users without paying the Micronet Sub, so this might be an attempt to make more people do so!)

Commodore launches 'Compunet'

You may already know that Commodore has launched its own rival to Prestel Microcomputing. The system will use viewdata standards (that is, 1200/75 baud rate and Prestel type graphics) and Commodore has produced a modem for the 64 to go with the service. The price of £100 will include the first year's subscription to the service (about £30). In the long term Commodore hopes that it will be able to do away with subscriptions and finance the service by charging for specific services and from commission on home shopping sales.

The modem includes the necessary software and will give Commodore 64 users access to Prestel and other viewdata services. One novel feature is a built-in identification code used for security purposes: it enables the modem to function as a 'dongle' for software downloaded from Compunet (in other words the software will only run on the 64 with the modem present).

Null modems

A 'null modem' isn't really a modem at all. It's simply a device used to connect two systems; for example, where there would otherwise be some conflict of connection or other problem if a simple RS232 lead were used.

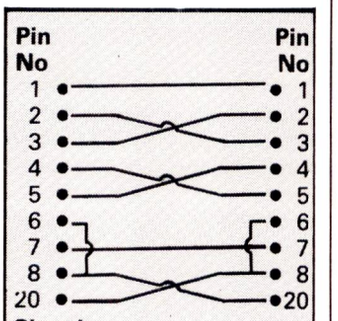
Usually, when computers are fitted with an RS232 port using a standard 25-pin plug, they transmit data on pin 2 and receive on pin 3. This is a problem if you want to connect two computers together to transfer a file between them. Each will be talking on pin 2 and listening on pin 3! You'll appreciate the problem!

The simple answer is to make up a lead that has the connections to pin 2 and 3 reversed. This is all that a null modem is.

In some systems there will be other connections to be made, but this depends more on the software. Some terminal software won't do any transmitting until it sees that a carrier is present, or that the modem is ready—or both. To get around this, just link a few more pins together to fool the computer into thinking that it's connected to a modem that is online to another. A typical set of connections for a null modem is given in Fig 1.

Null modems are usually made from two RS232 connectors and a small box so that they can receive normal RS232 cables. However, there is no reason why you shouldn't make up a whole lead connected in this manner.

Some systems, such as my trusty old TRS-80 Model 1, have a switch to reverse the positions of pins 2 and 3 so that a null modem isn't necessary (unless the software needs one).



Signal	
Protective Ground	(PGND)
Transmit Data	(TD)
Receive Data	(RD)
Request to Send	(RTS)
Clear to Send	(CTS)
Data Set Ready	(DSR)
Signal Ground	(SGND)
Carrier Detect	(CD)
Data Terminal Ready	(DTR)

Fig 1 Details of typical connections for a 'null modem'

UK free networks

CBBS South West . . . Tel: (0626) 890014. Hours: 24 hours daily.

Mailbox-80, W Midlands Tel: (0384) 635336*. Hours: 6pm-8am daily (ring-back system).

Forum-80 Hull . . . (Forum-80 HQ) Tel: (0482) 859169. International electronic mail, library for up/down loading.

Hours: 3-11.30pm, Mon-Fri; noon-11.30pm, Sat & Sun (CCITT); midnight-8am, daily (Bell 103).

Forum-80 Users Group, PET Users section shopping list system. Hours: Tues/Thurs 7-10pm; Sat/Sun 1-10pm; nights, midnight-8am, US (Bell 103) standards.

Forum-80 London . . . Tel: (01) 902 2546. Electronic mail, library for down-loading. Hours: 7-10pm weekdays; midday-10pm weekends. Ring and ask for Forum-80.

MG-Net CBBS London . . . Tel: (01) 399 2136. Facilities: electronic mail, program downloading. Hours: Sun 5-10pm.

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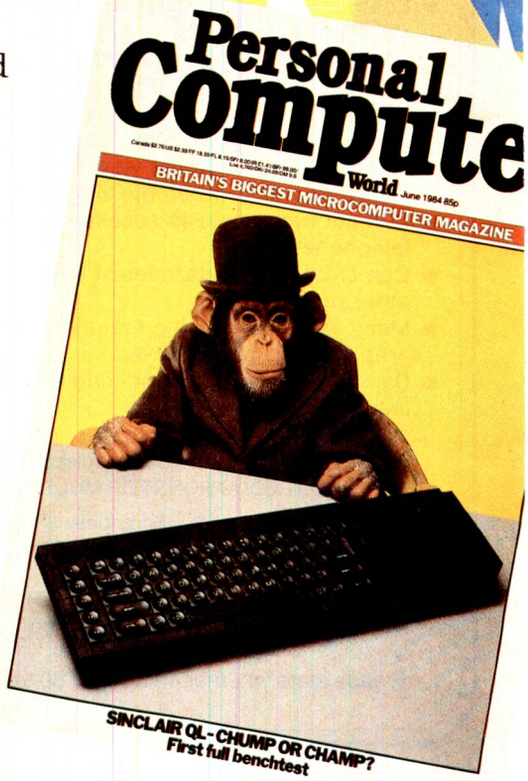

System Science

C Compilers for CP/M-80

Software Toolworks C/80 ver 3	£50.00
C/80 Mathpak	£30.00
Aztec C II	£155.00
Eco-C for Z80 code	£185.00

Lisp £45.00, UVMAC Z80 Assembler £35.00, Mychess £40.00

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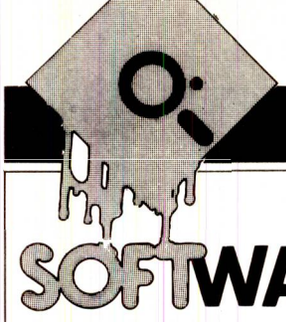


type. As soon as the orginal type is restored, the display reverts to what it was previously. If a document has an embedded formula only the result is displayed, and it cannot be edited without revertingto spreadsheet type.

Lotus has pre-empted the software-tutorial vendors by supplying Symphony with its own tutorial software.This is organised as a series of lessons, designed to take the novice through the basics of Symphony spreadsheeting.

On the subject of teaching — not only can Symphony teach you, but you can also teach it! This is called Symphony's 'learn' mode, where every keystroke in a sequence is remembered so that it can be re-executed later. This is useful for any situation where you might be repeatedly performing the same sequence of operations a number of times, but is particularly appealing to the more mathematically-minded spreadsheet user.

Once the system has done some learning it is fairly instructive to see how the keystrokes information has been stored which serves as an introduction to Symphony's macro facility. The information on the keystrokes is stored as text, in a column and might look like this:

```
123.456~
{RIGHT}
666.789~
+a36 * b36
/ c {UP}~{RIGHT}{UP}
```

Symphony does not store the keyboard codes of the characters, but gives them readable names like {RIGHT} for the right arrow key and '~' for the RETURN key. The example above shows that everything you do at the keyboard can be noted in learn mode: numeric and formula entry, cursor movement, and menu selections. (The '/' key activates the menu.)

The macro language includes a number of other features, which cannot be entered by 'learning' at the keyboard. For example there is {IF} and {WHILE} which can be used just like IF and WHILE in any other programming language. To work fully with Symphony's macros, it is easiest to open a document window and use the normal word processing facilities to create the program. Like anything else the document is stored in Symphony's spreadsheet, so it is perfectly usable from a spreadsheet window.

Conclusion

Framework and Symphony integrate the same five applications, cost about the same and will be launched within a few weeks of each other. They both come with huge volumes of documentation which were, unfortunately, incomplete at press time.

On the database front, for applications which involve a good mixture of database and spreadsheet work and where the amount of data involved is not large, Symphony is invaluable.

But limitation to computer memory space also applies to Framework. However, the ability to use it in conjunction with dBasell and to extract subsets of dBase files directly should make Framework a useful package as a complement to dBasell for users of large data files.

Symphony's spreadsheet calculations are decidedly faster than those of Framework's. Ashton-Tate claims that Framework's spreadsheet can be used for accounts ledgers, cash flow analysis, job cost estimates and budget preparations, yet it's worth questioning how easy it would be to implement this sort of project.

Ashton-Tate obviously hopes to stimulate independent software houses to develop applications within the Framework environment with FRED, and it would be a worthy feat indeed for such software to compete successfully with some of today's specialist accounting packages.

Writing in Symphony's macro language is also for advanced users, but once a specialised application has been implemented as a macro, the system could be operated by a relatively unsophisticated user. Nevertheless, if you intend building complex structured spreadsheet models Framework's frames are definitely easier to handle.

As word processors both packages perform adequately. Users probably shouldn't choose either package on the strength of word processor requirements alone. As well as producing integrated reports the word processing facilities offered are suitable for memos and documents.

Framework is the more 'powerful' of the two overall, but much of this power is inaccessible to all but the most enthusiastic user. It's no cop-out to say that neither product stood out as being visibly superior.

Both products get a big thumbs-down on size of documentation. Certainly the main thrust of both packages is firmly towards the business user who doesn't want the hassle of learning to use a number of different packages. On balance, both packages are probably easier to use than the more traditional 'integrated' approach of a package such as Open Access.

Framework will cost £495 and Symphony £550 (excl VAT) at launch.

END

Symphony Database Benchmarks

(Framework's Benchmarks will be published as soon as Ashton-Tate releases a production version of the package)

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	3secs/Inst
BM4	Time to access 20 records from 1000 sequentially on 3-character field (same field as in BM2 key)	NA
BM5	Time to access record using wild code	3secs/Inst
BM6	Time to index 1000 records on 3-character field	NA
BM7	Time to sort 1000 records on 5-character field	1min 10secs
BM8	Time to calculate on one field per record and store result in record	12secs
BM9	Time to total three fields over 1000 records	5secs
BM10	Time to add one new field to each of 1000 records	3secs

Time to import a file of 1000 records: 2mins 5secs

Spreadsheet Benchmarks

Both systems were prototypes, not the final release version, and were tested on IBM PCs (see *PCW* December 83).

Framework

The prototype Framework software occupies 210k of RAM, but the released version will be cut to 150k (plus a 60k 'overlay'). If this goes according to plan it will be feasible to run small Framework applications in just 256k of RAM. This will undercut the minimum Symphony memory requirement by 64k.

These tests were made on an IBM PC with 512k of RAM. Although Framework can use the 8087 numeric processor chip to enhance calculation speeds this was not available in the test machine. It was not possible to test the spreadsheet capacity (Benchmarks 1(a), 2 and 3) owing to a software malfunction when large spreadsheet frames were created. The remaining tests were performed on a 100 row by 13 column spreadsheet.

1 (b) and (c) Integer and decimal recalculation time: 48 seconds; that is 2.08 rows per second.
1 (d) Horizontal scrolling: 6 seconds; that it 2.16 columns per second.
1 (e) Vertical scrolling: 63 seconds; that is 1.59 rows per second.

Symphony

These tests were made on an IBM PC with 458k of RAM. 310k of this was occupied by the software, leaving 148k for spreadsheet data.
(1) (a) Number of rows accommodated: 247.
(1) (b) and (c) Integer and decimal recalculation time: 33 seconds; that is 48 rows per second.
(1) (d) Horizontal scrolling: 7 seconds; that is 1.86 columns per second.
(1) (e) Vertical scrolling: 68 seconds; that is 3.63 rows per second.
(2) Number of rows of text accommodated: 820.
(3) Number of rows of numbers accommodated: 967.

restrict your view of the data table. This is done either by setting up search criteria to select particular records, in which case all records are displayed but those matching your criteria are highlighted, or by constructing windows to restrict your view to a particular rectangular range or ranges.

Advanced features

You can link information in two or more separate sets of data, but only where they are all contained in the same worksheet and reside in memory at the same time, thus encountering memory limits. A good macro facility is provided, so you could construct tailor-made applications if these were appropriate. It is possible to run DOS commands directly from within Symphony, and this, combined with the fact that all your data is held in memory, makes it possible to recover cleanly from a 'disk full' error when saving the worksheet — a distinct advantage!

SPREADSHEET

To start using Symphony as a spreadsheet the 'services' menu must be activated. Symphony always has two menus on hand: 'services' is for general operations relevant in all contexts, and 'applications' is tailored to the needs of the particular type of window in use.

The services menu includes options for creating all types of window, and so for spreadsheeting the spreadsheet window must be specified. A name must be given to the window, and its display position and size defined. Several windows of differing types can appear onscreen simultaneously, and Symphony provides a number of facilities for organising this layout.

As Symphony provides only one place for storing everything, it is not surprising that it is very large. And any unrestricted spreadsheet window has unrestricted access to the whole of it. The spreadsheet is 256 columns across by 8192 rows down.

Of course, even though both Symphony and Framework operate on IBM PCs with identical keyboards, most of the keystrokes are different. Some of Symphony's cursor moves involved two keystrokes, but were slightly easier to remember. For example, pressing the 'END' key, then the 'right-arrow' key moves the cursor to the right-hand of a row, whereas 'END' plus 'down-arrow' moves to the bottom of a column, and so on.

Like Framework, Symphony offers a rich variety of functions to be used in building up models. On a casual inspection it looks like Ashton-Tate's and Lotus's programmers picked up the same functional spec. But there are a few differences. Symphony does not have the same maze of date functions (a good point), but generally elsewhere it does have one or two bonus functions not found in Framework. On a close inspection, Symphony can offer: @ROUND, @RAND, @ISNUMBER and a few other minor functions which have no counterpart in Framework.

There is one unfortunate aspect to Symphony's management of the spreadsheet, illustrated by the fact that it is impossible to use the top-left and bottom-right cells together. Even if nothing else exists anywhere the system gives an 'insufficient memory' error. This extreme example is unlikely to trouble most users, but it does point to inefficiencies in Symphony memory-management.

When in spreadsheet mode the applications menu keystroke accesses the Sheet menu. This menu is tailored to the needs of spreadsheeters. It is this, coupled with the distinctive spreadsheet display and differing action of the cursor keystrokes, that distinguishes Symphony spreadsheet mode from other possible modes. The sheet menu offers 11 different 'commands' to facilitate manipulations to the spreadsheet, such as Move, Copy, Delete and Insert.

Symphony has a fairly unusual spreadsheet command called a 'range-command'. The basic idea is that a rectangle of cells (a 'range') can be given a name, and this name can be used in subsequent operations in place of the range coordinates. This has a surprisingly large number of uses: ranges can be filled with numbers, be protected from accidental erasure and act as the source for distribution counts.

In common with 1-2-3, Symphony spreadsheet also has a database facility. This is, of course, in addition to the main Form window, which offers rather more database functionality. It is possible to sort records, and there are also some special database functions available for use in formulae. These apply descriptive statistical operations to selected records only. They are all duplicated by non-database equivalents that work exhaustively down a column.

(Database enthusiasts would be better advised to work through a Form window, but presumably Lotus has included the database commands in the spreadsheet window primarily for the benefit of 1-2-3ers who have opted for Lotus's upgrade to Symphony.)

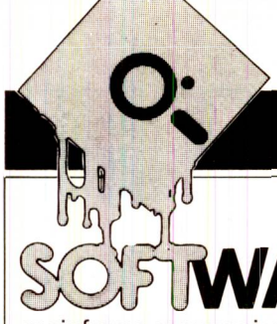
From a spreadsheet window, data in other applications can be readily accessed. Since all types of window actually store their data in the spreadsheet this is particularly simple, and the data can be referenced in the normal way.

An interesting feature of Symphony, which is not permitted in Framework, is the ability to change the type of a window. Some type changes are of limited value, although it can be instructive to change to spreadsheet from one of the other types, just to see how Symphony structures the underlying information. In the middle of a word processing session it is possible to change the type to spreadsheet, enter a formula into a cell alongside the text and the word processor document will have an embedded reference to information elsewhere in the spreadsheet, automatically updated in the normal way by spreadsheet recalculations. No damage is done by changing

Database summary

	Framework	Symphony
Max file size	ML	ML/8191 recs
Max record size	ML	256 × 240 chrs
Max no fields	ML	256
Max field size	ML	240
Max digits	NA	15
Max prime key length	NA	240
Special disk format?	No	No
File size fixed?	No	No
Link to ASCII files?	YV	YV
Data types	C,N	C,N,D,T,M
Fixed record structure?	Yes	Yes
Fixed record length stored?	Yes	Yes
Amend record structure?	Yes	Yes
Link data files?	NA	Y*
No. data files open	NA	ML
No. sort fields	UL	3
No. keys	NA	ML
Max key length	NA	ML
Subsidiary indexes kept up-to-date?	NA	NA
Data validation	Adequate	G
Screen formatting	P,D	P,D
Unique keys	NA	Optional
Report formatting	P,D	P,D
Store calculated data	IN,BA	IN,BA
Totals & Statistics	Yes	Yes
Store selection criteria	No	Must
Combining criteria—And,Or,Not—>1 criterion/field?	Yes	Yes
Wild code selection?	SW	AF
Browsing methods	AF	SW
Interaction methods	—Menu,	Full Tailoring—
Reference Manual+	PR	**
Tutorial Guide+	PR	***
Reference Card+	PR	?
On-Line help+	****	?
Hot-Line?	F	Dealer support

Notes: ML = Memory Limited. * = Within Worksheet/Memory. + = Max five stars.
Screen and Report Formats: D = Default supplied. P = Paint-a-screen. L = Letter format.



mainframe communications. Instead it contents itself with providing comprehensive micro to micro links along with the ability to access the popular dial-up information services.

The communications protocols can be altered from the SETTINGS option on the main menu.

Apart from allowing you to play around with the baud rate and parity, Symphony also allows you to control some more esoteric features connected with auto-dial/auto-answer 'smart' modems. With a bit of work it should be possible to hook most modems to Symphony.

COMM allows you to transmit and receive sections of worksheet and whole disk files. It can cope with both text and program files. The latter are transmitted and received using the XMODEM protocols which are widely used in the micro world.

A nice touch with this system is that it can translate data produced on a foreign PC into British characters. It is unlikely that many people would use this in their day-to-day work, but it could be useful to, say, multi-nationals and the like.

Macros

Macros allow you to write rudimentary programs consisting of Symphony commands which can be called by a few keystrokes. The simplest form of macro could imitate a series of often used keystrokes or return an often used string.

In addition Symphony has what it calls the Symphony Command Language. This extends the abilities of macros by allowing FOR... NEXT loops, IF... THEN structures, subroutines, error trapping, and so on. Although this extends the programmability of Symphony, it doesn't come near Framework's FRED in terms of sophistication.

DATABASE

Symphony's method of operation is to store information in spreadsheet format, with each data item occupying a single cell, each field a column, and each record a row.

This approach gives a number of distinct advantages — among which are high-speed retrieval of information and flexibility in viewing the information as individual records, as a table or mixed with text.

In addition, all the 'housekeeping' information, such as the format of the screen used to display individual records, the criteria which may be needed to select subsets of records, and so on, are also stored in the same worksheet as the data, which also speeds up operation, and makes it possible to change such administrative details quickly.

However, the corresponding disadvantage is that you are limited as to the amount of information you can store. These limits apply to any kind of information held by Symphony, but are more likely to prove a serious drawback in processing structured data considered as batches of records than in other applications.

Symphony takes up approximately 290k characters, so on the minimum size memory on which it will run you would only have room for about 30,000 characters, or about 150 records of 200 characters each. The maximum amount of memory you can have on a standard IBM PC is 640k characters, giving you a maximum of 350,000 characters of working space, or, theoretically, about 1750 records of 200 characters each. In practice, the limit would be rather lower, since the 'housekeeping' information seems to take up quite a lot of room. My Benchmark file contains 1000 records each of 152 characters; in Symphony, these records, together with the screen format, record definition, three selection criteria and a sort criterion took up about 220,000 characters, and was in fact nudging against the memory limit on a 512k machine.

Record creation

To use Symphony for data management, the minimum necessary is to set up a list of field names, and then ask Symphony to generate a set of definitions and a screen entry format. This format can then be used in FORM mode to add, amend or display individual records, one record occupying the whole screen. If you work this way, Symphony sets up all fields with the same data type and length. Alternatively, you can specify these attributes yourself. The field names are also used as column headings when the data is viewed as a table in spreadsheet mode. A Calc field type is allowed, which permits data values to be calculated from other fields or constants or both. Good data validation features are provided.

To enter records in FORM mode, you simply type them in. You can also enter records in SHEET mode, but if you do you must also amend the separate set of data set definitions to tell Symphony that that total number of records has changed. In either case, you can use the usual cursor controls to move about.

Once a record has been inserted, to amend it you must recall it to the screen and use the Edit key (a function key) to show that you wish to make changes. When amending records, you can set selection criteria to allow retrieval of a particular subset that needs changing. Since the whole of the data is held in memory, with a coordinate reference for each data item, the effect is that each field is indexed for direct access. As a result, access times of individual records are very fast — see the timings for Benchmarks 2 to 5; such times would apply to any field without an intervening indexing step, hence the absence of BM6 which is irrelevant in the Symphony context.

In SHEET mode, you can amend fields across the whole data set or across ranges, using the spreadsheet recalculation facilities; this was the approach used to carry out BM8.

Displaying and printing information

Individual records can be displayed using the form designed for input, or displayed or printed in formatted reports by designing a format using a 'paint-a-screen' approach within the worksheet. Such formats may include multi-line formats suitable for mailing labels.

Once designed, such a format can be stored in a separate file for use in different worksheets if desired, or to save space in the worksheet. A default print format is also provided, using the field names as column headings. Data from individual records can also be processed via documents such as standard letters created in DOC mode; the 'template' letter looks very much like the corresponding document in WordStar's Mailmerge facility. However, the standard letter must reside in memory with the data while the two are being merged, so this would also reduce the space for records.

Calculations for analysis are very powerful, as you would expect on a spreadsheet-based package, and include a variety of statistical functions as well as totals. By using these features carefully you can also calculate subtotals.

Selection and sorting

You can set up selection criteria to display particular sets of records in FORM mode. Each criterion may contain one or more tests, and a record must pass all the tests to be selected. You may have several criteria in operation together, and in this case the record must pass any one criterion.

Using this combination, you can set up most combinations of AND and OR; the operators provided are the usual comparison operators for both numbers and character strings, and there are also a good range of special string operators such as LEFT. You can ask for searches to start at a particular point in the string, and for partial matches using wild codes.

While in SHEET mode, you can also

elapsed since...) and handling times as well, and Framework adopts the usual spreadsheet convention (where function names are preceded by '@').
For example:
@COS(B23)
would calculate the cosine of the contents of cell B23.

In multiple-spreadsheet applications it is essential for formulae to be able to reference cells in other spreadsheets. Each frame can be given a name after it is created, and this is used in the cell reference for non-local cells. Thus, if there are three spreadsheet frames called "DivA", "DivB" and "Both", a formula such as:
DivA.Profit.Total + DivB.Profit.Total
could be used in 'Both' to obtain the total profit of both divisions. A further refinement is that a frame itself can be assigned a formula. This enables more 'global' spreadsheet manipulations, in particular consolidation operations, to be readily performed.

Since cell entries are generally fairly brief, most spreadsheet systems have fairly limited editing facilities for changing cell contents. Not so with Framework! After all, it has a full-grown word processor elsewhere so it might as well give you full access to its editing power when you are amending formulae.

In general Ashton-Tate has attempted to do this sort of factoring of resources throughout Framework. This greatly reduces the learning effort. Pressing the 'home' key gets you to the top of a word processor document or the top of a spreadsheet depending on context.

Framework offers extensive spreadsheet formatting facilities. These include the usual variable column widths and scientific displays but, in an attempt to appeal to the business user, Framework provides a wide variety of styles for displaying financial figures. Thus it is possible to arrange for parentheses around negative numbers, and a choice of currency prefixes or suffixes.

The rich variety of functions in Framework will be primarily of use to the spreadsheet worker, but they also constitute a major part of FRED. In the standard release of Framework, FRED will be fairly lightly documented (except for the functions), since most users will not need it; but Ashton-Tate plans to release full documentation of FRED to expert users or programmers who need it for sophisticated applications.

SYMPHONY

Three of the most commonly used Symphony commands are 'services', 'menu' and 'help'.

The services key provides functions such as disk operations, printing and system configuration common to all applications within Symphony. The options from the menu key will vary according to what you are doing. In both cases pressing ESCAPE will get you out, although sometimes the menus provide a specific get-out option which is a better choice. The help is context-sensitive and is pulled in from disk. (This was not working on the review system).

Help is provided in the form of the window manager. When you define a window, you can specify the area of the main worksheet to be accessed. This can range from the whole worksheet to just a few cells. When you are within the window you can scroll around as much as you like until you hit the boundaries set in the window definition, at which point the machine bleeps and won't let you past the border.

Once you have mastered this idea, Symphony is much easier to live with because you are back to the idea of separate areas for different sets of data.

The window manager will also allow you to do all the usual window tricks — expanding and contracting a window, moving windows, and zooming into and out of a specific window.

Integration

A window can be in any of five modes: SHEET (spreadsheet), DOC (word processor), GRAPH (graphics), FORM (database) or COMM (communications). The important point to remember is that you can easily switch the mode on the fly. For example, if you were preparing a memo which contained complex tabular data you would proceed as follows.

First, select DOC to enter word processor mode and type text until you reach the point where you want to insert the tabular data, then select SHEET. Your document will stay on the screen, but instead of displaying line and column numbers, the borders will change to spreadsheet mode showing cell references. The window is now a spreadsheet and you can then enter your data, formulae, and so on, and produce your table.

Finally, you can switch back into DOC mode and carry on entering text after the tables. The only restriction is that tables entered in spreadsheet mode, can't be edited in the word processor.

This ability to switch modes on the fly is one of the most impressive aspects of Symphony. If you attempted to perform the above example in Framework, the job would be much more difficult.

Moving data

This is another area where Symphony scores heavily over Framework and other more conventional integrated packages.

Moving data around within a single worksheet is a piece of cake because all you're doing is moving data from a part of the worksheet that contains, say, a spreadsheet model to another part that contains, say, a word processor.

Moving data from a section of one worksheet to another worksheet requires more care, but it is still very straightforward.

WORD PROCESSOR

The Symphony word processor is very simple and uncomplicated but those among you looking for WordStar-type power and features had better look elsewhere: this word processor is designed for knocking out memos not typing *War and Peace.*

All the word processor-specific commands are accessed by hitting the menu key; other functions such as printing and disk operations are accessed through the services menu. The available options are Copy, Move, Erase, Search, Replace, Justify, Format, Page and Line-marker. Most of these functions are standard and need no explanation, but I will go into Line-marker and Format in more detail.

Line-marker allows you to assign a name to a specific line in the text. You can then GOTO that line by name without having to wade through the whole document.

Format allows you to specify tab stops, justification, line spacing, margins, and so on. The interesting thing is that as well as defining default settings for the whole document you can also create a number of 'format lines' with different settings. As you go through your document you can call different format lines to alter the layout of the different sections.

The only major problem with the screen layout is that if you set the line spacing to double or triple spacing, it will still show up on the screen as single-spacing. As I am more used to the WordStar what-you-see-is-what-you-get style layout I found this annoying. Also you have to imbed special control codes into the text if you want to produce, say, underlining on bold. This is a messy way of doing things considering that this is supposed to be a friendly system.

Graphics

Symphony allows you to create a wide range of graphs and charts. Although it will work with the standard IBM colour display, the comparatively low resolution limits the display. Symphony graphics allow for six types of graphs: pie, XY, line, bar, stacked bar, and high-low-close-open. The graphs are contained within 'graphics windows' and take their data either from a section of a spreadsheet or database.

All the settings for a particular graph are controlled from the oddly named '1st Settings' and '2nd Settings' menus. These allow you to control a bewildering range of features: the graphics sub-system is the most complicated section in the whole package, but is easy to use once you get used to setting it up.

Communications

Unlike other integrated systems Symphony is not equipped for sophisticated

SOFTWARE

All this means is that, in practice, a Framework database frame is very quick and easy to set up.

Database frames may be viewed either as a table or as a form, one record at a time. When the database frame is created, Framework creates a default layout for this form.

This layout can be modified simply by using a function key to 'drag' the field to the appropriate place. Field sizes and numbers are limited only by memory size — you could have a single field occupying the whole of memory if you wanted.

As is common with Ashton-Tate packages, there is no special format for date fields. However, a variety of functions are provided for handling fields as dates, which, to a large extent, solves the problem.

To modify the database form, you can add a new field at any time with the Insert function. You can add records in either the Form view of the database frame, or in the Sheet (table) view. As with Symphony, the fact that all information is stored in memory means that there is no need for separate indexing arrangements; access to all records is effectively direct. When amending records, you can select by using a filter to restrict yourself to just one or a few records (more on this below). You can also amend one field in every record in a single operation using an appropriate formula; for instance to raise all prices by 10 per cent.

Displaying and printing information

When displaying data on the screen, you can either show one record at a time, using the Form view of the frame, or show 20 records in a table. Moving between the two views is simple — you just toggle with a function key. Records may also be printed out in either format. Alternatively, more complex formatting is available, using word processing features.

Selection and sorting

You can set up filters to decide which records to display or to delete. Filters may consist of many tests, combined with And, Or and Not. The syntax is very similar to that used by dBasell. You can also select particular records to be read in from a file, using a single criterion.

Records may be sorted into either ascending or descending order. You may only specify one sort field at a time, but the sort works in such a way that by specifying several sorts, least significant first, you can arrange the file in any order you please.

Advanced facilities

Framework has a programming language which allows you to tailor its use to particular applications. It can read files in most formats through its filtering facilities. At present, Framework can write files only in its own internal format and in text format — if you want to read in a dBasell file, make changes in Framework and return the file to dBasell, you must write the data to a text file and then get dBasell to translate it back to the original format. It is possible to link the DOS to run other programs, and this can be accomplished semi-automatically by running a .BAT file which exits back to Framework.

SPREADSHEETS

To start spreadsheeting in Framework, a spreadsheet 'frame' must first be created. First, select the 'create' main option, then specify the initial dimensions for the spreadsheet (that is, the number of rows and columns required — these can be changed thereafter) and, finally, give the go-ahead to create a frame of type 'spreadsheet'.

Once the frame is created, it is displayed alongside all the other frames — this can be particularly useful when plotting graphs from the spreadsheet, or otherwise transferring its data into other frames.

Spreadsheet columns are labelled A, B, C, .., Z, AA, and so on, while rows are numbered. As an added convenience, cell references can use any labels that may be in the first row and column of the spreadsheet. Thus cell D10 could also be identified by 'Sales. March', if column D is headed by 'March', and row 10 by 'Sales'.

If an attempt is made to move the cell-cursor off the edge of the screen a fairly rapid redraw is made but Framework never redraws the entire screen, only the current frame. A further sophistication involves 'locking' the first row and column of the spreadsheet. This is, of course, the location for the row/column names that offer the alternative cell-naming convention. But, in any event, keystrokes made while the display is being redrawn are buffered. This can easily occur if one of the arrow keys is pressed, or held down for a few seconds. Several keystrokes are transmitted while the screen is being updated for the first keystroke, and immediately it is finished another redraw starts.

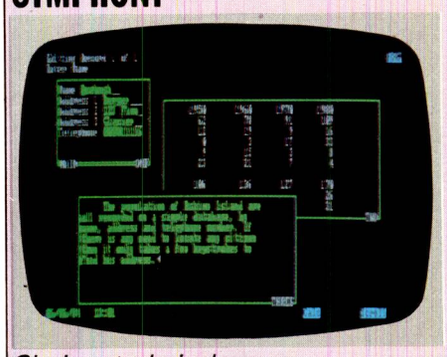
This is not as clever as it sounds. If you inadvertently press a key for too long, you can be treated to a lengthy sequence of redraws while the software catches up. This sequence can take several seconds to finish and is unstoppable. It can be particularly frustrating watching the cell you want scroll through the window and off the other side!

Framework offers 15 further keystrokes for moving the cursor further than a single cell at a time.

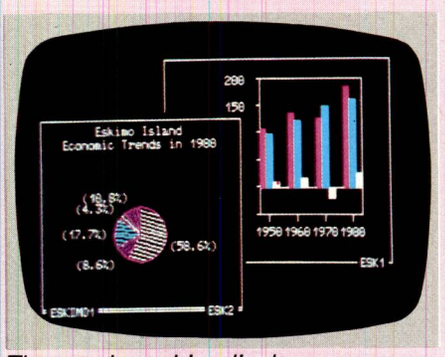
Numbers, text and formulae can be entered into the spreadsheet by moving the cell-cursor to the right place and then simply typing them in. Occasionally Framework might be confused by an entry. For example, 01-636 6890 will be interpreted as a calculation rather than the text of a phone number unless Framework is forewarned that text and not numerics is being entered.

Spreadsheet formulae can be built out of a comprehensive range of functions. In addition to '+' '*', '−', and '/', Framework offers functions for manipulating dates, handling basic statistics, finance, trigonometry and more besides. There are facilities for displaying various date formats, converting dates into numbers (of days

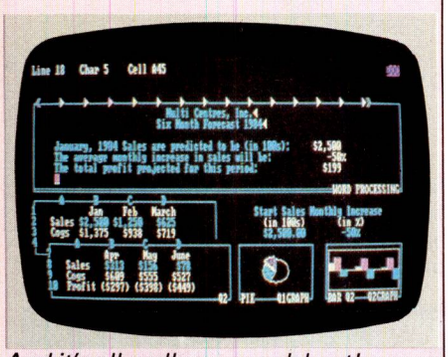
SYMPHONY



Glorious technicolour



The usual graphics displays



And it's all really a spreadsheet!

aspects of any integrated package. Framework allows you to move data in a number of different ways.

The easiest data transfer path is taking data from one numeric application and moving it to another numeric application. In effect, this means copying from database to spreadsheet, database to database or spreadsheet to spreadsheet; it doesn't include moves to or from the word processor.

If you want to include spreadsheet data in a word processor document, you have to get devious and contain frames within frames as follows:

First of all, create a new empty word frame. You can then copy both the document frame and the word processor frame into the new outline frame and print the outline.

Although this works, it is very clumsy, and getting the imported data exactly where you want it can be a problem. You can use the 'outline' feature (see below) to improve the layout and paginate the document.

(When you look at Symphony you'll see that it's much easier to incorporate selected spreadsheet data.)

The final method of data communication is via a 'pipe'. In any numeric frame (that is, not the word processor) it is possible to access data in another frame by quoting the frame name and cell reference. If the data changes in the 'parent' frame, then those changes are automatically reflected in all 'child' frames.

Outlining

Outlining allows you to use Framework's ability to handle frames-within-frames to create complicated report-style documents quickly and easily by using each frame to make up a page of the report. This is a powerful and innovative feature.

The outline can be used as an index page showing the names of all the frames and sub-frames and numbering them appropriately. Using the outline it is very easy to find and access the desired frame.

A simple outline might look something like this:

Example:

1 Intro
  1.1 Framework
  1.2 Symphony
2 Framework
  2.1 Word processor
  2.2 Database
  2.3 Spreadsheet
  2.4 Etc
3 Symphony
  3.1 Ditto
  3.2 Oh my God what next?

As it's so easy to switch between frames and create new sub-frames, you could easily use this feature as a sort of 'ideas processor' to impose structure on random thoughts.

WORD PROCESSOR

Like everything else about Framework, the word processor is RAM-based, so the number of pages of text that you get is directly proportional to the amount of RAM in your machine.

Most of the commands used in the word processor are exactly the same as in other modules of Framework. For instance, to copy a block of text use the EXTEND CURSOR and COPY keys in exactly the same way as you would in the rest of the system.

Those commands that are specific to the word processor are mostly contained within the pull-down menus at the top of the screen. For example, the WORDS pull-down menu contains commands for bold, underlined, italic and normal text as well as commands for the alignment and justification of text.

This makes the word processor very easy to use and the manual almost unnecessary.

Graphics

Framework can display six types of graphs and charts: bar, stacked bar, pie, line, scattergraph and X-Y. It can graph data from either a spreadsheet frame or a database frame.

The graphics functions are accessed from the GRAPHS pull-down menu, although experienced users will probably access the graphic functions through FRED (see below). Spreadsheet data can be selected using the EXTEND CURSOR key. However, database records will probably have to be run through a filter before they can be graphed.

Communications

When Framework is launched it will come with a communications program called MITE. Unfortunately this was not available at the time of the Benchtest.

Programming

Framework is supplied with a programming language called FRED ('FRames EDitor'). FRED is virtually a full-blown programming language in its own right. It can be used to access all the features of Framework with the advantage that it is totally programmable.

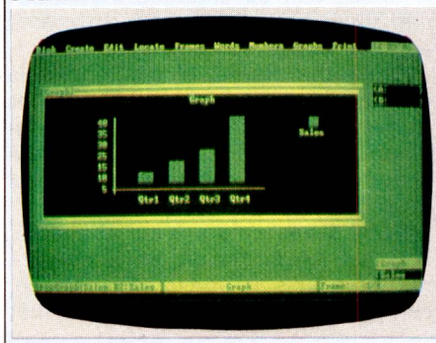
DATABASE

A Framework frame, stored in main memory, can be viewed on the screen, printed, saved in a file or written out to a text or dBasell file. Thus it has in common with Symphony the ability to process, as one unit only, as much information as can be held in the computer's memory. However, its method of use is a bit different, making it less easy to state exactly how much information you can process at any one time. Individual frames may be stored in separate files, or a complete outline containing several frames may be stored as one.

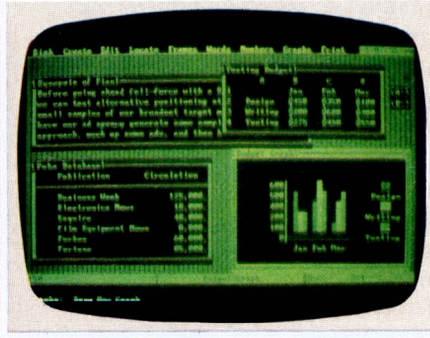
Record creation

To start putting records into a data set, you ask Framework to create a database frame. All you then have to do is enter the names of the fields you want. No indication needs to be given of length or type. Framework uses a default length which you can set up and change, by modifying the way the field names are displayed, using function keys. When data is entered into a field, Framework deduces from the characters entered what type of field this is to be. If you want to enter numbers into a field yet have its type as character, you can override Framework's assumption.

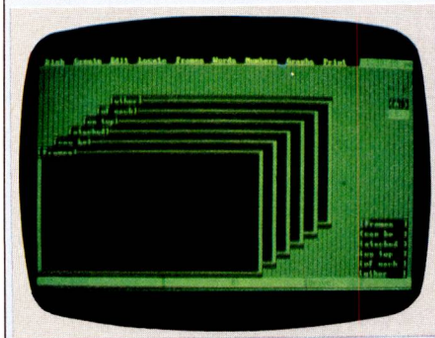
FRAMEWORK



Frames can be overlaid



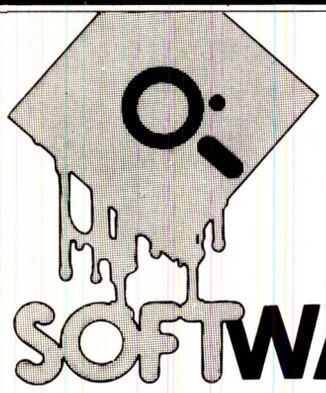
. . . or side by side



The usual graphics displays . . .



Document building in frames



Framework vs Symphony

The battle is on for lead position in the highly lucrative integrated software market with the main contenders being Ashton-Tate's Framework and Lotus's Symphony. Peter Bright, Kathy Lang and Mike Liardet give their verdict.

Ashton-Tate and Lotus are two of the most successful software vendors in the world. Ashton-Tate has the top selling database in dBasell while Lotus has the best selling spreadsheet/graphics/database combination in Lotus 1-2-3. (1-2-3 offers no communications facilities, however, and you can't write a novel on either it or dBasell.)

Both companies have decided to follow the current trend towards integrated software by releasing their own contenders for a highly lucrative market — Framework from Ashton-Tate and Symphony from Lotus.

Symphony and Framework are RAM-based and do not use virtual memory techniques which involve running data to and from disks. Framework has been designed to work on an IBM PC with just 256k of RAM, whereas Symphony demands a minimum 320k of RAM, of which the program uses about 290k, leaving a measly 30k for the user. Framework will overlay little used parts of the program by pulling them in off disk when needed, whereas Symphony will only pull help screens in off disk. In practice, Symphony users will have to buy more memory to get the program to do anything useful: Kathy Lang (our database reviewer) only just managed to run the database Benchmarks on a fully-expanded PC with 640k of RAM! The Framework review system was pre-release and did not use overlays or fancy code-compression techniques, which makes it hard to forecast exactly how much memory will be needed. At a guess you'll probably get away with less than you need for Symphony — but not much less. Display-wise both systems need high resolution capability for graphics, but monochrome output can be obtained with a suitable high-res card.

First impressions

Framework looks very similar to the Apple Lisa/Mac and other 'friendly' systems. This similarity extends even to the point of displaying the 'desktop' icon in dapple grey and moving frames to the disk icon when you close them down. The trouble is that the limitations imposed by IBM hardware mean this approach can't be taken to the same lengths as in Apple's case.

Symphony, like Lotus 1-2-3, is very much a spreadsheet system in appearance. Whereas Framework stores information in 'frames', Symphony provides a single spreadsheet. Whatever activity you're engaged in, be it word processing, database or number-crunching, the information is all stored somewhere or other on the spreadsheet. As this is also true of 1-2-3 you may wonder in what respect Symphony differs. In fact, it appears substantially different: if, for example, you're word processing it appears like a word processor, though underneath it all is a massive spreadsheet. You could end up with the top left-hand corner being occupied with a word processor document, the bottom right corner taken up with a spreadsheet and the middle holding database data. You might find this hard to accept if you're used to each application having its own nice neat little pigeon-hole.

Framework's 'frames' can hold data from any of the applications, and also other frames . . . you can have frames within frames *ad infinitum* until you run out of memory. Frames can be edited, made smaller, larger and dragged around the screen to your heart's content. However, if you have more than four or five on the screen at the same time it can start to look a mess. To solve this one a 'zoom' key fills the screen with a selected window.

Most Symphony commands are executed by a combination of the function keys and the cursor control keys. The same is true of Framework with the addition that Framework has to recruit some of the keys from the numeric keypad to take commands that won't fit

SYMPHONY

Most of the commonly used functions are contained within pull-down menus which are displayed along the top of the screen. The functions include disk utilities, creating a new frame, search and replace, text justification, setting graphs and printing.

Some of the functions in the pull-down menus are available whether you are in database, spreadsheet or word processor. For example, you know that whichever mode you're in, if you want to print something you go to the PRINT pull-down menu. This gives the whole package a much higher degree of uniformity and makes it easier to learn.

Framework also has context-sensitive help — wherever you are, by pressing the Help key you can get further information about the task Framework is performing.

Moving data

Moving data between different applications is one of the most important

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certainly be even further delayed, perhaps indefinitely.

Not a scenario which inspires confidence, so please BBC, don't let us all down. And make the next contract with Acorn a minimum of eight years.

R F Shepherd, Head of Computer Services, City of London Polytechnic

Epson PX-8 solution

I refer to Dick Pountain's article on the Epson PX-8 in your June issue.

As a solution to his difficulties with pressing the carriage return key while impatiently waiting for programs to execute, I suggest he use the SHIFT LOCK key. I have seen this technique in use by several professional computer users and it has several advantages:

(1) The keyboard buffer does not get clogged up by extraneous typing.

(2) There is also the satisfying clicking of 'hard' SHIFT LOCK keys.

Even on computers without this obvious advantage, one often sees a LED to indicate the state of the SHIFT LOCK key, as in this case, so a pretty light flashes to distract the user's attention from the annoyance of a snail-like program.

I hope this suggestion is of use to any other impatient user in the same dire predicament.

Mr RJR Williams, Worthing, W Sussex

Atmos going green

I saw an advertisement for the Oric Atmos: 'the cure for amnesia'. Not having seen an Atmos, I cannot comment on the validity of its claims, but I note that: 'The attributes are stored on the screen, instead of taking up space in memory.'

Then I realised that Oric has taken an idea from Space Invaders (remember them?): instead of Invaders turning green in memory, green cellophane is stuck on the screen. Presumably, to justify its claims, Oric supplies red, green and blue cellophane to its customers!

Finally, did you realise that if an infinite number of monkeys sat at an infinite number of word processors, one of them would not only type out Hamlet in full, but for an encore would type out a good Oric 1 manual?

Douglas Nunn, Edinburgh

Spirited away

I am writing to complain about a software company who advertised in the February issue of *PCW*.

On the 19 February I ordered a program from Spirit Software of Pembroke Mews, London. Three weeks later I received a letter saying the company had production problems, but the program would be despatched the following week.

Since then I have had no further explanation as to why I have not received the program, nor has my money been refunded. I have written a letter of complaint to the company concerned but have received no reply.

I would be grateful for any suggestions as to how I can get my money back.

D. Withers, Lisburn, N Ireland

(See below for details of the Mail Order Protection Scheme of the Periodical Publishers' Association—Ed)

Reminiscing . . .

PCW used to be more than a collection of Benchtests and news of forthcoming products: it used to have articles on ideas, and how people would implement them using personal computers—take the 3D animation problem for example which was featured in the May and June issues.

While I realise that advertising and inducements to buy are what sell your magazine (to which, incidentally, I have subscribed for three years) I, and perhaps many other readers, already possess a personal computer and am not quite as susceptible to endless Benchtests as I once was.

In short, I look forward to seeing a few more ideas, articles and discussions of problems in some depth, and the ways in which they might be solved.

G C Carter, Basingstoke, Hants

Photo Videotex

In view of recent correspondence about photo storage (Computer Answers, *PCW*, May), the following may be of interest to readers.

British Telecom Enterprises plans to launch 'Photo Videotex' early in 1985. This product will enable the display of full-frame, full-colour (or black and white) photos onscreen, together with text and graphics.

Both user and editing terminals will be based on the IBM PC, with central systems being run on GEC computers. Other machines will also be able to support central systems in due course.

Picture resolution will be equivalent to domestic television (sampling at 6.75MHz). With transmission at 64k bits per second on British Telecom's Integrated Services Digital Network or KiloStream service, the maximum time that a full-frame, full-colour photo will take to appear is 10 seconds. This performance is achieved by use of data compression techniques.

Photo Videotex will be sold on a private system basis.

Patrick Fitzgerald, New Information Services, British Telecom

BBC power supplies

With reference to 'Out of Stock', Communications, *PCW*, April, we will be pleased to supply BBC power supplies to Sean Phillips of EC2, or anyone else.

J H Lawrence, Lawrence Associates, 10 Somerset Avenue, Yate, Bristol BS17 5SF, tel: (0272) 321088

Help!

I've 'inherited' an Andromeda Alpha computer, but no-one seems to know anything about it. I've no software and no instruction manual.

I'd be very grateful to hear if anyone out there has or knows anything about this machine.

Brian Mitchison, 17 Brook Ave, Wembley Park, HA9 8PH

(You expect it to work as well! No, seriously, anyone got any information?—Ed)

Sargon chess for Spectrum?

As vice president of the British Postal Chess Federation and also owner of a Sinclair Spectrum 48k, I would like to know if any *PCW* reader has been able to convert the published Sargon chess program by Dan and Kathe Spracklen to run on their own Spectrum. If so, would they be willing to sell me a copy with a quick run-down about the program (as I know very little about machine code).

Mr B Whitby, 16 Mansefield Rd, Warrington, Cheshire

Marriage guidance

It's all down to you that my wife has fallen hook, line and sinker for what she calls '*Her* Sirius!' She moons about 'him' night and day!

To get my old lady back into bed with me, could you please write lots about Sirius and none of it nice! I think it's the only way my marriage is going to survive.

Dedwydd Jones, Lausanne, Switzerland

(You could always snuggle up with the Sirius and its dual 'floppies'—Ed) END

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If you order goods from mail order advertisements in *Personal Computer World* and pay by post in advance of delivery, *Personal Computer World* will consider you for compensation if the advertiser should become insolvent or bankrupt, provided that:

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Classified advertisements are excluded.

must either build a switch into the circuitry or unplug it.

We produce a professional business presentation system that runs on the 27in Profeel, and we find that two further modifications are required: a 680 ohm resistor between pins 19 and 29 to improve the blanking level; and because the monitor is very susceptible to mains noise when it's in RGB mode, a cheap filter plug can greatly improve the final image.

A teletext decoder requires the same 34-pin connector and so users of this will need to keep access to the back of their set clear—they may need to do a log of plug pulling.

The Sony Profeel has proved to be an excellent monitor for computer graphics, for display purposes as well as for use with video and broadcast TV.
Martin Conradi, The Rainbow Software Company, Isleworth, Middx.

The Micronet 800 Mo(dodo)em

Micronet subscribers beware—your acoustic modem could shortly be as much use as a cracked plant pot.

The Prism modem supplied with the system is not compatible with the latest type of domestic telephone, known as the 'Statesman'. 'So what,' you ask. 'Who would pay extra for a flash, push-button job, when a standard telephone suits both me and my micro?' The point is, good old BT is busy keeping up with the times (competition), systematically replacing the old dial version for a smart, push-button, warbling wonder, and all for free! (that is, if you are a new subscriber to BT or making changes to your existing telephone installation, such as having an answering machine installed).

There should be no problem, after all. You can call up those nice Micronet people on your (new) 'Statesman' and explain that your handset no longer fits the coupler. The company can send you a replacement plastic top moulding to fit your handset (£7.50+p&p) and a few screw turns later—bleep! bleep!, you're back online to Enterprise, or whatever. Alternatively, you can return your working coupler (with £19.95+VAT) and by return of post comes a hardwired 'job' (with its bug-ridden ROM) and once more, you're back online.

No such luck! Ask Micronet what it is prepared to offer you, and it'll say: 'Sell it' (who'll buy it?), 'Give it away' (who wants it?). 'But', you cry, 'it cost me £59.74 only a few months ago, and I've got to pay the rental (£52) for a full year!' 'Yes, we know all that,' says Micronet, 'but it's still not our policy to supply mod kits or replace the couplers. We will, however, supply you with the hardwired version for £76 and the (doubtful) ROM for £9.95; this is our special offer!'

There you are folks, Micronet will not help. You could try to get your old telephone back (but why should you? It is, after all, the BT-supplied standard) or just sit there for another six months paying £1 a week for a dead black box which no-one wants.

So what about it, Micronet? Pull that digit! Tell us it's all a computer error, or perhaps a good old fashioned mistake. You're already in trouble so don't add to it—just bring our micros back to life, as you promised. After all, you're still taking our money for the 'service'.
Bill Pethers, Wokingham, Berks

Alternative soap opera

Well, I finally did it. I am a 32-year-old bloke with a wife, two kids, five cats and a dog to support, and I have decided to purchase a computer.

Speak to Trudy (the wife), and establish some realistic parameters:
1 It ought to look nice.
2 Must be big and impressive looking—can't have folk thinking we aren't serious about it.
3 Trudy's still-now latent desire to type comes to the fore—proper keyboard, darling. Things are now becoming serious.

Of course, we realised that friends who already owned a computer would help us in our choice. Who were we kidding?

The ones who lent us a Spectrum may never speak to us again, due to our expressed concern for the cobweb of wires, tiny keyboard and multi-function keys. Valid criticisms we thought—let's tell them. After all, friendship can rise above all this.

Wrong!

We eventually decided on a Sharp MZ-711. Next step—a magazine. Revert to parameters one and two and come up with the gargantuan *PCW*.

Of course, I don't understand a bit (oops!) of it: 'Wait a minute love! It's got our computer in it, so we *must* have decided on a good one if the top magazine is writing about it!'

Your reviewer seems to have been fairly impressed by our choice (Benchtest, *PCW* February). Yes, there were criticisms but then, I don't suppose there *is* a perfect machine. As far as I'm concerned, what Surya lacks in a surname, he/she (with sincere apologies for whichever is incorrect) makes up for with an easily readable and understandable style.
Bob Courtney, South Molton, Devon

(He, for a he 'Surya' is, has now left PCW, *and although we wish him well, he'll be 'suryasly' missed—Ed)*

Counting in real-time

Following your note in June's ChipChat on the 'Sincalese' language developed by Sinclair, I think you should also look at the new 'Sincalese' mathematics.

This is used to explain the difference between quoted QL delivery dates and actual dates. For example, we ordered our QL on 25 January, and had the 28 Sinclair-day delivery confirmed *twice* over the phone.

After waiting 119 days to 23 May, we have been quoted eight Sinclair-days for delivery.

To put it mathematically: (28 Sinclair-days) minus (119 real days) = (eight Sinclair-days). That is, one Sinclair-day equals approximately six real days, giving us a forecast delivery date of 11 July.

Further research into developing this science could look usefully at the 'BBC-day' of 1981/2 vintage. Our data shows that delivery quoted at 42 BBC days in November 1981 actually meant 203 real days before delivery to us on 7 June. Thus the BBC day, of nearly five real days duration, shows a remarkable correlation with the Sinclair day, which is six days long.

Fans of *Hitch-Hiker's Guide to the Galaxy* will be familiar with these calculations as a branch of 'Bistromaths', which tries to explain the difference between the parts and the sum of restaurant bills.

On the basis of these forecasts, we have set a provisional date in July for our QL courses—leaving a margin of delivery error which even Sinclair-maths can tolerate!
J Coakes, Owl Consultants, Tring, Herts

Up for renewal

Newsprint (*PCW*, January) draws attention to the fact that Acorn's contract with the BBC to produce the BBC Micro expires in August.

I must admit that when this institution began to acquire large numbers of BBC Micros, it never occurred to us that such difficulties might arise, let alone so soon. Like many other academic institutions, much of our computing policy now centres on this brilliant little machine, which we use as a multi-functional workstation, and for which we have developed specialised networking firmware. Frankly, we are getting very alarmed about what the future might hold.

I hope that the BBC is aware of the problems facing all its users if it were to change the main contractor (to Sinclair, for example). For whatever undertakings might be given (and they are always easy to give), the reality of such a change-over is likely to be traumatic for all of us.

With a change of contractor there are bound to be many significant changes in design and construction of the BBC Micro, and especially in the products still to come. This will cause problems for users and third party suppliers (on whom we often depend). Many such suppliers are small companies producing excellent educational products for the BBC Micro, who might not survive the change.

It would be difficult to imagine any company going to as much trouble as Acorn has to produce (relatively) reliable and robust products. The company's very thoroughness has been a problem to many of us patiently awaiting the add-on processors, which have been a major attraction of the machine. But we can at least be confident that when they do finally emerge, these products will be well made.

All production, delivery and maintenance problems which beset Acorn in the early days, and which are even now not over, would recur. Future products, which we are all anxiously awaiting, would

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116PCW

The Basicode interpreter is required to load a Basicode program from tape, hence my suggestion that it should be marked as such. Once you have written and saved a Basicode program on a specific machine, however, the Basicode interpreter is — as you say — not necessary.

Referring to points (3) and (4), perhaps you have misread morning wiped that smile off my face in double-quick time.

Since November last year I have been writing software reviews for one of the weekly micro mags, and I've had a fair amount of rather worthless software through my fingers. There have been moments of actual joy as a rare piece of good quality, value-for-money software arrived and

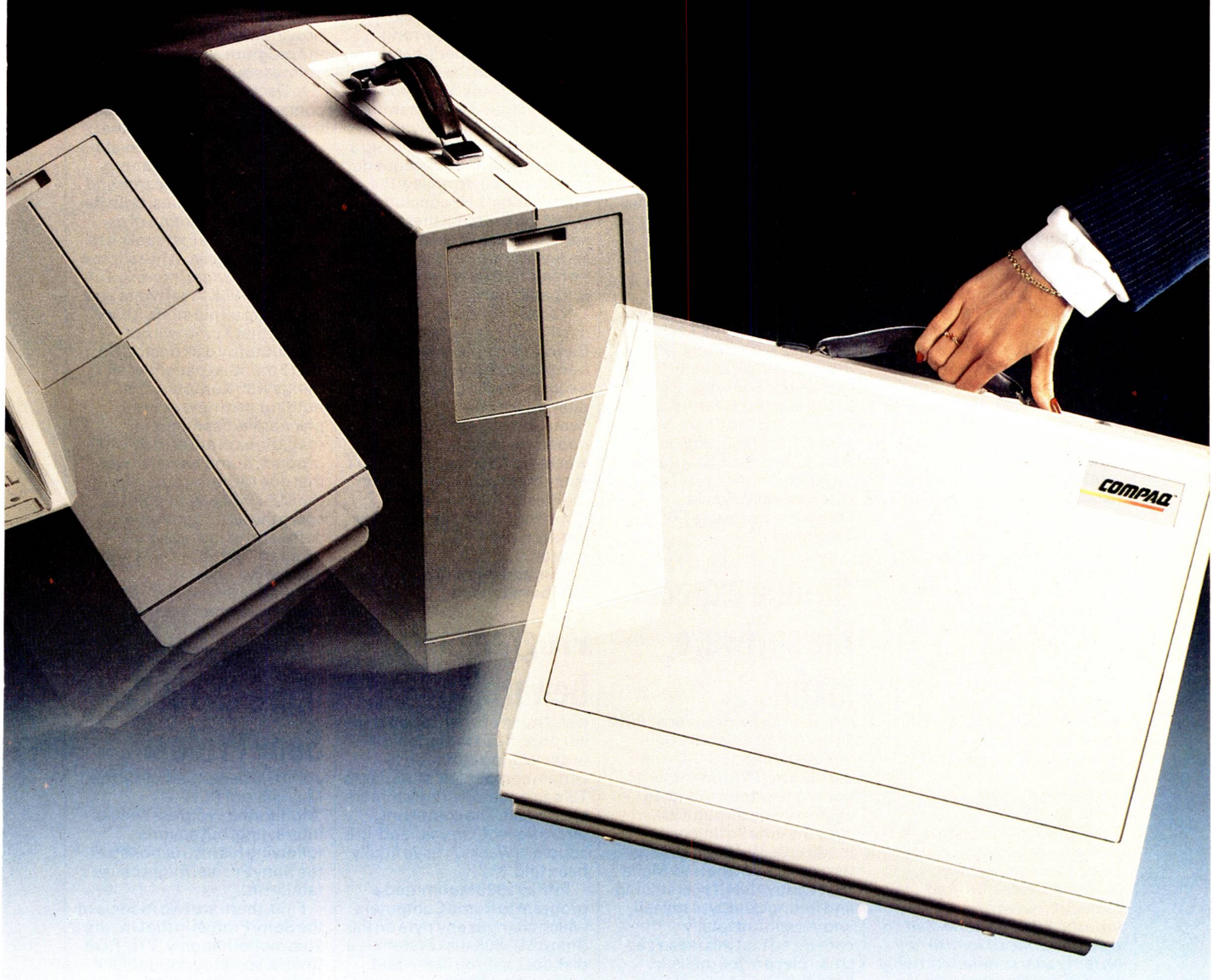
I was told that the company was interested in marketing the program and would be in touch. After four or five weeks I phoned and spoke to Tim Moore, who told me that the program was ideal for marketing and would be included in Kuma's next catalogue at a price of £30, of which I would receive 30%. This meant £10 for every

(nominal), the Z-88 accepts 'linear' RGB (all the colours you care to give it) and requires one-volt inputs.

To operate the Profeel you must first switch it to RGB mode; this needs the 10k ohm resistor between pins 33 and 19 as described in the article. But you cannot leave this plugged in if you want to use the Profeel as a family TV! You

Ask any of these dealers what 100,000 Americans found

only Compaq.®



created in America by three visionaries.

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Within a year it was number two to IBM® in the microcomputer market.

Ask any of the dealers overleaf what 100,000 Americans found so right about a personal computer called Compaq.®

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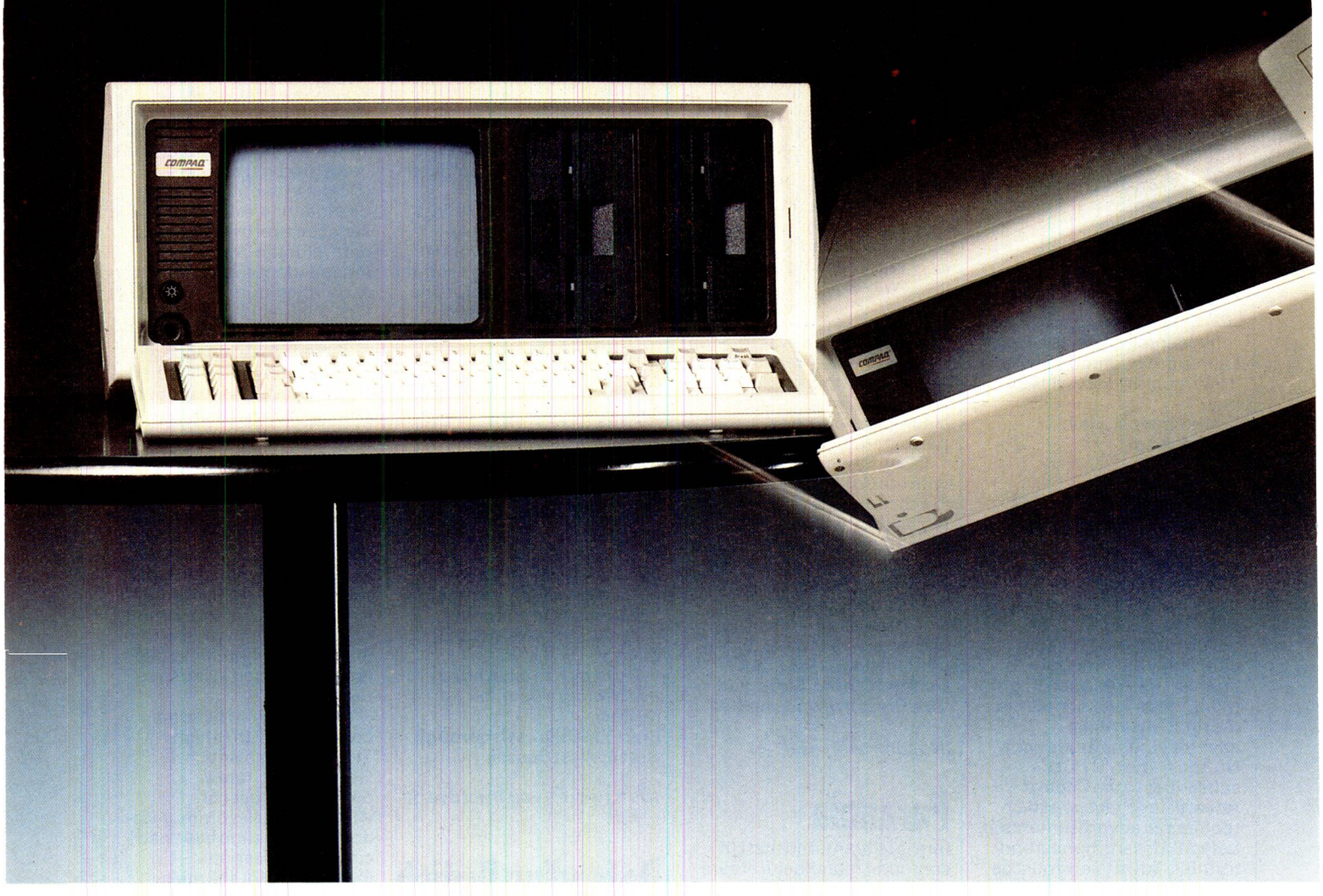

In an ideal world there would be a personal computer that was not only more compact than IBM's® but offered true compatibility with IBM® software.

It would weigh 28lbs and could be carried around and operating in seconds.

It would be tough enough to resist all the knocks that occur in the real world and protect the 256K byte RAM within.

This personal computer was in fact

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COMMUNICATIONS



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

The meaning of quantum leap

Although quanta are very small units of emergy emitted by excited atoms, changing the principle quantum number (n) in Bohr's treatment of atomic hydrogen involves a large movement along the electromagnetic spectrum: that is, a quantum leap. Basically, as we change n we achieve the results in Fig 1.

n				
1	Lyman	series of spectral	lines	(ultra violet)
2	Balmer	"	"	(visible light)
3	Paschen	"	"	(infra red)
4	Brackett	"	"	(far infra red)
5	Pfund	"	"	(approaching radar waves)

Fig 1

Incidentally, lawyers use the Latin word *quantum* to mean 'How much money will you pay?'

Leslie Phoenix, Llay, Nr Wrexham

Tilting wildly at windmills

Guy Kewney's ringing defence of freedom of speech for advertisers (*PCW*, May) is amusingly quixotic but bizarrely misinformed. 'To my mind,' he writes, 'people have the right to run their advertisements, true or not.' No, they haven't! *PCW* subscribes to the Code of Advertising Practice, which requires all advertisements to be legal, decent, honest and truthful. Advertisers must be able to substantiate all claims in their ads, and publishers are expected to demand such substantiation of any dubious claims. In some circumstances, dishonest advertising may even constitute a criminal offence.

Commercial advertising is not a medium for freedom of speech—that is what *editorial* pages are for. Advertising is a device for persuading punters to put their hard-earned money into the advertiser's pocket. Hence, it is the punters who need protection, not the advertisers. And this is particularly true in the computer industry, where dishonest advertising and misrepresentation are rife.

Fifty years ago, advertisers did enjoy the right, broadly speaking, to run their advertisements, 'true or not'. So, for example, Craven A cigarettes were sold with the claim that they 'do not affect your throat'. That was freedom of speech—the freedom to describe a lethal product as beneficial. Thankfully, such claims are no longer permitted.

If Guy Kewney is not familiar with the Code of Advertising Practice and the recent legislation to protect the consumer, perhaps he should do a little research before he trots off in all directions, tilting wildly at windmills. Don Quixote was an endearing character—but was, nonetheless, quite mad.

Dermod Quirke, Strangled Vole Press, Newark, Notts

(No comment—Ed)

Paranoia

I am totally amazed that UK computer manufacturers are as successful as they are.

I mean, Sinclair makes a computer, starts marketing it and no-one gets one for a year and a half because the company 'did not expect the demand'. Good grief; what does Sinclair expect? What's the point of launching what is going to be a highly successful computer before enough of them have been made?

Anyway, that's nothing to do with me because I have a good old BBC Micro.

Acorn produces a disk filing system far superior to all others with far more commands and greater speed, and then makes the maximum number of files for each disk thirty-one!

What on earth is the company doing? What use are 31 files on a 200k disk? When I fill a disk with 31 files and compact it, I'm told there is 160k left on that disk's side that I can't use . . .

Pathetic is the only word to describe 99% of the computer world.

And there's another thing. People complain about software piracy and wonder why it happens. The reason is, I think, because £9-£10 for one program is an unrealistic price.

Consider the work that goes into writing a book, and then the work that goes into writing a computer program: I would say about equal, yet a book costs £1.75 and software up to £10 . . .

Meanwhile, every single electronics manufacturer is churning out pathetic computers and Atari still insists on charging £20 for one game and wonders why no-one buys Atari computers.

Perhaps I am just being paranoid about the whole thing.

Anyway, I'm amazed by *everything* to do with micros . . .

Brett T McBain, Wisborough Green, West Sussex

(Don't worry, you'll get over it—Ed)

Defending British Telecom

Could I just put right the false statements made by Guy Kewney in Newsprint (*PCW*, May 1984, 'Spaghetti Western') in which he commented on the British telephone network.

Mr Kewney is correct in stating that the 'present' telephone system is cabled up with copper wire. But surely even he has heard of British Telecom's inroads into fibre-optics? Also, what is wrong with copper wire? Has Mr Kewney not heard of the imminent Integrated Services Digital Network (ISDN) now referred to as the Integrated Digital Access (IDA) system? This service utilises the existing two-wire copper cable to the local exchange providing an 80kbps (kilo-bits per second) transmission path which will carry simultaneous voice (64kbps) and data (8kbps) to two separate destinations. Additionally, the service can provide 64kbps data (plus the 8kbps independent channel) and can carry voice, data, video (SSTV) facsimile—in fact, any digitisable information. Once onto the ISDN exchange the data is combined with other streams and passed around high-speed trunks at Mega-bps rates between the ISDN exchanges. Additionally and at a higher level, large companies may be provided with 2Mbyte co-axial lines to their local exchanges capable of carrying up to 30 times the above-mentioned. All this is accomplished utilising the existing network and current cable technology, and will fit into the fibre-optic links that are being buried in the street right now!

May I add that I have no connection with British Telecom or the British Government. I am a professional user of world-wide telecommunications services and have had contact with various international authorities.

Danny Thompson, Dartford, Kent

Basicode discussion

Surya's review of Basicode (*PCW*, April & May) was, uncharacteristically, flawed. I

continued on page 114

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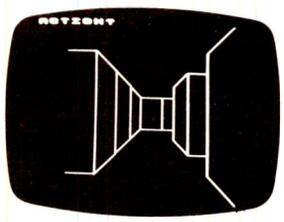

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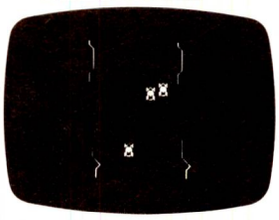

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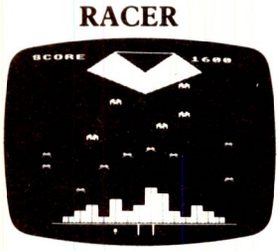

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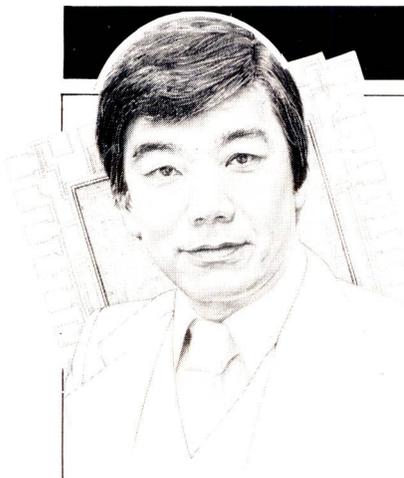
NEWS FROM JAPAN



Monsoon season or not, PCW gets the news. This month, Shinichiro Kakizawa reports on the Tokyo Business Show, micro-controlled golf caddies, word processor survival and tinned software . . .

Shinichiro Kakizawa is a computer technology and applications consultant, and a freelance journalist. He has worked in the computer industry for twenty years, originally on mainframes, and for the last five years on micros. Fujitsu and NEC are among the companies he has worked for in Japan, Singapore, the Netherlands, and the UK. He has been involved in policy setting for the Japanese fifth generation project and in Britain he participates in SPL's fifth generation project, Insight.

It is now the monsoon season in Japan, which usually lasts for six weeks during June and July. The heat and moisture bring the unpleasantness meter reading to a maximum 100, with unbearable humidity day and night. If you don't have air conditioning, condensation pearls drip down the front of your CRT; if you happen to be debugging last night's machine code routines, the machine appears to sob along with you.

Two-eyed giant

Along with half a million others, I visited the Tokyo International Business Show recently. One business micro astonished me—the SuperPower X-X from Miroku Keiri KK (KK, or Kabushi Kaisha, is the Japanese equivalent of PLC). X-X is the top-end micro of Miroku's business series containing two VDUs in one box.

Miroku claims that the two-eyed system provides multi-layer, multi-dimensional management information simultaneously. In addition to X-X eyes, it has a multi-table keyboard and three 5¼in floppy drives. This may be the ultimate solution to the current windowing trend—why not have as many VDUs as you need windows on the screen?

The outstanding trend at the show was in copiers, personal copiers and facsimile devices. All major manufacturers exhibited low-cost personal copiers priced at under £900. Many are following the lead of Minolta's Zoom PPC, which can enlarge/reduce originals. The star product was the Digital PPC. This can be connected to a micro like any other peripheral device. Images copied by the Digital PPC can be edited and inserted into any document created by the micro.

Portable facsimile machines were given a lot of attention too, and can also be connected to micros. Ricoh, Matsushita and Fuji Xerox are all offering such systems. At present, the best they can do is transmit micro output via facsimile, but potential applications include integration of handwritten pictures with a micro's output, and free combination of images with information stored in the micro. Again, digitisation is the key issue.

Fighting for survival

In the world of word processors, more than 30 manufacturers are fighting for survival. Unlike the Latin alphabet, Japanese Kanji characters are ideograms developed from pictograms and signs. They have very complicated structures and consist of many strokes, and require more computer power to play with. To store all 50,000 characters, a huge memory overhead is required. Low resolution displays, which would be perfectly adequate for Latin characters, are just not good enough for Kanji characters: 5 × 7 or 9 × 9 pin printers can't even do draft quality Japanese sentences.

Japanese people at home or in the office could not even do simple word processing at a reasonable price, as people in the west could early on in micro history. Bringing down the price to affordable levels has been the major thrust behind the development of Japanese high-quality printers, with more memory and higher resolution graphics. The end products of this effort are now appearing on the market: cheaper and better printers, VDUs and memory chips.

AT&T 3B series

Toshiba and the giant trading house Mitsui, the sole Sinclair distributors in Japan and Sord distributors in Germany and France, are negotiating with AT&T for marketing and support of that company's 3B series computers in Japan.

There have been numerous rumours on who will win the manufacturing and marketing rights for AT&T Unix machines in Japan. Among the names suggested are Fujitsu, NEC and Hitachi.

However, although these mainframe companies are interested in Unix itself, collaborating with AT&T in the hardware field is said to present some problems, due to the possible duplication of product lines. Mitsui took advantage of the hesitant mainframers and jumped to the negotiation table with AT&T—being eager to establish itself in the information technology market place. Toshiba, as a member of the Mitsui Group of companies, seems to have been persuaded by Mitsui to join the venture.

Of course, the fact that Toshiba cannot offer as wide a range of minicomputer products as other mainframers must have encouraged it to join Mitsui.

Intelligent plotter from MAX

MAX, known for its excellent range of paper staplers has announced the graphic X-Y plotter 'Graph Art GA-100'. GA-100 has a 10-key board, and produces graphs of various shapes including bar charts, pie charts, and other business graphs in conversational mode. It costs £1100, and can be attached to any microcomputer.

This marks MAX's first entry into the computer market-place.

Secret IBM PCs

IBM 5550 is the Japanese equivalent of the IBM PC or PC/XT, manufactured by Matsushita on an OEM basis and marketed only by IBM Japan. However, it was discovered recently that OEM supplier Matsushita is also planning to sell a compatible box with the Panasonic brand name on it.

It has been said that Matsushita has approached a few large corporate IBM customers who are desperate to cut microcomputer costs. If this move becomes common knowledge, it will be an embarrassment to IBM Japan: a chill wind may blow in to cool the already uneasy relationship between Matsushita and IBM.

On the other hand, there may be a possibility that IBM and Matsushita have agreed to each other's activities. We hear that IBM is ready to ship the next generation machine, the IBM 5560, and Matsushita is actually helping IBM to clear the stock as soon as possible.

Robot caddie for golfers

Olympic angling equipment makers Cosmo Eighty, IBM Japan's partner in a new media business, is planning to build a micro-controlled 'Mechatronics golf course' in the Yamanashi Prefecture suburb of Tokyo.

The course, to be opened in 1986, will have a robot caddie which follows each player, and runs on the fairway via an optical fibre network buried underground. The robot will have electronic eyes to trace the ball wherever it flies, tell the player the exact spot where it drops, and shout 'Good shot!'—I'm sure it will be very popular. Total cost for the golf course electronics is over £3,000,000.

Software in a tin

A nicely vacuumed tin and software are available for Fujitsu and NEC 8-bit micros. Each pint-size tin contains a software cassette tape and a manual for a word processing package. The supplier, Kobayashi of Nichicon Ltd, believes the beer can image is clean and safe and will give customers the impression that the software is simple and easy to use. END

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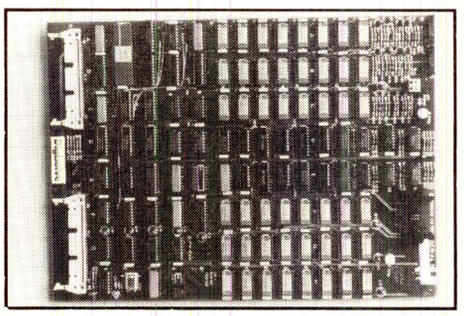

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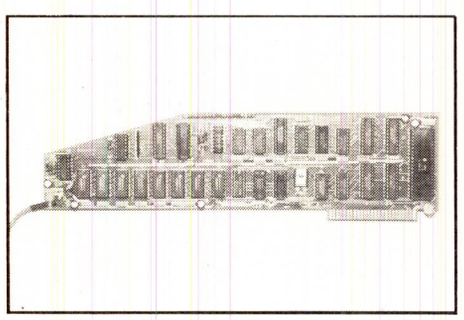

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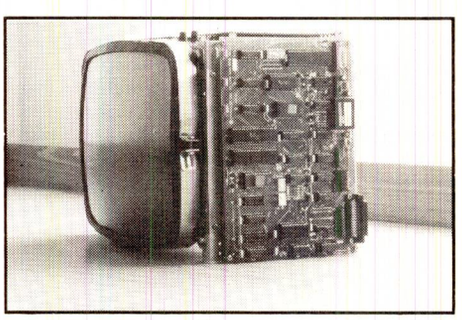

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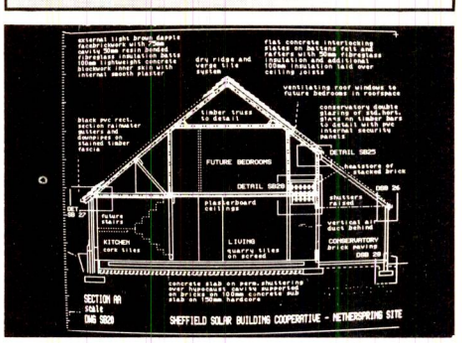

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YANKEE DOODLES



Computerland moving east, Atari dropping the 600XL, IBM software 'at bargain prices', Japan leading the way in notebook computers. David Ahl reports from Stateside.

Random bits

Computerland has signed a letter of intent with the China Ministry for the Electronics Industry to sell microcomputers through retail outlets in China under a joint venture . . . IBM has announced a line of eight software packages for word processing, database management, spreadsheet calculations, and so on, to sell for $149 each, a move that will probably trigger fierce price competition among software vendors. The company is also re-evaluating the keyboard design on all its personal computers as a result of the criticism of the Chiclet-style keys on the PCJunior and the non-standard key locations on the PC . . . Digital Research has announced StarLink, a hardware implementation of Concurrent PC-DOS which allows up to four users to share files, software, and data on one IBM PC . . . Atari has closed its Hong Kong manufacturing plants and dropped the 600XL computer and 5200 game unit from its line, leaving only the 800XL computer and 2600 and new 7800 game units . . . The new 'CX Series' from Franklin Computer incorporates three operating systems for Apple, MS-DOS, and CP/M software . . . Apple is seeking software in Japan for its Macintosh and Lisa computers so it can begin more serious marketing in that country . . . Insoft, supplier of the Coleco Adam software, has declared bankruptcy after settling for less than half the money owed to the firm by Coleco.

More defections from Commodore

Ever since Jack Tramiel, former president of Commodore International, resigned last January, a slow and steady procession of people have been leaving the company. The latest series of departures involves eight, top-level people, some of whom resigned and others who were fired. I spoke to one of the departing executives and he said that: 'The company would like you to believe that only eight people have left; actually it's more like 15 or 20.'

The company also lost the vice presidents of finance, manufacturing and technology, as well as managers in product development, software technology and software marketing.

Commenting on the departures, Marshall Smith, Commodore's new president, said: 'The internal restructuring that has been implemented has streamlined and tightened up the organisation.' He continued: 'Most importantly, these changes have shortened our lines of communication.' He stressed that there had not been any reshuffling 'in our very strong European company or in US semiconductor operations,' which he calls 'the guts of the company'.

As for Jack Tramiel, he recently used a small piece ($671,000) of his fortune to purchase an additional 113,000 common shares of Adac Laboratories. This brings the share of the company owned by members of the Tramiel family to about 6.5%. According to the SEC filing, the Tramiels 'intend to seek representation on the Adac board of directors and expect to be more than "passive" investors.'

Japan scores again in notebook computers

Japanese manufacturers have targeted the more lucrative areas of the semiconductor business, and as more and more manufacturers rush to enter the notebook computer business they find they must turn to the Japanese for critical components such as LCD displays and CMOS circuits.

Moreover, US manufacturers of notebook portables must also compete with Japanese-made machines. In other sectors of the computer market, the Japanese have been largely overshadowed by US-made computers but the Japanese notebook portables appear likely to take a significant share of the market.

With the prospect of IBM entering the notebook market along with Compaq, Kaypro and Apple, smaller companies are rushing to line up long-term reliable suppliers of components. Sharp LCD displays are particularly in demand as they are the only ones to offer 24 lines by 80 characters, a size deemed necessary for serious spreadsheet applications.

The marketing of notebook computers within the next year or so will probably rival that of desktop computers today. Currently there are 19 notebook units on the market ranging from the low end Tandy, NEC, and Olivetti machines to upper end units such as those from Sharp and HP.

Vendors are attempting to differentiate their products and establish unique positions on the price/performance curve—the Sord IS-11 has integrated software built in, the Sharp PC-5000 has a removable bubble memory cartridge. At the lower end of the market the battle has already degenerated with Tandy and NEC alternately cutting price to gain a temporary advantage. The street price of a 16k NEC 8201 is now just over $400 . . . and falling!

Computer stores 'apprehensive'

New manufacturers of personal computers are having an increasingly difficult time getting on the shelves of retail computer stores in the US. Dealers are limiting the lines they carry for several reasons: the financial cost of carrying inventory of both computers and software, training service technicians and sales people, and the lack of shelf space.

With the Chapter 11 (bankruptcy) filings of Osborne, Victor, and Computer Devices, three seemingly promising companies, retailers are now even less willing to take on new vendors. Instead, they prefer to stay with well-established manufacturers such as IBM, Apple, HP, DEC, Compaq, and TI.

Several of the established manufacturers have expanded their product lines both upwards and downwards, or have announced intentions to do so. This also lowers the likelihood that dealers will pick up new lines since they can cover the entire spectrum with just a few makers.

Apple, for example, has machines ranging from the under $1000 Apple IIe to the Lisa at the upper end, while IBM has machines ranging from the PC Junior to the PC XT.

Until recently, the conventional wisdom was that success in the small business market was assured for an IBM-compatible machine: the more compatible, the better. Certainly, this seems sensible since business customers demand the ability to run IBM software; furthermore, stores don't want to have to carry identical software packages for several computers. On the other hand, the long-standing shortage of IBM hardware seems to be ending as IBM catches up with demand, thus eliminating one reason to buy a competitive system.

Furthermore, customers are becoming wary of saving 20% or 25% on their hardware by risking buying from a company that may not stay in business.

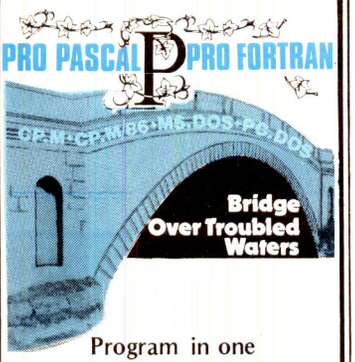
Hence, this softening of demand for IBM-compatible systems is causing dealers to be reluctant to take on those lines. The net result is a sort of two-tier system of dealers and manufacturers. The top retailers carry four or five of the top brands, while the second-tier dealers, who are unable to get IBM or Apple, carry an assortment of computers made by smaller manufacturers.

Observers feel that these dealers and manufacturers are prime candidates for attrition as the competition continues to heat up. END

A SELECTION FROM OUR PRODUCT RANGE

		CP/M	CP/M-86	MS-DOS	PCDOS
High Level Languages					
ADA	Supersoft	●			
BASIC INTERPRETER	Microsoft	●		●	●
BASIC COMPILER	Supersoft		●	●	●
BASIC COMPILER V5.3	Microsoft	●		●	●
BUSINESS BASIC COMPILER	Microsoft			●	●
C COMPILER	Microsoft			●	●
C COMPILER	Supersoft	●	●	●	●
CBASIC	Digital Research	●	●		
CBASIC COMPILER	Digital Research	●	●		
CIS COBOL	Micro Focus	●	●		
COBOL COMPILER	Microsoft	●		●	●
FORTH	Supersoft	●			
FORTRAN	Supersoft	●		●	●
FORTRAN COMPILER	Microsoft	●		●	●
LEVEL-2 COBOL	Micro Focus	●	●	●	●
LISP	Supersoft	●			
muLISP	Microsoft	●			●
muMATH/muSIMP	Microsoft	●			●
PASCAL COMPILER	Microsoft			●	●
PASCAL MT+	Digital Research	●	●	●	●
PL/1	Digital Research	●	●	●	●
Low Level Languages					
MACRO-80	Microsoft	●			
DR ASM + TOOLS	Digital Research	●	●	●	
Program Development Tools					
ANIMATOR	Micro Focus	●	●		
BUG	Phoenix Software	●			
DISPLAY MANAGER	Digital Research	●	●		
FTNUMB	Micrology	●			
LEVEL II ANIMATOR	Micro Focus	●	●	●	●
PDEVELOP	Phoenix	●			
PLINK	Phoenix	●			
PLINK II	Phoenix	●			
PLINK-86	Phoenix		●	●	●
SID	Digital Research	●			
SPEED PROGRAMMING PACKAGE	Digital Research	●	●		
XLT-86	Digital Research	●			
ZSID	Digital Research	●			
Utilities/System Tools					
CLIP	Keele Codes	●	●	●	●
DESPOOL	Digital Research	●			
DIAGNOSTICS II	Supersoft	●	●		
DISK DOCTOR	Supersoft	●	●		
DISKED-2	Slogger Software	●			
DISK-EDIT	Supersoft	●	●	●	●
DISKMAN	Slogger Software	●			
DISKORG	Slogger Software	●			
DISKTOOLS-1 (DISKMAN & DISKORG)	Slogger Software	●			
DISKTOOLS-2 (DISKTOOLS-1 & DISKED-2)	Slogger Software	●			
dUTIL (FOR DBASE-II)	Fox & Geller				
FILESHARE	Micro Focus		●		
DEC RAINBOW SERVICE S/W:	Silicon Valley Corp.				
(1) Format/Verify Service			●		
(2) Autorun Service			●		
(3) Function Key Service			●		
SERVICE S/W VOL. 1 (1, 2 & 3)			●		
SYSTEM CHECKER	Supersoft	●			
THE OPERATING GUIDE	Decision Systems	●			
UTILITIES I	Supersoft	●			
UTILITIES II	Supersoft	●			
Sorting					
MSORT	Microsoft	●		●	●
SUPERSORT	Micropro	●	●	●	●
Code Generators					
AUTOCODE	Stemmos	●		●	●
FORMS-2	Micro Focus	●	●	●	●
QUICKCODE	Fox & Geller	●			●
SOUCEWRITER	Softwright	●	●	●	●
THE LAST ONE	D.J. 'A1' Systems	●	●	●	●
THE LAST ONE—COMPACT	D.J. 'A1' Systems	●	●	●	●
Telecommunications/Conversions					
BACDEBIT	Comley	●			
BACSCOPY	Comley	●			
BSTAM	Byrom Software	●	●		●
BSTMS	Byrom Software	●			

		CP/M	CP/M-86	MS-DOS	PCDOS
Telecommunications Cont.					
ICL CO3 EMULATION (Bulk)	Synchro Systems	●			
ICL CO3 EMULATION (Interactive)	Synchro Systems	●			
ICL CO3 EMULATION (Interactive & Bulk)	Synchro Systems	●			
REFORMATTER CP/M ↔ DEC	Microtech Exports	●			
REFORMATTER CP/M ↔ IBM	Microtech Exports	●	●		
Word Processing/Text Editing/Editors					
CORRECTOR	Supersoft	●			
EDIT-80 V2.02	Microsoft	●			
FRIDAY	Ashton Tate	●	●	●	●
MAILMERGE	Micropro	●	●	●	●
MEMOPLAN	Chang Labs	●	●		●
WORD	Microsoft				●
WORD WITH MOUSE	Microsoft				●
PARAGRAB	Focus	●			●
PEDIT	Phoenix	●			
PMATE	Phoenix	●			
SPELLSTAR	Micropro		●	●	●
STARBURST	Micropro				●
STARINDEX	Micropro	●	●	●	●
WORDMASTER	Micropro		●		
WORDSTAR	Micropro	●	●	●	●
WORDSTAR PROFESSIONAL (WS · MM · SS · STAR INDEX)	Micropro	●	●	●	●
Databases/Data Management Systems					
DATASTAR	Micropro	●	●	●	●
dBASE-II	Ashton Tate	●	●	●	●
INFOSTAR	Micropro	●	●	●	●
REPORTSTAR	Micropro	●	●	●	●
Financial Accounting					
INCOMPLETE RECORDS SYSTEM	MPI	●	●	●	●
NOMINAL LEDGER	Padmede	●		●	●
OPEN ITEM PURCHASE LEDGER	Padmede	●		●	●
OPEN ITEM SALES LEDGER	Padmede	●		●	●
PADMEDE BUSINESS CONTROL SYSTEM	Padmede	●		●	●
PAYROLL	MPI	●		●	●
PURCHASE LEDGER	Padmede	●		●	●
SALES INVOICING	Padmede	●		●	●
SALES LEDGER	Padmede	●		●	●
TIME & COST RECORDING	Padmede	●		●	
Financial Modelling/Problem Solving					
CALCSTAR	Micropro	●	●	●	●
DECISION ANALYST	Executive Software	●	●	●	●
LINEAR & GOAL PROGRAMMING	E A S	●			
MATHSPACK	MPI	●		●	●
MICROPLAN	Chang Labs	●		●	●
MULTIPLAN	Microsoft	●		●	●
PLANTRAC 1	Computerline	●		●	●
PLANTRAC 1	Computerline	●		●	●
PROFIT PLAN	Chang Labs	●	●		●
QSTAT	Pivotal Software	●			
STATSPACK	MPI	●		●	●
TK! SOLVER	Software Arts				●
TK! SOLVER PACKS					
FINANCIAL MANAGEMENT					●
MECH ENGINEERING					●
Business Applications					
JOB COSTING	Heseltine	●	●	●	●
POLICY MASTER	CSA Micro Systems	●	●	●	●
PRINT ESTIMATION	Software Mgmt Systems	●		●	●
STOCK CONTROL	Padmede	●		●	●
Training Aids					
CP/M TUTOR	Syntax Software	●			
KEYBOARD MASTER	Anthony Ashpitel	●	●		●
TYPING MASTER	Anthony Ashpitel	●	●		●
Graphics					
dGRAPH	Fox & Geller	●			●
STATSGRAPH	Supersoft	●			



Program in one operating system and you are source code compatible with the others!

Pro Pascal has all the features of Standard Pascal, plus some useful extensions such as dynamic strings for characters and an assembler-level interface for systems program.

Pro Pascal is a compiler with a very simple user interface. A one line command is all that is needed to convert a source file into an executable program.

Pro Fortran is a complete implementation of Fortran 66 with a number of features from the later Fortran 77. Both Pro Fortran and Pro Pascal include a compiler, linker, run-time library, librarian and a source cross-referencer. There is also a useful utility to configure the software to suit variations, such as disc capacity differences.

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teachers.



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can bank on it.



Keeps haulage firms
trucking.



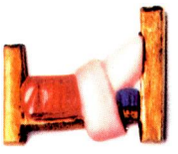
Dentists extract
clients' details from it.



Restaurants
price dishes on it.



Does plumbers' job sheets
in one burst.



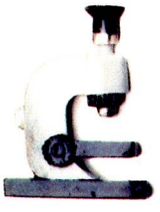
Hoteliers know who's been
sleeping in their beds.



Builders
speculate on it.



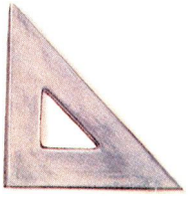
Cooks store
recipes on it.



Scientists appreciate its
microscopic attention to detail.



Tailors draw
patterns on it.



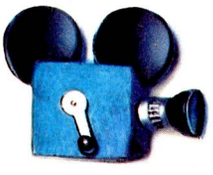
Handles
architects' plans.



Administers to
governments.



Designers
have designs on it.



Film directors
budget with it.



Helps band leaders
call better tunes.



Doctors keep
patients with it.



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for pharmacists.



Florists plan
their growth with it.



Zookeepers feed
camels with it.



Helps firemen
go to blazes.



Traindrivers drive
their son's trainsets with it.



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*Based on National Computer Centre data for January/February 1984.

Roger Kojecky, IBM United Kingdom Product Sales Limited, FREEPOST, Greenford, Middx. UB6 9BR. (Tel: 01-578 4399.)

PCW 8/84

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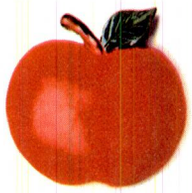
Company_____

Address_____

_____ Tel No:_____

IBM

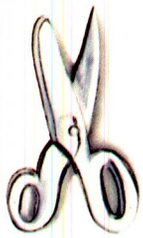
LITTLE TRAMP CHARACTER LICENSED BY BUBBLES INC., S.A. HMS/GGK



Fresh ideas on
grocers' stock control.



Museum curators
collate on it.



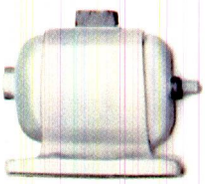
Hairdressers
cut costs with it.



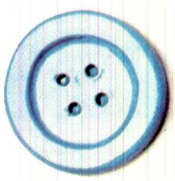
Generals could
play war games on it.



Editors cut
editing time.



Engineers
tinker with it.



Haberdashers do VAT
with more dash.



Fits shoe shops
perfectly.



Conjurors
try tricks on it.



It doesn't dictate
to secretaries.



The collector uses it
to pin down a species.



School children
learn from it.



Keeps track of
the canteen's cutlery.



Watchmakers tick off
their accounts.



Opticians see
sales forecasts with it.



Theatres
put seats on it.



Car hire companies
drive better bargains with it.



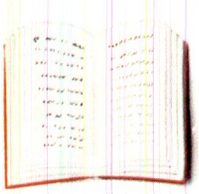
Telephones
talk to it.



Resort managers
resort to it for scheduling.



Helps farmers
plough profits back.



Tells librarians
what's left on the shelf.



Record companies
keep records on it.



Auctioneers hammer out
accounts on it.



Gym owners keep
their books in shape.



Takes risks out
of insurance premiums.

At last, there's a Personal Computer that's made for people who are specialists in their own business, not computer specialists.

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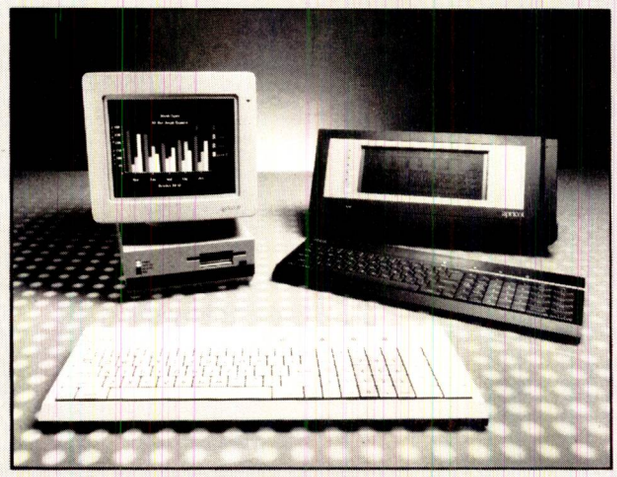
If you're interested in a computer that talks your language, why not drop into your nearest IBM

Channel Four isn't the only one with special programs for minority groups.





Left to right: the Apricot F1 and the Apricot Portable

STOP PRESS . . .

ACT has launched two new machines to extend its Apricot range of transportable micros. Codenamed 'Rascal' both machines are positioned below the existing Apricots and will provide a lower entry level into the ACT range.

The machines will be known as the Apricot F1 and the Apricot Portable and will offer hardware and software compatibility with the existing Apricot range.

The Apricot F1 will sell for £995 and includes an 8086 processor, 256k of RAM and one 720k double-sided 3½in Sony disk drive. Graphics resolution is 640×256 pixels. This is not as high as the more expensive 'old' Apricots, but it is still very respectable. As a bonus the F1 supports both black and white and colour displays. ACT can supply appropriate monitors as optional extras.

The most novel feature of both the F1 and the Portable is that instead of using a cable to link the keyboard to the main unit, it uses an infra-red light beam. Although this was disastrous on the IBM PC Junior, ACT is confident its version works.

A mouse is an optional extra with both Apricots. This also uses an infra-red beam. At £100 ACT says that it expects the majority of customers to buy the mouse with the rest of the system.

ACT has bundled seven programs with the new machines comprising a tutorial/utilities program, an electronic diary, ACT Sketch — ACT's version of MacPaint, and an oddly named 'Domination' game. Also included in the package are three programs from Sorcim: Superwriter, Supercalc and Superplanner.

ACT is also using the F1 to try to get a slice of the BBC contract and to sell into the schools and colleges market. Educational establishments will be able to buy a cut-down version to be known as the F1E for £795. This will have 128k of RAM and a single-sided 315k disk drive. It won't be supplied with the bundled software, but it will be supplied with the Logo programming language.

The Apricot Portable at £1695 is more expensive than the F1, but is one of the first micros to be supplied with an integral Hitachi 80-column × 25 line liquid crystal display. It is also possible to plug a monitor into the machine and output different data to the LCD screen and the monitor.

The whole unit weighs just under 13lb which means that the main unit and the display can fit into a carrying case and can be carried around with comparative ease. The main restriction is that none of the Apricot machines make any attempt to run on batteries — they are all mains powered.

Finally, the Portable is the first micro that is supplied with speech recognition facilities as standard. ACT says that it is easy to replace function keys with spoken commands and that whole programs can be tailored (with some effort). Only time will tell how useful this feature will be.

Peter Bright

IDMS — The secret of thermal success

An optical character reader for handwritten texts driven by the IBM PC — with a footprint no bigger than the PC base unit — was the star microcomputing attraction at the Montreux International Direct Marketing Symposium (IDMS).

To this idyllic venue on the shores of Lake Geneva came 120 arch perpetrators of junk mail — sorry, direct marketing specialists. While the heavy stuff went on at the symposium sessions, laser printing specialists tussled on the exhibition floor with their arch-rivals, the ink-jet brigade.

Most serious direct marketing is still mainframe or mini-based and revolves around the manipulation of hundreds of thousands of addresses. Microcomputers are beginning to make their mark in the industry, and the Personal Reader was the microcomputing star turn.

Personal Reader (PR) is an optical character reader (OCR) for the IBM PC. It's a joint effort by Swiss optical instrument specialists Felle and a German PC dealer, EPA. The OCR in production will come in a box the size of a PC base unit, though the show demo was running on a somewhat larger prototype.

Personal Reader is software-driven. This means that the OCR can be primed to read different document formats stored on floppy or winchester. Switching between formats is a matter of seconds.

Equally impressive is PR's handling of upper case handwriting. When it comes across a document it can't read (in whole or part), it reads the format and the intelligible bits then ejects the rogue paper into a reject tray. An operator can then go through the rejects in order on the database, filling in the gaps. Documents of formats other than the currently programmed format are similarly ejected (three output trays in all are provided) — that is, the OCR itself performs a sort operation on mixed format input.

PR is due on the market in the summer: it will be sold as a turnkey system including the PC. Prices start at DM65000 — UK prices not yet fixed. Further information from EPA Regensburg, telex 65770 EPA D.

Jerry Sanders

A writer's best friend

Duplex Communications has developed what looks like becoming the writer's best friend — an add-on which turns an RS232C interfaced typewriter into a versatile text editor which can store and manipulate up to 100 A4 pages of typing.

The Text Typer comes as a 12in×7in×2in box which plugs straight into the typewriter's interface and displays the keyboard's output on an integral LCD screen. Using designated keys for control the user can delete, insert, and manipulate lines or whole blocks of text; which can be stored or printed out on the same typewriter or another printer.

The Text Typer wordwraps, justifies, and has an unusual facility 'undelete' — which enables the user to resurrect any text deleted during editing.

The integral display is only a single line of 32 characters but variously-sized, clip-on screens expand the display to up to 16 lines×80 characters. The CMOS memory, backed by a Nicad battery to hold data while the unit is switched off, is provided as a standard 16k expandable in 8k steps to 56k.

Also under development is a version with an output for an external monitor and floppy and hard disk drives. The unit can already be supplied with an integral auto-dial modem or an acoustic coupler incorporating error-detection.

The Text Typer sells at £295 (ex VAT), which means that it can be bought together with a Brother EP44 portable to provide a self-contained text-editing system for well under £600.

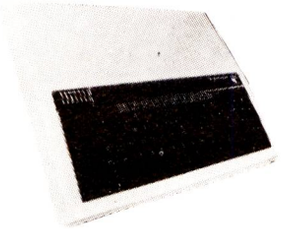
Contact Duplex Communications (Midlands) Ltd, Leire Lane, Dunton Basset, Leics for more details.

Mark Jackson

Rules Rule OK

Not graffiti but the theme of a knowledge engineering workshop at which five expert system shells were put to the test: ESP/Adviser from Expert Systems Ltd, APES, an expert generating front end to Micro Prolog, Tymshare's REVEAL for the IBM PC and Brainstorm Solutions' HULK for the BBC. All shells require the user to input the rules. END

BBC Micro Computer System



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Termi Emulator Rom	£28.00d
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Report from Comdex Atlanta, USA 22-25 May

IBM comms board has sixth sense

For me the smartest product at Comdex was one which can tell if you are using your phone.

It's a communications board for the IBM. It's called Master Link, and it's not just a modem (suitable for use in America *and* here!) but also the software to run it, and also the address list and phone number list you need to run it automatically.

What makes this $1000 board unique is the fact that it is totally invisible to the computer.

I watched the developers running WordStar, and switch to running Master Link software by the simple technique of picking up the phone. Instantly, the master Link board took over the system, freezing WordStar exactly where it was, and put a menu up on the screen.

That menu included options to recall the screen display as it was, to call a phone number directly, to log on automatically to a remote system, transfer a file to another computer from diskette or download a diskette file.

All that, and you can go back to what you were doing simply by disconnecting the phone.

The same thing happens if the phone rings: the computer can answer it, or *you* can, but either way, whatever you were doing carries on.

Better yet: for a couple of hundred dollars extra, there is a little box called Nite Owl.

Nite Owl is an answering machine. You call the system up in the middle of the night, and of course it isn't switched on, and the software isn't loaded. Not to worry: Nite Owl turns the computer on, and takes commands from you from your remote or portable micro. You can then dump files to the home diskette, or download files, or even load and run programs on the home system, and get the results.

Best of all: if somebody else has Master Link, then you can transmit anything you like at about twice the normal speed, because it can use data compression and expansion. That means that there are tricks to recognise common 'cliches' of data, and encode them, and decode them at the other end.

It sounds like a lot of money, but for somebody with an IBM XT, it isn't, especially when you realise that it automatically keeps track of all the phone numbers which it dials, and links them to automatic log-on procedures — all on its own memory on the card, and independent of whatever diskette you have in the drives (or even if the drives aren't working).

And for somebody with a Compaq Plus, the portable version of the XT, the fact that it will work in Europe as well as America, at 1200 as well as 300 baud, means that $1000 will seem ridiculously cheap.

The product is distributed in the US through Modtech on (801) 264 2050.

Apple IIc coming under fire

Apart from the Franklyn, one other company has had the idea of putting an Apple-compatible machine in a box with a Z80 chip included: the difference with the CTI Eve II is that it is portable.

The portable 'official' Apple, the IIc (see Checkout on page 176), is already coming under fire from Apple enthusiasts in America — especially those who have Apple II Plus machines.

As one of them put it at Comdex: 'The IIc runs a large proportion of programs on the IIe, which runs a large proportion of II Plus stuff — but somehow, none of my II Plus programs happen to be included in the ones that filtered through to the new machine.'

And for those who bought the Microsoft CP/M card, the number of programs that will run on the IIc is zero, because nobody has found a way of plugging anything at all into the tiny IIc.

It is apparently quite true, by the way, that Apple prepared, and was on the point of releasing, an advertising campaign for the IIc, which suggested that it wasn't as small as it looked. The slogan: 'It gets bigger when you plug it in' — wasn't checked out for possible humorous content until a couple of weeks before the advert was due to be aired.

I have to confess to my own failure to make sense of the price list, but the Amercian price of a single disk CTI Eve II system appears to be $1376, and a complete system with CP/M and a printer and some software (unspecified) is available in a package deal for $2200.

The company is in East Rutherford, New Jersey 07073, on (201) 935 9300.

Lois working at system integration

Something in system integration from a start-up company called ModTech: its main product is called Lois, and it reconciles your other programs.

The drawback of this product is simple: it needs an IBM with DOS 2.0. That said, it is the only attempt I know of at persuading conflicting business programs to talk to each other, and switch between one another.

Lois sits on the screen, looking like a menu. The options are various word processing, communications, spreadsheets, spelling checkers, stock market analysers, games, and so on, which you have bought over the years.

Lois can re-format files between all these programs, and can load and run each one for you, without your having to close the first one down and reload the second.

The limitation is that it can't load programs which ModTech doesn't know about. Currently, the list is short.

Oh, and it will also emulate intelligent terminals. And it works with any phone.

With Nite Owl, you can even tell it to turn the computer on some time during the evening, phone some remote system, keep trying if it can't get through, log on, transmit a file, look for a particular acknowledgement, and log off, switch off the system, and sleep well.

Modtech is in Salt Lake City, on (801) 264 2050.

Macintosh ready to take world by storm

Macintosh's success now seems certain to me: it also seems certain that its success will have to wait for the half megabyte version, due out in December/January 1985, when the big capacity memory chips become available.

Many software producers at Comdex spoke of 'limited memory' versions of their programs, for the IBM Junior, and the Macintosh — things that couldn't do quite so much, but were still usable versions of programs for the PC.

Lotus boss Mitch Kapor spoke of his company's efforts to put something on the Mac — a program something like 1-2-3 but with as many of the extra features of the new Lotus product 'Symphony' as possible (see the Symphony vs Framework software review in this issue on page 120).

Kapor described the Mac as 'somewhere between quite good and completely wonderful,' and said that if only he had more memory to play with, the super-spreadsheet he is developing would be unrecognisable — and, when it is, it will be. He's given to 'understatement' like that.

Another company, Living Videotext, author of Think Tank (a US rival to the UK Brainstorm) released a version of that ideas processor, especially truncated for the Macintosh. 'It isn't that 128 kbytes isn't enough to do some nice things,' explained David Winer, the boss. 'It's just that with a machine like this, there are so many things you want to do, that it isn't enough,' he said.

In the meanwhile, it is nice to see that the add-on extra diskette drive is starting to appear in the shops.

And so are other add-ons — things like custom mice, and (latest) a hard disk add-on.

This last is from Small Systems Engineering, and uses the Applebus twisted pair network (it links up to 32 devices).

One might imagine that two wires can't compete with the sort of speed you'd normally get data in and out of a hard disk: in fact it isn't too bad, running at 230 kbytes per second.

Details of pricing and disk capacities on (01) 328 7145.

IBM

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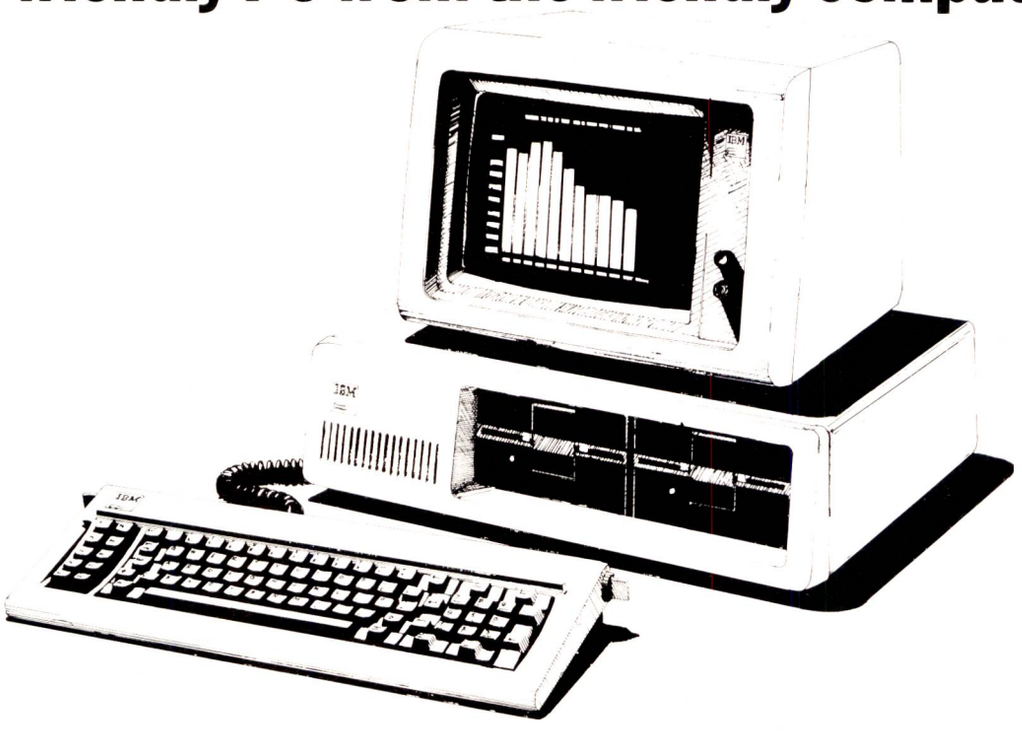

THE IBM Personal Computer: teacher, accountant, supersecretary, friend. Stocked in depth at Morse. It's the most trusted personal computer, with a huge software library, fine engineering and solid after-sales support. Morse have the IBM PC range, from our 'Small System' starter pack to the full-house PC/XT with 10Mb hard disk and high-res colour monitor. Morse/IBM-PC packages include graphics or daisy printer + software at no extra charge. Friendly Morse staff will explain all, and help you select the IBM system that your office needs. Call us. We *promise* not to treat you like a Charlie!



The 4th Generation Personal Computer is here. Not only that, its big brother the new Apricot Xi, with a tremendous 10 megabyte storage capacity. Morse have the complete Apricot range, also expansion boards, Pulsar software, latest-type Apricot monitor.

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SANYO



At Morse from an amazing £649, includes disk drive, MS-DOS, Wordstar, Calcstar.



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reveals a neatly designed single board with 120 ICs on it. The processor is the 80C86 — a CMOS version of the Intel 8086 — which has just become available in quantity, and of which we shall be seeing a lot more in the next year or two. There were three ROMs holding the Vadem BIOS and the special application programs, and a NEC 8318 disk controller to handle the drives.

The standard Encore will have 16, 64k dynamic RAM chips (128k total), but the review machine had 512k fitted, in the new 256k chips — the first I've seen in the 'flesh'. Most of this was allocated to a RAM disk; it will be an expansion option in the final product.

A real-time clock/calendar chip with battery back-up is used by one of the built-in programs to keep an appointments calendar and world clock.

All the rest of the ICs are high speed, CMOS discrete logic. A spokesman for Vadem told me that in a later version of the machine these will all be replaced by four Gate Arrays (ULAs) but not until they're absolutely sure that the design is frozen.

Firmware

The four special 'keys' on the Encore let you select one of the three built-in utility programs, even in the middle of running an application from disk.

The key with a picture of a disk on it selects normal operation from the disk drives. When an application is running from the disk drives it can be interrupted at any time by pressing one of the other three special keys; pressing the 'disk' key then resumes the application where it was left off.

The effect is rather similar to working under Concurrent CP/M, except that the changeover can be even faster as the utilities are in ROM, and so don't need to be loaded and run.

The key marked with a clock selects a clock/calendar/scheduler program called the Time Manager, which was only partly implemented on the test machine. A screen display of a one month calendar, the time and a map of the world in hi-res graphics appears when you press it. The cursor sits over today's date on the calendar. All that could be done with the review machine was to move the cursor with the arrow keys around the calendar — when it moves beyond the first or last day, a new month's calendar is substituted.

The intention in the finished version is that the Time Manager will allow you to enter appointments (stored in a disk file) which will be displayed in a window on the screen. As the cursor is moved to a date, the appointments for that date will be retrieved and displayed. The world map will be incorporated in a similar way; moving a cursor across the map will display the local time for the appropriate time-zone. Nice ergonomics.

The Time Manager function is selected by default when you switch the Encore on, so you need to press the disk key before you can boot DOS.

The 'telephone' picture key selects a ROM-based communications program which works through the built-in modem; since the latter was not fitted to the test machine, the software merely produced a non-functioning command menu, which would allow such parameters as parity, stop bits and text capture to be set. In a similar way to the Time Manager, the communications program will allow a file of telephone numbers to be kept on disk and recalled for use by the auto-dial modem.

The third special key is the calculator, marked with the four arithmetic symbols. This was not implemented at all on the prototype. When it is, it will turn the block of 22 keys starting with T H N on the keyboard into a standard desk calculator (with a memory). The calculator functions are marked in blue at the bottom right corner of the keytops — a full numeric keypad is included.

These special keys are so convenient to use that one wishes there could be more of them; there's a tantalising space big enough for three more, and three spare ROM sockets on the main board. A ROM-based word processor would be very handy indeed.

Software

The Encore is claimed by Vadem to be almost completely hardware-compatible with the IBM PC (the display is of course the source of incompatibility at present) and completely software-compatible with well-behaved PC-DOS programs. It will read disks taken out of an IBM PC.

IBM's placing of the PC-DOS BIOS in ROM has lead to a confusing situation for the look-alike manufacturers (I don't suppose it was accidental). The IBM ROM is of course copyrighted, and IBM has successfully acted against several manufacturers for infringement. If software houses write programs which only use legal DOS function calls, there is no problem; as long as a look-alike has PC-DOS (with its own, non-ripped-off BIOS) then the programs should run. Such programs are said to be 'well-behaved'.

Many software houses, though, are tempted by the demons of more speed and less code, to write programs which make direct calls into the IBM ROM BIOS. These will not run on any machine that does not have all the BIOS entry points in the same place as IBM's (in other words an exact copy of IBM's BIOS).

'The Encore is claimed by Vadem to be almost completely hardware compatible with the IBM PC (the display is of course the source of incompatibility at present) and completely software-compatible with well-behaved PC-DOS programs.'

Worse still, some well known programs make calls direct to the IBM hardware (for example, writing characters straight into the screen buffer) bypassing even the BIOS. To run these you need to duplicate the IBM PC exactly in all respects, or to get cunning.

The Encore will boot standard IBM PC-DOS version 2.00 from an IBM disk, so any well-behaved program will be run immediately. Well-behaved programs are not the majority, though, especially among the best sellers.

Vadem got cunning over Lotus 1-2-3, the best selling PC program of all, which is notoriously badly-behaved. It incorporated a special 1-2-3 driver in its BIOS so that a standard IBM copy of the program can be booted and run. I know it's true because I did it with a virgin copy.

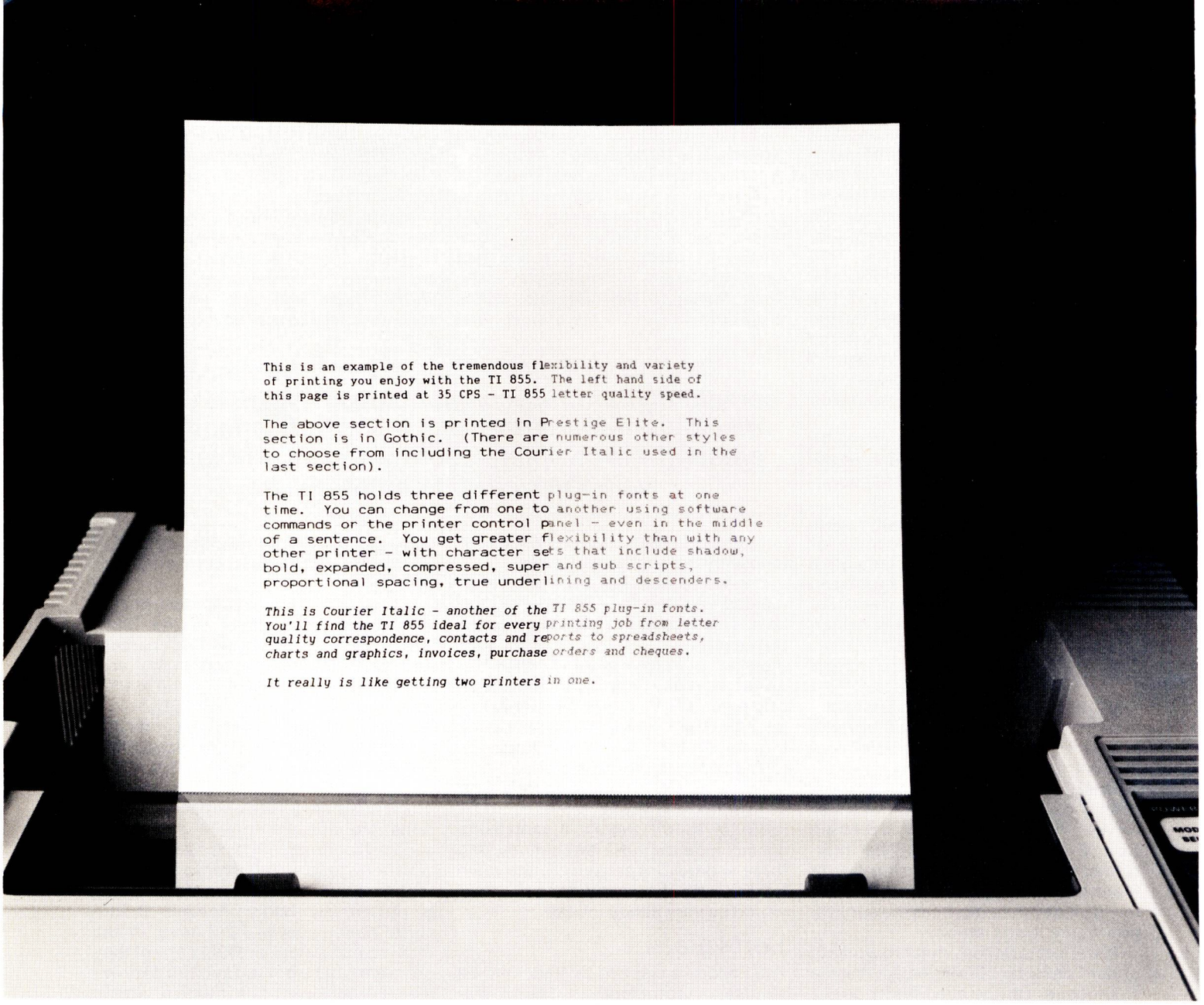
At the moment you can't use the graph functions of 1-2-3 because the 16-line display is not only a different size from the IBM's, but it isn't configured to do bit-mapped graphics. It emulates 4/5ths of an IBM monochrome screen. When the 80 × 25 screen arrives it will emulate the IBM Graphics Adaptor's 640 × 200 pixels too. The only difference will be the lack of colour and the aspect ratio — the LCD display has square pixels which makes it much wider in proportion to its height than the average CRT.

I tried a variety of other IBM PC programs in the Encore with mixed results. The word processors WordStar and Palantir both worked as they should, aside from the fact that with eight screen lines missing some of Palantir's menus scrolled off the top. Microsoft Word would not boot nor would Forth Inc's polyFORTH; the latter does not run under PC-DOS anyway but is its own operating system.

Two other PC operating systems that I tried — CP/M-86 and the UCSD p-system — would not run, though the p-system showed willing by reporting that it couldn't find SYSTEM.INTERP.

Encore (Olivetti GW Basic)	IBM PC (MBasic)
BM1 1.9	1.5
BM2 6.6	5.2
BM3 14.2	12.1
BM4 14.6	12.6
BM5 15.8	13.6
BM6 28.3	23.5
BM7 44.0	37.5
BM8 47.8	3.5 for 100 iterations only

All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.



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Software compatible

The TI 855 uses industry standard escape sequences for compatibility with virtually all third-party software.

And for those with proprietary software needs, a model is available with ANSI standard escape sequences.

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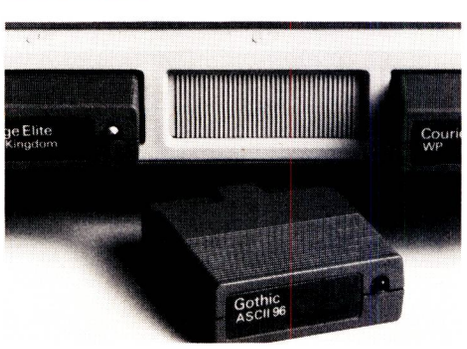

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TEXAS INSTRUMENTS

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The queerest experiment was running Laboratory Microsystems' PC Forth. This booted up OK, but seemed at first not to accept input. When I pressed the DEL key, however, everything I had typed not merely appeared on the screen but had been correctly executed! Tantalising stuff; clearly a quite trivial patch would make it work properly if one only knew what.

A call to Vadem's chief designer elicited the following list of IBM programs that were known to work correctly on the Encore: WordStar, 1-2-3, Multiplan, dBase II and NewWord. The latter is a WordStar look-alike written by ex-Micropro employees, which Osborne is going to bundle with the machine.

Vadem says that Microsoft's GW-Basic will run on the Encore in its generic MS-DOS form, though I found that neither IBM Basic nor Basica will. This may be connected with the fact that the IBM has Basic in ROM; the disk versions probably rely on some of the ROM routines.

As shown in the Benchmarks box the Encore's Benchmarks are slower than the PC's. On the subject of speed all the programs I ran responded about as fast as they do on the PC, and the disk operations felt about right, too, booting PC-DOS in 10 seconds.

Expandability

The standard Encore will have one disk drive, 128k of memory and mains power only. An extra disk drive, 256k or 512k of memory and a battery pack will be optional. The 80 × 25 line display will become standard fitting when it's available in volume.

Osborne was not prepared to discuss details, but admitted the principle that early buyers would be offered a special price for upgrading.

Documentation

No documentation was available with the prototype machine.

Prices

Though Osborne executives were very cagey about pricing at the press conference where Encore was announced, they implied that the cost would be competitive with 'transportable' PC-compatibles such as the Compaq. This suggests a price of around £1500-1600 for the standard machine.

Shipment is planned to begin in September of this year, with or without the 25-line display.

Conclusions

It looks as though Osborne/Vadem may have done it again. The Encore at last makes all the capabilities of a desktop business computer available in a fully portable form. It looks and feels like a new kind of computer, and the package feels right. As it sits on the desk in front of you, you start to wonder: 'Why *should* a computer take up any more room than this?

The dedicated keys for the ROM-based utilities are a treat to use, and make one wonder if this isn't perhaps a better way to go than mice and windows and all that stuff. After all, in every other sector of consumer design, 'push-button' operation has become the paradigm for ease of use — just look at radios, TVs and washing machines.

There are a few provisos to this fulsome accolade though. Firstly, it only applies to the full 25-line display version. The 16-line version is an uncomfortable compromise, which will require some software packages to be modified in order to be usable.

It's a pity the Encore couldn't have had the full screen at launch, though in the present cut-throat state of the market I can quite see why Vadem is nervous about holding back for too long.

Secondly, don't expect to see the Encore displacing the lap-held machines. The battery life will be quite low when the disk drive(s) and modem are in constant use, and small as it is, you can't easily use it in a crowded meeting hall or in the back seat of a car.

Most buyers will probably use it as a mains powered, desktop computer, but take it home every evening, and on business trips too. And it can fold up so that it takes up no more desk space than a radio; in fact one of those 'ghetto blaster' radio/cassettes provides rather a good analogy for this machine's portability, whereas a lap-held is more like a Sony Walkman. A lap-held machine works best when used with only a RAM disk, as a 'satellite' to a home-based desktop. The Encore, however, could happily serve as your only computer.

Thirdly, someone just has to invent a low-powered light for illuminating LCD displays — preferably some sort of thin strip that clips along the top of the screen. It's just too inconvenient only to be able to use them in brightly lit rooms, which is the case at present.

'Most buyers will probably use it as a mains powered, desktop computer, but take it home every evening and on business trips too. And it can fold up so that it takes up no more desk space than a radio.'

As to the question of IBM PC compatibility, the Encore is already capable of running some of the best selling PC programs. If it's a sales success (as it surely must be) then software houses will start to take account of it when configuring their products, as many of them already do with Compaq.

One final point; the bundling of only a word processing package with Encore looks positively mean compared to Osborne 1.

Perhaps that is the lesson learnt from the collapse, but perhaps also it is a reflection of the diminished value for money and higher profit margins which seem to have been the most tangible results of the 16-bit 'revolution' so far.

END

Technical specifications

Processor:	80C86 16-bit
Memory:	128k RAM expandable to 256k using 64k DRAM or 526k using 156k DRAM
Display:	16 line × 80 column LCD text and graphics, 480 × 128 pixel addressable
Storage:	360k integral 5¼in floppy disk drive
Keyboard:	63 alphanumeric keys, 10 function keys, 22 key calculator (keyboard overlay)
Modem:	Integral 300 baud auto-dial/auto-answer Bell CCITT & NTA Centronics parallel port
Power:	15v DC supplied by AC/DC adaptor, battery circuitry
Size:	Height 9.5in, width 13in, depth 5.5in
Weight:	9.5lbs with strap (excl battery)
Clock:	Real-time addressable with battery back-up
Calculator:	Four function windowing
Comms:	Terminal emulation program functions integrated with modem
Bundled software:	MS-DOS 2.1: NewWord word processor
Options:	Second integral 5¼in floppy drive, 25 × 80 column display
Battery:	Rechargeable removable 1.8 AhNiCad, weight 1.5lb.



BANKS' STATEMENT

Knife or boomerang?

Creating a market for a product is a well-known marketing strategy. But it's a dicy business, especially if you're no longer the sole contender . . . Martin Banks wonders whether Sinclair has bitten off more than it can chew.

One of industry's more adventurous pastimes is setting out from scratch to create a new market which it can then service with the new product it has just developed. It will invariably be a product that potential purchasers would not claim to need, until they saw one in action and decided to change their minds. For the companies that succeed in creating the new market, however, the excitement, rewards and potential for disaster can all be great.

Take Nascom, for example, a company that created, almost single-handedly, the market for cheap kit computers in this country with the launch of the Nascom 1 of blessed memory. It wasn't the first small kit micro onto the market, but it was the first cheap machine to have a real keyboard and Basic available in the price, compared to the toggle switches and machine code of its rivals.

The story is familiar. Nascom sold, at its launch in Wembley, as many machines as it thought might take nine months or more to sell, and sold them in just one morning. Demand outstripped supply, the latter being exacerbated by the fact that the design hadn't even been properly finished.

Sir Clive Sinclair then created the next market — the sub-£100 assembled micro — with the launch of the ZX80. To date, via the ZX81 and the Spectrum, he and his company have not looked back, and have not ducked the challenge of creating more new markets.

The Cambridge mafia are still at it, aren't they? Earlier this year the QL was launched which, we were portentously informed, stood for 'Quantum Leap'.

With past attempts at creating new computer markets Sinclair has been conspicuously successful. So if the QL is not aimed at one of these existing market sectors, such as games machine or small business systems, then it is intended for some new market altogether. As the company has indicated that it intends this to be the case, what are its chances of success?

Just a cursory glance at the specification of the QL will show it falling easily between the two stools of games player and business machine — over-specified for one and arguably under-specified for the other. The market at which it has been aimed is the new home/professional user. The trouble with this sector, from Sinclair's point of view, is that it is only new in practice.

It has been obvious for a couple of years that such a market would exist at some time. The trend in hardware pricing made it certain that the facilities would be available at an affordable price, while the trends in small computer utilisation pointed towards people looking to have processing facilities at home that were up to doing 'real' work.

The problems that face the QL, therefore, are more complex than the almost standard ones of late first deliveries and lashed-up first versions. If Sinclair had this market to itself these would be only a temporary hindrance to future fortunes, as they were with the ZX80, '81 and Spectrum.

Unfortunately for Sinclair, it is not the only contender for the favours of the home/professional user. Several other companies have either made a declaration or made announcements of intent, and the range of options available to the user is quite wide already. The QL must stand on its merits, rather than on the fact that it is the only contender in an area that no-one had thought of.

Some of the competition, most notably Amstrad and to a lesser degree Triumph Adler, is following a different route to the market from Sinclair, yet it is one that has, if anything, a slightly better chance of succeeding than the QL. That route involves one of the oldest, and occasionally most hated artifacts of the whole microcomputer scene — the CP/M operating system.

Now, this has been written off as obsolete and antiquated more times than anyone cares to remember. The trouble is, it won't lie down and die decently. Instead it keeps finding new markets, the latest being the home/professional user. In an age when techno-flash is the accepted order of the day it may seem strange to find something so palpably 'old' maintaining such an influence in the market. It is its age, however, that may prove the key to its future success.

I am one of several million people sceptical of CP/M as a user-friendly operating system. What it does have, however, is straightforward clout in the market where it counts — applications software.

For many professional users, who perhaps work both at home and at an office, there will be the possibility of working with a small computer that uses the same environment as the one at work. With packages like BSTAM and a modem, the two systems could even communicate.

Boring and old technology they certainly are, but CP/M hardware and software is now pretty reliable and for the majority of users in this new home/professional market-place, that is going to be at least as important as new advances in technology or design.

Against this, the QL offers the promise of considerable processing power and an operating system that, when it is fully operational, will make CP/M look archaic. Unfortunately for Sinclair, as recent reports have indicated, such promise is still in the future.

The Microdrives are an interesting innovation but could prove a positive hindrance to the success of the machine. Unless Microdrives and cartridges are freely available to all software producers they will stay a non-standard medium, obliging software houses to consider carefully whether to invest in the QL market. Such investment will also be prejudiced by the new operating system, especially as it still seems to be incomplete. Without abundant applications software the QL could be beaten to the punch in this new market.

There have been the expected strong suggestions that the QL was launched in January as a pre-emptive strike against such as the Apple Macintosh, and that it should not have been launched until April at the earliest.

Only time and the market-place will tell whether the knife the company has thrown at the opposition will strike home, or turn into a boomerang. If it is the latter, it will be interesting to see if Sinclair can catch it, or duck in time.

END



Illustration by Nick Hardcastle

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Dragon Professional

The sudden demise of Dragon Data unfortunately coincided with the company's entry into the business market. However, Liz Coley feels the Dragon Professional may be just the thing to get the company back on its feet.



After months of speculation we all shook our heads as Dragon Data entered the hands of the receiver on 31 May 1984. At the same time the 3½in disk drive, modem and OS9-equipped GEC Dragon Professional appeared for review at a suggested price of £699, with a single drive, and £849 with double drives (incl VAT).

The '64 repackaged for business' flavour of the machine illustrates the dogged refusal of this Dragon to lie down despite a series of PR and marketing hashes that destroyed most of the company's credibility as a manufacturer of home computers.

Rise and fall

Dragon Data commenced trading at the end of 1981 as an attempt by Swansea's Mettoy Ltd to grab a share of the rapidly expanding home computer market. To this end the Dragon 32 took shape as a low-cost alternative to the Tandy TRS-80 Color Computer, complete with the same Motorola 6809 microprocessor, 16k Microsoft Extended Color Basic and 32k of user RAM. This, coupled with a recommended retail price of £199—the same as the 3.5k equipped VIC at the time and £150 less than the Tandy — promised a bright future when the 32 was announced in August 1982.

Initial high demand stretched the manufacturing and cash resources of Mettoy to the limit. By October 1982 most of Dragon Data had been sold off.

The new company seemed a viable proposition, but a curious lack of PR know-how put the focus on Mettoy's now irrelevant problems and gossip, fuelled by competitors, caused confidence in Dragon to nose-dive.

September 1983 saw the launch of the 64 plus 175k single and double disk drives at the *PCW* show, coinciding with a further £4 million cash boost from shareholders — which again highlighted Dragon's difficulties. The 64 was received with muted enthusiasm and, a month later, Mettoy showed incredibly bad timing by folding.

Although Mettoy's financial interest in Dragon Data was a scant 18%, the memory of Dragon beginnings was fresh in the minds of all concerned. Limited development and frenzied but ineffectual marketing continued until February 1984 when another of the Prudential's heavy investments, GEC, was called in to oversee sales and marketing and to lend its respected name to prop up the now mistrusted Dragon logo. Freed of marketing responsibilities, hard core Dragon people concentrated efforts on development, working to extend the GEC Dragon catalogue to include low-cost, self-contained business systems, such as the Professional, in an attempt to improve credibility but, it appears, too late and too expensive. GEC Dragon ceased trading on the point of launch.

Hardware

The Dragon Professional is, essentially: a Dragon 64 PCB redesigned to make room for the modem, disk controller and disk expansion port, additional diagnostic ROMs and a composite video output.

Along with this come one or two 500k (340k formatted), 3½in Sony disk drives, an efficient switched mode power supply and a 1200 Baud Prestel 1/600 Baud machine link modem.

Everything comes in a standard Dragon bottom case with a restyled top cover that continues the slope of the rickety Dragon keyboard to the rear of the machine to form a wedge, increasing rear headroom in the process.

Immediately above the keyboard on the left side are two minute LEDs; red power-on to the left and a green one to the right connected with modem operation.

The now familiar Sony micro floppy drives and the power supply are contained in a second wedge above the LEDs, with extra ventilation slots along the top. Drive door 0 emerges on the far right of the front panel. Drive 1 (if fitted) sits on its left next to a new GEC Dragon 'The Professional' logo, complete with green and blue 'go-faster' stripes. Each drive door panel sports a disk-eject button to the right and a red disk-in-use LED to the left and is finished in a light grey that enhances the visual effect of the otherwise mid grey livery.

The connectors fitted round the edge

of the bottom case follow standard Dragon layout with a few changes. To the right is the expected cartridge connector. The left-hand side has the same line-up as the 64 with the exception of a one metre modem lead, fitted with a swish British Telecom 'phone plug, in place of one of the joystick ports.

This leaves TV output, reset button, modem lead, RS232 port, joystick port, tape connector and parallel Centronics printer port. Major surgery on the rear replaces the 'D' type transformer connector and push-button on/off switch with a one-piece mains supply panel consisting of a 3-pin Euro mains connector and a robust rocker switch.

Looking from the rear, the monitor socket remains to the right of the supply panel but gains two pins to provide RGB and composite video in the same cable. On the far left a new disk expansion connector allows the Professional to control up to two additional Dragon drives.

Removing four screws, one in each corner on the underside, frees the top case. There's an awful lot packed in there! As in the rest of the Dragon range, the keyboard lies across the front of the PCB attached by four screws. A two inch gap allows access to the 6809 — with the rest of the PCB covered by a very solid cast aluminium frame fitted across the case providing a mounting for the closely-packed, fibreboard covered drives (on the twin drive review model) and power supply. This doubles as a massive heat sink in an attempt to disperse the excessive heat generated by the drives and, more importantly, the power supply. Massive though it is, the heat sink should have the aid of a cooling fan to keep this crowded environment cool, but more of that later. Sensibly, the drives are fitted with long ribbon cables so that releasing four easily accessed screws allows the frame to be swivelled backwards away from the case by simple removal of the PCB power connector. The rear half of the board is now open to scrutiny.

In the new layout the eight 4864 RAM chips from the 64 now extend under the keyboard from the right of the socket mounted 6809. Other socketed chips include the 6847 video display controller, 6883 SAM synchronous address multiplexer and the 8346 disk controller, as fitted in the Dragon disk interface cartridge, mounted directly beneath drive 0. Modem components are soldered directly into the board, adjacent to the cable outlet. The extensively reworked PCB layout seems relatively free from gross, hardwired afterthoughts, although there are two small, neatly fitted PCBs soldered proud of the board, possibly due to putting quarts in pint pots!

In use

The review model supplied was highly temperamental in that it played ball for a short time, usually about an hour, then randomly refused to obey commands and pretended that some files on disk didn't exist. This got rapidly and progressively worse until the machine gave up completely, requiring several hours to recover. Dragon personnel, when questioned, didn't seem at all surprised at this phenomenon and a second Professional was provided which soon suffered the identical problem.

Judging by the amount of heat transferred to the plastic case and, more alarmingly, to microfloppies within drives, the massive heat sink is definitely not enough to prevent heat from affecting operations. As an aside, interesting hang-ups could be obtained on both machines by pressing lightly on the case above the power supply. I persisted with the machine, on and off, over two days of these problems but tests of the supplied software were, of necessity, patchy and sketchy (a new ad agency?) as a consequence.

On power-up the Professional assumes 51-column monochrome mode. This is actually the 256×192, high resolution Dragon graphic mode 4, using simplified characters for standard text.

However, Dragon has taken the trouble to produce an attractive system boot menu that includes the Professional logo. Options given are 'B' to access the built-in Microsoft Basic and 'D' to boot a system disk in drive 0, in this case OS9. 'B' selects a 32k Dragon configuration complete with Microsoft copyright banner and lurid green screen. Curiously, EXEC (ENTER), the normal method of claiming the extra 32k of RAM, returns a syntax error. Also, Dragon DOS is not supplied so DOS commands have no effect from Basic and alternative routines were not apparent.

Software

Selecting 'D' from power-up scrolls the display, resulting in the appearance of a delightful Sony drive and microfloppy graphic, inviting the insertion of the system disk. The 'shell' of essential OS9 control routines takes about 20 seconds to load. On completion a 1980 Motorola and Microwave copyright banner appears with an invitation to 'log on'. The 'OS9': prompt follows. On completion of a task the prompt reappears to remind you that you're still in OS9.

OS9 was developed by Microware as a Unix equivalent for the 6809, specifically to support compiled Basic 09. Although OS9 requires 96k of code, only the shell is held permanently in memory acting as the middle man, calling command routines from the remaining 80k on the system disk as required. This is possible because the 6809 uses position-independent code, or PIC, that can be loaded into, and run from, any point in memory. This makes memory management very efficient and enables several separate programs and routines to be stored at once.

In addition, files are stored on disk (and, in a limited fashion, in memory) in a multi-level directory file system configured as a 'tree' structure where the main (or root) directory of a disk contains filenames that can refer to files of directories to other files, and so on, though any file can be called directly by name, however far up the tree its directory is.

Another important feature is that OS9 supports, and the 6809 is capable of, some background processing, enabling limited multi-tasking.

All three business packages supplied with the Professional are contained on separate disks and depend on OS9 to operate. These were reviewed on the 64 in the June 1984 issue of *PCW* but it's worth noting in passing that Stylograph suffers badly from the 51-column screen and makeshift characters. It's almost impossible to use on a standard TV.

The review machine was not supplied with software to drive the modem or any further indications of modem performance, therefore its function cannot be assessed.

Dragon has further OS9 packages available, at extra cost, such as the compiled Basic O9, a 'C' compiler, Pascal, Cash & VAT bookkeeper, Stock Recorder and an Editor/Assembler/Debugger; all at less than £80 per package.

Documentation

No specific Professional manuals were supplied; but if they match the standard of the readable and thorough, 64-orientated software manuals they will be adequate for all but the most demanding user.

All the software manuals abandon rear indexes in favour of detailed Tables of Contents at the front, referring to clear paragraph headings by page number. I found this extremely convenient for finding particular command routines. I also liked the use of coloured pages for sections that refer to separate modules on the same disk.

Conclusion

The Professional certainly offers convenience, and better value than a fully equipped Dragon 64. Broadly:

. . . If Dragon recommences trading;

. . . If the quoted prices are realistic;

. . . If the cooling problems are overcome;

and

. . . If a new incarnation of Dragon can regain lost credibility;

. . . then even counting the QL the Dragon Professional would be hard to beat for small businesses.

Given suitable mouse and icon-driven software, eminently feasible with OS9, it would fulfil Dragon's promise of a self-contained, easy to use system at low cost, and clean up!

If *not* . . . Nothing.

END

Flag setting on logic instructions

Mario Gianota explains the purpose of AND, ORA and EOR logic instructions in assembler language with the aid of a 'guessing game' program. Although written for the Commodore 64, it is easily adaptable to a wide range of micros.

How good a communicator would you be if your vocabulary only consisted of two words? At electronic level that's the only language computers understand. What they can do that we can't is to string these two words together and recognise them at very high speeds.

It's usual to describe a binary (two-state) system in terms of switches being on and off. At electronic level, though, it's not language but voltage that counts, and logic chips contain circuits which react to, or deliver, one of two possible voltage levels. Logic 1, known as 'high' actually means that the voltage present in that part of the circuit is somewhere between +2.8 and +5 volts, while Logic 0 or 'low' corresponds to a voltage between 0 and 0.8 volts. Thus, high and low voltage are the electronic equivalent of on and off or yes and no in human language.

Logic gates

The circuits printed on micro chips consist largely of logic gates, which are essentially switches with one or more inputs and a single output. They have names such as AND, OR and EOR (pronounced Eyore, as in *Winnie the Pooh*).

Instructions with similar names pop up in assembler language and, like the gates, act on input data and produce an output.

One of the most difficult leaps the assembler language learner has to make is understanding how these logic instructions work. The object of the program presented here is to show how the assembler instructions AND, ORA and EOR work and for what input combinations the zero and carry flags in the processor status word are set.

Flags

Those of you who've been following our Teach Yourself Assembler series will be familiar by now with flags. These are sections of a processor's memory which indicate whether any or all of a number of predetermined conditions have arisen during the execution of instructions by the processor. For example, if the result of an arithmetic operation is zero, then the zero flag will be set (in most processors this means it will be 1 rather than 0). If the result of an arithmetic operation produces a carry, the carry flag will be set. Equally, a program can look up the state of a flag and branch to its next instruction depending on the result.

The program here is in the form of a guessing game with points awarded for a correct answer and double or triple points awarded for guesses written in hexadecimal or binary notation.

Program breakdown

Lines 10-90 are the main command lines which initialise the variables then GOSUBs the middle of the program, waiting for a keypress before looping back to the middle again. It is therefore a Q-shaped program with a beginning and a middle but no end. The beginning is visited once — the tail of the Q — then the program is a loop.

The beginning runs 30 000 to 30 990. It sets up HX$ for use in translating hexadecimal numbers. A random function is set up to produce questions. The score PNTS for points is set to zero. A title string is set up to show which columns on the screen are binary, hexadecimal, decimal, negative flag and carry flag. Then the three cases are set up in a small array of $ (2). The OP stands for OPERATION. Case 0 is AND, case 1 is ORA (OR the accumulator with the memory) and case 2 is EOR (exclusive −OR the accumulator with the memory). At the end of the beginning the screen is cleared. The program returns to the main line.

The main line sends the program to the MIDDLE at 20 000 — 20 990.

The MIDDLE does six jobs:

(1) It picks one of the OPERATIONS — AND, ORA or EOR.

(2) It picks a number to go in the accumulator register.

(3) It picks a number to stand as the contents of a memory location.

(4) It accepts a guess from the user as to the contents of the accumulator after the operation has been completed. It translates the guess from binary or hexadecimal back into decimal.

(5) The operation is performed and the flags are set.

(6) The player's guess is checked against the result of the operation.

The user should run the program and put '%' in front of a binary guess, and '$' in front of a hexadecimal guess. Since binary is the way to understand these operations, binary guesses which are correct are rewarded more than the other two kinds of guess.

'One of the most difficult leaps the assembler language learner has to make is understanding how logic instructions work.'

Notes

The program will run on any Commodore machine. By changing the character string commands for HOME and DOWN CURSOR, it will run on any micro supporting DEF as a basic command. By changing FNA (B) to a GOSUB routine, it will run on any micro whose Basic supports arrays.

```
0 :
1 REM ************************************************
2 :
3 REM                TO SHOW MPU  CHIP
4 :
5 REM                FLAG  SETTINGS ON
6 :
7 REM                LOGIC INSTRUCTION
8 :
9 REM ************************************************
10 REM ..........MAINLINE OF PROGRAM.....................
20 GOSUB 30000
30 GOSUB 20000
40 PRINT
50 B$ = "PLEASE PRESS 'SPACE'" : X = 1 : Y = 15 : GOSUB 7000
60 GET A$
70 IF A$ = "" THEN 60
80 :
90 GOTO 30
1000 :
1001 REM *** SET NEGATIVE AND ZERO FLAGS ***************
1002 :
1197 :
1198 REM SET NEGATIVE FLAG BY BIT 7
1199 :
1200 NEG  = ABS( INT( ACC /128 ) )
1297 :
1298 REM SET ZERO FLAG IF ACC= ZERO
1299 :
1300 ZERO = ( AC = 00 ) * ( -1 )
1397 :
1990 RETURN
5000 :
5001 REM *** DECIMAL N TO HEXADECIMAL HN ***************
5002 :
5100 HI = INT( N / 16 )
5110 HN$ = MID$( HX$ , HI + 1 , 1 )
5200 LO = N - HI * 16
5210 HN$ = HN$ + MID$( HX$ , LO + 1 , 1 )
5990 RETURN
6000 :
6001 REM *** DECIMAL N TO BINARY BN$ ********************
6002 :
6100 BN$ = ""
6200 FOR Q = 7 TO 0 STEP -1
6210 :BIT$ = "0"
6220 :IF (N AND 2^Q ) THEN BIT$ = "1"
6230 :BN$ = BN$ + BIT$
6240 NEXT
6990 RETURN
7000 :
7001 REM *** PRINT B$ AT X Y ****************************
7002 :
7100 PRINT CHR$( 19 ) : REM HOME CURSOR
7200 FOR YY = 0 TO Y
7210 :PRINT CHR$( 17 ); :REM DOWN CURSOR
7220 NEXT
7300 PRINTTAB( X ) B$;
7990 RETURN
8000 :
8001 REM *** BINARY BN$ TO DECIMAL N *********************
8002 :
8100 N = 0
8200 FOR Q = 0 TO 7
8210 :IF VAL( MID$( BN$,Q+1,1 ) ) THEN N= N + 2^ ( 7 - Q )
8220 NEXT
8990 RETURN
9000 :
9001 REM *** HEXADECIMAL HN$ TO DECIMAL N ***************
9002 :
9100 A = ASC(  LEFT$( HN$,1 ) ) - 48
9110 B = ASC( RIGHT$( HN$,1 ) ) - 48
9200 N = B + 7 * ( B>9 ) - ( -1 ) *
     ( 16 * ( A + 7 * ( A>9 ) ) )
9990 RETURN
10000 :
10001 REM *** AND THE ACCUMULATOR WITH THE DATA **********
10002 :
10100 ACC = ACC AND DT
10200 GOSUB 1000
10990 RETURN
11000 :
11001 REM *** OR THE ACCUMULATOR WITH THE DATA ***********
11002 :
11100 ACC = ACC OR DT
11200 GOSUB 1000
11990 RETURN
12000 :
12001 REM *** EXCLUSIVE-OR THE ACCUMULATOR WITH THE DATA *
12002 :
12100 ACC = ( ACC OR DT ) - ( ACC AND DT )
12200 GOSUB 1000
12990 RETURN
20000 :
20001 REM ****MIDDLE**********************************
20002 :
20100 REM CLEARSCREEN,PICK CASE,PRINT HEADER
20101 :
20110 PRINTCHR$(147):REM CLEAR SCREEN
20120 MAX = 3 : MIN = 0 : CASE = FNA(B)
20130 PRINTTAB(10) OP$( CASE )
20140 B$ = HEADER$ : X = 1 : Y = 3 : GOSUB 7000
20190 :
20200 REM PRINT TRANSLATIONS OF ACCUMULATOR CONTENTS
20210 MAX = 255 : MIN = 0 : N = FNA(B)
20250 Y0 = 5 : GOSUB 21000
20260 ACC = N
20300 REM PRINT TRANSLATIONS OF DATA ADDRESS CONTENTS
20301 :
20310 N = FNA(B)
20320 Y0 = 7 : GOSUB 21000
20330 DT = N
20390 :
20499 REM GET & SORT GUESS INTO BINARY HEX OR DECIMAL
20500 B$ = "" : X = 1 : Y = 9 :GOSUB 7000
20510 INPUT"RESULT ";G$
20520 IF LEN( G$ ) < 1 OR LEN( G$ ) > 9 THEN 20500
20530 A$ = LEFT$( G$,1 )
20540 C$ = RIGHT$( G$,LEN( G$ ) -1 )
20550 IF A$ <> CHR$( 37) THEN 20600 : REM GUESS NOT IN BINARY
20560 BN$ = C$
20570 GOSUB 8000
20580 F = 3
20590 GOTO 20700
20599 :
20600 IF A$ <> CHR$( 36) THEN 20650 :
      REM GUESS NOT IN HEXADECIMAL
20610 HN$ = C$
20620 GOSUB 9000
20630 F = 2
20640 GOTO 20700
20641 :
20650 N = VAL( G$ )
20660 F = 1
20661 :
20700 REM GUESS HERE
20701 :
20710 G = N
20800 REM DO OPERATION
20810 ON CASE+1 GOSUB10000,11000,12000
20820 Y0 = 11 : N = ACC : GOSUB 21000
20900 REM UPDATE SCORE
20910 IF G = ACC THEN PNTS = PNTS + 10 * F
20920 B$ = "SCORE" + STR$( PNTS ) : X = 5 : Y = 13 : GOSUB 7000
20990 RETURN
21000 :
21001 REM *** TRANSLATE N AND PRINT AT Y0 ***************
21002 :
21210 GOSUB 6000
21220 GOSUB 5000
21240 B$ = BN$ : X = 1 : Y = Y0 : GOSUB 7000
21250 B$ = HN$ : X = 10 : Y = Y0 : GOSUB 7000
21260 B$ = RIGHT$( "   " + STR$( N ) ,3 ) : X = 14 : Y = Y0
      : GOSUB 7000
21290 :
21300 IF Y0 <> 11 THEN 21990
21400 B$ = STR$( NEG ) + STR$( ZE ) : X = 17 : GOSUB 7000
21990 RETURN
30000 :
30001 REM ** BEGINNING **********************************
30002 :
30100 HX$ = "0123456789ABCDEF"
30110 DEF FNA(B) = INT( RND(1) * ( MAX-MIN ) ) + MIN
30120 PNTS = 0
30130 HEADER$ = " BINARY  HEX DEC N Z"
30200 DIM OP$( 2 )
30210 FOR I = 0 TO 2
30220 :READ OP$( I )
30230 NEXT
30240 DATA AND,ORA,EOR
30300 PRINT CHR$( 147 ) : REM CLEAR SCREEN
30990 RETURN
40000 :
40010 REM ************************************************
40020 REM A PROGRAM FOR MPU  COMPUTERS
40030 :
40040 REM BY A.D. MACHINERY
40050 :
40090 REM ************************************************

READY.


READY.
```

GOTO... thou sluggard

Structured programming makes for clear listings, but that's no help when you're debugging on a 20-row screen. David Bradnack believes judicious use of GOTOs is the answer.

10 It seems to be widely believed that good programming uses subroutines and does not use 'GOTO'. Gosub 20. I hope I have made my point.

15
```
100 GOSUB 3000
200 GOSUB 1000
300 GOSUB 2000
400 PRINT "TOTAL =";T
500 END
1000 REM SELECT RECORDS
1005 REM FOR CALCULATION
.....
1999 RETURN
2000 REM DO CALCULATION
....
2999 RETURN
3000 REM OPEN FILES
3005 REM & INITIALISE VALUES
....
3999 RETURN
```

Return

20 My first serious attempt at understanding and adapting a professionally produced program has left me unconvinced of this — though I may have been unlucky in my program! Gosub 50. Gosub 30. Gosub 40. Obviously this structure does not suit my subject matter, but return.

30 Gosub 150. The emphasis needs to be put more on the length of program sections. There seem to me to be critical lengths at about 20 lines (a screenful) and at either 65 lines (a page) or possibly 130 lines (a double page). Gosub 110. Gosub 100. Gosub 120. In other words, program structure must take into account the physical constraints of how much of a program one can examine closely 'at a glance' as one unit (a screenful?), and how much one can get a reasonable overview of (one or two pages?).

On a printout, it is possible to clarify a program structure considerably by arrows, coloured marks, and so on, but this is much less effective if one cannot see the whole scheme at once, without turning pages backwards and forwards. Return.

40 In our culture, in trying to understand a text, one normally starts at the beginning (the top) and goes on to the end (the bottom). Gosub 150, this should be taken into account in program structure, so that within the obvious constraints imposed by the fact that programs branch and double back, the logic of a program should flow from the beginning of the listing to the end. Gosub 190. Return.

50 Though it is true that the use of subroutines encourages the programmer to plan his program in clearly defined blocks, this does not help understanding of the program if the blocks are left in haphazard order, as is sometimes the case with subroutines. Gosub 150. Gosub 60. Gosub 80. Gosub 70.

Subroutines have contributed to some extent to the clarity of programs not because they are subroutines, but because they tend to be readily identifiable sections of the program. To achieve greater clarity one must therefore, Gosub 150, divide programs into identifiable sections, but not make these sections into subroutines unless there is some overriding reason to do so. Return.

60 For example, writing a program in the form (Gosub 15) actually obscures the logic of the program. Gosub 90. Return.

70 To use a subroutine listed in a distant part of the program, Gosub 150, inevitably obscures its logical flow and I can see no justification for this for a short sequence that could easily be embodied in the main program. Gosub 130. Return.

80 With nested subroutines, it is difficult to follow the flow of the program, as 'RETURN' does not give any indication of the level to which one should return, whereas 'GOTO' would make this clearer. Return.

90 At the very least, the subroutines need to be listed in their logical order. Even then, however, one has to jump up and down the page unnecessarily in trying to follow the structure of the program. Return.

100 Within a block of one or perhaps two pages of printout, one can follow the general flow of the program but not its detail, so GOTO should be used only to move to the beginning of sections, (Gosub 160). Provided this is done with discipline, use of GOTO should not (Gosub 150) bring more hazards than 'GOSUB'. Return.

110 Perhaps, because of the usual size of the VDU screen, one tends to work with a block of about 20 lines at a time, and one can reasonably hope to keep track of all the detail in it. Within that compass, GOTO can therefore be used without danger, as its implications will be clear. Return.

120 Moving further than that in a program must involve refilling the screen or turning over pages of printout, and makes it difficult to get a clear view of the program flow. Return.

130 It is easy (Gosub 170) to forget what variables have been used in a subroutine if it is out of sight several pages away. Return.

150 In my opinion (Gosub 200). Return.

160 Clearly marked with REM statements. Return.

170 And dangerous. Return.

180 If you are reading this line, you are reading *normally*, not following the 'GOSUB'.

190 I do not imply that there is anything wrong with using subroutines for substantial sequences of code that are used at more than one point in a program. Return.

200 For what it's worth. Return. END



ACT Pulsar 'File Transfer'

It's easy to get the impression that the differences between micros are there to tie you down. How do you upgrade from 8-bit Apple to today's 16-bit micros, or copy files between different 16-bit machines, without hours or even days of laborious data re-entry – and all the dangers that entails?

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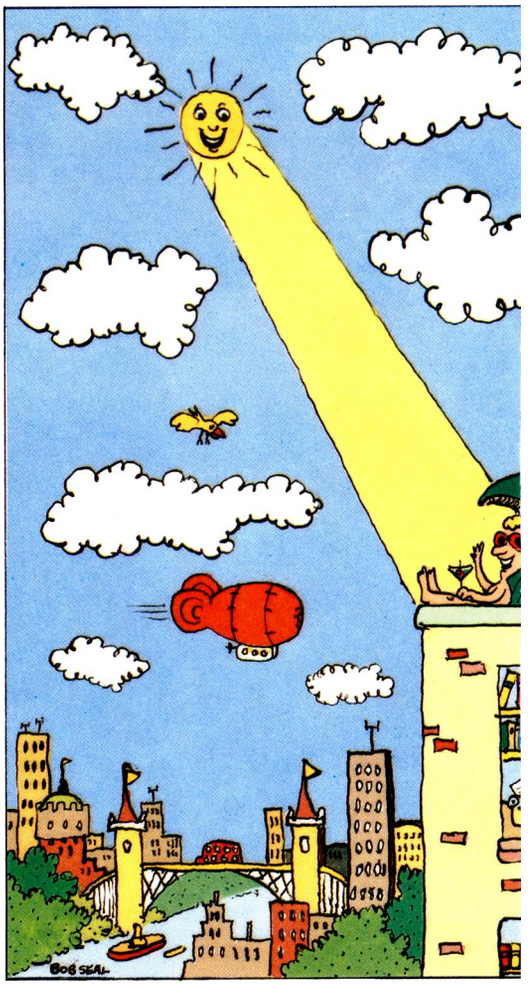
Come rain or shine

Computers can't make the sun shine but they can help us understand the weather. Theo Wood describes how a 48k Spectrum is being successfully used in a primary school project as part of the learning process.



Computers are essential tools for today's professional meteorologists. They provide data storage and manipulation, continuous monitoring through control applications and computer modelling for long and short range forecasting.

The first of these areas has provided the basis for a project currently in full swing at my daughter's primary school. The exercise introduces children both to the computer and to the concept of scientific observation. It's especially important at primary school level for children's contact with data to be meaningful — they could so easily be put off computers if the work were uninteresting.

Collection of weather data is a good choice, since it gives children the opportunity to explore their surroundings with a firm footing in everyday observations. It's a familiar and important area — how often have trips to the park been cancelled on rainy days, or holidays made perfect by hot sunshine and cool breezes!

Equipment

The instruments used by the children in the project are a max/min thermometer, rain gauge, hygrometer and barometer. Cloud cover and wind speed/direction are observed as well and a place is made for general comments to allow for free expression and the possibility of insight and instinct: two important supplements to strict scientific observation. Instruments are read and observations made daily, but by different groups of children each week. Through their reading of the instruments the children's powers of observation have steadily increased and over a period of four months they have become quite capable of predicting the temperature even before consulting the thermometer!

Use of the computer, a 48k Spectrum, is a major factor in maintaining their interest and the weekly data input session is eagerly anticipated. The program is a dedicated database called Arnold Wheaton's 'Weather Station', and has sufficient storage for a year's entries on the Spectrum version.

As an information storage device, Weather Station contains format and structure options, which means that the supervising teacher need not be a computer specialist. An efficient database can be put together using menus which are accessible to primary school children with appropriate guidance, so that children are involved both in the observations and in the techniques used to manipulate them.

Within Weather Station, the option to create a data file allows the children to start a new file — and wipe out any data currently in memory. This led to the occasional disappearance of data when a stray finger hit the wrong button. Mistakes such as these, although greeted by groans at first, were also accepted with cheerfulness as the children understood the importance of concentration at the keyboard and became more confident in their control of 'the machine'.

The limitations of a dedicated database such as Weather Station are obvious in the measurements used, as their accuracy is not of the highest order. Using the Beaufort scale rather than mph for wind speed does have its advantages. Reliance on acute observation rather than a wind gauge is perhaps more useful in an inner city area where wind speed in a sheltered playground is likely to be much lower even than in the local park.

Before the class proceeds to comment on the exercise, data has to be validated; at this point open discussion invariably arises about careful checking of entries and spotting dubious readings.

Weather Station really comes into its own in search mode. Children can look for a given value in a field from the data entry sheet: for example, days when there was no rain or cloud. One activity option displays all the data within the database in multiples of four days, and printouts of the data can be made for further analysis.

Bands of data can be checked for range searches, so, for example, maximum temperatures can be seen within the ranges Hot 20 to 40 degrees, Warm 10 to 19 degrees, and so on. These facilities, all built into the database, allow extensive questioning of the data.

After learning how to use this aspect of the base children are able to formulate their own questions with ease — and benefit from the learning process. Enthusiasm is shared equally by boys and girls: for many of the girls, in particular, their first experience of a computer is a stimulating one, likely to lead to further interest in the future.

In the classroom, the teacher provides back-up material in the form of graph plotting and the drawing of weather roses; which provide alternative methods of presenting information. Listening to recordings of shipping forecasts together with locating the various shipping areas adds a further dimension by providing practical examples of the effect of different weather conditions on industry.

Other valuable back-up material used includes the Royal Meteorological Society's magazine *Weather* and its weather log which includes daily charts of pressure systems. A monthly collection of data from amateur weather stations, Climatological Observers Link

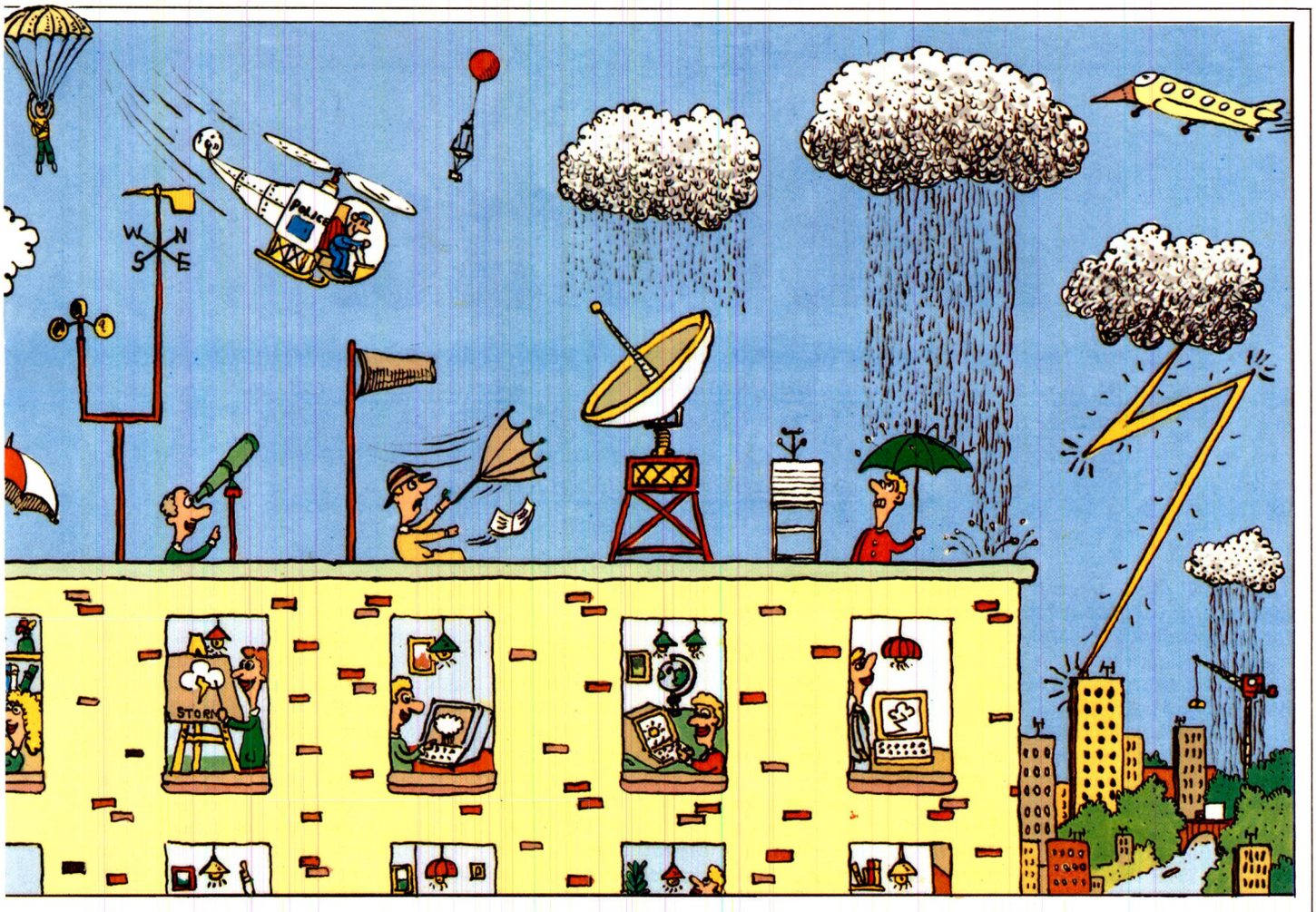


Illustration by Bob Seal

(COL) provides yet another source of data for comparison and comment.

Other projects

The Weather Station exercise is ideal for a school project. However, manual collection of daily data cannot hope to compete with automatic collection for serious study.

At St David's University College, Lampeter, the Microcomputer Environmental Probes Project (MEPP) makes use of a BBC B Micro and an interface box (MODAS, by University College Swansea Micro Centre) to enable two-way communication between the software and the various types of weather sensors. The interface allows three types of sensor to be used, providing an eight-channel temperature probe module for use with semiconductor temperature sensors, a four-channel by eight-bit binary input module and a five-channel event counter module.

An all embracing monitoring system such as MODAS is perhaps beyond the range of schools and micro-owning weather watchers, but other hardware and software for monitoring some weather variables is available.

Suppliers

Temperature sensors can be obtained from Griffin and George, price £56.80, for interfacing with the BBC or Spectrum micros. Harley Systems Ltd supplies an ADC analogue input module which takes in signals from sensors and instruments. Harley also has a program, Data Recorder, which puts the response from sensors to the Spectrum screen in real-time and allows for ongoing events to be stored. Cheshire Micro Design has temperature sensors for the ZX81 with 8k ROM, supplied with software for the four-channel 16k ZX81 and 48k Spectrum. Details of the organisations and suppliers mentioned in this article are given in Fig 1.

Conclusion

Weather observation has proved to be an excellent way of introducing schoolchildren to the fundamental capabilities of microcomputers in manipulating and managing data as well as basic principles of scientific method.

The main advantage of weather observation is flexibility, since projects can be designed to suit a range of students from primary school through to colleges of education. It will also suit all pockets — a most significant factor when considering how to utilise, to best advantage, a school's precious resources. END

Weather Station — Arnold Wheaton Software, Parkside Lane, Leeds LS11 5TD. *Stockists:* Boots — Spectrum 48k cassette version, £13.95. Other versions: BBC B, Apple-DOS 3.3 48k, RML machines.

Climatological Observers Link (COL) — GW Rolfe, 2 Hervey Close, Ely, Cambs CB6 3DU. Subscriptions, BM Smith, 388 Maidstone Rd, Wigmore, Gillingham, Kent, UK, £9.50. Overseas surface, £10.25. Overseas airmail, £12.50. Draft or money order to be drawn in sterling.

Computer subgroup of COL — John Shade, 8 West Lemming St, Letham, Angus DD8 2PU, Scotland. Send £1 for initial mailing and information.

Royal Meteorological Society — Mrs M Whitworth, James Glaishier House, Bracknell, Berkshire RG12 1BX. Membership for nominated representatives on behalf of their schools, £17 pa. Members can attend meetings of the society, attend field courses at reduced rates and receive advice on careers and education and speakers. Non-members can receive *Weather* magazine, £12 pa, and the weather log, £6 pa. Apply at the above address.

Microcomputer Environmental Probes Project (MEPP), c/o Dr Gerald Sumner, Dept of Geography, Saint David's University College, Lampeter, Dyfed SA48 7ED. Or for enquiries about software, contact Leigh Sparks, Dept of Business Studies, University of Stirling, Stirling FK9 4LA.

Harley Systems Ltd, The Pepperboxes, Great Missenden, Bucks HP16 9PR

Cheshire Micro Design, 66 Close Lane, Alsager, Stoke-on-Trent ST7 2TR.

Fig 1 Addresses and useful information

IEEE control

Some micros such as the PET and Osborne have IEEE as well as, or instead of, RS232 and Centronics interfaces. The IEEE control system has its advantages but it's often complex to use. R W Cranage looks at the principles behind the IEEE 488 standard and compares two recently launched for the BBC Micro.

The IEEE 488 interface standard evolved from a Hewlett Packard system for interconnecting and controlling measuring instruments such as digital voltmeters or analysers, and was originally defined by the Institute of Electrical and Electronic Engineers.

The interface system is known by several names, the most common of which are the IEEE Bus, the GPIB (General Purpose Interface Bus) and the HP-IB (Hewlett Packard Interface Bus). In 1978 the IEEE standard was subject to minor revision and in 1980 the International Electrotechnical Commission published IEC 652-1 which is identical to IEEE 488-1978, except for its use as an RS232-type, 25-pin connector.

As befits its parentage the IEEE interface is a carefully designed and standardised interface system. Any of the 2000-plus products that contain the interface will (usually!) interconnect smoothly, with none of the plug re-soldering, and so on, that often attends RS232 connections.

The interface system is a sort of external 'bus' which, by means of cables and plugs, extends the internal bus used to carry data between printed circuit boards within the computer. The system transfers data in 8-bit parallel (byte serial) form between devices, and high data transfer rates (up to one Mbyte/sec) are possible over short distances.

The system may be thought of as a very local area network which allows up to 15 devices, including the controlling computer, to be connected in a star or linear pattern. The total length of cable allowed is restricted to 20 metres or two metres per device — whichever is the less — although parallel to serial convertors are available for long distance communications.

The IEEE interface allows data to be safely transferred between devices with very different response rates, such as a high speed oscilloscope and a graph plotter. The sections below outline the features of the interface which make this possible.

IEEE hardware and logic

The IEEE 488 standard closely defines the mechanical and electrical components of the interface. The standard connector consists of a 24-way combined plug and socket, with pins arranged back to back. This arrangement allows connectors to be 'piggy-backed' onto one another using each connector's integral screws, and ensures that all lines are automatically connected in parallel (see Fig 1).

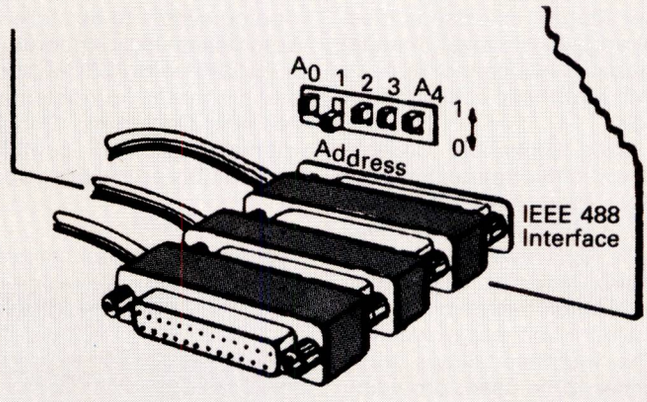


Fig 1 Piggy-backed IEEE 488 connectors

16 of the 24 lines carry signals; the remaining eight wires being earths. The signal lines are defined as being at logic value 'TRUE' when the voltage on them is less than 0.5V and 'FALSE' when their voltage is above 2V. This is known as low-true logic and reduces susceptibility to electrical noise in the true state.

As all devices connect to the bus in parallel it is necessary for any one device to be able to control the state of a line. This can be achieved by using open collector drivers in the circuits driving the bus lines. This ensures that if any device on the bus drives a signal line low (TRUE), the signal line will immediately assume that value, whereas it requires all devices connected to the bus to be at high voltage before the line goes to a high voltage (FALSE) value.

If very high speed (<250 Kbyte/sec) data transmission is required then tri-state outputs are used, but a microcomputer-based system would not normally operate at such high speed. A typical modern microcomputer interface will use a general purpose interface adaptor chip which handles most of the interface functions itself, calling on the CPU for instructions when necessary.

The 16 signal lines divide into the following three groups: eight data lines; three handshake lines; and five management lines (see Fig 2).

The data lines (DI01-8) carry all the variable information on the bus, system commands as well as data. The interface standard does not define the way in which data on these lines is formatted or interpreted but a 7-bit

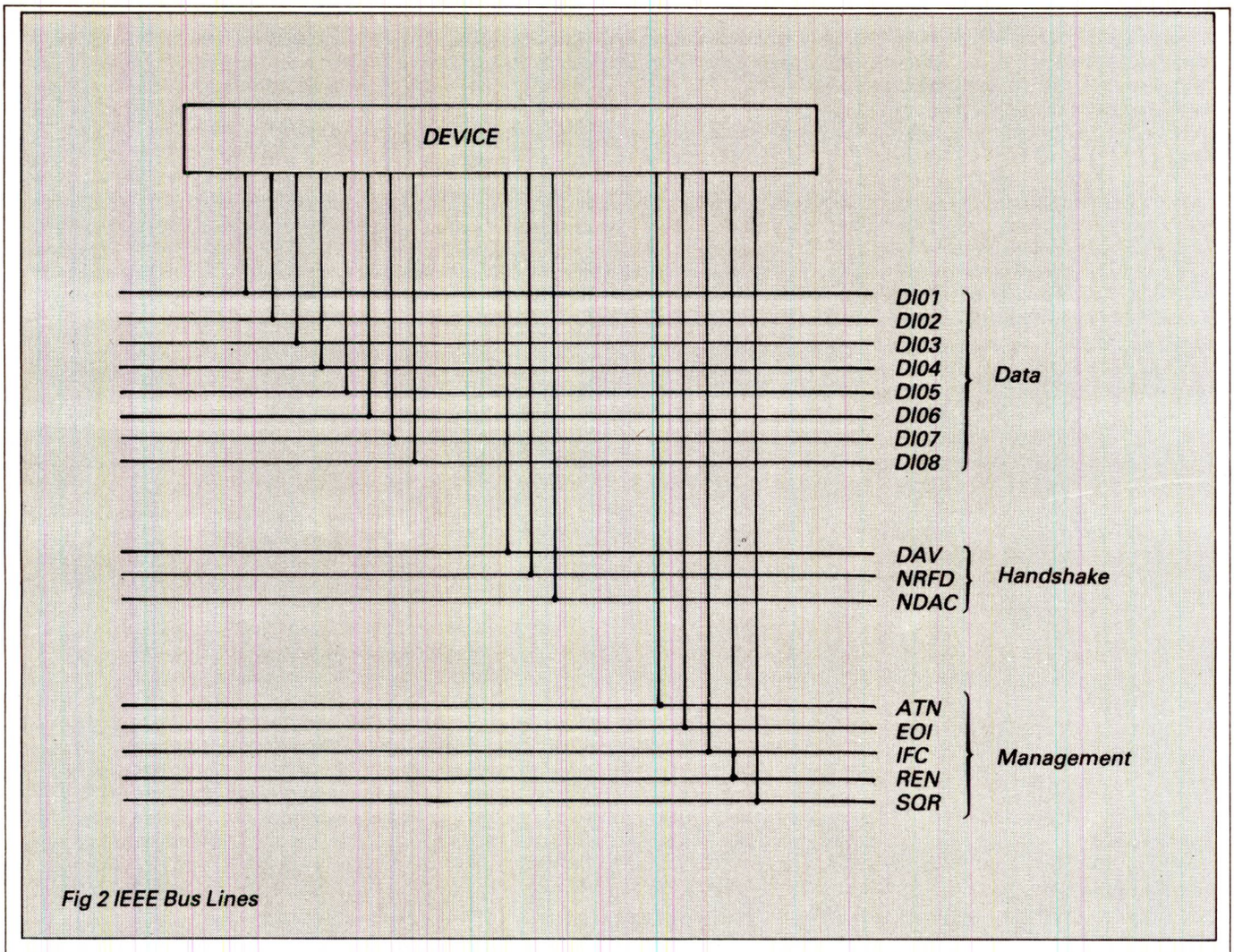


Fig 2 IEEE Bus Lines

ASCII code is normally used to transmit data. The five management lines are used to control the flow of information between devices on the bus and to distinguish data bytes from control bytes. (The detailed action of these lines and the three handshake lines are described below.)

Device functions and addresses

Every IEEE 488 device must be able to perform one or more of the following functions:

(a) Listener: capable of receiving data over the interface; that is, a printer or plotter. There can be 14 active listeners at one time.

(b) Talker: capable of transmitting data to other devices via the interface; that is, a digital voltmeter. There can only be one talker active at a time.

(c) Controller: capable of managing the system and of controlling data transfer by means of the management lines, normally a computer or microprocessor. In multiple controller systems only one device can act as system controller.

System commands are sent in bit parallel form along the data lines (DI01-8), and are distinguished from data bytes by the 'Attention' or ATN management line. When ATN is TRUE all other devices must listen to the controller sending the commands.

Data transfer cannot take place while ATN is TRUE. Every device present is assigned a unique address in the range 0-30; this address may be set by a panel switch on each device or by software. If information is required from a device with address 6 (00110 in binary), the controller will send a 'command' byte (ATN TRUE) 1000110 over the data lines. The least significant five bits signify device 6 and the most significant bits (10) tell the device to talk as soon as ATN is FALSE. The eighth bit is not used. Any other talker on the interface is automatically unaddressed by this command so as to leave only one active talker present.

If the command 0100110 is sent, device 6 will become a listener, as the most significant bits (01) will set the device's listen address. Secondary addresses are possible which allow one of several functions in a device to be selected.

The general format of a data transfer consists of:

(1) One or more addressing commands that select which device is to talk and which to listen. ATN is TRUE during this operation.

(2) A group of data bytes sent by the talker to the listener(s) with the 'End or Identify' (EOI) management line being used to signify the last byte.

(3) A group of commands to readdress talkers and listeners (ATN TRUE).

The Interface Clear (IFC) management line is used by the system controller to reset the interface to the idle state with all talkers and listeners unaddressed; this would normally happen on system power up.

The Remote Enable (REN) line is used by the system controller to put devices into remote mode so that they do not respond to their front panel switches. (Useful for preventing itchy fingers changing range settings!)

The final management line is the Service Request (SRQ) line which is used by a device to indicate an error condition or request service. Examples would be a printer out of paper or a measuring instrument over-range.

When the controller detects a service request it conducts a 'serial poll' of all devices on the bus to find out which device has requested service and why. As its name implies, the serial poll involves interrogating each device in turn to discover if it was responsible for sending the service request.

It is also possible for the system controller to conduct a 'parallel poll' in which the status of up to eight devices can be ascertained simultaneously by means of status bits sent along the data lines DI01-8.

The 'handshake'

A unique feature of the IEEE interface is

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ESSEX.

the 'three-wire handshake', patented by Hewlett Packard but licensed for a nominal fee to other companies. Data is transferred asynchronously (there being no system clock present to determine transfer speed), and the transfer rate automatically adjusts to the speed of the slowest device involved. The handshake protocol ensures that no data bytes are lost or accepted twice by any device.

The handshake sequence for the transfer of one byte from a source to several listeners is outlined by the following sequence of events:

(1) All listeners become ready to receive a byte of data and the Not Ready For Data (NRFD) line goes high; that is, FALSE. This logical double negative means that this line now signals 'ready for data'.
(2) The source now sets the Data Valid (DAV) line TRUE to indicate that it has put a valid byte on the data bus, lines DI01-8.
(3) The listeners respond to this by making the NRFD line TRUE and process the byte at their own pace.
(4) When the slowest listener has accepted the data byte the Not Data Accepted (NDAC) line goes FALSE; this does not happen until all listeners have accepted the byte.
(5) As soon as this happens DAV goes high (FALSE) to indicate that the data byte is no longer valid.
(6) The first listener sets NDAC TRUE and the cycle is completed by the source changing the data on the data line.
(7) GOTO 1.

This rather complicated protocol is necessary to ensure the foolproof transfer of data between devices with very different listening speeds.

Many popular microcomputers support an implementation of the IEEE interface but tend either to be expensive (Hewlett Packard) or require the user to descend into assembly language to make full use of the interface (PET, Osborne).

However, two recently introduced interfaces from Acorn and Cambridge Systems Technology ('CST') provide BBC Micro users with access to a relatively cheap and easy to program IEEE control system.

The CST interface uses a Motorola MC68488P controller chip which is packaged together with a handful of support chips and a power supply in a small brushed aluminium box. A 34-way ribbon cable is provided to connect the box to the 1MHz bus socket on the BBC.

The Acorn interface uses a Texas Instruments TMS9914A chip and peripherals housed in a standard, and largely empty, Acorn box similar to that used to house its teletext adaptor. The large size of the box together with the short length of ribbon cable supplied can lead to problems in positioning the unit on a table covered with monitors, disk drives, and so on. Both units use the standard IEEE 488 socket.

'A unique feature of the IEEE interface is the "three-wire handshake", patented by Hewlett Packard . . . Data is transferred asynchronously and the transfer rate automatically adjusts to the speed of the slowest device involved . . . The handshake protocol ensures that no data bytes are lost . . .'

In both cases the software needed to control the interface is supplied in the form of a paged plug-in ROM, the CST software being offered in a standard 8K version, or a 16K version containing additional commands to enable the BBC to access data on CBM (PET) disks.

The BBC operating system regards the software in both devices as an additional filing system (selected by *IEEE), analogous to disk or tape, and allows the interface to be accessed from any high level language such as Basic or Forth, as well as allowing second processor operation.

The standard of documentation supplied with both interfaces is very high; the CST handbook is particularly informative with program examples in BBC Basic, Lisp, Pascal and assembler as well as MBasic via the Torch Z80 disk pack.

'Many popular microcomputers support an implementation of the IEEE interface but tend either to be expensive (Hewlett Packard) or require the user to descend into assembly language to make full use of the interface (PET Osborne) . . .'

The program below is written in BBC Basic and enables the computer to monitor the mains voltage using a digital voltmeter fitted with an IEEE interface (device 2) and to print out high voltage readings on an IEEE printer (device 4). The program was written for the CST interface; a similar but slightly longer program could be written using the Acorn software.

```
 10 REM Voltage Monitor
 20 *IEEE
 30 INPUT "ENTER HOUR" HOUR
 40 INPUT "ENTER MINUTES" MIN
 50 TIME = ((HOUR*60+MIN)*60)*100
 70 PRINT #2, "MOROI1NO"
 80 REPEAT
 90 INPUT#2, volts$
100 voltage = VAL (volts$)
110 IF voltage> = 245 THEN PROC–
    printout
120 UNTIL FALSE
130 END
200 DEF PROC–printout
210 PRINT#4, volts$
220 hour = (TIME DIV 360000) MOD24
230 min = (TIME DIV 6000) MOD60
240 hours$ = STR$ hour:min$ = STR$
    (min)
250 time$ = hour$ + min$
260 PRINT#4, time$
270 ENDPROC
```

Line 20 pages the IEEE filing system and initiates the interface. Lines 30-50 set the BBC's internal clock.

Line 70 sends a command string to set the range on the DVM (device 2); this string is peculiar to this make of DVM.

Lines 80-120 obtain a reading from the DVM as an ASCII string and initiates the printout procedure if the voltage sampled is more than 245 volts.

Lines 210-260 print out the voltage and time as strings on the printer (device 4).

The program demonstrates how the software provided insulates the user from the nitty gritty of IEEE 488 hardware and logic and allows for the easy control of complex measuring and control systems based on IEEE devices.

The software in the CST extended ROM enables a BBC Micro to read and write sequential files on CBM 4000 or 8000 series disk drives, which employ an IEEE interface as standard. A full range of software commands is available to enable CBM disks to be formatted and to enable program and data files to be transferred from the CBM drives to the BBC. The concept of using a hybrid PET/BBC disk operating system is a little strange at first but I found it very easy to access an 8050 disk containing over 80 files (compared with the Acorn DFS limit of 31 files) and transfer data to the BBC.

Conclusion

The two rival interfaces are easy to use and provide a full implementation of IEEE functions; the CST device having the edge if you want to transfer files from CBM equipment. The only reservation you might have is cost as the interfaces are around £300 each, which seems a little high considering the small amount of hardware in each unit.

END

Practical Pick

David O'Byrne concludes his examination of the Pick operating 'environment' with a look at the wide range of utilities available and their relation to the Proc procedural language.

The Pick operating system has a reputation for flexibility, due partly to the ease with which data formats and relationships can be amended, and partly to the wide range of tools available to the user — a large collection of utilities that can be extended by means of the procedural language, Proc.

All Pick commands are entered at a base prompt, known as the terminal control language or TCL. Generally, these commands conform to the following format (the filename and record-key may not be required in some cases):

COMMAND filename record-key(s)
(OPTIONS) <Return>

Commands entered will normally invoke a system utility, a Proc, a Basic program, or an enquiry sequence. One of the features of the Pick system is that system commands can be removed or renamed, providing a tailored environment for each user.

Command options are standard throughout Pick, with options such as (P) to direct output to the printer and (S) to suppress error messages. The simplified file organisation of Pick means that file-orientated commands can be used (assuming suitable access levels and privileges) on any file in the system, whether it contains system software, Basic programs, text, or data.

As several of the system utilities are written in Proc, they can be amended by the user to suit his requirements. Probably the most common change is to amend disk-to-tape security to start at a specific time (that is, when all users have finished for the day).

Standard utilities supplied with Pick include the full range of file management facilities (create, clear, delete, copy, display, secure), together with general system utilities which enable the user to make full use of magnetic tape and spooler. Additional utilities cover areas such as system performance, parameter setting, monitoring, and sending of messages to other terminals.

Suitability

The VDU market is very competitive today, with users demanding a choice of terminal types, and Pick is particularly well-suited to the attachment of a range of different terminals. Although the actual number and range of terminals supported varies depending on which hardware the operating system is running on, the majority support up to a dozen different brands. This is achieved by using standard cursor control sequences, which are translated by the OS into the relevant codes for the particular terminal.

One interesting feature of the operating system is its treatment of error/information messages, most of which are held in a central file. The user is allowed to tailor messages, even to create differing versions of the messages for each account.

This gives the designer tremendous flexibility in putting together a system, and makes it readily acceptable to the end user.

The standard system editor is a line editor and acts upon only one record within a file at any one time. Data in the editor is shown as a series of lines, each line being a field within the data record; the line numbers relate to individual field numbers. The line pointer can be positioned at the top (first field) or bottom of the record, or within the record on an absolute or relative basis.

Commands are available to add, replace, locate, merge, delete and list data, to expand macros, set tabs and reverse previous commands, with options to limit or completely suppress output, line numbers, or object code. The are ten 'prestore' buffers available which facilitate the storage of strings of editor commands, and the subsequent execution of the string by means of the prestore buffer number, that is, 'P4'. These buffers have space for 100 characters each, with the facility to chain buffers (prestore P1 calls P2 which calls P3): this makes repetitive editing of a series of data records a relatively painless operation.

As with any operating system, Pick has a number of commands that prove especially useful for the programmer. There are calculator commands for addition, subtraction, multiplication and division in either decimal or hexadecimal, together with conversion commands for decimal to hex and *vice versa.* There is a search facility for locating occurrences of a particular string anywhere within the records of a particular file. There are commands to display or clear any basic locks, and there is check-sum creation to highlight whether changes within a particular file/field have occurred.

Pick also includes a sophisticated print spooling system which enables users to direct output to any printer attached to the system, including those attached directly to a terminal.

Output from a process (an enquiry, a Basic program, a utility) to the printer is stored in a 'print job', which is assigned to a particular job queue. Each job queue will be associated with a logical printer, thus enabling output to be carried out on any one of a number of physical printers. The spooler is capable of supporting approximately four parallel and sixteen serial printers.

A comprehensive set of print utilities allows the user to modify the printer arrangements, examine individual print jobs (including the use of a string search facility), and set up automatic print direction for individual databases, ports, or users. The main advantage of this system is its flexibility in directing output from any process to any printer connected to the system, or to the mag tape unit (for archiving or transfer to another system).

Pick includes both text and word processing options. For text there is Runoff, essentially a print formatting utility that has been used extensively in large related document areas such as the production of manuals or contracts.

The word processing option is a more recent acquisition, which was developed by an outside firm and then incorporated into the operating system as a standard feature. Called Jet, it features the usual word processor facilities: full screen movement, move to next or previous character, word, sentence, paragraph, page, line, record, delete, insert and replace the same, character transposition, cut and paste, search and replace, and change case. These facilities mean that the system can perform word processing functions which have excellent links into the database. They also offer a considerable improvement in the entry and modification of programs.

Proc

The Pick operating system's Proc (stored procedure) language is effec-

tively a job control language with one or two enhancements. A Proc can contain any command(s) that could normally be entered at TCL, it can accept input from and output to the user's terminal with validation, branching, field manipulation, and so on, and can link to other internal/external subroutines.

The usage of Proc tends to vary greatly between different sites. While often used as a means of storing strings of TCL commands, building complex enquiries, or processing menus in shorthand fashion, it can occasionally be used as an alternative programming language. Its advantages in this area lie mainly in its concise syntax and ability to pass parameters between several separate processes.

A Proc to execute a simple enquiry could be:

```
PQ
HLIST THE STOCK FILE PART DESC
  QTY
P
```

Line one of the Proc is an identifier. In this case, the command (LIST THE STOCK FILE) is held within the Proc as a literal and moved to the output buffer by means of the 'H' command. Finally, the contents of the output buffer are executed via the 'P' (process) command.

As you can see, the syntax is anything but wordy, the majority of Proc commands being one or two characters long. One essential feature of Proc is the ability to 'stack' inputs for a particular process, so that the process, once initiated, can have all subsequent responses supplied automatically from one of the output buffers.

There are commands within Pick's Basic programming language which allow the programmer to load information to or from the Proc buffers, a facility which becomes very important when one considers the integration of the various operating system features. This facility could be used to pass a selected list of record keys to a Basic program, thereby linking the easy-to-use data selection facilities of one Pick feature to the processing capabilities of another.

The most widespread use of Proc is in the menus area. Screens can be displayed from Proc in similar fashion to Basic, direct cursor control and highlighting are supported, together with conditional and unconditional branching. Operator entries can be validated (length, pattern, relational operators, and so on), and control passed to other Procs, Basic programs, enquiry sequences or utilities.

Another useful Proc feature is its ability to check error return codes from other system processes, enabling a Proc to take different courses of action depending on whether a previous process was completed successfully. A Proc can distinguish between the different types of message returned by the system at completion — all system error and information messages are held in a separate file, in order to ensure accurate processing of subsequent data. Many Pick utilities consist of Procs which drive other processes or amalgamate information from one or more functions. Any report of system information, such as details of terminals logged on, statistics relating to the current state of files, or computer usage statistics, should consist of a Proc driving one or more enquiry language statements.

Powerful enquiry language

Pick possesses one of the most powerful enquiry languages available, ideally suited to the demands of both applications programmer and end user.

The first part of an enquiry sentence is a 'verb' which specifies the action to be performed on the relevant file, for example, LIST, COUNT, SELECT. This is followed by the name of a file upon which the command will be processed. Only one filename may be specified, but the dictionary records used to access information within the file may refer to other files.

A verb and a filename are mandatory for any enquiry. The following elements are optional: record keys (for accessing specific records), selection criteria, sort criteria, output specifiers, print limiters, and various modifiers.

A sample enquiry command would be:

```
LIST CUSTOMERS WITH
  CREDIT-LIMIT < 5000
```

This command would process only those records meeting the selection criteria. To specify output criteria (default output fields can be set up in the dictionary file if required), the relevant fields' names are simply added to the statement: that is, NAME CREDIT-LIMIT BALANCE. To make commands more readable, a variety of 'throw-away' elements are available (and can be added by the user), which can be inserted at any point. For example, the above command could be specified:

```
LIST THE CUSTOMERS FILE WITH A
  CREDIT-LIMIT < 50000 PLEASE
```

Some of the available verbs are LIST, SORT, SELECT, SSELECT (sort and select), COUNT, SUM (for totalling a specific field), STAT (to provide count and averages), LIST- and SORT-LABEL (for printing labels), SAVE-, GET- and DELETE-LIST (for saving, restoring and deleting 'lists': that is, a series of record keys created via a SELECT or SSELECT), T-DUMP and T-LOAD (for selective dumping of information to/from tape/diskette), and ISTAT and HASH-TEST (for producing file-hashing histograms and file utilisation statistics).

To facilitate the creation of complex selection criteria, a variety of relational operators and logical connectives are available: = or EQ, > or GT or AFTER, < or LT or BEFORE, >= or GE, <= or LE, £ or NE or NOT or NO, AND, OR. These can be used simultaneously to form a selection, such as WITH INVOICE-NO BEFORE "11/A22" AND WITH BALANCE <= 1000 OR WITH PAYMENT-CODE EQ 2.

To specify which data elements should be output, the user specifies the relevant dictionary names. If totalling is required, these are prefixed with 'TOTAL'.

Report headings and footings can be indicated by means of the HEADING and FOOTING specifications, a number of codes being allowed within a heading/footing to incorporate date, time, page number, control-break values and filename automatically, or to centre text within the heading, skip to new lines, and so on.

Where sorted information is required, the relevant dictionary names can be prefixed by BY, BY-DSND (for descending sequence), BY-EXP (for exploding fields containing multiple sub-fields), and BY-EXP-DSND. These are entered one after another, SORT STOCK BY CATEGORY BY-DSND QTY.

The enquiry language forms very much the core of Pick, and is probably the principal reason why people rate the system's 'user friendliness' so highly.

'Pick's benefits are flexibility and ease of use, which make the design and maintenance of a computer system a much simpler and speedier task.'

The provision of a powerful enquiry language/report generator means that one of the most onerous parts of the development cycle — the creation of reports matching the user's requirements — can be quickly and effectively completed, with subsequent alterations to the physical database being reflected in the data dictionary and not in the report statements. The end user can also enter his enquiries first-hand, thereby ensuring that his specific needs are fulfilled, and that the development team can progress without the restraining hands of the user.

Conclusion

Pick's benefits are flexibility and ease of use, which make the design and maintenance of a computer system a much simpler and speedier task.

The conceptual simplicity means that the system can safely be placed outside the DP department and be looked after totally by non-technical staff. This in no way reduces the capabilities of a system which, because of advanced features such as variable length data structure, database philosophy and powerful enquiry language, could be said to be the first true 'end user' computer system. END

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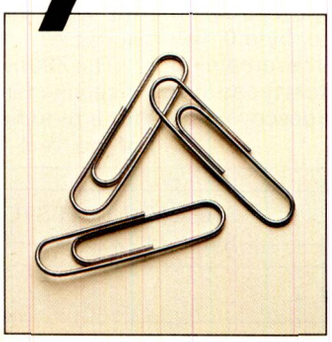

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TEACH YOURSELF ASSEMBLER

This month Paul Overaa continues his discussion of assembly language programming with a breakdown of the myriad and often complicated first steps.

This is part seven of PCW's Teach Yourself Assembler series. It's unique in using Basic as its point of reference, and avoiding the 'drop you in it' approach often used on this subject. Three processors, the Z80, 6502 and 8080 are covered in detail, but enough information is provided to enable users of other processors to follow the course. Copies of earlier articles in the series, which started in February 1984, may be obtained from our Back Issues dept (see page 240).

One of the problems with writing assembly language programs is that it's often difficult to know just where to begin. This is not so much an indictment of low level languages, but an indictment of many of the techniques used to identify the first steps needed. To give an example of how such breakdown can be performed, let's look at the simple problem of storing text in a buffer area.

Buffers

It is often necessary to temporarily store an input item before using it. Such temporary storage areas are termed buffers, and are areas of memory that we reserve as part of our program/memory use strategy. We select an arbitrary but commonly used arrangement that will take one page (256 bytes) of memory. The first byte, byte 0, will hold the character count; the remaining bytes will hold the characters typed in at the keyboad. A schematic description is shown in Fig 1.

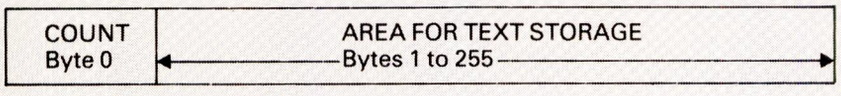


Fig 1 Text buffer layout

In the source code, such an area would be defined using one of the 'define space' directives. The conventions vary from assembler to assembler but our Z80 assemblers, for example, would use the pseudo-op — DS 256 to reserve 256 bytes of uninitialised space within the object code.

What do we need to implement a routine that will place a word in a buffer? Obviously, some type of 'loop' (*cf* repetition structure) and a means of counting the number of characters typed in are required. We also need to test for the end of a word. Normally, we use a carriage return (ASCII 13) to signify the end of input, and earlier on in the series we used several loops that tested for such a character. We must also be able to identify which location in our buffer area is to be used for the current input character.

In the May issue we talked of 'computed addressing', that is, indexed and indirect addressing. We use computed addressing to determine the address of a 'buffer' pointer', to tell us where in the buffer the next character should be placed. On the 8080 we can only use indirect addressing, and we simply load the HL register pair with the address of the start of the buffer and increment HL as we add characters. On the Z80 and 6502 we can use either indirect or indexed addressing, which brings us to the following question. Can you see why it's better to use indirect addressing on the Z80, yet on the 6502 indexed addressing is more suitable?

The Z80 indexing facilities use a fixed displacement. Unless we create a run time modified displacement (which is of no real benefit in this case), it's simpler to use the HL register pair as an 'indirect pointer' into the buffer area (we'll need to maintain a 'count' of the number of characters). The 6502, on the other hand, implements a form of indexing whose displacement is held in the X or Y registers. By using this arrangement, we won't need to maintain a separate character count as the indexing variable itself provides the count.

We can define the essential characteristics of a 'Get-word' subroutine with the diagram in Fig 2. With one important (and deliberate) omission, this diagram will provide the overall structure needed.

What does the diagram show? After some initialisation (for example, setting up pointers) we perform a routine 'Build-string' at least once and up to a maximum of n times. The purpose of Build-string is to use a system routine to collect a character; then, if the character is *not* a carriage return we increment the character count and place the new character in the buffer. As soon as we detect a carriage return, we exit from Build-string and perform the last operation of the most left-hand side bracket: that is, END GET WORD. This entails writing the character count at the head of the buffer. A Z80 translation is shown in Fig 3 using a simple loop. When a carriage return is detected, we perform a relative jump to CLOSE$BUFFER, re-load HL with the starting address of the buffer, and store the contents of the C register (which is used to hold the character count) by using a LD (HL), C instruction. Remember that this will store the contents of the C register into the byte whose address is specified by the CONTENTS of HL: that is, it stores the character count at the start of the buffer.

An equivalent 8080 form avoiding relative jumps is shown in Fig 4, and again the code is based on the diagram structure. Remember — with the 8080 mnemonics, LXI loads a register PAIR and MVI loads a single register, thus MVI C,0 is placing zero into the C register, but LXI H, BUFFER$SPACE is

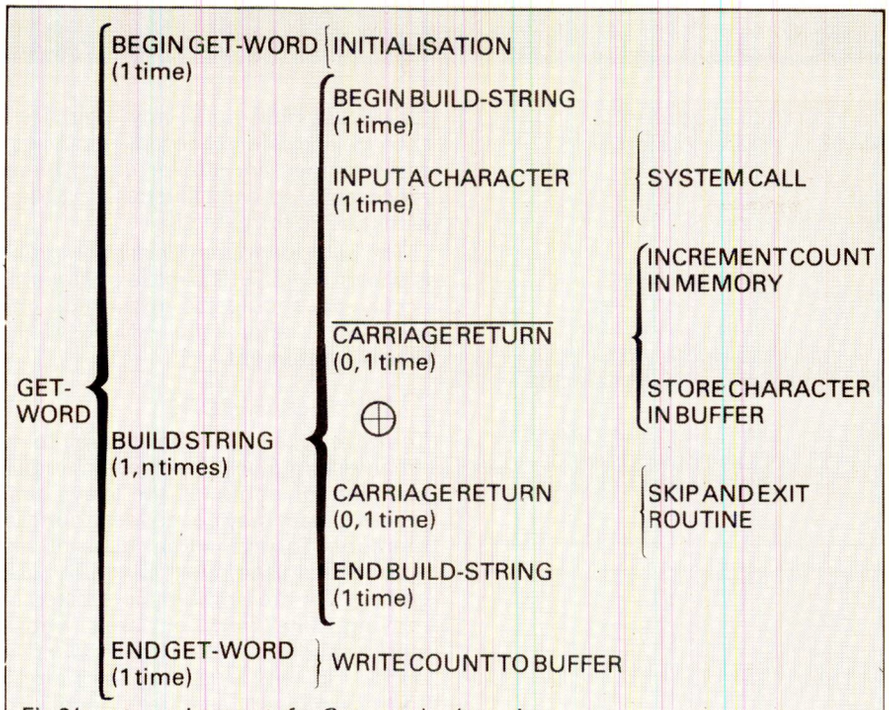


Fig 2 Input requirements for Get-word subroutine

```
GET$WORD:          LD    C,0                 ;Initialise count
                   LD    HL,BUFFER$SPACE     ;Start of buffer

BUILD$STRING:      CALL  INPUT$ROUTINE       ;System call
                   CP    CARRIAGE$RETURN     ;Is it a CR?
                   JR    Z,CLOSE$BUFFER
                   INC   C                   ;Increment count
                   INC   HL                  ;Increment pointer
                   LD    (HL),A              ;Store character
                   JR    BUILD$STRING        ;Back for next character

CLOSE$BUFFER:      LD    HL,BUFFER$SPACE     ;Need start address again
                   LD    (HL),C              ;Store character count
                   RET                       ;Return from subroutine
```

Fig 3 Get-word Z80 version one

```
GET$WORD:          MVI   C,0                 ;Initialise count
                   LXI   H,BUFFER$SPACE      ;Start of buffer

BUILD$STRING:      CALL  INPUT$ROUTINE       ;System call
                   CPI   CARRIAGE$RETURN     ;Is it a CR?
                   JZ    CLOSE$BUFFER
                   INR   C                   ;Increment count
                   INX   HL                  ;Increment pointer
                   MOV   M,A                 ;Store character
                   JMP   BUILD$STRING        ;Back for next character

CLOSE$BUFFER:      LXI   H,BUFFER$SPACE      ;Need start address again
                   MOV   M,C                 ;Store character count
                   RET                       ;Return from subroutine
```

Fig 4 Get-word 8080 version one

```
GET$WORD:          LDY   #0                  ;Initialise count

BUILD$STRING:      JSR   INPUT$ROUTINE       ;System call
                   CMP   #CARRIAGE$RETURN    ;Is it a CR?
                   BEQ   CLOSE$BUFFER
                   INY                       ;Increment count
                   STA   BUFFER$SPACE,Y      ;Store character
                   JMP   BUILD$STRING        ;Back for next character

CLOSE$BUFFER:      STY   BUFFER$SPACE        ;Store character count
                   RTS                       ;Return from subroutine
```

Fig 5 Get-word 6502 version one

placing the address BUFFER$SPACE into the HL register pair. Remember also that the letter 'M' represents the 8080 convention for an indirect address held in the HL register pair, thus LD (HL),A on the Z80 has an 8080 parallel instruction that is written as MOV M,A.

The 6502 version (Fig 5) performs the same essential functions but uses indexed addressing. We start by initialising the Y register to zero, then we use a loop to collect characters from the keyboard. If a character is not a carriage return, we increment Y (the character count) and store the character using STA (BUFFER$SPACE),Y. This is using indexed addressing to place the accumulator contents in the byte whose address is given by the base address (which the assembler calculates from your BUFFER$SPACE label), plus the offset held in the Y register.

To 'close' the buffer, we store the contents of the Y register at the start of the buffer. This is achieved by the instruction STY BUFFER$SPACE.

The three routines are all correct in that input data will be placed into the buffer as required, but we did say that there's a deliberate omission. What is it? In practice, the buffer can hold only 255 characters, so it's necessary to perform a check to see whether the buffer is full or not. Here's a couple of problems concerning this check.

Problem one

In every version we have shown, it's possible to add a single instruction to perform a suitable check. Think about the effect of incrementing the count as the buffer becomes full, and decide which flag will be affected. Use this flag to conditionally jump or branch out of the loop and perform the close buffer operation.

Problem two

The test for possible buffer overflow should be indicated on the Warnier diagram. The mutually exclusive action subsets to be added are as follows:



This pre-test alternation description can be superimposed on the existing Warnier diagram to reflect the change made to the code. When you have tackled problem one, try to redraw the Warnier diagram so that the coding changes are mirrored in the Warnier description.

Solutions

The first part should have been easy! The character count when it reaches 255 will increment to zero; thus buffer overflow can be detected by the setting of the zero flag. A simple but effective solution is to use a conditional branch or jump immediately after the instruction that increments the character count. By jumping to the

```
GET$WORD:        LD    C,0                ;Initialise count
                 LD    HL,BUFFER$SPACE    ;Start of buffer

BUILD$STRING:    CALL  INPUT$ROUTINE      ;System call
                 CP    CARRIAGE$RETURN    ;Is it a CR?
                 JR    Z,CLOSE$BUFFER
                 INC   C                  ;Increment count
                 JR    Z,CLOSE$BUFFER     ;Z set + overflow
                 INC   HL                 ;Increment pointer
                 LD    (HL),A             ;Store character
                 JR    BUILD$STRING       ;Back for next character

CLOSE$BUFFER:    LD    HL,BUFFER$SPACE    ;Need start address again
                 LD    (HL),C             ;Store character count
                 RET                      ;Return from subroutine
```

Fig 6 Get-word Z80 final version

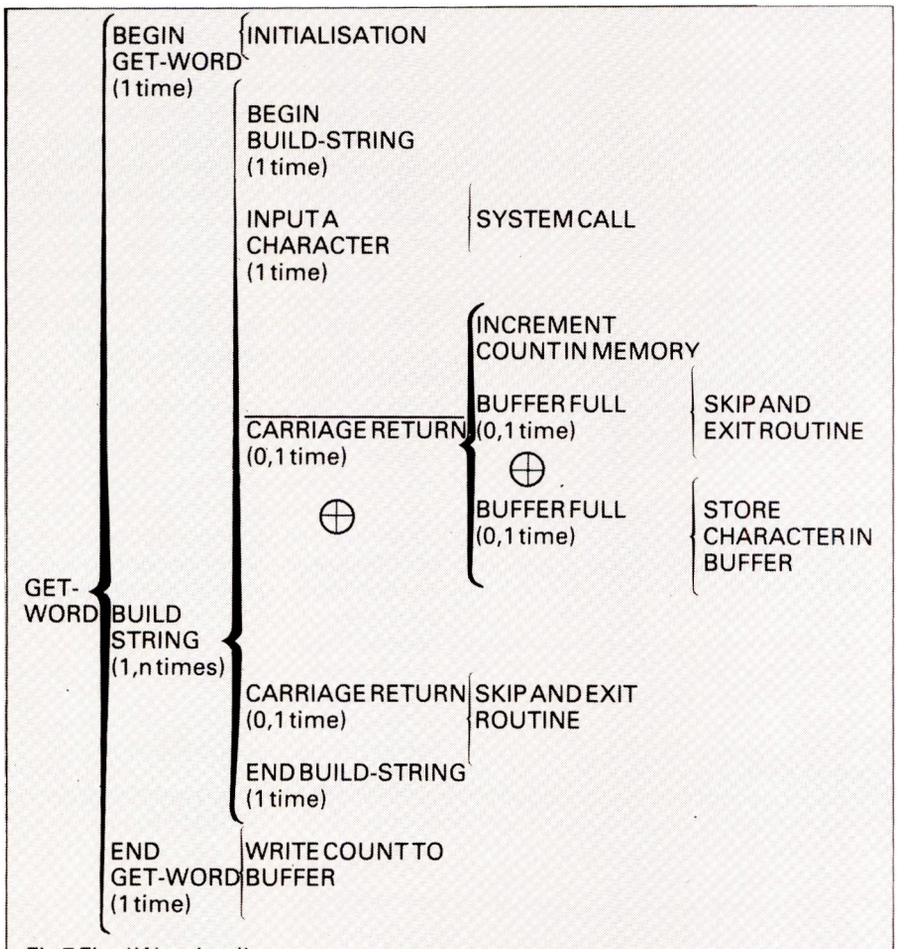


Fig 7 Final Warnier diagram

```
ENTRY CONDITIONS:

HL = SOURCE START ADDRESS
DE = DESTINATION START ADDRESS
C  = NUMBER OF CHARACTERS TO BE TRANSFERRED

MOVE$BYTES:  LD   A,(HL)          ;Get byte
             LD   (DE),A          ;Store byte
             INC  HL              ;Increment source pointer
             INC  DE              ;Increment destination pointer
             DEC  C               ;Decrease count
             JR   NZ,MOVE$BYTES
             RET                  ;Return from subroutine
```

Fig 8 Move block Z80 version

CLOSE$BUFFER label, any over-sized entry will be safely ignored. The necessary changes are similar on all three processors, so we'll illustrate the idea with the Z80 form (Fig 6).

The addition to the Warnier diagram is shown in Fig 7. The extra operations occur, as should be expected, immediately after the INCREMENT COUNT statement.

Data movement

To move data from a buffer area to its 'final resting place' involves an understanding of some of the ways that blocks of data may be moved around in memory. To give some ideas of the approaches used, we'll look at typical coding. We are primarily interested in moving data from an area whose starting address is fixed (that is, our text buffer) to an area whose starting address will vary as data is added. To move a block of data we need to know three things:

a) Where the data is to be obtained from.
b) Where the data is to be transferred to.
c) The size of the block to be transferred.

In other words, we need a source pointer, a destination pointer, and a count of the number of bytes to be transferred. On the 8080 and Z80, a byte of data may be transferred via the accumulator using HL as a source pointer and DE as a destination pointer. Thus the instructions needed on the 8080 are:

```
MOV A,M  ;Get byte
STAX D   ;Store byte
```

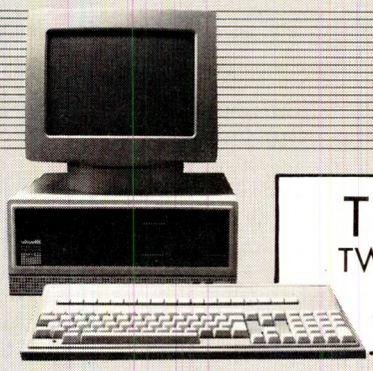
The equivalent Z80 instructions are written as:

```
LD A,(HL)  ;Get byte
LD (DE),A  ;Store byte
```

If a count of the number of bytes to be transferred is kept in the C register, a loop can be used to transfer up to 255 bytes from a source area to a destination area. A typical Z80 code is shown in Fig 8.

The 8080 version (Fig 9) incorporates the same ideas and should not prove too difficult to follow.

In the case of the Z80, a far more efficient alternative to the loops just described is available. The Z80 has incorporated in its instruction set some very powerful 'block move' instructions. In essence, the HL register pair is loaded as a source pointer, the DE pair as a destination pointer, and BC as a 16-bit byte counter. One such instruction using this pointer arrangement is the repeating block load with increment instruction whose mnemonic is LDIR. This instruction loads the contents of the byte addressed by HL into the location addressed by DE; HL and DE are then incremented and the BC pair decremented. If BC does not equal zero,



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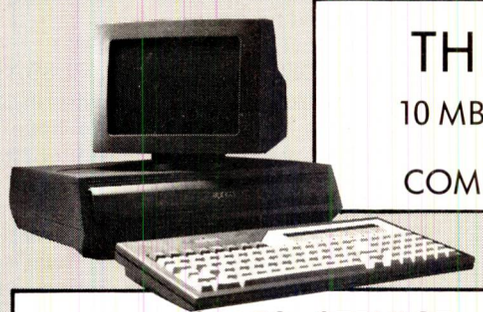

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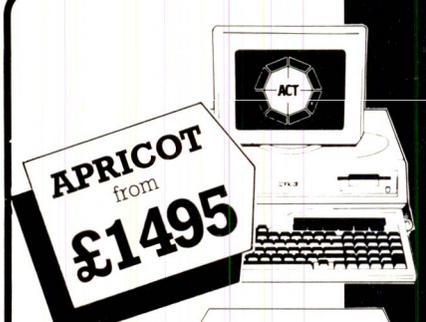

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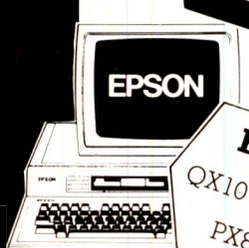

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the program counter is decreased by two and the instruction re-executed. The automated version of the Z80 loop shown earlier is given in Fig 10 for comparison.

On the 6502, we can move a specific byte from one address to another using the instructions:

```
LDA SOURCE$ADDRESS
STA DESTINATION$ADDRESS
```

This is all very well if only one byte is being moved and we know the addresses at the time we write the program, but when several bytes must be transferred, the indexed equivalent instructions may be used to move the Y'th byte of a page of data. The equivalent indexed forms are:

```
LDA SOURCE$ADDRESS,Y
STA DESTINATION$ADDRESS,Y
```

For the purpose of transferring data from a buffer such as we have described, we are particularly interested in moving data from a fixed base area (that is, the buffer area) to an area whose starting address may well vary (we could be transferring text into a dynamically changing 'string space' area). This being so, we will want to keep the destination address in two zero page locations and use indirect indexed addressing to define the destination address. The code that achieves this data movement will be of the form:

```
LDA  SOURCE
     $ADDRESS,Y        ;Get byte
STA  (DESTINATION
     $ADDRESS),Y       ;Store byte
```

One possible approach on the 6502 (Fig 11) is to use a backward counting loop to perform the above instructions Y times, decreasing the value of Y with each pass through the loop. As the loop that follows does not deal with the base address bytes themselves (that is, the case of Y=0), it's necessary to address the byte below the intended source start address. It's also important to ensure that the indirect pointer stored in the zero page is a pointer to the byte below the actual destination start address.

END

```
ENTRY CONDITIONS:

HL = SOURCE START ADDRESS
DE = DESTINATION START ADDRESS
C  = NUMBER OF CHARACTERS TO BE TRANSFERRED

MOVE$BYTES: MOV A,M          ;Get byte
            STAX D           ;Store byte
            INX  H           ;Increment source pointer
            INX  D           ;Increment destination pointer
            DCR  C           ;Decrease count
            JNZ  MOVE$BYTES
            RET              ;Return from subroutine
```

Fig 9 Move block 8080 version

```
ENTRY CONDITIONS:

HL = SOURCE START ADDRESS
DE = DESTINATION START ADDRESS
BC = NUMBER OF CHARACTERS TO BE TRANSFERRED

MOVE$BYTES: LDIR             ;Automated block move
            RET              ;Return from subroutine
```

Fig 10 Automated move block Z80 version

```
ENTRY CONDITIONS:

Y = NUMBER OF BYTES TO BE TRANSFERRED

DESTINATION ADDRESS DEFINED IN ZERO PAGE MUST BE ONE BYTE
BELOW THE INTENDED DESINTATION ADDRESS

MOVE$BYTES: LDA  SOURCE$ADDRESS-1,Y      ;Get byte
            STA  (DESTINATION$ADDRESS),Y ;Store byte
            DEY                          ;Decrease counter
            BNE  MOVE$BYTES
            RTS                          ;Return from subroutine
```

Fig 11 Move bytes 6502 version

LEISURE LINES



by J J Clessa

Quickie

The area in square metres of a square patch of my garden is equal to three times its perimeter in metres.

What is the side of the square?

Prize Puzzle

This one shouldn't be too difficult.

256 is a perfect square whose digits are in ascending sequence (2,5,6): that is, each successive digit is greater than the one preceding it.

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a) The largest perfect square with this property and;

b) The largest perfect square with the converse property: that is, whose digits are in descending sequence.

The answer to (b) might surprise you. Incidentally, leading zeros are not counted.

Answers on postcards only to — Prize Puzzle August 1984, Leisure Lines, *PCW*, 62 Oxford Street, London, W1 to arrive not later than 31 August 1984.

May Prize Puzzle

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A micro program was not really needed, but it offered a lazy way to find the answer, which was 7000 items @ 214.99 each giving 1,504,930 Australian Dollars.

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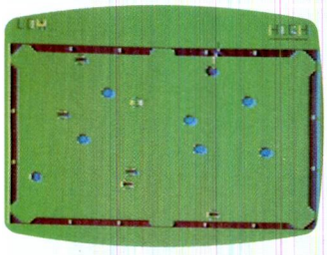

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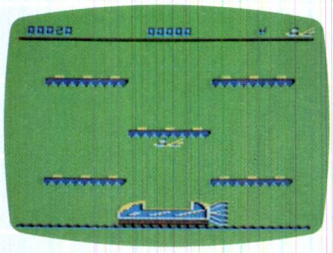

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Tatung Einstein

The Tatung Einstein may not be the most brilliant invention this century but 'it's an honest box for the money,' writes Guy Kewney. This 8-bit, disk-based home micro has business pretensions and hopes to safeguard its future with some clever design tricks.



The Tatung Einstein is the first home micro of its price range to come complete with a disk, only a disk, and no tape cassette. At £500 it isn't the cheapest diskette system on the market, but comes pretty close — and apart from the Dragon Professional (see Checkout on page 146) is the only system I know of with its diskette built into the main processor box.

An ordinary, 8-bit home micro with Basic, a disk operating system and little else to surprise the unwary, the Einstein could have been put together from standard parts by a careful component shopper: the chips are all readily available. The software was bought off the shelf, and changed — not substantially — to run on this design.

The Basic is like Commodore/Microsoft Basic, the version which is known as GW (Gee-Whizz) Basic on the IBM. The operating system is like CP/M Plus. Together, they work well and are much more closely related than most operating system/Basic combinations, both being written by the same software house.

The Einstein is similar to the Japanese/Microsoft MSX in specification. Before Dragon Data collapsed (at press time, no news was available about how likely the Dragon was to become a Phoenix) that company was expected to be the first British supplier to have an MSX design. But quite by coincidence, the Einstein is virtually MSX already, needing only the licence from designer Microsoft, and the software, to make the conversion.

Hardware

Physically, the Einstein is a big box — bigger than an Apple and in fact bigger than any home micro apart from the Advance 86 (Benchtested last month). It has a plain, typewriter keyboard, one Hitachi 3in diskette drive built in, and a firm, strong top on which a special monitor screen can be placed.

Users unable to afford a colour monitor can plug the micro into an ordinary colour or monochrome television. However, for those who have the extra £240.35 (inc VAT), Tatung will sell one of its own 14in TMO1 monitors. It matches the processor box, can be pushed back about six inches, and swivelled to suit the user's seat and gives medium to low resolution colour display. That is to say, not as good as the MicroViteC Cub, but a whole lot better than any television.

Behind the main flat box are the expansion and connection sockets. Starting from the on/off switch, you will find: the RESET button, a socket for external diskettes, the Tatung 'pipe' or expansion bus, the user input/output port, the printer plug, and the video out socket. Coming round that corner to the side of the machine you'll find a serial RS232 port for modem or printer connection, two analogue sockets and a volume control.

The 'pipe' is so like the Spectrum expansion bus that people who make Spectrum add-ons may find it very tempting to adapt them for this machine! However, this one goes further, in having the option of external control of the system built into the expansion bus. In the words of one of the designers: 'There is a line called bus request. If you make that active, the bus will "tristate" the internal processor buffers, giving you access to all the peripheral chips inside the computer.'

This feature, however, is still in its infancy: to use it, the add-on maker would have to re-write the internal operating software to make sure that the internal micro could start up again after losing control.

The only noteworthy point about the printer socket is that despite appearances, a standard BBC/Tandy cable will not work with it. You have to get a Tatung cable.

The analogue sockets, however, are pretty special, being able to accept incoming analogue signals at a frequency so high that digitising a microphone output for speech recognition is a real possibility — and one which Tatung itself is planning to tackle early next year. However, most people will probably use them for BBC-style joysticks. Since one of the designers owns a BBC Micro, you would imagine the sockets to be the same as on the BBC. I can't tell you why this is not so, when it would obviously have been a clever thing to do.

The keyboard is remarkable! The TAB key is missing, which (with a delete button) is one of two keys which nobody notices on the keyboard, until it isn't there.

In every other respect the keyboard is comprehensive with function keys, graphics characters and a reasonable action. However, it is not buffered at all: it's irritating to start typing a command, and find halfway through that the computer has interpreted PRINT ONE as PRONE, because it was trying to read the disk, or was caught up in a loop of its own internal musings, while you were typing INT.

The central chip is the 8-bit Zilog Z80. It has a full 64 kbytes of memory, plus a 'second page' with permanent read-only memory and video memory, with 16 kbytes used for the video display, and 32 for the permanent software.

Unlike most British micro builders these days, Tatung decided that there wasn't time to spend on a 'custom ULA' chip, and decided to use a standard Texas Instruments video processor. By coincidence, the one chosen is the one which is used in the MSX design. However, Tatung has improved the job, fooling the chip (by software) into believing that it has less memory for its character generation than it really has — so where the TI chip should give only 32 characters across the screen, the Einstein coaxes 40 characters out of it.



Plain, typewriter keyboard

The designers' idea is that the Einstein is a business-type system, a 'cheap CP/M disk-based computer'. They realise that a lot of CP/M software assumes that you can see 80 characters per line, not 32 or even 40.

Accordingly, I'm assured, there will be an 80-column box to plug into the 'pipe' at the back, which will feed a signal into an ordinary monochrome screen.

The sound chip is the General Instruments circuit, used on just about every standard microcomputer these days. It can produce three notes, and one noise, which are all available to the Basic programmer, and are mentioned in more detail below.

The analogue to digital conversion is handled by a new National Semiconductor chip, the ADC0844, with a 40-microsecond conversion time.

The other surprise is the double-density diskette controller chip, which became available just in time to use on this machine. It allows the designers to get 190 kbytes capacity on each side of the 3in diskette surface.

Parallel communications are handled by the full set of Zilog peripheral chips, which are very powerful, and under-used in the basic configuration of the Einstein. Expanders will use them with glee.

Software

DOS: operating system

The operating system is so similar to CP/M that it is possible to take a copy of WordStar in its standard, 8-bit CP/M form, transfer it to the Einstein and watch it run. WordStar is a program which does not drive the machine directly, but drives the CP/M operating system, and Crystal's Xtaldos has the same controls.

The need for this type of software — cheap, readily available, and thoroughly debugged — was a major reason for the selection of the 8-bit Zilog processor, instead of the 16-bit families which are getting the glamour headlines.

The 8-bit logic has meant that tried and tested software could be used. The Basic is one which has been around for a while, and the operating system is also well tested. Both are the products of Trevor Brownen's Crystal Software. Xtaldos, however, hasn't been seen on the shop shelves, because most of its users are people who design their own systems — like the Ministry of Defence, for example.

From the point of view of the operator, it seems very similar to CP/M Plus. It's rather better than CP/M, but very much the same from the programmer's point of view, and will catch any system function attempts by applications programmers who are reaching for CP/M's handles.

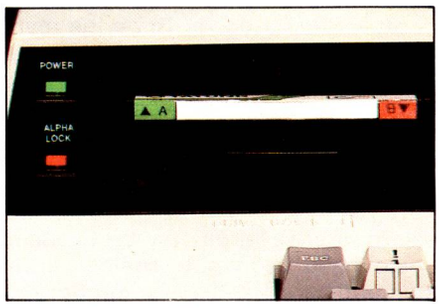
All the job control commands for loading, examining, running and renaming programs are the same or similar. For somebody who uses standard CP/M a lot, and the Einstein only occasionally, some of the changes, even where they are improvements, will seem irritating.

For example, the rename command in CP/M is extremely annoying, because it works backwards. It goes against all instinct to say REN FRED BILL, when what you want to do is to rename a file called BILL, and make it FRED. But that's the way CP/M does it, and habitual users eventually get accustomed to it. So when Xtaldos wants you to write REN BILL TO FRED, it makes more sense, but you have to stop and think for a moment.

There are other little improvements, too. Xtaldos will automatically write the operating system program onto the system tracks when a diskette is formatted, and so an Xtaldos system, when it crashes, will automatically restart, and a CP/M system might do absolutely anything.

Another point: CP/M refers to drives by letters. The first drive is A:, the second is B: and so on. An incredible amount of software is written by careless loons who never stop to wonder whether everybody has two diskettes, and whether both are working, with the result that having just one can be a serious handicap, and three can be a serious hazard.

On Xtaldos, the diskettes are referred to by system variables, and (as on the Morrow MicroDecision CP/M system) can be changed during the program.



Built-in Hitachi 3in diskette drive

The same physical drive can be switched from A: to 1: to B: to P: or whatever.

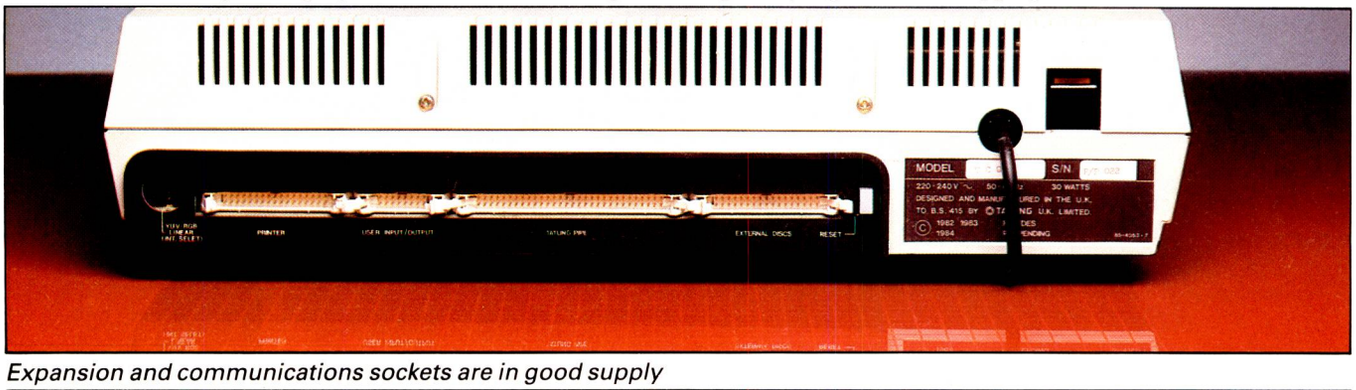
Summarising the new features of Xtaldos which will come as a surprise to CP/M users:

files can be locked;
locked files are shown on the directory with an asterisk;
the machine code monitor and debugger can be invoked from Xtaldos at any moment by the MOS command (see MOS below);
the delete command ERA will not erase locked files, and unless told otherwise, will only erase files one at a time, after checking that you really want each file to go;
the command GO will start the computer running the program currently in memory without the need for a diskette to be loaded;
the command LOAD is a native function, not a 'transient' loadable program;
the DIR command not only shows what files are on the disk, but how much space is left;
the TYPE command is replaced by DISP to examine text files on disk;
files can be protected by password;
and
disks can be backed up (safety copies can be made) with only one drive, using the utility program BACKUP. It takes only a half dozen or so swaps of diskette, too.

Machine code monitor: MOS

Any microcomputer can load a program giving direct access to the memory of the computer.

In the case of the CP/M family, that program is called DDT — a dynamic debugging tool.



Expansion and communications sockets are in good supply

On the Einstein, this is available without having to load a special tool. The machine code monitor is part of the permanent memory of the system, and it is called the MOS — machine operating system.

There is one very important consequence of this: the Einstein is the only CP/M family micro today which can be started up as if it had a 'front panel'. Purists will object that Research Machines, Sharp and Triumph Adler micros can do this; but they are machines which fundamentally do not have diskette operating systems, and fundamentally are front panel micros. The difference with the Einstein is that the MOS is a permanent or emergency utility, and the Xtaldos is standard.

So much for an argument with purists; the point is that when you melt your diskette, it is theoretically possible to retrieve the contents of the micro's memory, and even run the program there, without a diskette available.

It also gives you all the things a programmer needs — such as a hexadecimal calculator, a disk track and sector reader and writer and a tool for doing things to the input and output ports. And it's always there.

Basic

There is nothing truly astonishing about Xbas as it appears when you start using it. It is in most ways similar to, though older than, GW Basic on the IBM. It has a similar editor to that on the Commodore 64; that is with cursor keys changing the lines of program code on the screen directly. And the commands and functions are initially all familiar.

The most remarkable exceptions are not the sound and graphics, but the program control commands.

And even more important than a few exceptions to the 'standard', are the new commands which a programmer can create, and load with a program.

This means that there is no theoretical limit to the length of Crystal Basic, and 64k versions do exist. However, the Einstein isn't likely to get one of those, because there is no easy way of extending its memory beyond 64k internally, as there is on the Amstrad and will be on the Enterprise.

The music commands are very reminiscent of the BBC Micro sound commands in the way they work — which isn't all that surprising because Crystal boss Brownen was one of the contributors to the original BBC specification. However, they are simpler to use: notes being described by their musical names from A to G, and the envelope shape being defined by the VOICE command if required. The Tempo command decides the speed at which they are played. And for those who want to play out of tune, the PSG command gives direct 'peek and poke' access to the programmable sound registers of the GI chip.

Graphics is handled in a totally unsurprising way.

Limitations are similar to those of the Spectrum: high resolution only, as long as you don't push it. It is possible to draw a very fine line circle, and another overlapping it, as long as they are not in different colours. Change colours, and vast ungainly blobs of low-res colour appear on the screen. On the positive side, it is possible to get 16 colours (including black, white, transparent and grey) on the screen at the same time.

Commands

Commands which will strike the new user of Crystal Basic as strange include:

IOM

Fans of the system will swap stories about tricks they have played with this feature. Without a month of uninterrupted time to explore it, I will tell you only that it controls the input-output mode of the Basic, allowing you to set a bit to do almost anything. You can prevent echo of characters from keyboard to screen; you can switch from line edit to screen edit; you can disable the SHIFT-BREAK interrupt for a program; you can have your numbers printed with an automatic space or not; you can have (or not have) automatic line feeds with a new line; you can have tabs set to 10 spaces or to a control-I character; you can . . . oh, it's a long list. I'm sure I'll be grateful for it one day.

DEEK and **DOKE, VPEEK** and **VPOKE**, and **POKE**

Deek is simply a double Peek. Doke, however, will load a whole string of bytes with data, as will Poke — the operation starts at the location specified, but you can load a whole series of bytes after that with the same Poke, Doke or Vpoke. Vpeek and Vpoke are video memory operations, naturally.

HOLD, MERGE, RUN, CHAIN, RENUM

Renumber is an ordinary enough renumber command, but with the ability to HOLD part of one program, stuff the variables onto the stack, and run a second program *and then revive the first*, renumber can become a powerful tool. It can also be a nightmare — any careless attempt to renumber a program when another program is being HELD can lead to duplicate numbers, with *both* lines retained in the final program . . .

An excellent example of the versatility of the system control possible with these commands is supplied as a demonstration program. It is a 'menu' program, which goes into HOLD mode every time one of the subsidiary programs is invoked. But it sets the slave programs to trap the normal Break command, so that control is passed back to the demo menu.

Combine this with the ability to hold only *part* of a program, and it becomes clear that the Basic programmer can set up very sophisticated options for the user.

One program can, of course, RUN another, losing all known system variables. There may be crucial memory locations which are not system variables, of course, which will remain corrupted. If you want to retain all the variables, but eliminate the first program entirely, then you use CHAIN.

CREATE

This works in conjunction with the normal OPEN and CLOSE for disk files. File handling is not quite conventional, being organised through a string name. This is called a 'file descriptor' by Crystal, and the difference between this method and the normal one is that normal Basics need to know, before they start running, how many files you will be using. This Basic uses the dynamically changing string space. You can create a new file, right in the middle of the program, and keep creating new ones, and providing you don't have too many open at once, there will be plenty of memory available. The normal method sets aside file space, whether or not you have the file open, and there is no way of using that space for the program itself.

MAG, SHAPE, SPRITE

Sprite handling isn't vastly complicated, but the MAG command is interesting. It lets the programmer magnify a given sprite — or, for that matter, any character held in memory. So you can get an enormous letter A on the screen if you transfer the SHAPE of a character into the area used for the 32 sprites, and magnify it.

POP

This lets you get out of a subroutine, but go back to a different place from normal. It only works with nested subroutines, and it lets you break right out of the nests.

ERA, DIR, REN, DOS, MOS, LOCK and **UNLOCK**

These are all duplicates of the Xtaldos commands, with the exception of the Basic's need for quotes in front of file names. Don't try typing SYSTEM on this one to get out of Basic!

TI$

This is the same as TIME$ on Microsoft Basics. While it is nice to have it, since the thing is a string, you have to put yourself through a hoop to write a program to work out how long something took, because you can't subtract strings . . .

Benchmarks

BM1	11.7
BM2	6.05
BM3	11.42
BM4	12.55
BM5	14.03
BM6	22.46
BM7	35.17
BM8	49.99

All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.

Applications software

I only had time to test the demonstration program pack, and a strange Kuma

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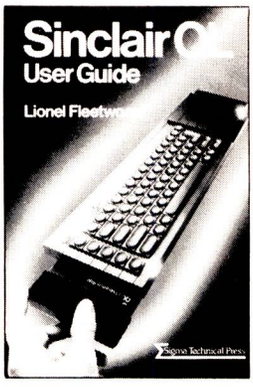

Sinclair QL: User Guide

by **Lionel Fleetwood**

Whatever your requirements, the Sinclair QL User Guide will help you to get the most out of your new purchase - or to decide if you should purchase a QL.
It shows how to produce letters, keep records, prepare accounts and draw useful graphs. Examples are drawn from real life and each section can be used independently.
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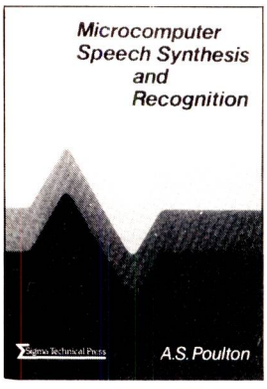

Microcomputer Speech Synthesis and Recognition

by **Adrian Poulton**

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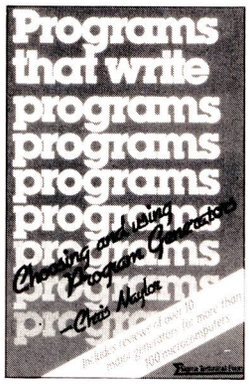
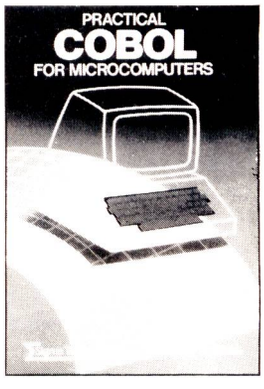


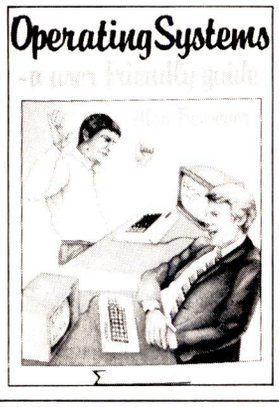
Practical COBOL for Microcomputers

by **Kevin Sullivan**

BASIC is a fine language, but most business applications use COBOL, which is now widely available for all popular microcomputers. And, it's not a difficult language to learn: Kevin Sullivan takes you from writing the simplest possible COBOL program, through the use and design of screen layout, right up to handling all types of file.

0 905104 60 9 160pp £6.95





Operating Systems: A User Friendly Guide

by **Alan Trevennor**

A 'friendly' guide that uses the widely-used Digital Equipment Corporation's operating systems for its examples and spans the range of large minicomputers, all the way down to the new micros.
After describing the major components of all operating systems, the author describes how files are handled, error handling, hardware features and optimisation of hardware and operating systems.

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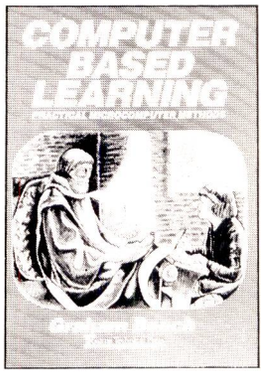

Computer Based Learning: Practical Microcomputer Methods

by **Graham Beech**

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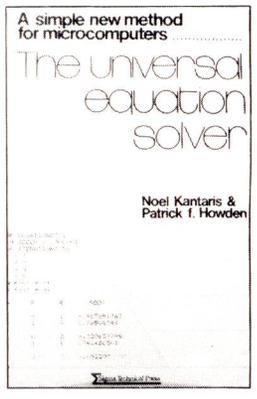

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word management program called WDPRO. I'm assured that all CP/M programs run: I have the mental reservation about this which is inevitable on a machine which only has 40 columns on the display.

However, Digital Research has given Tatung its Logo licence, and DR Logo will be available, included in the price. As of today's date, I'm assured that there will be *no* manuals for this. You want manuals, you pay extra.

The plan is to offer some kind of word processor, but not WDPRO, which is not well suited to this sort of machine. That is not much more than a rumour at press time, but there it is.

Documentation

On the positive side, the type of information made available about the system and the Basic is very valuable to the programmer, and unusually full. Crystal has a policy of concentrating its effort on the manuals, thus making it very difficult to copy programs effectively.

However, it isn't clear that the quality of the documentation will match the quality of the software. Even making allowances for improvements I wasn't impressed by the manuals.

I am assured that there will be indexes. I am told that information currently missing will be included, and that information currently incorrect will be corrected. But even so, there have been several points on which I was assured that: 'We'll publish that information in a user magazine,' or that: 'When a few users have got their machines, we'll know the answer to that, and we'll publish it.'

And frankly, I found the manuals heavy going. Where the information matched what I already knew, I could see what the writer was getting at. Other times, I was less certain, and occasionally, baffled. There are much worse, true, but it would be possible to be better without busting the budget. And for the beginner, I think better is needed.

Prices

Basic price of the Einstein is £499, including diskette.

The Tatung colour monitor will cost £240. A matrix printer, vaguely similar to the Epson, will be available for £229. Diskettes cost around £4.50 at press time, but are expected to be available for £2 from Tatung, if deals go ahead as arranged. An additional diskette (supplied in a DIY kit form, but very simple) will be £149 for the second internal slot. Any external diskette will cost more, at £190.

Conclusion

As a business micro, the Tatung has the glaring omission of 80-column display. As a home micro, £500 is asking quite a lot. Tatung will have to work hard on its advertising to make the point about the disk, and how cheap it is.

When it has the essential peripherals and software to link up to Prestel or Telecom Gold, or both, and when there are enough machines out there — and enough software to make it interesting — it will be an honest box for the money.

The idea that it can be turned into an MSX machine is only attractive if you believe that MSX is going to be a major force. I don't. It is hardly sweeping Japan by storm, and America doesn't seem to care a bit.

But if there is little to rave about, there is little to grumble about, either. The only substantial questions still to be answered are caused by the fact that when it was Benchtested, it was still not in its final form. Several of the niggles that arose during trials were factors which, said the designers: 'are being put right at this moment.'

In perspective

Nobody could seriously describe this machine as 'exciting', in the way that the BBC Micro was when it was first announced, or the way that the Sinclair QL appeared to be — or even the way the Enterprise (Elan) might have been.

However, the home micro market has been in the doldrums for so long that this very plain, workman-like design must be taken seriously.

At £500 for an 8-bit system including one diskette drive, the Einstein is priced very similarly to a Commodore 64, a bit cheaper than a BBC, and a bit pricier than the new Amstrad.

The main point of comparison where the Einstein scores over the Commodore is the disk; the Commodore drive is unbelievably slow, very unfriendly, not specially cheap, bulky and clumsy.

In terms of sounds, graphics, sprites, display quality and memory space, the 64 and the Einstein are close enough for detailed comparisons to be more a question of bickering.

The BBC Micro still has the edge in display sophistication over both, and so does the Amstrad — both are capable of 80-column displays without modification, where the Commodore and Einstein can only go to 40 columns.

In terms of disks, the Einstein and Amstrad have it clearly ahead of Commodore and BBC, where the disk operating systems have their virtues but are fundamentally restricted and restricting. There are plans to make the BBC disk filing system better, but those are just plans; in the meanwhile, the Amstrad's CP/M and CP/M equivalent Xtaldos are significantly more powerful, especially for anybody planning serious 'business-type' software.

Obviously the Amstrad's £400 system including monochrome monitor, diskette and operating software has the edge over the Einstein, which would cost around £700 or more to reach the same specification.

It would need an add-on board (not yet available, or priced) to give it 80-column display, plus the monochrome monitor, (also not available, or priced, but presumably a standard £80 screen will work) to match.

However, for people who feel they must have a two-drive system, it will be apparent that both the Einstein's drives are neatly packaged in the same box with the same power supply, whereas the Amstrad has just the one add-on drive floating on the end of a cable, and no clear plans to produce a two-drive system (yet). And the planned price of the Tatung extra drive(s) is attractive.

And Commodore, Atmos, Amstrad and BBC still have the advantage of very low-cost tape cassette software which can be 'borrowed' — not a trivial consideration to the average teenage user.

In my opinion the success or the failure of the Tatung Einstein will hinge on two things: how many dealers will stock it, and how much software will be written for it. And given that programmers will find it easy to write for, and that Tatung has good contacts (through its TV business) with the retail side of the market, I expect Einstein machines to make the top ten, and possibly even the top five, of British micros, by Christmas. END

Technical specifications

Processor:	8Z80-A, 4MHz clock speed
Memory:	64k RAM, 16k display RAM. 8k ROM expandable to 32k
Display:	24 line x 32 or 40 text, 16 colour graphics, 256 x 192 pixels, 32 sprites, UHF output
Storage:	400k integral 3in compact disk drive (500k unformatted)
Keyboard:	71 keys including eight function keys
Size:	Height 4.6in; width 17.4in; depth 21in
Weight:	13.2lbs
Comms:	Analogue/digital convertor (joysticks, etc), RS232C port, 8-bit user port, Centronics Parallel port, external drive connector, Tatung 'pipe'
Bundled Software:	Xtaldos
Options:	Second integral 3in floppy drive, 24 × 80 column display

BIBLIOFILE



Despite being upstaged by its kid brother, Atmos, the Oric-1 still has plenty of takers—and there's a good selection of reading material for beginners. Linnet Evans sifts out the good, the bad and the ugly.

Getting Started On Your Oric

Authors: Tim Hartnell & Peter Shaw
Publisher: Futura Publications
Price: £2.95

While Tim Hartnell needs no introduction, I'm also happy to add that neither in a sense does his present book. His companion-at-arms now is sixteen-year-old Peter Shaw, a young veteran already with credits in *Interface* magazine, *ZX Computing* and the like.

The result is a fresh and zesty approach to the harrowed and harrowing matter of *Getting Started*.

Taking a strictly empirical line (hands-on to you), the pair coax the far-from-lonesome reader through the basics, the true bottom lines. Surprisingly, behind the high jinks the introduction is handled in a highly orderly fashion. One telling example is the Shaw and Hartnell workout on the RND(1) randomiser theme as a prelude to doing wicked things with dice. The clarity of even this modest little escapade in contrast to Mr Cole's — indeed, many other writers' — treatments shows just how much Joe Punter is often prepared to stomach.

Unusually, the Hartnell *Getting Started* avoids becoming engrossed in machine code and memory mapping; instead it's prepared to treat Basic for what it is, an English-like language for getting the beast to work. The reader is asked to hustle for him/herself, but rewards are many and manifold.

There are, incidentally, a goodly measure of code illustrations including some excellent full programs — the loopy Galactic Grocer being one — which are, as so often, contributed by third party authors.

Getting Started On Your Oric is not, and doesn't pretend to be, exhaustive. Tacky, non-essential subjects like ROMs and I/O are kept out — rightly so. It's a low-budget production for a low-budget machine with an option on some high resolutions at the end. Whatever else, it should be a lot of fun. Recommended.

Getting Started On The Oric-1

Author: DGJ Cole
Publisher: Ellis Horwood Ltd
Price: £6.95

Let's preface this review (and others) with a CLS on the 'Oric-1' of the title. After all, quite a few thousand Orics have been shifted, and despite the traumas of the old ROM, the senile keyboard et al, the machine still remains a real gunner in the sub-£100 shootout. Practical differences between Oric and Atmos there are indeed, but practical similarities too.

Publishers Ellis Horwood have a track history of really quite eminent serious/business computer books. It's slightly poignant, therefore, to find hiding between the covers of this *Getting Started* not just an occasionally fogged piece of writing but the kind of production gaffes that an experienced editor should have wrinkled out in a few hours with the blue pencil.

Coverage overall is — and no criticism here — very much the usual stuff with prominence to maths, sound and graphics. A really annoying amount of white space is left, so the amount of text and illustration is around two-thirds of what you might expect from the size and thickness of the volume.

What's more, for a book apparently intended for beginners, more than the odd seeds of discontent might be sown. For example, an early chapter quite reasonably introduces cassette usage. The innocent reader will thereby feel perfectly enfranchised to try out a stash

of 10-year-old EMI Soundhog tape on the enterprise with ne'er a tweak of the volume control. Yes, the maverick nature of the average comms link is well enough known to most of us — but not necessarily a novice working in isolation. Where the book isn't prepared to refer the reader back to the user manual or other documentation, perhaps a boiler-plate chapter wouldn't be out of court?

Having steered through that one, we then meet with CSAVE and, quite logically, the associated parameters to save a block from memory. Surely at this stage the most helpful course of action is to leave the matter there, and refer onwards where needed to a separate, calm discussion of correct addressing. Instead our hapless reader is shoved without apology through a hardware hypermarket.

David Cole was, I'm sure, well-intentioned in his approach, and some of these reactions are admittedly on the over-sensitive side. But we just shouldn't be getting into this rut at this stage.

The Companion To The Oric 1

Author: Ian Adamson
Publisher: Pan/Personal Computer News Library
Price: £5.95

Companion: 'One who accompanies another; associate; sharer.' Even in the intimate one-to-one of the microworld, that's quite a deal to live up to.

The Companion To The Oric 1 is a fairly substantial and certainly well-stocked book which, even measured merely in terms of fax 'n pix, has to represent neat value for money. Its introductory index doesn't give much away with a modest list of woolly catch-phrase chapter headings like 'Building with Basic' and 'Down Memory Lane'. That belies, though, a very thorough, caring and highly ordered text which is readable throughout — even if necessary in the absence of an Oric to work on.

Saving and reading back from cassette, for example, here gets real-time, real-world coverage. If EMI Soundhog isn't mentioned by name, it only shows that the author is more cautious than the reviewer.

Importantly, differences between the old and new ROMs are duly noted as they arise.

The Companion also fits an alternate role as a reference book, with an extended chapter dealing word by buzzword with Oric Basic commands. There are no prizes for guessing what an improvement this is on the standard Microsoft offering: the rewards are elsewhere.

A chapter on machine code doesn't pretend to be authoritative, but again is an eminently clear backdrop to the hows and whys of 6502 opcodes pending fuller investigation. A quick note is also provided on I/O interfacing. The book closes with more than the usual token set of tables of ASCII/hex/binary codes, escape commands and the like.

In short, Ian Adamson has produced a guidebook to the Oric which is difficult to fault. With a little further tuning, it's a model of what a home computer owner's manual could/should look like. Not only a *Companion*, but also an example to us all!

Exploring Adventures On The Oric 48k

Author: Peter Gerrard
Publisher: Duckworth
Price: £6.95

Computer games are transient, OK? That is, The Trade being what it is, it's naturally anxious to keep up sales and turnover by bringing new software into the world. So, in due course, the older games go out-of-catalogue: one man's semi-fruitless search for the lost logical roots of Atari's by then bygone Breakout was recorded in *Pilgrim in the Microworld*, reviewed last month.

There are parallels here with the pop music business. Even in the year of the Thompson Twins and Culture Club, the Sunday supplements can still run features on the Stones, while we joyously await the next rerun of *American Graffiti* on the box. Out of catalogue maybe, but rarely out of style.

And there can't be a better example in our own arena than the game of Adventure. The original — supposing anyway that even this isn't just a latter-day media myth — was coded in Fortran for a DEC-10. Messrs Woods and Crowther's fantasy run-round was probably sampled by not many more than ever saw Mick and Keith play the Crawdaddy Club.

Peter Gerrard pays brief but critical tribute to these and other pioneers of the Zork/World's Edge/Treasure Island genre.

Such a briefing isn't a mere matter of names and locations, but also covers the very important hallmark of style:
FEED BIRD
THE BIRD IS NOT HUNGRY, HE IS MERELY PINING FOR THE FJORDS!

This leads naturally to the questions of both solving other people's Adventures, and of creating your own using some of the time-honoured tools of the trade. From the simplest INPUT A$, the middle chapters of *Exploring Adventures* offer a very credible introduction to Basic syntax with an unusually golden carrot at the end.

So, although there are in fact a trio of full Adventure programs tucked away at the end, this is in no way a listings book. The cornucopia of information and ideas, tricks and trips for working adventure holidays is plainly just too great. No, it's a valuable confirmation, however transient a particular boxed and branded game may be for The Trade, for all of us individually, the tradition lives on.

A cassette is also available at £7.95. Lastly, owners of the VIC-20, BBC, Electron and doubtless others in future may like to know that Duckworth has parallel editions for these machines, too.

Getting More From Your Oric

Author: HE Hicks
Publisher: Sigma Technical Press
Price: £6.95

Just before *Getting More* went to press, someone saw an Atmos commercial on Channel 4. 'Strewth', they said over at Sigma Press, 'better git hit on da jacket!' This is, of course, no more than a precautionary note: while the word Atmos is delicately flashed across the corner of the megabronze cover of Henry Hicks' opus, there's not a word within of the big 'A' as such. But as we shall see, it's not quite that kind of book.

Getting More opens, as ever, with a brace of Getting Started chapters, after which it falls in effect into two sections. The first carries a pot-pourri (or, if you've got a hangover, pig's breakfast) of post-Basic topics ranging from binary arithmetic and the workings of the interpreter, to screen handling and comms. The second is a treatise on 6502 assembler programming, with a dictionary of mnemonics. Appending this are some handy routines: scrolling, for example; 'Twinkle Twinkle Little Star' in three-part harmony (untested, I confess!) and again a better-than-average batch of appendices.

Despite the lack of in-text Atmos, differences between possible Oric ROMs are again identified as they crop up. A full table of comparisons might have been useful in this context.

Harry Hicks is a bread-boarder, a hardware head. Once you appreciate this, then the obvious difficulties for him with coping with a raw readership, the sometimes rather awkward writing style both fall into a new place, as does what at first seems a cavalier arrangement of subject matter. Crossing this psychological barrier, he's a writer in love with his subject with the capacity to put it through its paces realistically and enthusiastically.

Taken at that level, *Getting More From Your Oric* is a natural complement to a good Basic/basic introduction such as Ian Adamson's, reviewed alongside. The decision to try to be an all-things-to-all-comers, taking space and energy for the novices' chapters was, I feel, a mistake. This apart, it's a very good handbook. END



Apple IIc

Capable of running the vast store of Apple II software, the IIc adds another dimension to the Apple II range with its 'portable' tag. But the high price could be prohibitive. Peter Bright gives his verdict.



Photographs by Crispin Thomas

The Apple II range of micros must qualify for a medal for service above and beyond the call of duty. It was in at the start of the micro boom and it's still going strong today. Its latest incarnation is as the Apple IIc — a neat, integrated, 'portable' machine capable of running the majority of Apple II software.

Although much of this machine is new, it is fundamentally based on the Apple II. For this reason *PCW* decided not to give it a full Benchtest, but to try and bring out the new and interesting points that have been built into what is now a very old machine.

Hardware

A look at the photographs will show that the IIc is presented as an extremely compact unit — all available space has been used.

The back panel is especially crowded. From left to right we have: joystick/mouse port, RS232 modem port, TV adaptor port, monitor output, second disk drive port, RS232 printer port, power socket and the on/off switch. The back panel also houses a carrying handle which locks down to tilt the unit upwards for easy typing and to allow air to circulate over the electrics.

The right-hand side of the unit houses a half-height 5¼in Apple II standard floppy disk drive — by 'Apple standard' I mean that you are stuck with a measly 100 odd kbytes. The drive is made by Alps Electric in Japan and has been designed to draw much less power than a conventional Apple disk drive. According to Apple the new drive uses about half the power of the old one.

However, the price you pay for compactness is that the IIc's power supply is separately cased. This means that you have to find somewhere to put the power supply, so, although the main unit only has a small footprint, you have to allow more space for the PSU.

An optional feature for the IIc is an Apple mouse. This plugs into the joystick port and is exactly the same as the mouse used with the rest of the Apple range.

Inside

Apple PCBs are always nice and neat and the IIc is no exception. As with the IIe, the use of LSI chips means that the chip count is vastly reduced over the original II.

The IIc departs from its predecessors by using a 65C02 processor. At first sight this looks like a CMOS version of the old 6502 engine; however, the new chip has been upgraded by including an extra 27 instructions. Old 6502 code should still run on this chip, but code written for the IIc won't work on the older Apple IIs if you use the extra instructions.

(For those of you who want to know more about this processor, see July's feature entitled '6502 Revival' on page 174.)



The back panel is crowded and houses a dual-purpose handle

The IIc comes with 128k of RAM and 16k of ROM as standard. As with expanded IIe's, the RAM is divided into two 64k pages, each of which can be switched under software control.

Expansion slots

Two factors have played a major part in the success of the Apple II range of machines. The first is the vast range of software available for the machine. The second is the ease with which you can plug customised hardware into the expansion slots. Over the years a whole sub-industry has grown up offering everything from real-time clocks to polyphonic synthesisers which plug into an Apple II.

The IIc doesn't have *any* expansion slots. At a stroke this cuts out a large chunk of Apple II applications — those of you who use Z80 cards, Robocom graphics systems, and so on, will have to stick with your present hardware.

Apple says that third party hardware vendors are working on external interfaces which will allow Apple cards to be plugged in via one of the RS232 ports. I don't have any more details at the moment, but it doesn't seem a very satisfactory answer.

This problem is offset to some extent by the fact that the IIc comes with two RS232 ports, a disk interface and 80-column colour display as standard. With previous Apple IIs these had to be plugged into the expansion slots as extras.

Keyboard

The Apple II family has always been let down by its keyboard. The IIe keyboard was a definite improvement over the II, but it still left a lot to be desired. The keyboard on the IIc certainly looks better than previous Apple II keyboards — its 62 keys are nicely spaced even though there isn't much room to play with.

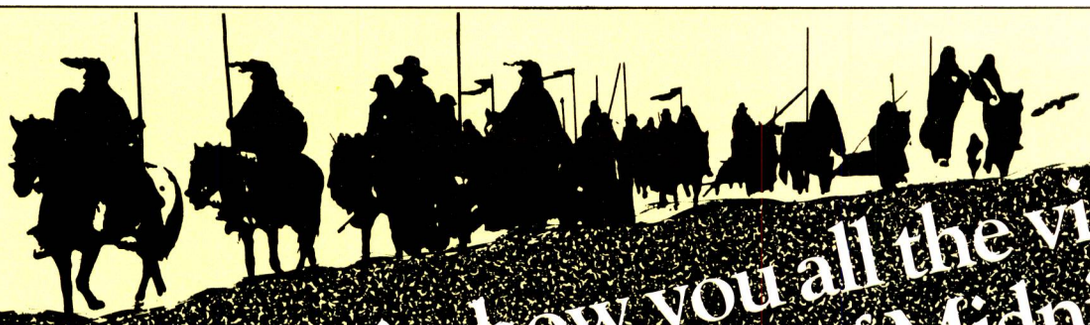
All the keys press onto a plastic membrane. I can't see any reason for doing this except to help prevent tea spillage getting into the works!

In use the keys all have a positive feel to them — you can hear a click when the key registers. As with some of the cheaper lap-held portables, the keyboard is flat rather than pitched. Some people don't mind this, but I find that it takes getting used to. In fact I didn't much like the feel of the keyboard — it takes more effort than usual to get a key to register and I don't like flat keyboards. Having said this, one of my *PCW* colleagues liked the keyboard — there's no accounting for taste!

The IIc comes with 80-column and colour graphics capabilities thrown in free. It can be used with three different displays — domestic television, monitor and LCD flat panel.

The cheapest way to use the IIc is with a domestic television. To do this you need the PAL convertor box which plugs into the back of the machine. The use of a convertor box makes it much easier for Apple to ship the machine to countries with different television standards. Instead of having to re-engineer the whole machine, a different convertor is supplied.

The IIc can be set to run in either 40 or 80-column mode by setting a switch on the top of the machine before power is



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switched on. Domestic TVs work best in 40-column mode.

The Apple monitor — which can be supplied with the IIc — is styled to match the main unit. Although it has been made as slim as possible, it's still fairly large — it also feels like it weighs three tons. I don't know why it had to be so big; ACT managed to do much better with its Apricot monitor.

Apple can also supply a nifty little tilt/swivel stand for the monitor. This wasn't supplied with the review machine, which was a pity because I had to balance the monitor on a pile of books.

Later in the year Apple says that it will be able to supply the IIc with an 80-column by 25 line liquid crystal display. This will certainly cut down on the bulk of the unit, but I suspect that the display could be quite expensive.

Software

The IIc can run both DOS 3.3 and Apple's new ProDos. Apple is pushing ProDos very hard as its first choice operating system at the moment, so it is unlikely that anyone would use DOS 3.3 unless they were upgrading from old software.

This is not the place for an in-depth look at ProDos, but at first sight it looks like a nice little system. It is certainly much faster than DOS 3.3. ProDos follows the trend by organising its files on a hierarchical basis in a tree structure. I'm still not sure how helpful this idea is on a system that can only hold around 100k on a disk. It's not as if you are going to get lost in a pile of files.

ProDos comes complete with utilities that allow you to convert files from DOS 3.3 to ProDos and back again, so software compatibility at the operating system level should not be too much of a problem. The major software compatibility problems start when you try to run software from one of the previous Apple IIs on the IIc.

When the Apple IIe was released, it was about 90 per cent compatible with the II Europlus. By the same token the IIc is about 90 per cent compatible with the IIe. The problem is that the IIc is now two generations away from the original Apple II and the further it gets away, the more software compatibility becomes a problem.

One of the problems already is that the IIc has re-defined what used to be the upper case inverse character area to contain mouse-related characters. This means that some programs written for the IIe could produce some strange characters in unexpected places.

Programs that are known to be affected include VisiCalc, Multiplan and the PFS family of programs. All three companies either offer or will offer trade-in schemes where your old disks are swapped for new versions which will run properly on the IIc. Schemes vary from company to company, but you will probably have to fork out about £25 to pay for the change over. So much for 'compatibility'.

If you buy the mouse you also get a program called 'Mousepaint' thrown in free. This looks very similar to MacPaint on the Apple Mac. Before the IIc arrived I couldn't see how Mousepaint could be implemented on the humble 8-bit 65C02. After all MacPaint runs on a very fast Motorola 68000 16/32-bit chip.

In fact Mousepaint does a creditable job of living up to its big brother. Although some of the facilities of MacPaint are missing, you can still draw some very impressive pictures. Most of the credit for this must go to Bill Budge who wrote the program. Those of you who have played the Pinball Construction Kit on the Apple II will know that Bill Budge is one of the best Apple II programmers in the business.

I'm still not sure how useful all these painting programs are. They can be very entertaining for a time, but I can't see many practical applications for them within a business other than for just keeping people amused.

Other software included with the review machine included Apple Logo, Basic, various utilities and an integrated database, spreadsheet and word processor called Appleworks. If you want to know more about Appleworks, see last month's Checkout on page 184.

Documentation

All the user documentation is produced to a very high standard. The main user manual is written in a 'Teach Yourself' manner with all the information broken down into easy-to-handle, bite-sized chunks. Good use is made of colour photographs and diagrams and, above all, the user manual has a useful index in the back.

The only point that jarred slightly was that everywhere I looked on the packaging and the manuals there was a female holding a IIc with a stupid grin on her face. Maybe I'm sceptical, but I can't believe anyone would be *that* pleased to see a IIc.

Prices

I think the machine is overpriced. The basic IIc will set you back £925, then you have to add a monitor at £140, monitor stand at £27, second disk drive at £230 and mouse at £70. This brings the price for a twin disk system to £1300. This is a very competitive sector of the business market and I don't think Apple is doing anyone a favour.

Conclusion

I have never been a great fan of the Apple II and the new IIc does nothing to change my mind. If you are an Apple II enthusiast or you are already using Apple II software, then you should look at this machine. However, if you are not already tied to the Apple II range, you could probably get a better deal elsewhere.

I'm not sure how relevant the 'portable' tag is for the IIc. I tried moving the main unit, screen, power supply, mouse and all the cables across the road and ended up dumping them all in a cardboard box and carrying that. There are better portables around.

What really worries me is the fact that the IIc hasn't got any expansion slots. I realise that many of the options on the previous machine are standard on this one, but a great many people use Z80 cards and the like. If you are one of these people, stick with what you've got.

I think that the IIc will do very well in the US where the II range is sold as a 'serious' home machine as well as a small business machine. The IIe has been doing very well recently against the IBM PC Junior in the US and I think that the IIc with its more integrated approach will do even better in the home market. At the same time it's out of its depth as a business machine in this country. END

Technical specifications

CPU	Rockwell 65C02 CMOS
RAM	128k
ROM	16k
Keyboard	62-key qwerty
I/O	Two × RS232, Joystick/Mouse, Disk, PAL Television.
Display	Television, 40/80-column monitor or 80 × 25 LCD display
Languages	Applesoft Basic, Logo, Pascal
Operating System	ProDos, DOS 3.3

Tree-like structures

This month Mike Mudge guides you through the ramifications of tree-like structures due to Collatz.

As a student, the famous numerical analyst L Collatz asked if the sequence defined by:
$a_{n+1} = a_n / 2$ when a_n is even together with $a_{n+1} = 3a_n + 1$ when a_n is odd, is tree-like apart from the root 4,2,1,.

By this he meant, starting from an arbitrary positive integer a_1 and repeatedly applying the appropriate formula chosen from the above pair, is there always a value of n, which we may denote by $c(a_1)$ such that $a_n = 1$?

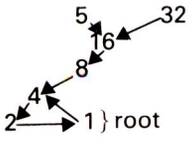
For example: if $a_1 = 10$, then $a_2 \times 5$, $a_3 = 16, a_4 = 8, a_5 = 4, a_6 = 2, a_7 = 1$. Thus we write $c(10) = 7$. It is readily verified that $c(152) = 24$ also that $c(18) = 21$.

D H & E Lehmer together with J L Selfridge have answered this in the affirmative for 0 less than a_1 less than 10^9 while as recently as 1978 Corroda Böhm and Giovanna Sontacchi extended the range of a_1 up to 7×10^{11}.

Now if $3a_n + 1$ is replaced by $3a_n - 1$ it seems likely that the possible trees have roots (1̇,2̇,.) or (5̇,14,7,20,1̇0,.) or
(1̇7,50,25,74,37,110,55,164,82,41,122, 61,182,91,272,136,68,34,.)

The generalisation of these two problems is due to D C Kay (Pi Mu *Epsilon Journal,* Vol 5, 1972, page 338) who defines a sequence thus $a_{n+1} = a_n/p$ if p is a factor of a_n else $a_{n+1} = a_n \times q + r$ and asks for what values of p,q and r the problem can be completely analysed ?

Readers are invited to reproduce the results given above, and to extend them in any natural way. Particular interest is focused upon computer generated tree-like structures which may help to reveal the underlying behaviour of these Collatz sequences — which it must be emphasised are not one-one. In general we cannot retrace the history of a sequence as the inverse is often not unique — the tree branches!



Submissions should include program listings, hardware descriptions, run time and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order). A prize of £10 will be awarded to the 'best' entry received by 1 September 1984. Please address entries to Mr MR Mudge, 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffs WV4 5NF.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided. Telephone comments, both favourable and otherwise, are welcome on (0902) 892141.

Review of Numbers Count -13- Kaprekar Numbers

In addition to numerous regular respondents both from the continent and the UK one submission introduced a new efficiency parameter; being the ratio of computer work time to programming time and estimated at 112hrs. : one evening using Knight's extended

This month's prizewinner is W J Duffin of 14 Orchard Croft, Cottingham, North Humberside, HU16 4HG using Basic on a BBC Micro 32k, OS 1.20, with a Microvitec medium resolution monitor, a Sanyo Slim 3A cassette recorder for saving programs and an MCP-40 printer/plotter or Olympia Compact 2 electronic typewriter for listing and output.

The exceptions in question A are seen to be the trivial case of all digits equal; also the case when the fourth differs by unity from the other three when the first difference is always 999.

It is hoped that the reproduction of Bill Duffin's results to questions B & C, together with his closing comments upon this problem, will encourage other readers to try their hand at 'Numbers'.

Due to lack of space, results to Question C are printed on page 209.

Type of cycle *	Value of n 2	3	4	5	6	7	8	9
C(1)		1 (954)	1 (7641)		2 (995544) (766431)		1 (98754210)	
C(2)				1 (95553)				
C(3)							1 (88763220)	
C(4)				2 (97641) (97443)				
C(5)	1 (81)							
(C7)					1 (875421)		1 (87664320)	
C(8)						1 (9775431)		
C(14)								1 (996654321)

Question B: tabulated results

For each cycle, one ordered n-digit number within the cycle is given, from which the others can be generated.

Thus the only self-generating numbers under this operation, having 9 digits or fewer, would seem to be:

495
6174
549945
631764
97508421

For example, C(3) for n=8 means that many 8-digit numbers eventually yield one of the differences 86526432, 64308654, 83208762 which regenerates.

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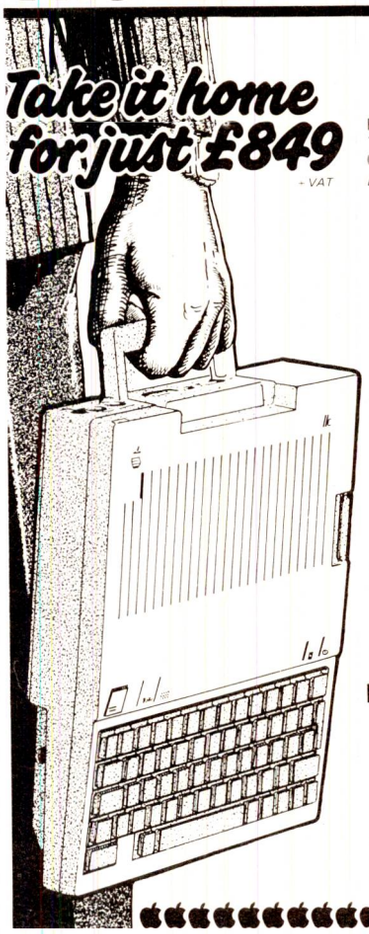

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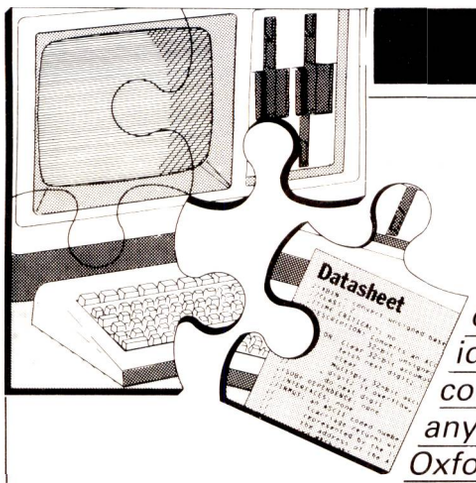

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Intelligent block moves

Martin Ford's intelligent data block transfer routine for the 6502, BLKMV (*PCW*, February), resulted in a fairly hefty response from readers. At 112 bytes, it certainly isn't the most economical 6502 solution and several shorter versions for the 6502 have been submitted, along with routines for the Z80 and 6809, to do the same job.

First (Datasheet 1), a Z80 equivalent to BLKMV from Kim Michelson, a systems analyst of Copenhagen, who extracted it from his test monitor.

IBTZ8, like BLKMV, checks for the destination of the transfer being at the same location as the source and exists immediately if it is. This is a feature not included in the 6809 and improved (shorter) 6502 versions. Though a byte-miser by nature, I think it worth a couple of extra bytes or so to account for any error conditions and eliminate as much unnecessary processing as possible.

Now an improvement to the 6502 routine (Datasheet 2). IBT65 from Alex Selby knocks 29 bytes off BLKMV. Alex also sent a similar routine at 81 bytes which transfers 'n + 1' data bytes — one more than the number input in M4 and M5. This is a problem commonly encountered in 6502 code when using index registers which can address the 'zeroth' byte as the first.

IBT65 solves the problem by incrementing the index register after transfer for the forward move and decrementing before transfer for the backward move. In each case the byte at 'base + n' is disregarded. As the index registers of the 6502 are only 8-bit, data is moved in 256-byte blocks. This requires manipulation only of the high byte of the base address.

Post-incrementing and pre-decrementing is automatic in the 6809 version, IBT68 (Datasheet 3), from Bob Kellock of Richmond. IBT68 differs from the Z80 and 6502 versions in requiring the end address of the source block to be input instead of the block byte length. If you prefer to input length rather than end address in register D then the five instructions at label DOWN should be replaced by LEAX D,X and LEAY D,Y. This

Datasheet 1

```
;= IBTZ8 - Intelligent Block Transfer for the Z80.
;/ CLASS: 2 (flags corrupted).
;/ TIME CRITICAL?:  No.
;/ DESCRIPTION: Overwrite-proof data block transfer.
;/ ACTION:  IF destination <> source THEN
;/              IF destination < source THEN
;/                 transfer from 1st byte upwards.
;/              ELSE transfer from last byte downwards.
;/          ELSE no transfer effected.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES: Source & destination RAM.
;/ INPUT:   HL = source 1st byte.
;/          DE = destination 1st byte.
;/          BC = byte length of data block.
;/ OUTPUT:  Block at destination.
;/          F BC DE HL changed.
;/ REGs USED: BC DE HL
;/ STACK USE: 0.
;/ LENGTH:  19.
;/ PROCESSOR: Z80.
;
;....IF dest = source THEN exit immediately.
IBTZ8  OR   A        ;clear carry for SBC and test     B7
       SBC  HL,DE    ;for source <, =, >, destination  ED 52
       ADD  HL,DE    ;restoring source with no flag    19
       RET  Z        ;change. Exit if same place.      C8
;
;....ELSE IF source > dest THEN move from 1st byte....
       JR   C,BACK   ;skip if dest above source.       38 03
       LDIR          ;source above dest so move from   ED B0
       RET           ;1st byte to last and exit.       C9
;
;....ELSE move from last byte.
BACK   ADD  HL,BC    ;move source pointer to last      09
       DEC  HL       ;byte in block, and               2B
       EX   DE,HL    ;also move destination pointer    EB
       ADD  HL,BC    ;to last byte in dest block by    09
       DEC  HL       ;adding byte length then dec'ing  2B
       EX   DE,HL    ;to point back to last byte.      EB
       LDDR          ;now move from last byte to 1st   ED B8
       RET           ;and exit.                        C9
```

Datasheet 2

```
;= IBT65 - Intelligent Block Transfer for the 6502.
;/ CLASS: 2 (Page Zero changed, direct memory reference).
;/ TIME CRITICAL?:  No.
;/ DESCRIPTION: Overwrite-proof data block transfer.
;/ ACTION:  IF destination < source THEN
;/              transfer from 1st byte upwards.
;/          ELSE transfer from last byte downwards.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES: Source & destination RAM.
;/ INPUT:   M0,1 = source 1st byte.
;/          M2,3 = destination 1st byte.
;/          M4,5 = byte length of data block.
;/ OUTPUT:  Block at destination.
;/          M1 and M3 corrupted.
;/ REGs USED: M0 to M5
;/ STACK USE: 4.
;/ LENGTH:  83.
;/ PROCESSOR: 6502.
;
IBT65  PHP           ;save registers                   08
       PHA           ;on stack                         48
       TXA           ;                                 8A
       PHA           ;                                 48
       TYA           ;                                 98
       PHA           ;and                              48
       CLD           ;ensure binary arithmetic.        D8
       LDX  M5       ;get byte length hi-byte          A6 ZZ
                     ;for 256-byte block count.
;
;....test relative positions of source and destination.
       SEC           ;no borrow going into             38
       LDA  M0       ;source - destination             A5 ZZ
       SBC  M2       ;comparison.                      E5 ZZ
       LDA  M1       ;                                 A5 ZZ
       SBC  M3       ;if source below dest             E5 ZZ
       BCC  RVRS     ;then move from end down.         90 18
;
;....initialise index and count for 1st to last byte move.
       LDY  £0       ;index from lowest byte.          A0 00
       INX           ;correct for DEC end check.       E8
;
;....1st to last byte move in 256-byte blocks.
FWDLP  CPY  M4       ;test possible end of             C4 ZZ
       BNE  FWDTFR   ;block, skip if not there.        D0 03
       DEX           ;else dec length hi-byte          CA
       BEQ  EXIT     ;and end if block end.            F0 2E
FWDTFR LDA  (M0),Y   ;get source byte into             B1 ZZ
       STA  (M2),Y   ;destination and move index       91 ZZ
       INY           ;to next byte, looping till       C8
       BNE  FWDLP    ;end of 256-byte index            D0 F2
       INC  M1       ;then inc base hi-bytes           E6 ZZ
       INC  M3       ;for next 256-byte block          E6 ZZ
```

```
        JMP  FWDLP     ;and repeat.                    4C YY YY
;
;....note that carry flag is clear on branch to RVRS.
;....move   base   addresses  to  last  page  of  block  and
;....initialise index and count for last to 1st byte move.
RVRS    LDY  M4        ;index from highest byte.       A4 ZZ
        TXA            ;add hi-byte of byte length     8A
        ADC  M1        ;to source and destination      65 ZZ
        STA  M1        ;base addresses so they         85 ZZ
        TXA            ;index the highest page of      8A
        CLC            ;the data blocks.               18
        ADC  M3        ;                               65 ZZ
        STA  M3        ;                               85 ZZ
        INX            ;correct for DEC end check.     E8
;
;....last to 1st byte move in 256-byte blocks.
RVRSLP TYA             ;test for end of index          98
        BEQ  HIDEC     ;256-byte block, skip if so.    F0 08
RVTFR   DEY            ;pre-dec index and move one     88
        LDA  (M0),Y    ;byte from source to            B1 ZZ
        STA  (M2),Y    ;destination and                91 ZZ
        JMP  RVRSLP    ;repeat till 1st byte done.     4C YY YY
HIDEC   DEC  M1        ;end of 256-byte block so       C6 ZZ
        DEC  M3        ;dec base address hi-bytes to   C6 ZZ
        DEX            ;index next lower block and     CA
        BNE  RVTFR     ;repeat if count not done.      D0 F1
;
;....transfer effected, restore and return.
EXIT    PLA            ;restore registers              68
        TAY            ;from stack                     A8
        PLA            ;                               68
        TAX            ;                               AA
        PLA            ;                               68
        PLP            ;                               28
        RTS            ;and exit.                      60
```

makes the routine seven bytes shorter.

At the cost of three extra bytes of stack use to accommodate the U and DP registers, Bob has achieved a two byte saving by the trick of using the RTI (Return from Interrupt) instruction for exit. This restores all registers—but only if the Entire flag (bit 7 of the Condition Codes register) is set before the CCR is pushed. Otherwise only the CCR and PC are pulled.

As it stands, IBT68 can only be used when the E flag is known to be set.

Inserting the instruction ORCC £%10000000 at the start of IBT68 to eliminate the risk of stacking errors adds back the two saved bytes.

Datasheet 3

```
;= IBT68 - Intelligent Block Transfer for the 6809.
;/ CLASS: 1.
;/ TIME CRITICAL?:  No.
;/ DESCRIPTION: Overwrite-proof data block transfer.
;/ ACTION:  IF destination < source THEN
;/                  transfer from 1st byte upwards.
;/          ELSE transfer from last byte downwards.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES: Source & destination RAM.
;/ INPUT:   X = source 1st byte.
;/          D = source top byte.
;/          Y = destination 1st byte.
;/          X = D and X = Y are valid input parameters.
;/          E (Entire) flag must be set.
;/ OUTPUT:  Block at destination.
;/          All register contents as at input.
;/ REGs USED: X D Y
;/ STACK USE: 10.
;/ LENGTH:  35.
;/ PROCESSOR: 6809.
;
;....save all registers to use byte-saving RTI
IBT68  PSHS U,Y,X,DP,D,CC ;instruction on exit.     34 7F
;
;....test relative positions of source and destination.
       CMPX 6,S       ;if source less than dest     AC 66
       BLO  DOWN      ;then move from end down.     25 09
;
;....source above dest so move from 1st byte to last.
UP     LDA  ,X+       ;get source byte, inc point,  A6 80
       STA  ,Y+       ;to dest, inc point,          A7 A0
       CMPX 1,S       ;looping till source point    AC 61
       BLS  UP        ;gone past source end byte.   23 F8
       RTI            ;then exit restore all regs.  3B
;
;....source below dest so index block tops......
DOWN   ADDD £1        ;inc source top for auto dec  C3 00 01
       TFR  D,X       ;X indexes source top + 1     1F 01
       SUBD 4,S       ;sub source start for block   A3 64
       ADDD 6,S       ;length & add to dest start   E3 66
       TFR  D,Y       ;for Y index to dest top +1.  1F 02
;
```

```
;....and move from last byte to 1st by auto-decrement.
DOWNLP LDA  ,-X       ;dec point, get source byte,  A6 82
       STA  ,-Y       ;dec point, to destination,   A7 A2
       CMPX 4,S       ;looping till source point    AC 64
       BHI  DOWNLP    ;at source 1st byte.          22 F8
       RTI            ;then exit restore all regs.  3B
```

Repetitive speed

QUKFLL (Datasheet 4) from R Easto of Reigate demonstrates that programming for speed often means ignoring some of the more powerful Z80 instructions. Filling a block of RAM with a single character is usually done by storing that character in one location and then using one of the block transfer instructions to copy it repeatedly into subsequent locations.

Every iteration of LDIR or LDDR takes 21 Time States for each byte filled against the very low 6.3 cycles per byte of the method used in QUKFLL. With the loop section extended to provide a complete screen line clear or fill, say, at 32 characters (16 PUSHes), the time per byte reduces to less than 6 Time States.

According to R Easto, QUKFLL can clear the Spectrum screen in 1/80 of a second compared to 1/25 second using LDIR.

Datasheet 4

```
;= QUKFLL- Rapid store single character to 16-byte blocks.
;/ CLASS: 2 (Not interruptible, direct memory reference,
;/           registers corrupted).
;/ TIME CRITICAL?:  No, but written for speed.
;/ DESCRIPTION: Stores a single character in an input count
;/              of 16-byte blocks of contiguous memory.
;/ ACTION:  Save Stack Pointer to temporary RAM store
;/          Load Stack Pointer with destination end address
;/          For count: Push character to 16 bytes
;/          Restore Stack Pointer and exit.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES: Destination RAM and 2 bytes temporary store.
;/ INPUT:   A = character to be stored.
;/          B = count of 16-byte blocks.
;/          HL = address of destination end + 1.
;/ OUTPUT:  Destination filled with character.
;/          H = L = A.  B = 0.
;/ REGs USED: AF B HL
;/ STACK USE: 0.
;/ LENGTH:  22.
;/ TIME STATES:  101 * block count + 59
;/               (approximately 6.3 cycles per byte).
;/ PROCESSOR:  Z80.
;
SPARE  DEFS 2          ;assign temp SP store.
;
QUKFLL LD   (SPARE),SP ;save SP in temp for use  ED 73 YY YY
       LD   SP,HL      ;indexing destination.    F9
       LD   H,A        ;move char to H & L for   67
       LD   L,A        ;2-byte pushes.           6F
;
;....loop for block count, pushing 16 chars each loop.
PUSHLP PUSH HL         ;(this section could      E5
       PUSH HL         ;be extended to provide   E5
       PUSH HL         ;a complete screen line   E5
       PUSH HL         ;push in each iteration   E5
       PUSH HL         ;making B the count of    E5
       PUSH HL         ;no. of screen lines      E5
       PUSH HL         ;to be cleared/filled     E5
       PUSH HL         ;from bottom up).         E5
       DJNZ PUSHLP     ;loop for each block.     10 F6
;
;....recover Stack Pointer from temp store.
       LD   SP,(SPARE) ;get correct stack and    ED 7B YY YY
       RET             ;exit.                    C9
```

Z80 Conditional Restart

Peter Mortimore of Plumstead, London makes an interesting point. Did you know that your Z80 has a conditional RST 38H facility? The machine code for RST 38H is FF, which has the value minus one. If you jump on zero, not zero, the carry or no carry by minus one, you will jump back to execute the FF or RST 38H. In other words:

20 FF ie. JR NZ,−1 = RST NZ,38H
28 FF ie. JR Z,−1 = RST Z,38H
30 FF ie. JR NC,−1 = RST NC,38H
38 FF ie. JR C,−1 = RST C,38H

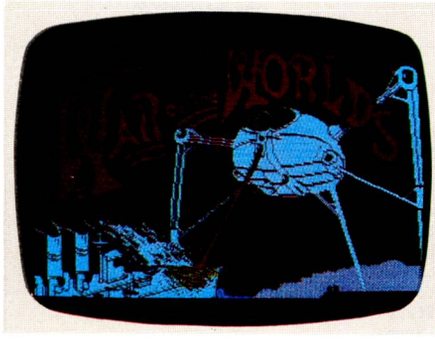
Contributors

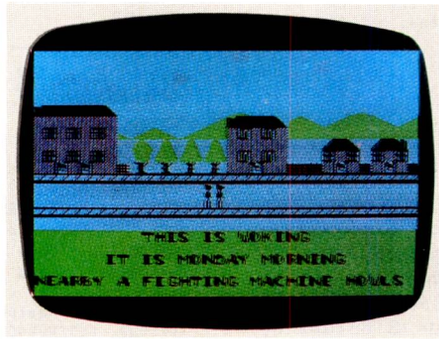
Will all readers who have had Z80 or 6502 code published in SubSet between September 1980 and February 1984 please contact me, Dave Barrow, c/o PCW.

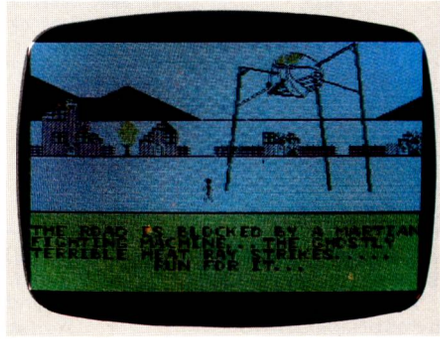
SCREENPLAY



'The chances of anything coming from Mars are a million to one . . . but still they come.' Tony Hetherington plays Richard Burton, mobilises the forces of good, has a rough time at sea and gets involved with gangsters, as he combats this month's selection of games for the Spectrum and Commodore 64.







The War of the Worlds

Computer: 48k Spectrum
Supplier: CRL
Price: £7.95

If you've ever wanted to be Richard Burton, this is the game for you. It's the video game version of the best-selling album by Jeff Wayne, and you take Mr Burton's part as the journalist.

It's definitely not a zap-em game, as your sole objective is to survive the Martian invasion. You must arrive at the Martian encampment at the right time having survived hunger, thirst, depression, panic-stricken crowds, the dreaded red weed and, of course, the Martians. They are encased in their giant fighting machines and are armed with deadly heat rays. Should you meet one, the correct response is run away — save the heroics for another game.

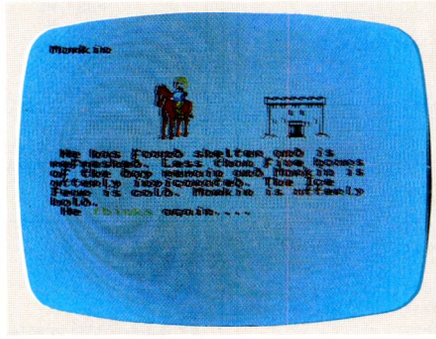
It's almost impossible to categorise this game, as it requires the mapping skills of an adventurer and the reactions of an alien zapper, topped up with a liberal helping of strategy.

If you get hopelessly stuck the records may be of some use, although they're not essential. I found a map of southern England vital since as I hail from northern climes, names like Chobham and Woking were as alien to me as the Martians.

This game can't fail to be a winner as it draws heavily from the album. It uses the same text and illustrations, and even the music is recognisable, which is quite a feat considering the Spectrum's limitations in this area.

Presentation: Good
Use of graphics: Great fighting machines
Addictive quality: Good
Value for money: The record's cheaper, but it's still worth it





Lords of Midnight

Computer: 48k Spectrum
Supplier: Beyond Software
Price: £9.95

Your job is to mobilise the forces of good in their nightmare struggle with the evil minions of the Witchking of Doomdark. You start the game controlling the four main characters of good — Luxor the Moonprince, Morkin, Corleth the Fey and Rorthron the Wise. Your first task is to send them out into the land of Midnight to recruit others to the cause, otherwise evil will win the day.

The game is played through a number of turns, or days, in which you attempt to either destroy the forces of evil on the battlefield, or send Morkin on his solo quest to destroy the Witchking's ice crown. In essence it consists of two separate games, and you can concentrate on one aspect without losing any enjoyment.

I have no doubt that the game is considerably enhanced by superb packaging. Not only do you get a keyboard overlay, but also a 32-page instruction book which includes a fantasy story to set the scene for the game. There's also a map of Midnight printed on the back of the booklet for reference during play.

The game plays very well and features some novel touches, the main one being that you can select any of your controlled characters and see, out of their eyes, the view of the area they are currently in. You can also display their thoughts and determine their state of health and mind — this is important, as a tired or nervous character may let you down at a crucial moment.

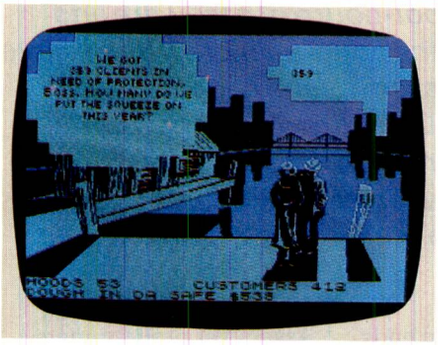
I would describe it as a computerised fantasy wargame, while Beyond calls it an epic, and I think we mean the same

thing.

To be successful, you'll need a delicate sense of strategy and a cool nerve. My best chance of success was spoilt by the untimely arrival of a bloodthirsty business computing editor who was advocating the big gang theory. I accumulated all my forces and sent them into battle — a fatal mistake.

The Lords of Midnight is apparently the first in a trilogy of epics, and I look forward to the others.

Presentation: Epic
Use of graphics: Excellent use of landscaping
Addictive quality: Good
Value for money: Superb





Mugsy

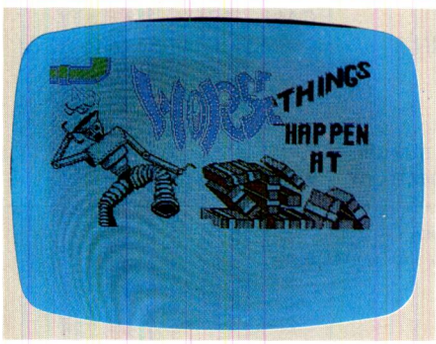
Computer: 48k Spectrum
Supplier: Melbourne House
Price: £6.95

OK, listen up. It's easy being da boss in Mugsy, yeah. All you gotta do is lean on da clients and getta da dough, but remember to keep some to kick back to da kops. If you're wise you'll give some to da boys to keep them happy, or they'll send a man from Detroit round to see ya.

That's basically all there is to Mugsy, but when you're trying to stay alive it doesn't seem that simple. It falls squarely into the 'dictator' style of games, in which you make decisions in order to postpone your demise for as long as possible, the decision-making process being punctuated by superb comic-style graphics. In addition, at the end of each year you're treated to one of two animated sequences which will have you aghast when you first see them, but they soon wear thin until all you want to do is get on with the game.

It's a test of survival as you try to steer your gang of hoods to the top. Along the way you'll face many hazards including rival gangs, greedy cops, and the man from Detroit. He's the hitman employed by your own boys to rub you out; if you meet him, the game switches to a shoot-out in a bar where you fight for your life. Success means that you survived another year.

Presentation: OK
Use of graphics: Superb
Addictive quality: Better than a concrete overcoat
Value for money: Get it or else



Worse Things Happen at Sea

Computer: 48k Spectrum
Supplier: Silversoft
Price: £5.95

It's tough being a robot. It's even tougher when you're a robot on a sinking ship, especially when it's your job to patch up the holes in the hull and pump out the water. To make matters worse, your human masters don't realise that water drains your power and you have to keep going back to the recharge chamber. All they're concerned about is loss of the cargo due to water damage, so you try your best to keep the ship afloat until you reach port.

If you're successful, your reward is another trip, but this time you have to keep the ship on course too. Later, you'll also have to collect oil to keep the engine cool, but then again it's tough being a robot. The next time you hear someone say that worse things happen at sea, you'll know what they mean.

The screen display is impressive and the moving graphics are smooth enough to be believable. There's a lot of information displayed on the screen so it's advisable to keep an eye on the gauges, which feature robot power, water level, and distance from the port. A particularly important display is a diagram of the ship's compartments, showing the ones that are currently flooded.

It's a well-balanced game which is enjoyable to play, except if you happen to be a robot.

Presentation: Pre-production copy: no packaging
Use of graphics: Well-oiled
Addictive quality: You'll have that sinking feeling
Value for money: Good



Sheep in Space

Computer: Commodore 64 + joystick
Supplier: Llamasoft
Price: £7.95

Many years have passed since the Attack of the Mutant Camels, and the humans have settled in strange modules which orbit Sothis B (strange due to earth-like surfaces on the floor and ceiling).

They have settled into a life of rearing sheep, only to cut the poor things into little pieces before eating them. Fortunately, this peaceful existence is short-lived, otherwise it would be a very boring game. The Zzyaxians are attacking the modules with droids, with the intention of blowing them apart.

The erstwhile camels have taken the hump and spend the game standing around on the planet, so the humans turn to ovine intervention: they genetically mutate some of the sheep that they haven't cut up and send them into battle. Your job is to control these space sheepoids and once again defend the human race from a myriad collection of monsters.

All this fighting makes the sheep hungry, so you should watch the 'stomach status' and be prepared to land should you get too peckish.

Sheep in Space is written by Jeff Minter and carries all his trademarks, which are excellent use of sprite graphics, superb sound (this time pinched from Bach or should it be Baa-ch), and a doubt in my mind whether its appeal will last. However, it should provide enough enjoyment in its first few playings to make this unimportant. I felt that I should warn you as I didn't want to pull the wool over your eyes.

Presentation: Good
Use of graphics: Minter magic
Addictive quality: Not for the sheepish
Value for money: Ewe'll love it



T.J.'s Workshop

Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to TJ's Workshop, PCW, 62 Oxford Street, London W1. Please keep your contributions concise. We will pay £5-£30 for any tips we publish. PCW can accept no responsibility for damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

Commodore 64 paging

BBC Micro (and Electron) users are probably well aware of the use of the 'PAGE' command to allow more than one program to be stored in memory at one time. This very useful facility can be easily implemented on the Commodore 64.

The Commodore 64 has a system variable which stores the start of a Basic program. This is located at addresses 43 (low byte) and 44 (high byte).

Separate programs can be stored in different places in memory, simply by altering these memory locations to the relevant addresses. Basic programs on the 64 are normally stored at address 2049 (location 44 set at 8 and location 43 set at 1). To store another program at another location in memory, set location 43 to 0 and 44 to the high byte of the address you wish your program to start at (high byte is the address divided by 256). Before entering the program type NEW, and the memory area you have chosen will be set up.

To retrieve the old program set at another memory location, set locations 44 and 43 to the address where the program is stored. For example, enter: enter:

10 PRINT "PROGRAM 1"

and type POKE 44,100:POKE 43,0:NEW.

Now enter;

10 PRINT "PROGRAM 2".

Program 1 can be retrieved by:

POKE 44,8:POKE 43,1

(normal program area)

and program 2 by:

POKE 44,100:POKE 43,0

(new program area).

CJ Hinton

Expanding Sinclair Basic

Spectrum owners who have bought the ZX Interface 1 for their machines are probably aware that as well as providing Microdrive, RS232 and network interfaces, it also allows the user to expand Sinclair Basic by writing new commands which are called by a user-defined keyword, rather than by the cumbersome PRINT USR function.

The following machine code program, which provides a command that lists all the variables being used by a Basic program, exploits this feature.

The command is called by typing *VLIST, which will list the variables on the screen, or by typing *VLIST#n, which will list the variables to output device n. The variables are listed in the order they appear in memory, the contents of simple strings and simple variables being printed out with their names.

The program was compiled on Sinclair's Zeus assembler. The resulting machine code is 540 bytes long and is position-dependent, but the following loader program will write the machine code to any given address.

The loader is used as follows. When asked for an ORIGIN, enter the address that the machine code is to be copied to. The loader will then alter the machine code to run at the ORIGIN address that was specified.

When the program ends, save the machine code as indicated.

To use the program, first make sure that one of the new ROM commands has been used, for example, CLOSE#0. Next, POKE the new system variable VECTOR (addresses 23735 to 23736) with the ORIGIN of the machine code.

Example

POKE 23735,ORIGIN-256*INT (ORIGIN/256)

POKE 23736,INT (ORIGIN/256)

The program as it stands will only run on a Spectrum with an Interface 1 fitted. Assembler programmers should be able to convert the program to run on an unexpanded Spectrum as follows:

Ignore lines 0 to 710.

Change all the 'restarts' followed by 'defined bytes' to calls.

Example

RST#10

DEFW#2DE3

is changed to

CALL #2DE3.

Change JP #05C1s to RETs.

Andrew Pagin

```
 10 REM MACHINE CODE LOADER

 15 INPUT "ORIGIN ADDRESS ";AD: LET ORIGIN=AD
 20 RESTORE 1100
 50 FOR N=AD TO AD+540
 60 READ V
 70 POKE N,V
 80 NEXT N
 90 RESTORE 1000
100 FOR N=AD TO AD+13
110 READ A
120 LET A=A+AD
130 READ V
140 LET V=V+AD
150 POKE A,V-256*INT (V/256)
160 POKE (A+1),INT (V/256)
170 NEXT N
180 PRINT "SAVE CODE ";ORIGIN;",";540
190 GO TO 10000
1000 DATA   127,203,135,240,143,277,151,434,159,366,167,319,177,193,217,532,230,
515,307,532,455,532,468,515,482,515,496,515

1100 DATA 254,92,194,240,1,215,32,0,246,32,254,118,32,244,215,32,0,246,32,254,10
0,32,235,215,32,0,246,32,254,105,32,226,215,32,0,246,32,254,115,32,217,215,32,0,
246,32,254,116,32,208,

1110 DATA 215,32,0,254,13,40,28,215,24,0,254,58,40,21,215,24,0,254,35,32,187,215
,32,0,215,130,28,205,183,5,215,213,45,24,5,205,183,5,62,2,215,1,22,237,75,75,92,
237,67,176,

1120 DATA 92,237,75,176,92,237,91,89,92,27,120,186,32,5,121,187,202,193,5,10,230
,224,87,122,254,96,204,251,117,40,226,122,254,160,204,32,118,40,218,122,254,128,
204,69,118,40,210,122,254,224,

1130 DATA 204,226,118,40,202,122,254,64,204,158,118,40,194,122,254,192,204,111,1
10,40,186,62,13,215,16,0,17,241,117,1,10,0,215,60,32,62,13,215,16,0,195,193,5,68
,65,84,65,32,69,82,

1140 DATA 82,79,82,62,13,215,16,0,237,75,176,92,10,215,16,0,17,68,119,1,3,0,215,
60,32,42,176,92,35,205,51,119,215,227,45,62,0,254,0,201,62,13,215,16,0,237,75,17
6,92,10,

1150 DATA 214,64,215,16,0,3,10,203,127,32,5,215,16,0,24,245,203,191,215,16,0,237
,67,176,92,24,195,62,13,215,16,0,237,75,176,92,10,214,32,215,16,0,62,40,215,16,0
,62,41,215,

1160 DATA 16,0,42,176,92,35,78,35,70,35,9,34,176,92,62,0,254,0,201,62,13,215,16,
0,237,75,176,92,10,214,96,215,16,0,62,36,215,16,0,62,40,215,16,0,62,41,215,16,0,
42,

1170 DATA 176,92,35,78,35,70,35,9,34,176,92,62,0,254,0,201,62,13,215,16,0,237,75
,176,92,10,198,32,215,16,0,62,36,215,16,0,17,68,119,1,4,0,215,60,32,237,91,176,9
2,19,

1180 DATA 19,19,42,176,92,35,78,35,70,215,60,32,62,34,215,16,0,42,176,92,35,78,3
5,70,35,9,34,176,92,62,0,254,0,201,62,13,215,16,0,62,235,215,16,0,237,75,176,92,
10,214,

1190 DATA 128,215,16,0,17,68,119,1,3,0,215,60,32,42,176,92,35,205,51,119,215,227
,45,62,204,215,16,0,42,176,92,205,51,119,215,227,45,62,205,215,16,0,42,176,92,20
5,51,119,215,227,

1200 DATA 45,42,176,92,35,35,35,34,176,92,62,0,254,0,201,126,35,94,35,86,35,78,3
5,70,35,34,176,92,215,178,42,201,32,61,32,34,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

00010 ;          VLIST
00020 ;          *****
00030 ;
00040 ; (C) 1985 - ANDREW PAGIN
00050 ;
00060 ORG 30000
00070 ENT
00080 ;

00090 ;check line syntax
00100 ;(should be %vlist or)
00110 ;(%vlist0n          )
00120 ;
00130 CP 05C;is first character
00140       ;an "%" ? If not
00150       ;then run new rom
00160       ;error routine.
```

```
00170 ERR JP NZ,001F0
00180     RST #10   ;Get next
00190     DEFW #28  ;& make
00200     OR #20    ;lower case
00210     CP "v     ;Is it "v"?
00220     JR NZ,ERR ;no.
00230     RST #10   ;If yes 9et
00240     DEFW #28  ;next,make
00250     OR #28    ;lower case
00260     CP "l     ;Is it "l"?
00270     JR NZ,ERR ;No.
00280     RST #10   ;If yes 9et
00290     DEFW #28  ;next,make
00300     OR #28    ;lower case
00310     CP "i     ;Is it "i"?
00320     JR NZ,ERR ;No.
00330     RST #10   ;If yes 9et
00340     DEFW #28  ;next,make
00350     OR #28    ;lower case
00360     CP "s     ;Is it "s"?
00370     JR NZ,ERR ;No.
00380     RST #10   ;If yes 9et
00390     DEFW #28  ;next,make
00400     OR #28    ;lower case
00410     CP "t     ;Is it "t"?
00420     JR NZ,ERR ;No.
00430     RST #10   ;If yes 9et
00440     DEFW #28  ;next.Is it
00450     CP 13     ;chr$(13) ?
00460     JR Z,ckd  ;If yes
00470     RST #10   ;9oto ckd
00480     DEFW #0018;
00490     CP ":     ;Is it ":"?
00500     JR Z,ckd  ;If yes
00510     RST #10   ;9oto ckd
00520     DEFW #0018;
00530     CP "0     ;Is it "0"?
00540     JR NZ,ERR ;No,error.
00550     RST #10   ;If yes,9et
00560     DEFW #0028;next,
00570     RST #18   ;evaluate
00580     DEFW #1C82;as number.
00590     CALL #0567;End of
00600               ;statement?
00610 ;
00620 ;The rest of the Program
00630 ;is only used during run
00640 ;time.
00650 ;
00660     RST #10   ;Get number
00670     DEFW #2DD5;after "@",
00680     JR oPn    ;9oto oPn.
00690 ckd CALL #05B7;End of
00700               ;statement?
00710 ;
00720 ;VLIST ROUTINE PROPER
00730 ;********************
00740 ;
00750 wsP EQU 23728
00760 ;
00770 ;Set I/O device to be
00780 ;used (usually device 2.)
00790 ;(the screen,but can be )
00800 ;(set to any device     )
00810 ;(using *vlist#        )
00820 ;
00830     LD A,2
00840 oPn RST #10
00850     DEFW #1601
00860 ;
00870 ;Store sys.variable VARS
00880 ;at adddress (wsP)
00890     LD BC,(23627)
00900     LD (wsP),BC
00910 ;
00920 ;Check to see if every
00930 ;byte of variables area
00940 ;of memory has been used
00950 ;by *vlist yet.
00960 ;
00970 vlt LD BC,(wsP)  ;Does
00980     LD DE,(23641);Peek
00990     DEC DE       ;wsP
01000     LD A,B:CP D  ;equal
01010     JR NZ,var    ;Peek
01020     LD A,C:CP E  ;23641-1
01030     JP Z,#05C1   ;If yes
01040                  ;end.
01050 var LD A,(BC);Get next
01060               ;chr. from
01070               ;variables
01080               ;area of
01090               ;memory.
01100     AND 224   ;Reset bits
01110               ;0 TO 4.
01120 ;
01130 ;Read 1st letter of
01140 ;variable's name to find
01150 ;out which type of
01160 ;variable it is,and CALL
01170 ;the relevant routine.
01180 ; See chaPter 24 of
01190 ;Spectrum Basic manual.
01200 ;
01210     LD D,A   ;Is character
01220     LD A,D   ;chr$(96) ?
01230     CP 96    ;If yes then
01240     CALL Z,olv;9osub olv;
01250     JR Z,vlt;9oto vlt.
01260     LD A,D   ;Is it
01270     CP 160   ;chr$(160)?
01280     CALL Z,mlv;If yes
01290               ;9osub mlv;
01300     JR Z,vlt  ;9oto vlt.
01310     LD A,D   ;Is it
01320     CP 128   ;chr$(128)?
01330     CALL Z,aon;If yes
01340               ;9osub aon;
01350     JR Z,vlt  ;9oto vlt.
01360     LD A,D   ;Is it
01370     CP 224   ;chr$(224)?
01380     CALL Z,fnl;If yes
01390               ;9osub fnl
01400     JR Z,vlt  ;9oto vlt.
01410     LD A,D   ;Is it
01420     CP 64    ;chr$(64)?
01430     CALL Z,str;If yes
01440               ;9osub str;
01450     JR Z,vlt  ;9oto vlt.
01460     LD A,D   ;Is it
01470     CP 192   ;chr$(192)?
01480     CALL Z,aoc;If yes
01490               ;9osub aoc;
01500     JR Z,vlt  ;9oto vlt.
01510 ;
01520 ;If none of the above
01530 ;subroutines have been
01540 ;called,then the
01550 ;character beinG checked
01560 ;is not the name of a
01570 ;variable,and Program
01580 ;execution stoPs with a
01590 ;rePort "DATA ERROR"
01600 ;
01610     LD A,13   ;Print
01620     RST #10   ;chr$(13).
01630     DEFW #0010;(newline).
01640     LD DE,st0 ;Print
01650     LD BC,10  ;strinG
01660     RST #10   ;stored at
01670     DEFW #203C;st0.
01680     LD A,13   ;Print
01690     RST #10   ;chr$(13).
01700     DEFW #0010;
01710     JP #05C1  ;end.
01720 st0 DEFM "DATA ERROR"
01730 ;
01740 ;Routine for a variable
01750 ;with a one letter name
01760 ;
01770 olv LD A,13   ;Print
01780     RST #10   ;chr$(13).
01790     DEFW #0010;
01800     LD BC,(wsP);Get
01810               ;variable's
01820               ;name.
01830     RST #10   ;Print
01840     DEFW #0010;name.
01850 Pvl LD DE,st2 ;Print
01860     LD BC,3   ;strinG
01870     RST #10   ;stored at
01880     DEFW #203C;st2.
01890     LD HL,(wsP);Get
01900     INC HL    ;address of
01910               ;variable's
01920               ;5 byte
01930               ;value
01940     CALL stv  ;9osub stv.
01950     RST #10   ;Print
01960     DEFW #2DE3;value on
01970               ;toP of
01980               ;calculator
01990               ;stack.
02000     LD A,0    ;Set zero
02010     CP 0      ;flaG.
02020     RET       ;return.
02030 ;
02040 ;Routine for a variable
02050 ;with a multi letter name
02060 ;
02070 mlv LD A,13   ;Print
02080     RST #10   ;chr$(13).
02090     DEFW #0010;
02100     LD BC,(wsP);Get and
02110     LD A,(BC);Print first
02120     SUB 64    ;byte of
02130     RST #10   ;variable's
02140     DEFW #0010;name.
02150 cch INC BC    ;Get next
02160     LD A,(BC);letter.
02170     BIT 7,A   ;If last
02180     JR NZ,lst;letter
02190               ;9oto lst.
02200     RST #10   ;Print
02210     DEFW #0010;letter.
02220     JR cch    ;Goto cch.
02230 lst RES 7,A   ;
02240     RST #10   ;Print
02250     DEFW #0010;letter.
02260     LD (wsP),BC;Store
02270               ;address
02280               ;of last
02290               ;letter.
02300     JR Pvl    ;Goto Pvl.
02310 ;
02320 ;Routine for an array
02330 ;of numbers
02340 ;
02350 aon LD A,13   ;Print
02360     RST #10   ;chr$(13).
02370     DEFW #0010
02380     LD BC,(wsP);Get and
02390     LD A,(BC) ;Print
02400     SUB 32    ;array's
02410     RST #10   ;name.
02420     DEFW #0010
02430     LD A,"(   ;Print "("
02440     RST #10
02450     DEFW #0010
02460     LD A,")   ;Print ")"
02470     RST #10
02480     DEFW #0010
02490     LD HL,(wsP);Set BC to
02500     INC HL    ;no. of
02510     LD C,(HL) ;bytes used
02520     INC HL    ;to make
02530     LD B,(HL) ;up the
02540     INC HL    ;array.
02550               ;HL=address
02560               ;of first
02570               ;data byte
02580               ;of the
02590               ;array.
02600     ADD HL,BC ;HL=HL+BC
02610     LD (wsP),HL;Put HL in
02620               ;address
02630               ;wsP.
02640 ;
02650 ;(wsP now holds the   )
02660 ;(address of the start)
02670 ;(of the next variable)
02680 ;
02690     LD A,0    ;Set zero
02700     CP 0      ;flaG.
02710     RET       ;return.
02720 ;
02730 ;Routine for an array
02740 ;of characters
02750 ;
02760 aoc LD A,13   ;Print
02770     RST #10   ;chr$(13).
02780     DEFW #0010 ;
02790     LD BC,(wsP);Get and
02800     LD A,(BC) ;Print
02810     SUB 96    ;
02820     RST #10   ;array's
02830     DEFW #0010 ;name.
02840     LD A,"$   ;Print "$"
02850     RST #10
02860     DEFW #0010
02870     LD A,"(   ;Print "("
02880     RST #10
02890     DEFW #0010
02900     LD A,")   ;Print ")"
02910     RST #10
02920     DEFW #0010
02930     LD HL,(wsP);Same as
02940     INC HL    ;for array
02950     LD C,(HL) ;of
02960     INC HL    ;numbers.
02970     LD B,(HL) ;
02980     INC HL    ;
02990     ADD HL,BC ;
03000     LD (wsP),HL;
03010     LD A,0:CP 0;
03020     RET       ;
03030 ;
03040 ;Routine for a strinG
03050 ;variable
03060 ;
03070 str LD A,13   ;Print
03080     RST #10   ;chr$(13)
03090     DEFW #0010 ;
03100     LD BC,(wsP);Get and
03110     LD A,(BC) ;Print
03120     ADD A,32  ;strinG's
03130     RST #10   ;name.
03140     DEFW #0010
03150     LD A,"$   ;Print "$"
03160     RST #10
03170     DEFW #0010
03180     LD DE,st2 ;Print
03190     LD BC,4   ;strinG
03200     RST #10   ;stored at
03210     DEFW #203C;st2.
03220     LD DE,(wsP);Set DE to
03230     INC DE    ;address
03240     INC DE    ;of text
03250     INC DE    ;of strinG
03260     LD HL,(wsP);Set BC to
03270     INC HL    ;
03280     LD C,(HL) ;strinG.
03290     INC HL    ;
03300     LD B,(HL) ;
03310     RST #10   ;Print
03320     DEFW #203C;strinG
03330     LD A,""   ;Print""""
03340     RST #10   ;
03350     DEFW #0010 ;
03360     LD HL,(wsP);As in
03370     INC HL    ;routines
03380     LD C,(HL) ;to handle
03390     INC HL    ;arrays.
03400     LD B,(HL) ;
03410     INC HL    ;
03420     ADD HL,BC ;
03430     LD (wsP),HL;
03440     LD A,0:CP 0;
03450     RET       ;
03460 ;
03470 ;Routine for the control
03480 ;variable of a FOR - NEXT
03490 ;loop
03500 ;
03510 fnl LD A,13   ;Print
03520     RST #10   ;chr$(13).
03530     DEFW #0010 ;
03540     LD A,235  ;Print
03550     RST #10   ;chr$(235)
03560     DEFW #0010 ;(" FOR ")
03570     LD BC,(wsP);Get and
03580     LD A,(BC) ;Print
03590     SUB 128   ;name of
03600     RST #10   ;for-next
03610     DEFW #0010 ;loop.
03620     LD DE,st2 ;Print
03630     LD BC,3   ;strinG
03640     RST #10   ;stored at
03650     DEFW #203C ;st2.
03660     LD HL,(wsP);Set HL to
03670     INC HL    ;address
03680               ;of value
03690               ;of loop.
03700     CALL stv  ;9osub stv
03710     RST #10   ;Print
03720     DEFW #2DE3;value on
03730               ;toP of
03740               ;calculator
03750               ;stack.
03760     LD A,204  ;Print
03770     RST #10   ;chr$(204)
03780     DEFW #0010 ;(" TO ").
03790     LD HL,(wsP);Set HL to
03800               ;limit of
03810               ;for-next
03820               ;loop.
03830     CALL stv  ;9osub stv
03840     RST #10   ;Print
03850     DEFW #2DE3;value on
03860               ;toP of
03870               ;calculator
03880               ;stack.
03890     LD A,205  ;Print
03900     RST #10   ;chr$(205)
03910     DEFW #0010 ;(" STEP")
03920     LD HL,(wsP);Set HL to
03930               ;address
03940               ;of steP
03950               ;of loop.
03960     CALL stv  ;9osub stv
03970     RST #10   ;Print
03980     DEFW #2DE3;value on
03990               ;toP of
04000               ;calculator
04010               ;stack.
04020     LD HL,(wsP);Set wsP
04030     INC HL    ;to start
04040     INC HL    ;address
04050     INC HL    ;of next
04060     LD (wsP),HL;variable.
04070     LD A,0    ;Set zero
04080     CP 0      ;flaG.
04090     RET       ;Return.
04100 ;
04110 ;Subroutine to coPy a
04120 ;five byte floatinG Point
04130 ;number startinG at
04140 ;address (HL),on to the
04150 ;calculator stack.
04160 ;
04170 stv LD A,(HL):INC HL
04180     LD E,(HL):INC HL
04190     LD D,(HL):INC HL
04200     LD C,(HL):INC HL
04210     LD B,(HL):INC HL
04220     LD (wsP),HL
04230     RST #10
04240     DEFW #2AB2
04250     RET
04260
04270 st2 DEFM " = "
```

NewBrain quirks

The difficulty in varying a FN under program control referred to by Mr A V Thomas (TJ's Workshop, June, page 178) can usually be circumvented by multiple variables in the DEF FN statement, and in particular for the June problem thus:

```
100 INPUT("INPUT
   NUMBER UP TO 4 >> ")N
110 IF N<1 or N>4 THEN
   100
120 INPUT ("INPUT
  ANOTHER NUMBER >>")B
130 DEF FNZ(B)=B*(100+N)
140 Q=FNZ
   (B):PRINT"Q=";
   Q
150 END

INPUT NUMBER UP TO 4
   >> 4
INPUT ANOTHER NUMBER
   >> 5
Q= 520
```

which gives the expected results. This approach has the advantage of avoiding repeated 'IF . . . .THEN' statements or GOSUBs. It can be extended to incorporate one FN within another, useful where several related FN's are required.

```
530 DEF FNC(X)=A(X,1)-
   D*EXP (E*X)
540 DEF FND(X)=(FNC(X))
   ↑2
```

has worked successfully in the past, but over-enthusiastic use of either can lead to the dreaded ERROR X AT 130!

R Hall

Intercepting BBC PRINT VECTOR

One of the many attractive features of the BBC machine is its extensive use of vectoring, which allows interception, or even complete replacement, of OS routines by the user.

The three routines listed here all intercept the PRINT VECTOR at &20E(lo) and &20F(hi), before passing control on to the OS print routines. Use is made of one of the three spare vectors, at &230 and &231.

The routine DIVIDE forces a new line whenever a colon is encountered. This makes listings much clearer because multi-statement lines are broken down into one statement per line. MARGIN creates a left-hand

margin after every carriage return. Again, this improves the readability of a listing. In both routines, the margin width can be defined by the user prior to assembly by altering the variable 'margin'.

SUBSTITUTE substitutes one ASCII code (that specified in line 240) for another (specified in line 220). The crossed-zero, for example, can look messy on a beautifully laid out pie chart or histogram, especially when a screen dump is to be made (as with the GEMINI package BEEBPLOT). Replacing this with the letter 'O' tidies things up considerably. Indeed, you can define your own zero character (using VDU23) and print this instead. With a slight modification, it's possible to get the routine to suppress teletext control characters (which most printers can't cope with when they crop up in listings) and insert a space instead.

Mario Camilleri

```
10 REM MARGIN
20 :
30 REM M/C routine to create left-hand margin at every newline. 47 bytes
40 :
50 PROCASS:CALL KL%:END
60 DEFPROCASS
70 oldvectlo=&20E:oldvecthi=&20F:newvectlo=&230:newvecthi=&231:counter=&
8F:margin=5
80 DIM KL% 100
90 FORI%=0 TO 3 STEP3
100 P%=KL%
110 [OPTI%
120 LDA oldvectlo
130 STA newvectlo
140 LDA oldvecthi
150 STA newvecthi
160 LDA #(entry MOD 256)
170 STA oldvectlo
180 LDA #(entry DIV 256)
190 STA oldvecthi
200 RTS
210 .entry
220 CMP #&D
230 BNE out
240 JSR out
250 LDA #margin
260 STA counter
270 LDA #ASC" "
280 .BR
290 JSR out
300 DEC counter
310 BNE BR
320 RTS
330 .out
340 JMP (newvectlo)
350 ]
360 NEXT
370 ENDPROC
```

```
10 REM DIVIDE
20 :
30 REM M/C routine to divide multi-statement lines. 50 bytes
40 :
50 PROCASS:
    CALL KL%:
    END
60 DEFPROCASS
70 oldvectlo=&20E:
    oldvecthi=&20F:
    newvectlo=&230:
    newvecthi=&231:
    counter=&8F:
    newline=&FFE7:
    margin=7
80 DIM KL% 100
90 FORI%=0 TO 3 STEP3
100 P%=KL%
110 [OPTI%
120 LDA oldvectlo
130 STA newvectlo
140 LDA oldvecthi
150 STA newvecthi
160 LDA #(entry MOD 256)
170 STA oldvectlo
180 LDA #(entry DIV 256)
190 STA oldvecthi
200 RTS
210 .entry
220 CMP #58
230 BNE out
240 JSR out
250 JSR newline
260 LDA #margin
270 STA counter
280 LDA #ASC" "
290 .BR
300 JSR out
310 DEC counter
320 BNE BR
330 RTS
340 .out
350 JMP (newvectlo)
360 ]
370 NEXT
380 ENDPROC
```

```
10 REM SUBSTITUTE
20 :
30 REM M/C routine to substitute one character for another - in the example t
he letter 'O' is substituted for the numeric zero. 32 bytes
40 :
50 PROCASS:CALL KL%:END
60 DEFPROCASS
70 oldvectlo=&20E:oldvecthi=&20F:newvectlo=&230:newvecthi=&231
80 DIM KL% 100
90 FORI%=0 TO 3 STEP3
100 P%=KL%
110 [OPTI%
120 LDA oldvectlo
130 STA newvectlo
140 LDA oldvecthi
150 STA newvecthi
160 LDA #(entry MOD 256)
170 STA oldvectlo
180 LDA #(entry DIV 256)
190 STA oldvecthi
200 RTS
210 .entry
220 CMP #ASC"O"
230 BNE out
240 LDA #ASC"0"
250 .out
260 JMP (newvectlo)
270 ]
280 NEXT
290 ENDPROC
```

BBC fill routine

Here's an 'elegant' little fill routine. The actual routine is only seven lines long and works for any shape, no matter how convoluted, as long as you choose your seed inside the shape. Lines 10-70 simply draw a silly shape to test the fill routine. Lines 100-130 are data statements for the shape.

```
 10 REM Silly fill routine
 20 MODE4: CLEAR
 30 FOR i%=0 TO 20
 40    READ a%, b%, c%
 50    PLOT a%, b%, c%
 60    NEXT i%
 70 A=GET
 80 PROC fill (540,550)
 90 END
100 DATA 4,500,500,
          5,500,530,
          5,510,560
          5,510,580,
          5,580,580,
          5,540,540
110 DATA 5,560,540,
          5,570,560,
          5,580,560
          5,580,500,
          5,500,500
120 DATA 4,520,530,
          5,540,520,
          5,530,540
          5,520,540,
          5,520,530
130 DATA 4,530,570,
          5,560,570,
          5,540,560
          5,530,570
140:
150 DEFPROC fill (x%, y%)
160 IF POINT (x%, y%)=0
    THEN PLOT 69, x%, y%
180  IF POINT (x%+4,
    y%)=0 THEN PROC fill
    (x%+4, y%)
190 IF POINT (x%,
    y%+4)=0 THEN PROC fill
    (x%, y%+4)
200 IF POINT (x%-4,
    y%)=0 THEN PROC fill
    (x%-4, y%)
210 IF POINT (x%,
    y%-4)=0 THEN PROC fill
    (x%, y%-4)
220 ENDPROC
```

This routine is impractical for large shapes: because of the recursive nature of the fill routine the stack soon overflows.

Stelios Charalambides

BBC disk-write indicator

Some time ago I upgraded my BBC model B to disks, and I wondered recently about the purpose of the CASSETTE MOTOR indicator. It's hardly ever used, but it should be possible to make it serve some useful purpose pertaining to disks.

All disk drives have an 'IN USE' indicator, so there's no point in duplicating that. But a 'WRITE' indicator might be useful, and is not provided on any disk system that I have seen. Just follow the instructions to make a 'DISK WRITE' indicator on your BBC.

Make sure the computer is switched off, and locate the keyboard connector. Counting from the left side (PSU side), pin 13 is used for the cassette motor LED. Carefully remove the lead connected to pin 13, and strip the insulation off the end.

Then locate ICB0 (SN7438N, next to the keyboard connector) and carefully remove it. The 'WRITE ENABLE' signal from the floppy disk controller to the disk drive is driven from this IC. We need to buffer (and invert) the WE signal in order to light up the LED, so we need a SN74LS04 (hex invertor).

Cut off all pins except pins 7, 12, 13 and 14 close to the body of the IC. Bend pin 12 straight out, and solder a short lead (three-four inches) to it. Place it on top

of IC80, piggy-back fashion. Carefully solder pin 7 (ground), 14 (+5V) and pin 13 (WE) together. Plug the piggy-back assembly into the socket for IC80. Solder the loose end of the lead from pin 12 to the stripped end of the lead removed from the keyboard connector.

This should now work perfectly, and can be tested after a careful visual inspection of the modification (use a disk that you have a back-up of!) Load and save some files, and the LED should light when saving.

It is interesting to note the duty cycle when saving Wordwise files compared to VIEW files.

Morten Christiansen

VIC 20 machine code routines

Here are two short machine code routines for the Commodore VIC 20: one to move the top 11 lines of the display one character from the left-hand side of the screen towards the right-hand side; and the other to move them in the opposite direction.

The routines are particularly useful for a moving information display or games like Space Invaders, in which characters are continually moving backwards and forwards. The character at the end of the display line (which end is determined by the way the display is moving) is erased, and a space appears at the opposite end of the line.

The code is loaded by simple Basic programs and resides in a spare area of memory. The two routines are started by SYS (673) and SYS (721) respectively.

VIC display move left to right.

```
10 FOR A=673 TO 720
20 READ S
30 POKE A,S
40 NEXT A
50 DATA 169, 22, 133, 1,
   162, 0, 160, 32, 189, 0, 30,
   133, 0, 152, 157
60 DATA 0, 30, 232, 188, 0,
   30, 165, 0, 157, 0, 157, 0,
   30, 232, 228, 1, 208
70 DATA 233, 224, 242, 208,
   1, 96, 169, 22, 24, 101, 1,
   133, 1, 160, 32
80 DATA 76, 169, 2
```

VIC display move right to left

```
10 FOR B=721 TO 768
20 READ T
30 POKE B,T
40 NEXT B
50 DATA 169, 219, 133, 1,
   162, 241, 160, 32, 189, 0,
   30, 133, 0, 152, 157
60 DATA 0, 30, 202, 188, 0,
   30, 165, 0, 157, 0, 30, 202,
   228, 1, 208
70 DATA 233, 224, 255, 208,
   1, 96, 169, 234, 24, 101, 1,
   133, 1, 160, 32
80 DATA 76, 217, 2
```

Ralph Parfect

Lynx A to D convertor

In the Lynx manual, the only reference given to the A to D convertor is an entry in appendix four referring to pin 2 of the LP socket as a 'D/A I/P'. This pin is actually connected to an analogue to digital convertor within the computer.

Inside the computer, it is connected to one input of a comparator (input 1); the other input to this comparator (input 2) is connected to the output of the digital to analogue convertor. This comparator compares the two voltages at its input, and its output is a logic 1 if the voltage at input 1 is greater than that at input 2; otherwise, it's a logic 0. This output can be accessed by looking at bit 0 of port &0080. The circuit in outline is shown in Fig 1.

To determine what voltage has been applied at the A/D input, it's simply necessary to increase the voltage output from the D/A until either its maximum value is reached (63), or bit 0 of port &0080 changes from 1 to 0.

The digital to analogue convertor is connected to bits 0-5 of port &0084, and to set its output voltage, a value between 0 and 63 should be output to this port. This can be done using the OUT instruction from Basic or machine code.

The main complication in using this input is that port &0080 is used for at least three different functions that I have discovered so far:

i Reading the keyboard.
ii Reading the cassette input.
iii Reading from the A/D input.

To switch between the different inputs, it's necessary to set up different values in register 12 of the 6845 CRT controller. To set this to read from the A/D convertor, first output 12 to port &0086, and then output &0030 to port &0087. This can be done in Basic in two lines:

```
100  OUT (&0086),12
110  OUT (&0087),&0030
```

After conversion, the port should be set back to read from the keyboard by outputting zero to port &0087.

The last thing that has to be done before conversion can take place is to output a zero to port &0080, to turn off the speaker and cassette port.

To read in the value from a variable resistor, we can connect a 150k potentiometer to the port as shown in Fig 2, and the voltage produced at the slider can be read in by the program in Listing 1.

There are several methods of reading in this value which are much quicker than the method given here, but they are not as simple to understand. This routine could be speeded up several times if converted to machine code, but I have encountered problems with the settling time of the D/A convertor, and this delay seems to be quite considerable.

```
  9 REM   read one value
    from A/D
 10 proc AtoD
 20 PRINT x
 30 END
 98 REM procedure to read
in value from A/D
 99 REM returns value in x
100 DEFPROC AtoD
109 REM turn off speaker
110 OUT(&0080),0
119 REM select A/D
120 OUT(&0086),12
130 OUT (&0087),&0030
140 x=0
150 OUT(&0084),x
160 x=x+1
170 IF (x<63) AND
    (&0080)=255 THEN
    GOTO 150
180 OUT(&0087),0
190 ENDPROC
```

Listing 1

John Harvey

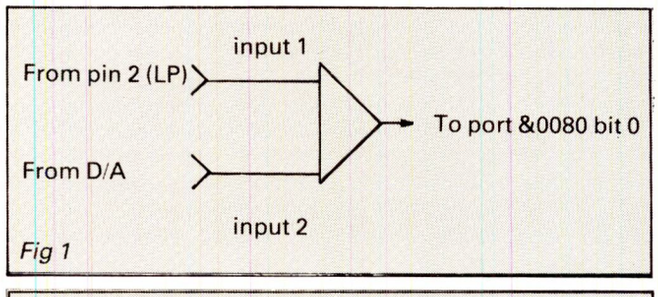


Fig 1

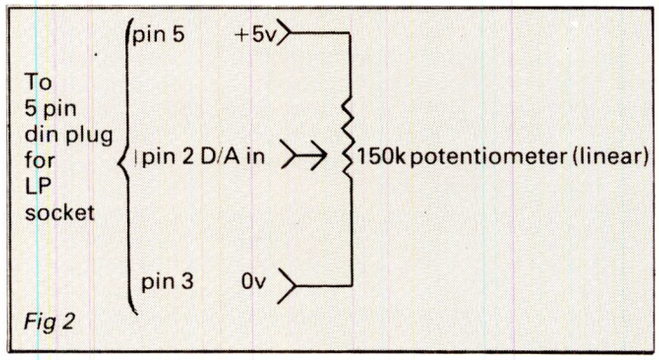


Fig 2

TEACH YOURSELF LISP

Dick Pountain continues his 'Teach Yourself' series by explaining how basic list manipulation is performed in Lisp; so it's hands-on and ready to go.

This is part two of PCW's Teach Yourself Lisp series. Copies of part one, which commenced in June 1984, are available through Back Issues.

In the first part of this series we took a look at the concept of a list and list processing. We concluded that most programming languages could not handle lists effectively because they concern themselves solely with the lower level objects, characters and strings. We also saw a notation for representing lists and three simple operations to perform on them.

The Lisp language (the name itself stands for LISt Processing) is devoted to the manipulation of lists. This doesn't mean that it is not a general purpose programming language, though, for as we shall see the list is a data structure that can be used to represent virtually anything you might want.

Behaviour

Having procrastinated so far, let's dive right in at the deep end and see how an actual Lisp interpreter behaves. The stuff we'll be doing is so simple that the difference between versions of Lisp won't show up yet; when it does I shall discuss them in more detail. I'm going to assume that you have at least a rudimentary experience of Basic, and that you have a computer running one of the Lisps mentioned at the end of this article.

Lisp is an interpreted language like Basic (though some mainframe versions can compile too); when the interpreter is loaded it sits there showing its prompt sign and waiting for you to give it something to do.

If we enter a number, say, 2, Lisp replies with 2. Basic would have taken the 2 as a line number and waited for us to input the statements that make up the line. Lisp behaves quite differently; it *evaluates* what we enter at the prompt. The value of 2 is simply 2.

If we enter a word, say 'FRED', Lisp will come back with 'UNDEFINED' or some equivalent message: it tried to evaluate FRED and discovered that it doesn't know a value for FRED. Basic would have created a new variable called FRED and returned us its automatic initial value of 0. Lisp only gives values to names (or 'identifiers') like FRED if we explicitly tell it to. What's more the values they can take are not limited to numbers; FRED could just as well have the value 2 or THOMAS or the list (EGGS MILK SUGAR).

If we enter a list (1 2 3) then Lisp gets quite upset and responds with a message to the effect that it has been given an UNDEFINED FUNCTION.

If we enter (PLUS 2 3) Lisp will reply with 5. (PLUS 2 3) is a list whose first item is a name, but in this case the name happens to be that of a *function* which Lisp already knows; it adds up the rest of the items in the list and gives us their sum.

We now have quite a lot of evidence about how the Lisp interpreter behaves:

a) The interpreter's behaviour is simpler than that of Basic. It merely tries to evaluate anything entered.
b) The things we can enter are numbers, names and lists.
c) The value of a number is itself.
d) The value of a name is what we give it. Lisp doesn't automatically give it any value.
e) If we enter a list, Lisp assumes that its first item is the name of a function, and it then applies the function to the rest of the list.
f) Lisp uses *prefix* notation for arithmetic (and in fact for all its functions); the name of the function comes *before* its arguments. Instead of 2+3, we say PLUS 2 3. This is the exact opposite of Reverse Polish, as used by Hewlett Packard calculators or Forth.

Numbers and names in Lisp are called 'atoms' to distinguish them from lists. 2 and FRED are atoms, while (2), (FRED) and (2 FRED EGGS) are all lists. () is an empty list with nothing in it. (2 FRED (A B C)) is a list with a list (A B C) as one of its elements; lists do not have to be made up only of atoms. Atoms and lists are the only objects that Lisp recognises, and they are collectively referred to as 's-expressions' (for symbolic expression). Lisp tries to evaluate any s-expression that is typed in at the prompt.

'Writing a program in Lisp consists entirely of defining new functions in terms of pre-existing ones. In this sense Lisp is an extensible language, like Forth, but unlike Basic.'

Whereas in Basic a program is executed by typing RUN, in Lisp the equivalent is to type a list with the name of a function as its first element, and any arguments it requires as the rest of the elements. Writing a program in Lisp consists entirely of defining new functions in terms of pre-existing ones. In this sense Lisp is an extensible language, like Forth, but unlike Basic in which you can only work with the keywords that are supplied such as PRINT and GOTO. We shall see how to

The majority of the Lisp systems support apostrophe as an abbreviation for the function quote. Unfortunately Serious Software's SpecLisp does not. For reasons of brevity, I shall use the apostrophe throughout this series.



define new functions next month.

Functions in Lisp behave in the strict mathematical fashion, that is they *always* return exactly *one* value. It's worth imprinting this on your brain, because the word 'function' is often used in a much sloppier sense in programming. The value of a function is printed on the screen if you type it directly at the keyboard, but inside a program it will return its value to the function which called it.

Let's try an example. The function SETQ is already defined in Lisp and it does roughly the same thing as = in Basic. So:

(SETQ FRED 12)

makes 12 the value of FRED. When you type this expression, Lisp replies 12. The value returned by SETQ is always the value of its second argument. It so happens that we only executed SETQ in order to put a value into FRED, but it returned us the value 12 anyway. In Basic the statement FRED=12 has a similar *effect*, but the *statement* itself doesn't return a value. If we type FRED, both Basic and Lisp will now reply 12.

Now try:

(SETQ FRED (PLUS 2 3))

This returns the value 5 and sets the value of FRED to 5. Why is FRED set to 5 and not to (PLUS 2 3)? The second element of the list which begins with SETQ is the list (PLUS 2 3), and so this is the second argument to SETQ. But what has happened is that Lisp has *evaluated* the argument. The value of (PLUS 2 3) is 5 as we saw earlier, and this value was returned to SETQ, which both returns it to us on the screen and puts it into FRED.

It's essential in Lisp to know how a function treats its arguments, and this information will always be given in the glossary of functions that is supplied in your manual. SETQ in fact evaluates its second argument but not its first. If you think about it, that is exactly what is required here, as we are changing the value of FRED, and we are not at all interested in what FRED's value happened to be before we changed it. Most Lisp functions evaluate *all* their arguments so SETQ is rather untypical.

Now consider:

(SETQ FRED (1 2 3))

Here we are attempting to make the value of FRED the list (1 2 3). In fact we bomb out with an UNDEFINED FUNCTION message because Lisp tries to evaluate the list, without success (because 1 isn't a function). What we need is a way to tell Lisp not to evaluate (1 2 3) but take it just as it is. The function QUOTE, which in most Lisp systems can be abbreviated to ', does just that.

Trying:

(SETQ FRED '(1 2 3))

achieves what we want. When we type FRED now, the answer comes back (1 2 3). To reinforce the lesson, typing 'FRED results in FRED; Lisp didn't try to evaluate FRED but just gave us its name back.

Now let's try:

(SETQ FRED 'THOMAS)

This makes THOMAS the value of FRED; unlike Basic, Pascal and similar languages there are no 'types' of variable in Lisp. A name (which is the equivalent of a variable) can have any expression as its value, whether a number, a string or a list. Furthermore the value of a name could itself have a value, and so on:

(SETQ THOMAS 'JASPER)
(SETQ FRED THOMAS)

leaves JASPER as the value of FRED, because a ', THOMAS gets evaluated in the second expression.

It's quite important to get this notion of evaluation clear in your mind. When we get on to defining our own functions further on in the series, keeping track of the values that are produced will play the same role that mentally or manually tracing execution does in debugging a Basic program.

Functions

Now is the time to look at the three most important functions in Lisp. They come with the highly unhelpful names of CAR, CDR and CONS and they correspond more or less to the three functions 'first', 'rest' and 'construct' identified last month. The odd names of CAR and CDR (pronounce it 'cudder') are derived from the mnemonics of machine instructions on the venerable IBM mainframe upon which Lisp was first implemented back in the sixties. It might have done wonders for the popularity of Lisp had more sensible names been adopted, as they were for Logo. Because Lisp is extensible, I could easily redefine CAR and CDR as FIRST and REST but that would be to put me out of step with all the textbooks and manuals.

CAR returns as its value the first element of its single argument, which must be a list. So:

(CAR '(EGGS MILK BACON))

returns the atom EGGS.

CDR returns a list consisting of all but the first element of its list argument, so:

(CDR '(EGGS MILK BACON))

is (MILK BACON) and :

(CDR '(MILK))

is (), the empty list. Applying either CAR

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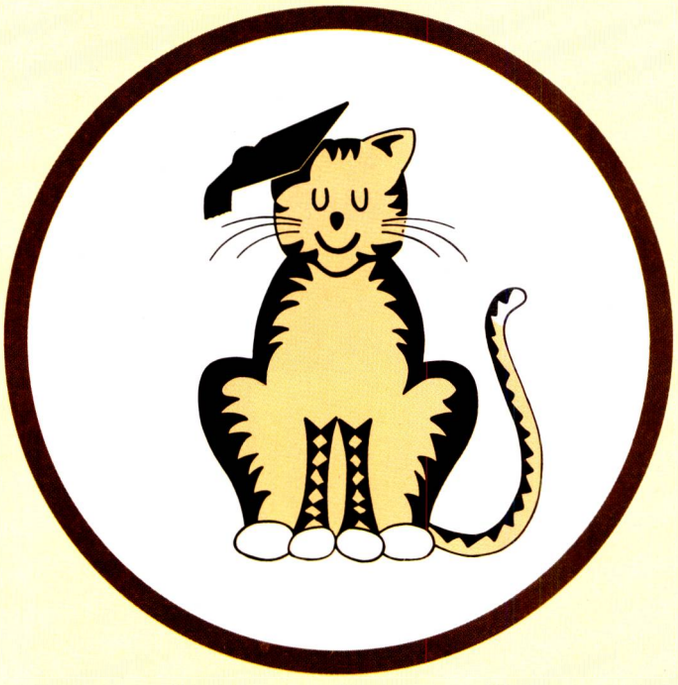

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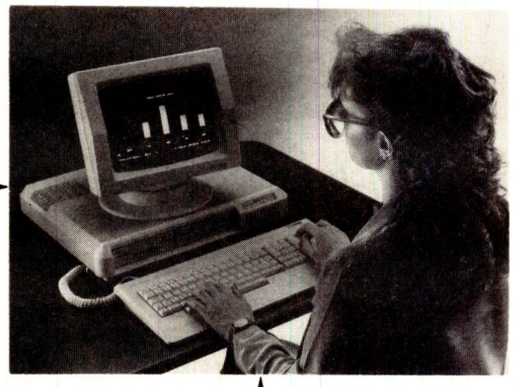

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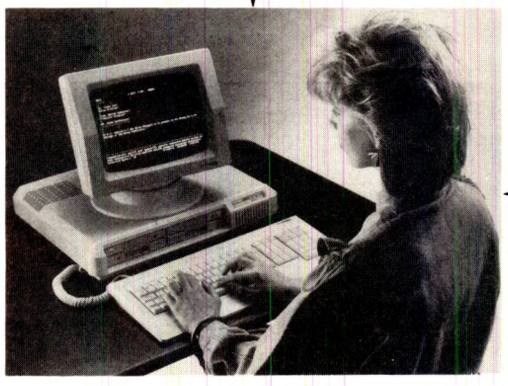

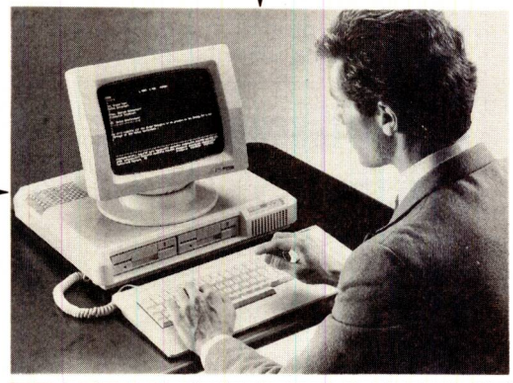

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or CDR to an atom or the empty list gives an error.

CONS is the main list building function. It takes any expression (not necessarily an atom) and a list and returns a new list with the expression as its first element, so:

CONS 'PIGS '(EGGS MILK BACON))

returns (PIGS EGGS MILK BACON), while:

(CONS '(PIGS DOGS) '(EGGS MILK BACON))

returns ((PIGS DOGS) EGGS MILK BACON). In other words CONS exactly reverses the action of CAR.

You've maybe noticed the careful use of 'a list' or 'a new list' in the above descriptions. CAR, CDR and CONS do *not* alter the lists they are given as arguments. For example, were FRED to be given the value (EGGS MILK BACON), then (CAR FRED) would return EGGS but leave the value of FRED quite unaltered. It's characteristic of the majority of Lisp functions that they merely return a value without altering their arguments. SETQ is thus doubly atypical as one of those functions that does change the value of its argument; Lisp people say that it has a 'side effect' (in fact it's used only for its side effect).

Familiarisation

It's quite difficult for us Basic-weaned programmers to come to terms with this style of programming; in Basic most programs work by altering the values of variables. A good lisp program uses the values produced by functions 'on the fly', storing them, if at all, only locally and temporarily. SETQ is used far less often than = is in the equivalent Basic program ('Lisp means never having to say X=X+1 . . .').

Once you do master it, the functional style has great advantages; without side effects the most common source of bugs is removed at a stroke, as each function can be guaranteed not to interact unexpectedly with others. This in turn allows you to modify a function deep down inside a nested set of definitions, in the confidence that none of the outer levels will need to be altered.

'Functions in Lisp behave in the strict mathematical fashion, that is they always return exactly one value.'

Practice

But enough of the philosophical prattle. Let's try out some list-bashing with CAR, CDR and CONS. To get the second element of a list, use:

(CAR (CDR '(TOM DICK HARRY)))

Most Lisp systems have this operation already defined as CADR, often accompanied by the outlandish CADDR, CAADDR and CADADR, whose meanings I'll leave to you to work out.

To get the list (TOM HARRY) out of this list — that is, to get rid of DICK, try:

(CONS (CAR '(TOM DICK HARRY)) (CDR (CDR '(TOM DICK HARRY))))

Notice that we have to build a new list with CONS because CAR and CDR do not alter the original list. This is a construction you will use over and again in Lisp programs. I suggest that you trace through this example and try some others until you are quite familiar with the way it works.

At this point some of you may be going into shock and wondering what it's all for. Well, just think of (TOM DICK HARRY) being replaced by the text of *War and Peace* and you may start to see some applications. But surely, if we want to extract the 24,567th word from *War and Peace* we won't have to use a string of 24,567 CARs and their associated brackets? The answer is obviously, no, we won't. We'll use some form of repetition as in any other programming language. It probably won't be an actual loop, but rather a function that says: 'Is the CAR the word I'm looking for? If not apply me again to the CDR.' But that is to get ahead of ourselves.

One very pertinent question that you might have is: 'Why doesn't Lisp have a random access function that can get the Nth element of a list directly?'. To answer that fully we'd have to go into the physical way that Lisp stores data.

The whole design of Lisp is intended to make it reasonably efficient on existing computers, and that means using linked lists which can only be accessed from one end, hence CAR and CDR. Even using linked lists, Lisp requires more processing power than conventional languages; in the future, with new generations of processor, list processing languages will probably have such a random access structure.

Next month we'll find out how to define new functions and so, at last, write some proper Lisp programs.

END

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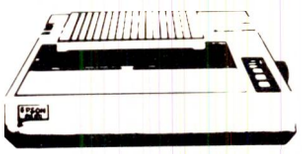

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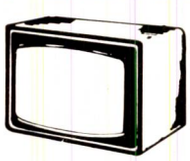

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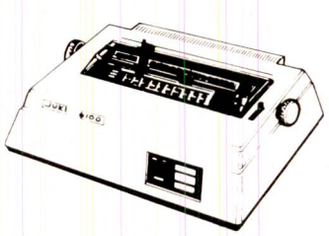

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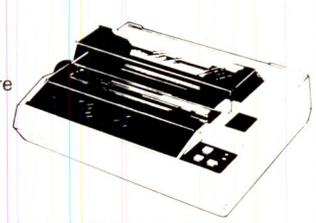

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Debugging the Oric-1

Frustrated Oric-1 owners can reap the advantages of the new Atmos micro without any extra cost. Andy Newman's article reveals how to debug the Oric-1 and provides some interesting tips for Atmos users in the process.

Underneath the cosmetics and new full travel keyboard, the Atmos is fundamentally the same as the Oric-1 with an improved ROM. The new V1.1 ROM is free of many of the bugs of the V1.0 ROM and has three added features: VERIFY; PRINT AT and STORE; and RECALL to allow separate 'files' to be created.

Oric-1 owners will soon see that, with a little effort, all these facilities can be programmed into the Oric at no extra cost. But first let's go through the bugs in the V1.0 ROM and see how they can be exterminated!

The TAB bug

The TAB command does not work correctly and only allows tabulation of text and numbers in the X direction. Indeed, TAB (X) is fairly useless as 13 has to be added to the column number and TAB positions are distributed by previous text on the same line.

Since TAB works by printing spaces on the screen, SPC(X) can be used to tabulate one piece of information on the line. If several columns of information are required, you will need to use the short subroutine in Listing 1, or the machine code PRINT AT provided in Listing 2. To use the machine code routine, follow the instructions given below.

The STR $ bug

This bug, eradicated on the Atmos, is the erroneous addition of a green attribute character when a number is converted to a string using STR$. It is particularly conspicuous when displaying numbers with PLOT. On the Oric-1, PLOT10, 10,STR$(10) puts a green 10 in the middle of the screen, whatever the INK setting. On the Atmos, it is the same colour as the INK setting. This problem does not occur with negative numbers, as the negative sign deletes the attribute.

A related problem occurs when you take the VAL of a positive number which has been converted to a string. The VAL command detects the attribute and returns zero, because the first attribute is not a space, a minus sign, a hash sign or a number. A simple solution is to strip off this attributor for positive numbers, using the following statements

```
10NUMBER$=STR$(NUMBER):IF
NUMBER>0THEN NUMBER$=
RIGHT$(NUMBER$,LEN
(NUMBER$)-1)
```

The apostrophe bug

If you type in 10 GET A$:PRINT ASC(A$), then RUN the program and press the ' (apostrophe) key, you would expect to get the ASCII code of the apostrophe, which is 39. But, no! Syntax error. Avoid this by replacing all GETs with REPEAT: A$ = KEY$: UNTIL A$<> "", when you want to obtain the ASCII code of input characters. This bug has been eradicated on the Atmos.

The free memory bug

On earlier models of the Oric, the command PRINT FRE(0) does not give the correct amount of free memory. The correct amount can be found by looking at the two pairs of bytes in Page 0. These store the locations of the top of the Basic program and of the top of the user RAM, (#9C, #9D and #A6, #A7 respectively). Type PRINT DEEK(#A6) –DEEK(#9C) for the correct figure. On the Atmos, PRINT FRE(0) gives the correct figure, which for an empty RAM in TEXT mode, without GRAB, is 37629.

The GRAB bug

On the Oric, GRAB takes up too much memory. It should access memory from #9800 to #B400 in TEXT mode, but it goes right up to #BAFF. This means that when you subsequently fill your string arrays, they overwrite the screen and character sets! Type in the following:

```
10GRAB:FORX=1TO100:FORY=
1TO100:A$(X,Y)="JJJJJJJJJJ":
NEXT:NEXT
```

The screen will go stripey! Press RESET. To stop this, type HIMEM #B400 after GRABs to ensure that the variables stay below #B400.

The spurious-characters-on-the-printer bug

You may have noticed additional characters on your listings and printouts, if you are using a printer with your Oric. With the Oric MCP40 printer, a ⊠ is often added. This is due to keyboard interference. It can be prevented by turning off the keyboard with CALL#E6CA, before sending information to the printer.

Remember to turn the keyboard on again afterwards with CALL#E804, although when LLISTing, the RESET button will need to be used at the end of the listing. This does not happen on the Atmos.

The IF . . . THEN . . . ELSE . . . bug

This structure either works or doesn't, depending on the combination of statements placed before or after the ELSE statement. The manual side-steps this problem by choosing an example that does work (see page 28)!Particular characters, like the semicolon, variables and suffixed letters (for example, the final S in CSAVE"PROG",S), cause the ELSE statement to be incorrectly identified. One solution is to add the dummy statement CONT before the ELSE statement when you experience difficulties.

```
 0 REM ======= LISTING 1 ==========
 1 REM === ORIC-1 16/48K PRINT AT ===
 2 GOTO100
 5 REM === PRINT AT SUBROUTINE ===
 6 POKE 616,Y:PRINT:POKE 617,X:RETURN
 100 REM ***** EXAMPLE PROGRAM *****
 110 CLS:X=10:Y=9:GOSUB6:PRINTCHR$(129)C
HR$(4)CHR$(27)"N""P. C. W."CHR$(4)
```

Listing 1 Oric-1 16/48k PRINT AT

```
0 REM === LISTING 2 ================
1 REM == V1.0 ROM IMPROVEMENTS =====
2 REM == FOR 16/48K ORIC-1 =========
3 REM == COMPILED BY A.J.NEWHAM 1984
4 REM ** 16K owners replace 97's in line
  16 with 17's. **
5 IF PEEK(#220)=0 THEN HIMEM#96D1:A=#96D
1 ELSE HIMEM#16D1:A=#16D1
6 FORI=1TO10:READ D$:FOR P=1 TO LEN(D$)
STEP2:X=VAL("#"+MID$(D$,P,2))
7 POKEA,X:A=A+1:NEXT:NEXT
10 DATAC9C8D0052061CAD007C927F0F74C4EEA4
C04E8FF
13 DATA2096D9ACF802C88C6902A51FA42085128
413A93B20DBCF4C61CBFF
16 DATAA59CA49D85008401082025E720CAE6202
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17 DATA2063E5A903A0E52076E52096E62030E6C
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52019C72004E8209FCBA9A1A09720EDCB209BFA
20 DATA4CB5C4100756572696679696E67202E2
E000D0A544150452045525 24F52
21 DATA202E2E2E0D0A5665726966696361746 96
F6E2061626F727465642E0D0A00A9D8
22 DATAA09720EDCB2085FA4C6BC90D0A5441504
5202620 4D454D4F5259204D415443482E0D0A
23 DATA5665726966696564204F4B2E0D0A00FF
24 REM ** LINE 10 = IF THEN ELSE DATA

25 REM ** LINE 13 = PRINT AT DATA

26 REM ** LINES 16-23 = VERIFY DATA
(COURTESY OF 'ORIC COMPUTING')
```

Listing 2 V1.0 ROM improvements

For example;
10 Y = 1: X = 2: GETA$: IFA$ = "Y" THEN PRINT Y ELSE PRINT X
works correctly if you press N, but produces a syntax error if you press Y. However, this version using CONT will work.
10 Y = 1: X = 2: GETA$: IFA$ = "Y" THEN PRINT Y: CONT ELSE PRINT X

Another example of a combination that does not work is in the example program below. If you press Y, a 1 and 2 are displayed, indicating that the ELSE has been completely ignored.
10 GETA$: IFA$ = "Y" THEN Y = 1: GOSUB100 ELSE Y = 2: GOSUB100
20 END
100 PRINT Y: RETURN
Again, placing a CONT statement before the ELSE solves this problem. Another solution to this bug is to use the ELSE debugger included in the machine code program in Listing 2. To use the machine code program, follow the instructions given below. On the Atmos this structure works correctly.

There are, however, three faults which must be dealt with by both Oric and Atmos owners.

The FOR . . . NEXT . . . loop problem
The start, finish and step values of the FOR . . . NEXT . . . loop can only be non-integer. The statement, FOR X =S% TO F% STEP ST%, is therefore invalid and must be replaced by the statement, FOR X = S TO F STEP ST.

This problem is mentioned in the new Atmos manual released by Pan Books, and is far superior to the Oric manual. Oric-1 owners will learn a great deal from it as it gives information for both micros — but not all the bugs are mentioned!

The elliptical circle problem
Another problem is that the CIRCLE command produces an ellipse! The program in Listing 3 uses the formula for a circle and a multiplication factor to squash the ellipse into a more circular shape.

The restricted variable name problem
Another common fault is the restriction on variable names. These names should not contain Basic reserved words; for example, TOTAL contains TO, SCORE contains OR, and so on. The obvious solution is to use an alternative name and test it by typing PRINT followed by the variable name you have chosen. If it is valid, you will get an 0. If it is not, you will get a syntax error.

Imitating the Atmos on the Oric

The VERIFY facility
A very useful additional facility provided on the ROM of the Atmos is the VERIFY facility. The format is CLOAD "Filename",V which loads and compares the tape recording with the program in memory. If it is recorded correctly, the message will be '0 Verify errors detected', but otherwise the program will have to be re-recorded.

However, all is not lost for the Oric-1 owner! Included in Listing 2 is a similar verify routine in machine code. Its only disadvantages are that it takes up some RAM and that it needs to be loaded in before each programming session. The routine will verify either Basic or machine code programs at a fast or slow baud rate. It will give a SHOOT sound if there is an error and a PING sound if the program has verified correctly.

The STORE and RECALL facility
Two new commands, STORE and RECALL, have been added on the Atmos. These allow files made up of array contents to be manipulated from within a program. Thus, in an address database, three files could be recorded onto tape consecutively using the following format:
STORE NAME$, "Names": STORE ADDRESS$, "Addresses": STORE AGE, "Ages"

Each new array, whether real, integer or string, needs a separate STORE command and a similar RECALL command to retrieve it from tape. If preferred, all arrays can be amalgamated into one larger two-dimensional array. (With the above example, if there were up to 100 people, the array ARRAY$(100,2) could be used. The three values of the second element, 0,1 and 2, divide up the three types of data.)

The Oric-1 has no such commands, but sections of memory can be saved and loaded. The Oric manual refers only briefly to this and in fact omits the important syntax necessary for using variables for the file name and the start and end addresses. The correct syntax is CSAVE FILE$, A(STARTADD), E(ENDADD).

When reloading the memory block, use CLOAD FILE$ and it will transfer automatically to the correct memory

locations since these have been recorded on tape by the CSAVE command.

It is usual to set HIMEM to the start address of the memory block to prevent the Basic variable storage wiping over it. However, this essential procedure causes difficulties when you try to re-RUN the Basic program after saving or loading a memory block. The end-of-program pointers, #9C, #9D, are updated to the end address of the memory block which is higher than the HIMEM setting, thus causing an 'OUT OF MEMORY' message to appear.

One way round this is to load the memory block before the Basic program or you can find the end address of the Basic program with PRINT DEEK(#9C) which will give a decimal number location and DOKE this number back into #9C before the HIMEM. However, there is still the inconvenience of having to re-RUN the program after loading in blocks of memory. To overcome this, use the saving/loading ROM routines as demonstrated in Listing 4.

Structured programming

Programs can be considerably speeded up if they are well structured.

It is better to place well-used subroutines before the main program to reduce the number of lines each GOSUB call has to search through. Similarly, it is advantageous to place data at the end of the program. A faster program structure will be as follows:

0 GOTO main program
1 REM *Most used subroutine*
100 REM *Least used subroutine*
1000 REM *Main program*
5000 END
6000 DATA

In heavily used sections of program, time savings can also be made by missing off the counter on NEXT statements and by using multi-line statements. An example of the way in which time can be saved with a little programming effort can be appreciated if the following alterations are made to the sort routine given on page 84 of the Oric-1 manual. Amalgamating lines 90 to 120 onto one line avoids the GOTO and the routine sorts 40 words in 19 seconds instead of 22 seconds.

90 IF A$(L)<A$(K) THEN U$ = A$(L): A$(L) = A$(K): A$(K) = U$

Using machine code routines

In order to use VERIFY, PRINT AT and ELSE which are all incorporated into one program in Listing 2, you must first type in the program, which consists of the Basic loader program and the machine code data. Before typing RUN, save a copy on tape. This program will transfer the codes to a memory block

```
 4996 REM * LISTING 3 - CIRCLE ROUTINE *
 4997 REM * COPYRIGHT A.J.NEWHAM 1984 *
 4998 REM ATMOS OWNERS REMOVE CALLS
 4999 REM IF ILLEGAL QUANTITY ERROR - PR
ESS RESET
 5000 HIRES:INPUT"ENTER X,Y OF CENTRE AN
D RADIUS SEPARATED BY COMMAS";XC,YC,R
 5010 CALL#E6CA:FORX=-RTO-.01STEP.005
 5020 Y=SQR(R*R-X*X)*1.15:CURSETXC+X,YC+
Y,1:CURSETXC+X,YC-Y,1
 5030 ST=ST-1/X:X=X+ST:NEXT:ST=0
 5050 FORX=R TO.005STEP-.005:Y=SQR(R*R-X
*X)*1.15:CURSETXC+X,YC+Y,1
 5060 CURSETXC+X,YC-Y,1:ST=ST-1/X:X=X+ST
:NEXT:CALL#E804
```

Listing 3 Circle routine

```
 0 REM ====== LISTING 4 ==========
 1 REM == SAVING/LOADING ARRAYS PROG ==
 2 REM == FOR THE 16/48K ORIC-1 ======
 3 REM == COPYRIGHT A.J.NEWHAM 1984 ====
 4 TEXT:GRAB  'increase RAM for Text only
  progs.
 5 IF PEEK(#220)=0 THEN HIMEM#9800 ELSE H
 IMEM#1800 'file space on 48/16K Oric
 7 GOTO1000
 9 REM 1) Converts variable A$ to codes
 10 L=LEN(A$):IF L>0 THEN FOR K=1 TO L:PO
 KE ME,ASC(MID$(A$,K,1)):ME=ME+1:NEXT
 20 POKE ME,13:ME=ME+1:RETURN
 49 REM 2) Converts arrays to codes and
 saves as a memory block
 50 CALL#E6CA   'Turn off keyboard
 55 ME=SA
 59 REM * Example string array *
 60 FOR X=0 TO ELEMENTS:A$=ARRAY$(X):GOSU
 B 10:NEXT
 69 REM * Example numeric array *
 70 FOR X=0 TO ELEMENTS
 75 A$=STR$(ARRAY(X))
 80 IF ARRAY(X)>0 THEN A$=RIGHT$(A$,LEN(A
 $)-1)  'strips off green attribute
 85 GOSUB 10
 90 NEXT
 99 REM * Start address of memory block *
 100 DOKE#5F,SA
 109 REM * End address *
 110 DOKE#61,ME
 120 DOKE#63,#100  'machine code file
 125 CALL#E804  'Turn on keyboard
 126 CLS:PRINT"PRESS ANY KEY TO SAVE 3 CO
PIES OF FILE '"FI$"' ON TAPE.":GET K$
 130 FOR X=1 TO 3:PRINT"COPY "X:CALL#E6CA
 140 CALL#E57B   'Save file ROM routine
 150 CALL#E804
```

```
160 NEXT
170 RETURN
199 REM 3) Poke filename FI$ into Page 0
200 FOR X=1 TO LEN(FI$):C=ASC(MID$(FI$,X
,1))
210 POKE#34+X,C:NEXT:DOKE#34+X,#100:RETU
RN
239 REM 4) Load block & convert to array
s
300 CLS:PRINT:PRINT"PRESS ANY KEY TO LOA
D":GET K$
310 CALL#E6CA:CALL#E4A8:CALL#E804
320 ME=DEEK(#5F):CALL#E6CA
325 CLS:PRINT"ASSIGNING VARIABLES"
330 FOR X=0 TO ELEMENTS:GOSUB 500:ARRAY$
(X)=A$:NEXT
340 FOR X=0 TO ELEMENTS:GOSUB 500:ARRAY(
X)=VAL(A$):NEXT
350 CALL#E804:RETURN
499 REM 5) Converts codes back to variab
les
500 A$="":FOR Y=1 TO 255:B=PEEK(ME):ME=M
E+1:IF B=13 THEN RETURN
510 A$=A$+CHR$(B):NEXT:RETURN
599 REM 6) Control sub. for saving or
loading files
600 CLS:PRINT"DO YOU WANT TO SAVE (S) OR
 LOAD (L) A FILE ?"
610 REPEAT:CH$=KEY$:UNTIL CH$="S" OR CH$
="L"
620 CLS:PRINT"AT FAST (F) OR SLOW (S) SP
EED ?"
630 REPEAT:SP$=KEY$:UNTIL SP$="S" OR SP$
="F"
640 IF SP$="F" THEN POKE#67,0 ELSE POKE#
67,1
650 CLS:INPUT"FILENAME";FI$
660 IF CH$="S" THEN CLS:INPUT"START ADDR
ESS FOR FILE";SA
670 GOSUB 200
680 IF CH$="S" THEN GOSUB 50 ELSE GOSUB
300
690 RETURN
999 REM ====== Main program ============
1000 ELEMENTS=99:DIM ARRAY$(ELEMENTS),AR
RAY(ELEMENTS)  'Example arrays
1010 REM *** USE GOSUB 600 TO SAVE/LOAD
A FILE ***
1012 PAPER0:INK2
1013 CLS:PRINT"FIRST SAVE ARRAYS"
1019 REM * FILL ARRAYS *
1020 FOR X=0 TO 99:B%=RND(1)*26+65:AR$(X
)=CHR$(B%):AR(X)=X:NEXT
1030 GOSUB 600
1040 CLS:PRINT"NOW REWIND THE CASSETTE &
 RE-LOAD THE FILE"
1045 CLEAR:ELEMENTS=99:DIMAR$(EL),AR(EL)
1050 WAIT500:GOSUB 600
1059 REM * Print out array contents *
1060 FORX=0TO99:PRINTAR$(X);:NEXT
1070 FORX=0TO99:PRINTAR(X);:NEXT
3000 END
```

Listing 4 Saving/loading arrays

from #96D1 to #97FF. To check for any typing errors type PRINT A which should give 38912 if all is well.

You can now save a copy of the machine code, by using CSAVE"V1.0EXT", A#96D1, E#97FF. This will subsequently load a lot quicker than the Basic program. Switch the computer off then on to clear the memory and then, before any programming sessions, load the machine code with CLOAD"V1.0EXT". Type NEW to reset the pointers, which have been disturbed by loading the machine code, and type HIMEM#96D1 to protect it from the Basic variable storage. Do not use GRAB or set HIMEM to a higher location or it could be wiped out.

The machine code is stored below the HIRES screen so that you can use either the HIRES or TEXT screens. To use the ELSE debugger, type:
DOKE#F0,#96D1.
This diverts the operating system from the ELSE bug in the ROM to a bug-free version in the machine code program. When using IF . . . THEN . . . ELSE . . ., always precede the ELSE statement with a colon. Test it out on the line below.

```
10 GETA$: IF A$ = "Y" THEN PRINT
"OK";:ELSE PRINT "NO";
```

Because the VERIFY and PRINT AT routines are called up by using the !, you will need to switch the setting from one to the other before you use either of them. Typing DOKE#2F5, #9700 sets the ! up for the VERIFY command and DOKE#2F5, #96E5 sets it up as the PRINT AT X,Y command.

To VERIFY a program, first set !, then type !"FILENAME" or !"FILE NAME",S — whichever is relevant. The message 'Searching' will appear on the top line. Play the recorded copy and the message will change to 'Verifying –FILE NAME' and the routine will check to see if it matches the same area of RAM in the memory. It will give a 'ping' sound and message if it has verified correctly, and a 'shoot' sound and message if there is an error in recording. To use the PRINT AT command, set ! correctly and type !X,Y;"Text".

Note: 16k owners should replace the 96 and 97s in the addresses in this section with 16 and 17 respectively.

Conclusion

Although these routines require some programming knowledge to use, they provide the Oric-1 owner with many of the facilities of the Atmos at no extra cost. Alternatively, they would be used as a fill-in until Oric offers an upgrade either with keyboard and ROM, or ROM alone.

The choice is yours — but at least now you won't feel cheated into having to rush out and buy an Atmos.

Acknowledgements are due to Oric Computing *magazine for permission to include the VERIFY listing in this article.*

END



Booked to win!

Tony Harrington is often asked for his advice on chess programming. This month he recommends one chess publication which should be of interest to beginners.

Welcome to Micro Chess

Micro Chess covers all the news and events in the busy world of computer chess. With new chess programs and new chess computers appearing all the time, we evaluate their strengths and weaknesses as they become available. We shall be presenting profiles of programmers, both amateurs and professionals, which will cover their methods and their interest in chess programming, and we shall be talking to suppliers and looking at their plans.

Computer Chess affects computer enthusiasts in two different ways. For some, the fact that they can now play chess against either their home computer or a dedicated chess computer has opened up the delights of the game. For others, the real interest is not so much in playing chess as in trying to build a chess program. Micro Chess aims to meet the interests of both.

Chess is a game that can be as exciting for the beginner as it is for the grand master. So if you haven't played before, get yourself a good introduction to the game — there are dozens in the bookshops — and get to it.

The Chess Computer Handbook (Batsford £4.95) written by David Levy is a very good place to begin to understand such abstruse matters as evaluation functions, killer heuristics and the alpha-beta algorithm. (Sorry if these terms put you off the idea of ever taking up chess programming.)

Levy's approach throughout the book is to take the layman firmly, though with some kindness, through the neat logical manoeuvres that make up the received wisdom of chess programming. Not all of what he says is easily grasped. There are mathematics professors who madden their students by saying things like: 'Now it can easily be seen that . . .' when students feel themselves groping about in near total darkness. You might find this text has, on occasion, a similar effect.

This is largely because it is an extremely compact work. The entire subject of chess programming is disposed of in four chapters, totalling 62 pages. The remaining four chapters, which make up the rest of the book's 131 pages, are on topics of general interest, and have titles like 'What to look for in a chess computer', 'How to play against chess programs' and 'How strong can chess computers become?'

The first four chapters are an account of the concepts needed in chess programming; they are not a guide to writing programs in machine code or Basic or anything else. There is not a line of code in the whole book (though Levy reckons that anyone who knows Basic should be able to put the concepts to work without much difficulty.) This absence of code makes it more approachable reading for all those non-programmers who might have wondered how computers can be made to play chess.

This involves two rather different kinds of problem. The first problem, stated by Levy in the opening line of the book, is: How do you tell a computer what chess is? As Levy reminds us: 'It is one thing for a human to gaze at a chessboard, see where the pieces are located and understand the relationships between them, but a computer is merely a device that can store and manipulate numbers.' The answer to this problem takes you into the fundamentals of a chess move generator.

That is the easy bit. The next and far more difficult problem, once the computer can generate chess moves, involves teaching it to recognise worthwhile moves from bad ones. This brings us to the evaluation function. In order for the evaluation function to work well (and computer chess programming still has a long way to go here), all the subtleties of chess have to be reduced to terms the computer can understand — that is, everything has to come down to numbers.

Take the move generator first. To start with, you need a way of telling the computer precisely which piece is on what square. This is achieved by assigning the pieces numbers, positive for white, negative for black. Even in so simple a step there are subtleties to be taken into account. Kings and rooks that have not moved (and which therefore still keep their castling rights) have to be earmarked in some way. Pawns that start with a double move (such as e2-e4) have to be noted so that the *en passant* capture rule can be applied.

This information gives the program all it needs to know about the location and identity of each piece. It still doesn't know what they are. Remember that computers are about numbers. Defining a knight, for example, for a computer is not a pictorial affair. There is no way to tell it that a knight, by historical convention, in the Staunton set, is a horse's head and neck on a pedestal. Tell it all the possible moves a knight can make in any position and you have told it all it needs to know.

Levy explains three ways of generating lists of all the possible legal moves for every piece in any chess position as follows:

(1) Move generation by square offset;
(2) Table driven move generation; and
(3) Incremental updating of move lists.

If you've never thought about this subject before, you should come away from this section with a fair idea of how all three work.

There are some lovely little gems of logic that chess programmers have come up with in even this rather basic area. But first, for the beginner, here, in summary form, is Levy's account of the first method, move generation by square offset. Assign each of the 64 squares on the chessboard a two-digit number, so:

18	28	38	48	58	68	78	88
17	27	37	47	57	67	77	78
16	26	36	46	56	66	76	86
15	25	35	45	55	65	75	85
14	24	34	44	54	64	74	84
13	23	33	43	53	63	73	83
12	22	32	42	52	62	72	82
11	21	31	41	51	61	71	81

If you place a king on square number 54, the rules of chess allow the king to move to any adjacent square not already occupied by his own pieces or not under direct attack by an opponent's pieces (he may, of course, move onto a square occupied by an opponent's piece — captures by the king are not unheard of in chess . . .). A series of arithmetical operations will generate the addresses of all the squares adjacent to square 54. The same operations will hold good for generating the addresses of legal moves for the king from any square on the board (the border squares excepted, for the moment).

As Levy points out, if you call the square the king is on, square k, then, in general form, the squares it can move to (rules permitting) are:
k−9, k+9, k−1, k+1, k−11, k−10, k+10.

Try it and see. If you do your arithmetic properly you should come up with the squares, 45, 63, 53, 55, 43, 65, 44 and 64.

When you've got this far, and defined the move sequences for all the pieces, you'll have an interesting little problem. What do you do about moves which would take a piece off the edge of the board? It might sound trivial, but try solving it.

The first step is to allocate an 'out of bounds' number to offsets without addresses on the board. A more sophisticated solution is to treat the board as a 10x12 cylinder.

Why 10? — knights can leap two squares off the board before hitting an 'out of bounds' square. Why 12? — because, as Levy puts it: '. . . the file which is two files to the left of the a-file actually occupies the same place in the computer's memory as the file which is two files to the right of the h-file.' Got it?

If you get through the first chapter, you probably have a taste for the joys of logical analysis. In which case, Chapter Two, which tackles the basics of building an evaluation mechanism, will be pure delight. Levy proposes ways of giving numerical weights to such factors as material, mobility, centre control, piece development, king attacks, pawn structures, piece attacks and piece defences.

Chapter Three, 'Tree Searches' tells you enough about minimax to get you started on your own program. It also provides a clear account of why the alpha-beta algorithm can cut down the number of positions a computer needs to evaluate by 99.5% — without the least danger of missing a good move.

The fourth and last chapter on this theme deals with search strategies. How dows the computer know when it can profitably spend time searching a position deeply? How does it decide when to terminate a search? This is well-trodden ground, but fascinating for newcomers.

Although I've concentrated on the conceptual side of the book, there is much of interest in the second, more anecdotal, half. All in all, a neat little volume and a useful book for chess programmers.

Games section

White: David Levy. Black: Cray Blitz. Notes by Dr John Nunn.

I had been favourably impressed by some of the games played by Cray Blitz in the world computer championships and other events, so the result of David Levy's match with this program came as rather a surprise to me. Not that David winning 4-0 was a surprise, but the manner in which he won was. Quite simply David made Cray Blitz look like a very weak club player. He relentlessly exploited all the weaknesses of computer programs, taking the machine out of its opening book at the first chance, never allowing complications to start, and utilising Cray's reluctance to repeat the position to induce inferior moves. It is apparently a very different matter for a program to play against other programs than it is to play against the adaptable mind of a knowledgeable human opponent.

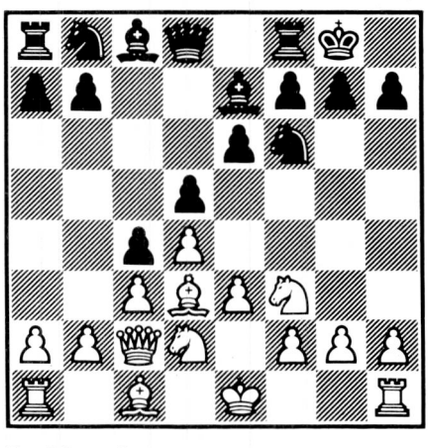
Here is the most interesting game of the match.

★ ★ ★

1	d2-d4	Ng8-f6
	c2-c3	

(An unusual move designed to take Black out of its opening book.)

2	. . .	e7-e6
3	Ng1-f3	c7-c5
4	e2-e3	Bf8-e7
5	Qdl-c2	0-0



Position after 7 . . . c5-c4

6	Bf1-d3	d7-d5
7	Nb1-d2	c5-c4?

(A serious positional error. Black is tempted by the prospect of forcing the bishop to retreat, but he forfeits the pressure against White's centre afforded by the attack of the c5 pawn on the one at d4. Without this pressure White has a completely free hand in the centre. To be fair to Cray Blitz, this type of mistake was often made by top human players in the 1890s, when the problems of central play were not well understood. The correct plan was to exchange White's most dangerous piece, the d3 bishop, by 7 . . . b7-b6 followed by 8 . . . Bc8-a6.

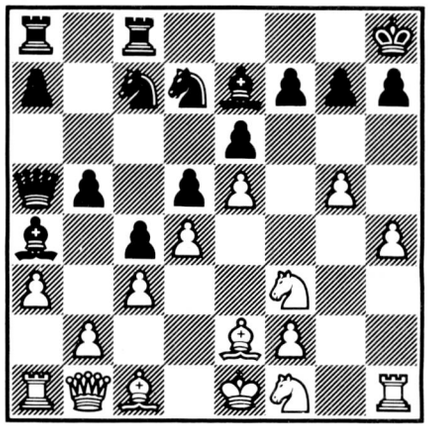
8	Bd3-e2	Qd8-a5?

(Black's only hope for counterplay was to advance his queenside pawns to a5 and b4. On a5 the queen obstructs the execution of this plan.)

9	e3-e4	Bc8-d7
10	e4-e5	Nf6-e8
11	Nd2-f1	Ne8-c7
12	g2-g4	

(It is a matter of personal taste how White conducts the attack. 12 h2-h4 followed by Nf3-g5 might have been even stronger.)

12	. . .	Bd7-a4
13	Qc2-b1	Nb8-d7
14	g4-g5	Rf8-c8
15	h2-h4	b7-b5
16	a2-a3	Kg8-h8



Position after 16 . . . kg8-h8

(Even Cray Blitz can make typical pointless computer moves.)

17	Nf1-h2	Ba4-b3
18	Nf3-d2!	

(Black threatened 18 . . . Qa5-a4 followed by . . . Bb3-c2. Now the knight can eliminate the bishop if Black plays his queen to a4.

18	. . .	Nd7-b6
19	Nh2-g4	Bb3-a4
20	Nd2-f3	Rc8-g8
21	h4-h5	Ba4-b3
22	Nf3-d2	Qa5-a4
23	Nd2xb3	c4xb3
24	g5-g6	f7xg6
25	h5xg6	h7-h6
26	Qb1-d3	

(Now Black cannot prevent a lethal sacrifice at h6.)

26		Be7-h4
27	Rh1xh4	Resigns

END

COMPUTER ANSWERS

Send your queries to Tony Hetherington, PCW, 62 Oxford Street, London W1. Note that Tony cannot answer questions on an individual basis, so please don't send an SAE with your query.

Sweden calling PC-8201A users

I am a satisfied owner of the NEC PC-8201A lap-held computer. However, as this amazing machine has not yet achieved the popularity in Sweden which it deserves, and my contact with other users is minimal, I have the following questions to ask:
1 Is there a magazine or newsletter for this machine?
2 Is there a PC-8201A user group?
3 Which companies write software for the PC-8201A (I am only aware of Pcalc)?
4 Which companies make peripherals for the machine?
MJ Wiechowski, Uppsala, Sweden

I'm afraid that neither I nor NEC knows of any user group or magazine which supports the PC-8201A, but NEC was kind enough to supply details of its Swedish distributor, Lundberg International AB, who may be able to help you.

The company's phone number is 011 1375 00.

Your best bet for peripherals is NEC itself, and a company doing great things in the software field is Microtime Ltd, 106A Bedford Road, Wootton, Bedfordshire NK43 9JB

Portable word processing

Two years ago I bought a word processing package consisting of a British Micro Mimi 802G micro, a Philips monitor, WordStar and a Fujitsu printer. The computer runs on CP/M.

I often write while on visits abroad, which means typing the text into the computer when I get home. I also often write in libraries.

I would like to be able to take some type of portable device around with me so that I can key in my work wherever I am, and run it into the computer for editing and storage when I get home.

Are there any products that I could use for this, either available now or in the pipeline, and how much do they cost?
Caroline Richmond, London SW15

No problem! There is now such a wide range of portable computers on the market that it's getting difficult to keep track of all the new machines.

Your choice of portable depends on two things: how much money you want to spend, and how many words you write. The cheapest practical portables are made in Japan by a company called Kyocera. These machines are sold by Tandy, NEC and Olivetti, and although the names change they are all basically the same machine.

Kyocera machines are supplied with 40-column by 8-line displays, which are just about acceptable for word processing. They also come with an adequate word processor, but have limited memory — 4-5000 words at the most.

Another machine to look at is the Epson PX-8. This offers a larger screen and more memory, but it's more expensive.

For more details about Kyocera and Epson see the recent *PCW* benchtests.

All these machines come with built-in communications software to allow them to talk to other micros. The trouble starts with your Mimi, which doesn't have any built-in comms software. I've spoken to British Micro, which says that the Mimi will run two communications programs — BSTAM and BSTMS. Both are very old and widely-used comms packages but are not particularly easy to use, which is a pity because there are many more friendly systems around, but they won't run without change on your machine. I strongly recommend that you ask your local dealer to set up the software.

The two machines will be physically connected by their RS232 ports and a length of cable. When you get back home, connect the two machines and start transmitting. You can either use a specially made 'communications' cable, or use a standard straight-wired cable with a 'null modem adaptor'. In either case, your dealer should be able to supply what you need.

Which micro for Lotus 1-2-3?

I am a director of a medium-sized company which imports and distributes coal and oil. We currently use a Burroughs B90 minicomputer for our computing needs, but we decided recently that we needed a smaller computer for spreadsheet applications. We intend to use Lotus 1-2-3, but are unsure about which micro to run it on. We have a shortlist of three micros: IBM XT, DEC Rainbow 100+ and ACT Apricot XI, each with a 10Mbyte winchester.

The arguments for and against each machine, as we see them, are:
1 IBM and DEC are unlikely to fold.
2 DEC in particular offers a very attractive service and back-up package.
3 The ACT Apricot is very compact and portable; it's also much cheaper.
4 The Apricot is regarded as a 'toy' by some members of staff.
5 The B90 is the main computer and the micro will only be used occasionally, so is it necessary to have high class back-up?

Can you help? Perhaps you can suggest a different machine.
James Neil, Bangor

All three names you mention are good machines. There is certainly no question of the ACT Apricot being a 'toy' micro — in fact, it's more powerful than the IBM PC! The only drawback is that Lotus Corporation does not support it as a legitimate machine to run 1-2-3. This means that even if you do find a version of 1-2-3 running on the Apricot, don't expect Lotus to be too helpful if you run into trouble.

This leaves the DEC Rainbow and the IBM XT, both of which are supported by Lotus. The Rainbow is a good machine, but it hasn't taken off in the same way that other major manufacturers' machines have. If your dealer is offering you a good deal, it could easily fulfil your needs.

Lotus 1-2-3 was written specifically for the IBM PC, so obviously this is where it's most suitable. It's difficult to say anything new about the IBM PC — it's *the* standard, 16-bit machine. It's reliable, and it's still overpriced. It's also getting old — there are many machines around that are technically superior to the PC but will still run PC software.

At the moment, my favourite PC clone is the Olivetti M24. I have had the machine on my desk for a couple of months now, and I still haven't found any PC software that it won't run. The M24 costs about the same as the PC, but it offers much higher performance by using the full 16-bit 8086 chip running flat out at 8Mhz.

Choosing a micro for word processing

I am 68 years old and have been using an Ohio Superboard 11 for many years, for which *PCW* has published some interesting articles in the past. I became interested in a small business for which I purchased a word processing tape to assist in administration.

I now realise the limitations of this tape and need to buy another word processing tape or EPROM, and change my computer accordingly. With this in view, can you suggest a good word processor and a computer to run it? I have put the cart before the horse because the word processor is the essential tool. I'm not interested in using the computer for anything other than word processing and add-ons are of no interest to me — all I require is a good, basic workhorse computer. What do you suggest?
Mr C Birchall, Wigan, Lancs.

You are taking the correct path towards choosing a computer as you have decided what you want to do with it — you are by no means putting the cart before the horse.

I can give some

suggestions, including hardware requirements, so that you can approach computer salesmen knowing exactly what you want.

Only consider disk or ROM-based word processors, as a tape system will be as inconvenient as your present one. You will also require a computer with a good keyboard, which will stand continuous use and allow touch typing, and you'll also need a disk drive to store created documents.

There are several systems which fit your requirements, including the Commodore 64, BBC, Dragon 64, NewBrain and Memotech. Visit the appropriate High Street shops (WH Smith, Dixons, and so on), and try them out for yourself before you decide.

Running CP/M on the NewBrain

As a NewBrain owner, I am always hearing about the CP/M operating system but have been unable to obtain it. I did read somewhere that by pressing the STOP key when switching on the NewBrain, the CP/M copyright sign could be released from memory and displayed on the screen. I have tried this but to no avail.

Please can you help me?
Hudson Croft, Workington, Cumbria

CP/M stands for Control Program for Micros. What the letters don't tell you is that it's an operating system for micros based on the Z80 processor, using disk drives for storing and retrieving data and programs. The NewBrain is a tape-based machine and has its own tape operating system in Read Only Memory (ROM). The NewBrain is, in theory, upgradable to a disk machine running CP/M, and many NewBrain owners managed to make that upgrade before Grundy folded.

Unfortunately, since that time supplies of disk units, together with the memory expansion units required, have dried up. Although Tradecom, the company which took over from Grundy, has been promising supplies since last year, rumour has it that a batch of drives delivered to a distrubutor recently was faulty to a unit.

Sadly, Tradecom has not convinced NewBrain owners that it is willing or able to support the machine in the UK.

The disadvantages of Basic compilers

I read with interest the first part of Mike Liardet's article 'Creating a Program' (*PCW*, June 1984). However, his warning about compiled Basic puzzles me.

Why can't a Basic compiler be as efficient as a Fortran or Pascal compiler? Is the performance of the following compilers unsatisfactory?
1 The Basic compiler for the Spectrum, by Softek.
2 The Basic compiler PETSPEED, for the Commodore 64.
3 The Basic-80 compiler for the Z80 Apple.
Wilf Morton, Rugby, Warwickshire

Mike Liardet's warning about Basic compilers springs from the simple fact that Basic was not designed to be a compiled language. Consequently, any Basic compiler will have to fight against the very nature of the language itself.

It's unfair to expect such compilers to compete with Fortran or Pascal which are, by definition, compiled languages. You should compare Basic compilers with programs written in Basic or machine code, remembering to take into account the language's ease of use.

Retrieving Commodore 64 programs

I have just spent three months developing a game on the Commodore 64 which I hope to sell to make a fortune. However, when I tried to load it to add the finishing touches, it failed with a bad error message.

Is there anything I can do to retrieve my program and my sanity, or do I have to start again?
R Deacon, Maidstone, Kent

You'll be delighted to know that there's a good chance of retrieving your program courtesy of the curious way in which the Commodore 64 loads programs. One of the reasons why it takes so long to load a program is that it loads it in twice. The first load is stored immediately in memory, and the contents are checked against the incoming second load. This is supposed to prevent loading errors, but it slows things down considerably.

If your program failed to load in this second stage, you can retrieve it by convincing the machine that all is well by typing in the following commands.

```
POKE 45, PEEK(831):
POKE 46, PEEK(832):CLR
```

Reliable Apple II INPUT routine

Using Applesoft Basic, the Apple II signals all errors except '?' or '??' following a bad INPUT response. This can be awkward when a semi-skilled operator is entering a long series of inputs without looking constantly at the screen.

Could you suggest a way of attaching a CHR$(7) signal to these two error signs? I have tried monitoring PEEK(254), which works — the first time an error occurs. However, I have been unable to prevent the signal appearing at subsequent requests for input before the response has been entered.

Until I can make the INPUT routine more reliable, I am asking operators to enter the inputs as sequences of DATA lines (errors which can be picked up during program execution), but this is tedious and a waste of time.

I would appreciate your help to enable me to revert more safely to the INPUT routine.
Graham Balmain, Bitterne, Southampton

It's remarkably easy to alter the Apple's operating system, as it's stored on disk and copied into RAM when the machine is switched on. Consequently, it's easy to change part of it by POKEing the required action into the correct location. The error messages are stored between the addresses 43380 and 43581.

The following program will allow you to display these locations and their contents onscreen, thereby allowing you to alter them at will.

```
10 FOR Z=43380 TO 43581
20 X=PEEK(z) — 128 * (PEEK
   (Z) >
   128):a$=CHR$
   (46*(X<32)+X*(X>31))
30 PRINT Z" " PEEK (Z), A$
40 NEXT
```

When you alter an error message, you must ensure that the new version has fewer or the same amount of characters as the old one, and the last character in your message must have bit seven set (the number stored is 128 higher than its ASCII value).

There is, however, a simpler answer to your problem — utilise the Apple's ON ERROR GOSUB command, which will go to an error subroutine, ring bells and display messages to its hearts content.
Dr M P Thorne

Commodore 64 bug warning: unacceptable errors

I hope you can help me with a problem which may serve as a warning to others contemplating buying a Commodore 64 plus VIC 1541 disk drive.

According to the disk drive manual, the sample programs issued with the drive, the word processing package Easyscript and all other published material I have investigated, an already existing file on a disk may be overwritten by a file of the same name by using the SAVE & REPLACE command.

What they fail to mention is that there's a very good chance that this will destroy many other disk files by overwriting them. This can naturally cause problems.

Is there a bug in this system or is it a mistake in the manual?
S James, Chester

You are right in thinking that there's a bug in the disk system, which in turn is causing a problem with the SAVE & REPLACE command.

The problem arises whenever the program you're about to save is bigger than the one to be replaced. The result is disastrous, as it overwrites existing data on the disk.

However, it's not unreasonable to think that it's a mistake in the manual, as it's littered with them. Such bugs and manual mistakes are unacceptable, and there seem to be no plans to rectify them. There's a new version of the manual but it still contains errors.

Commodore is about to launch the 1542 disk drive, which is basically the 1541 in a new coat. Whether it has inherited its predecessor's bugs remains to be seen.

END

MICRO JARGON

Newcomers start here

This is our unique quick-reference guide, reprinted every month, to help our readers pick their way through the most important pieces of (necessary) jargon found in PCW. *While it's in no way totally comprehensive, we trust you'll find it a useful introduction. Happy microcomputing!*

Probably the first thing you noticed on picking up this magazine for the first time was the enormous amount of unintelligible-looking jargon. In the words of *The Hitch-hiker's Guide to the Galaxy:* Don't panic! Baffling as it may sound, the jargon does actually serve a useful purpose. It's a lot easier to say VDU, for example, than 'the screen on which the computer's output is displayed.' This guide is intended to help you find your way around some of the more common 'buzzwords' you're likely to come across in the pages of *PCW.*

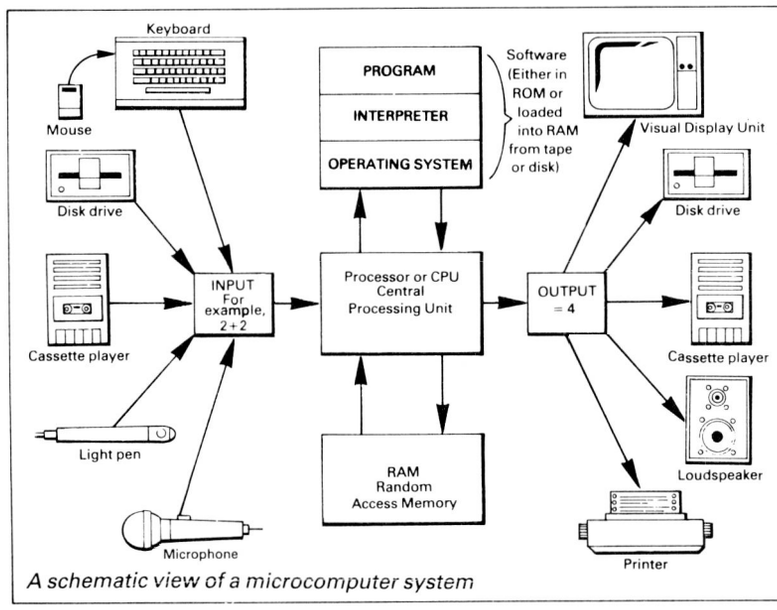
For those completely new to computing, let's start with the question: What is a microcomputer? We can think of a micro as: a general-purpose device in contrast to a typewriter, which can only be used for typing; a calculator, for performing calculations; a filing cabinet, for filing information, to name just a few of its functions. A micro can do all these things and more.

If it's to be of any use, a general-purpose device needs some way of knowing what to do. We do this by giving the computer a set of logical instructions called a **program.** The general term for computer programs is **software.** Every other part of a microcomputer system is known as **hardware:** 'If you can touch it, it's hardware.'

Programming

Programs must be written in a form the micro can recognise and act on — this is achieved by writing the instructions in a **code** known as a **computer language.** There are literally hundreds of different languages around, the most popular of these being **Basic.** Basic is an acronym of **B**eginners' **A**ll-purpose **S**ymbolic **I**nstruction **C**ode. Although originally intended as a simple introductory language, Basic is now a powerful and widely used language in its own right.

Other languages you're likely to come across in *PCW* are **Forth, Pascal, Logo, C** and **Comal** to name but a few. These are known as **high level** languages because they approach the sophistication of a human language. You'll also see references in *PCW* to the **low level** languages, **assembly language** and **machine code.** We'll look at these in a moment.



A schematic view of a microcomputer system

The heart of a micro, the workhorse, is the **processor** or **C**entral **P**rocessing **U**nit (**CPU**). The processor usually consists of a single silicon chip. As with computer languages, there are a number of different types of processor available, the **Z80, 6502, 6800** and **8088** being just a handful (literally!) of the types in common use. The processor is nothing magical — it's just a bunch of electronic circuits. It's definitely not a 'brain'.

As it's electronic, the processor's circuitry can be in one of two states: on or off. We represent these two states by **binary** (base two) notation, the two binary digits (known as **'bits'**) being 0 and 1. It's possible to program computers in binary notation, otherwise known as machine code (or machine language) programming.

Machine code is called a low level language because it operates at a level close to that 'understood' by the processor. Languages like Basic are known as high level languages because they are symbolic, operating at a level easily understood by people but not directly understood by the processor.

Between high level languages and machine code is a low level language known as assembly language or, colloquially, **assembler.** This is a mnemonic code using symbols which the processor can quickly convert to machine code.

Since everything has to be converted into binary form before the processor can make sense of it, we need some sort of code to represent each character to be processed by the computer. In order to simplify communication between computers, a number of standard codes have been agreed on. The most widely used of these codes is the **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange, **ASCII.** This system assigns each character a decimal number which the processor can then convert to its binary equivalent.

A program written in a high level language must be converted into binary before the processor can carry out its instructions. We could of course do this manually, but since this is exactly the sort of tedious job computers were designed to do for us, it makes much more sense to write a program to do it.

There are two types of program to do this translation for us.

The first of these is a **compiler** which translates our whole program permanently into machine code. When we **compile** a program, the original high level language version is called the **source code** while the compiled copy is called the **object code.** Compiled programs are fast to run but hard to edit. If

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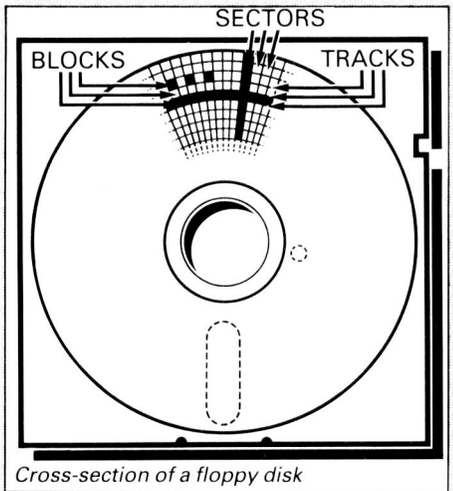
we want to change a compiled program, we either have to edit it in machine code (extremely difficult) or we have to go back to a copy of the source code. For this reason there is a second translation program: an **interpreter**. An interpreter waits until we actually **run** (use) the program, then translates one line at a time into machine code — leaving the program in its original high level language. This makes it slower to run than a compiled program, but easier to edit.



Cross-section of a floppy disk

There are two unusual Basic words you're likely to come across: **POKE** and **PEEK**. When you program in a high level language, you are normally unable to choose in which part of the machine's memory the processor will store things. This makes programming easier as you don't need to worry about memory locations, but slows down the program since the processor has to 'look up' addresses for you. Using the POKE command, however, you can 'poke' a value directly into a desired memory address. 'POKE 10000,56', for example, puts the value 56 into memory location 10000. PEEK allows you to examine the content of a particular memory address. If you were to follow the above poke with 'PEEK (10000)', the computer would respond by displaying the value 56. POKEing and PEEKing is normally done to increase program speed, but may also allow us to do things which could not be done through Basic.

Memory

So far, we have a processor and a program. Since a computer needs somewhere to store programs and data, it needs some kind of **memory**. There are two types of memory: **Read Only Memory (ROM)** and the badly-named **Random Access Memory (RAM)**. ROM is so-called because the processor can 'read' (get things out of) its contents, but is unable to 'write to' (put things in) it.

ROM is used to store **firmware**, the name given to software permanently available on the machine. An interpreter is a typical example of firmware (stick with it: it gets easier!).

RAM differs from ROM in two important ways. Firstly, you can write to it as well as read from it. This means that the processor can use it to store both the program it is running and **data** (information). The second important difference is that RAM needs a constant power supply to retain its contents: as soon as you switch the computer off, you lose your program and data.

There is a type of RAM, known as **CMOS RAM**, which requires only a tiny amount of power to retain its contents. This is found in portable computers like the Tandy 100 and the Gavilan MC. It is usually powered by small ni-cad batteries so that programs and data are retained even when the main power is switched off. At present, CMOS RAM is extremely expensive and is not likely to be used in desktop machines for a little while yet. (CMOS stands for **C**omplementary **M**etal **O**xide **S**emiconductor).

Memory is described in terms of the number of characters we can store in it. Each character is represented by an 8 bit binary number. 8 bits make one **byte** and 1024 bytes make one **Kilobyte** or **1k**. 32k, for example, means that the computer can store about 32000 characters in its memory. If 1024 sounds like an odd number, remember that everything is based on the binary system, thus 1,2,4,8,16 . . . 1024 being the nearest binary multiple to 1000.

While we're on the subject of bits, you'll often see computers and their processors described in terms of their **bit power**: **8-bit, 16-bit, 32**:**16-bit** and so on. This is a means of describing how large a binary number the processor can handle in one chunk. A binary number, incidentally, is known — confusingly — as a **word**. An 8-bit processor, for example, can handle 8-bit words, that is, up to 11111111 (255 in decimal). Anything larger than this has to be broken down into manageable chunks before it can be processed.

A 16-bit machine can handle bigger chunks of data at a time. This means it can handle ('**address**') larger amounts of memory at one time. This is why most 8-bit machines have a maximum of 64k RAM while 16-bit micros usually have 128k upwards.

As 16-bit processors can handle larger words than an 8-bit machine, they ought to be twice as fast. In practice, however, there is a little more to it than that. While it may take a 16-bit machine half as long to work out that 2+2=4, the actual processing is only part of the story.

The result of the calculation has to be placed into the appropriate memory location, passed to the screen or whatever is required. The transfers to and from the processor are often made in 8-bit form; this is why you'll hear people arguing that certain processors are not 'true' 16-bit. If the problem has to be handed to the processor in 8-bit form, turned into 16-bit, calculated and then the result turned back into 8-bit for transfer elsewhere, there may be little or no saving in time over an 8-bit system.

The other factor affecting speed is that the actual processing may form only a small part of the overall operation. A word processor, for example, spends most of its time passing files to and from disk and waiting for the user to type the next character. The processing itself consumes very little time. And if you look at the Benchmarks summary (*PCW*, December 1983, pp. 238-241), you'll see some 8-bit machines beating their 16-bit rivals — even in processor-bound operations like the *PCW* Benchmarks.

Returning to the subject of RAM for a moment, a word of warning: Don't rush out with your new-found understanding to buy the machine offering you the most RAM for your money. Quite aside from the fact that the amount of RAM is by no means the only consideration when buying a micro (no matter how much manufacturers may stress it), different machines use differing amounts of RAM for things like graphics. Always check how much RAM is actually available to the user for program storage. Machines which proudly proclaim '64k' may well leave you with less than half of this in which to store Basic programs and data.

Back up storage

There are numerous forms of **permanent** or **back up storage**, but by far the most common are **floppy disk, floppy tape** and **cassette**.

Floppy disks or diskettes are circular pieces of thin plastic coated with a magnetic recording surface similar to that of tapes. The disk, which is enclosed in a protective card cover, is placed in a **disk drive**. Disk drives comprise a high-speed motor to rotate the disk and a **read/write head** to record and 'play back' programs and data.

The disk is divided into concentric rings called **tracks** (similar to the tracks on an LP) which are in turn divided into small **blocks** by spoke-like divisions called **sectors**.

There are two methods for dividing the disk into sectors. One method is called **hard sectoring**, where holes punched in the disk mark the sectors, and the other is **soft sectoring** where the sectors are marked magnetically. The reason that disks from one machine can't be read by a different make is that each manufacturer has its own way of dividing up the disk. Recently, however, manufacturers have apparently begun to acknowledge

that this situation can't go on forever, and they are working on making their disks compatible.

Since the computer needs some way of organising the disk, we have a program called a **Disk Operating System (DOS)**, usually known simply as the **Operating System (OS)**. The operating system does all the 'housekeeping' of the disks, working out where to put things, letting the user know what is on the disk, copying from one disk to another and so on. As you might expect by now, there are lots of different operating systems available, each with its own advantages and disadvantages. The three most popular OSs are **CP/M** (**C**ontrol **P**rogram for **M**icros), **MS-DOS** (**M**icro**S**oft **D**isk **O**perating **S**ystem) and **PC-DOS** (**P**ersonal **C**omputer **D**isk **O**perating **S**ystem). MS-DOS and PC-DOS, incidentally, are all but identical.

Disks can support what are known as **random access files**. That is, you can randomly choose a point in a file and the drive head will move directly to that point. You can then edit the file, and only the blocks affected will be rewritten. The rest of the file remains unchanged.

Floppy disks provide a reasonably fast and efficient form of secondary storage and are cost-effective for business machines. For home computers, however, the usual form of program and data storage is on ordinary cassette tape using a standard cassette recorder. This method of storage is slow and unreliable, but is very cheap and adequate for games, for example.

Cassettes can support only **serial access files**. That is, whenever a file is to be edited, the whole file must be written back to the tape. This makes certain applications — word processing being a prime example — extremely tedious.

Floppy tape drives are a compromise between speed and cost. They use a small continuous loop tape which, like a disk, is divided into blocks. Floppy tape drives rely on serial access files, but by rotating the tape at high speed and using the block markers, they can simulate random access files. The Sinclair Microdrive is a floppy tape drive.

Another type of disk you'll see referred to is the **hard disk**. This is an extremely efficient method of storing large amounts of data. Hard disk capacity generally starts at around 10**Mbytes** (10 million bytes) and rises to . . . well, you name it. Besides offering a much greater capacity than floppies, hard disks are more reliable and considerably faster. They are, however, much more expensive than floppy drives.

Input/output

Since computers need some way of communicating with the outside world, we need **input** and **output** devices. Input and output devices include all manner of things from hard disk units to light pens, but the minimum requirement for most applications is a typewriter-style **keyboard** for input and a TV-like **Visual Display Unit** for output. The Visual Display Unit is variously referred to as a **VDU, Cathode Ray Tube (CRT)** and **monitor**.

The various component parts of a computer system (processor, keyboard, VDU, disk drives, and so on, may all be built into a single unit or they may be separate, connected by cables.

Take this paragraph slowly and it will make sense! When a computer communicates with an outside device, be it a printer or another computer, it does so in one of two forms — **parallel** or **serial**. Parallel **input/output (I/O)** requires a number of parallel wires. Each wire carries one bit, so with eight wires we can transmit/receive information one byte at a time (8 bits = one byte, remember). Serial 1/0, in contrast, uses a single wire to transmit a series of bits one at a time (that's why it's called serial), with extra bits to mark the beginning and end of each byte.

To enable different devices to communicate with each other in this way, standards have been agreed for different **interfaces**. An interface is simply a piece of circuitry used to connect two or more devices. The most common stardard serial interface is the **RS232** (or **V24**) while the Centronics standard is popular for parallel interfaces.

Networks

When two computers want to communicate with each other over a distance, there are again two ways of doing it (nothing is ever clear-cut in the world of micros — you'll get used to it). Both methods use the public phone network. The first is known as an **acoustic coupler**. This simply plugs into your computer, and has a receptacle into which you place your telephone handset. The acoustic coupler is convenient in that you can unplug it from one computer and plug it into another one in a matter of seconds. They are generally slow, however, and prone to interference.

The alternative method is to use a **modem**. Unlike an acoustic coupler, a modem is wired into the telephone system and you should get permission for this from British Telecom.

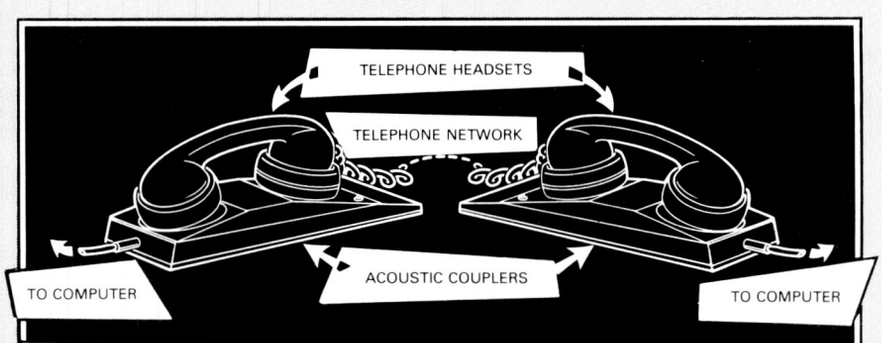
A term you'll hear used in connection with acoustic couplers and modems is **baud rate**. The baud rate is a measure of the speed at which a device can transmit and receive data. You can safely think of the baud rate as being bits-per-second, though the accurate definition is a little more complex. Therefore, a 300-baud modem can transmit/receive data at the rate of 300 bits (about 50 characters) per second.

A 1200/75 modem means that it receives at 1200 baud but transmits at 75. Most modems are 1200/75 and acoustic couplers 300/300. By way of comparison, saving programs to cassette is normally done at between 300 and 1500 baud.

Finally, communications between computers is either **full** or **half duplex**. Full duplex is when the machine receiving the data echoes it back to the machine transmitting it and says 'This is what I think you said — is that right?'. If it's wrong, the section will be transmitted again. Half duplex is where no checking is made. If you're ever unsure of which to use, start with full duplex. If everything you type appears on your display twice, then you should switch to half duplex.

Database

A database allows you to store, process and report on structured information. Most of the cheaper packages are based on a traditional card index where each card about an individual, order or item of stock is stored in a single record and a group of like records is stored in a file (corresponding to the index card box). Sophisticated packages can relate several files together, so that you can process groups of dissimilar but related records.



Computer-to-computer communications using acoustic couplers.

Spreadsheet

Spreadsheet software is useful to anyone who regularly uses a calculator. The VDU acts like a 'window' on a large sheet of numbers — neatly laid out in rows and columns, occasionally interspersed with text headings. The user is able to shift the window to the point of interest and so enter text. The rest of the calculation is displayed immediately with automatic recalculations throughout. **END**

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● WOULD anyone be willing to donate any computer hardware to a computer club? Write to Towcester Microcomputer Users Group, 20 Wordsworth Close, Towcester, Northants.
● ACT Sirius 1 128k RAM. 1.2Mb floppy disc + Epson EX80. Also listing paper and various software. Just 6 months old £2,500 ono. Tel: (0795) 534772.
● SHARP MZ-700. Built-in tape drive, 64k, can be used with colour TV. Knights software, Forth, Pascal, Machine Code, included. Hardly used £175 ono. Langton, 01-628 4266 (work).
● OSBORNE IS. 80 column, double density + CP/M, CBasic, MBasic, Wordstar, Supercalc, Mailmerge. Hardly used £900 ono. Tel: (021) 705 9340.
● IBM; model 73 golf ball electric typewriter. Recently overhauled, circuit and mechanical diagrams available for knowledgeable amateur to interface to home computer £100 ono. Tel: (061) 969 7847 (eves).
● SUPERBRAIN computer; 64k 2 × 168k disk drives, reliable machine with CPM programmes, 2 × RS323 interfaces, manuals. Excellent word processor, versatile machine. £750 + VAT. Tel: 01-959 2049.
● ITT2020 (Apple 2), 64k. Apple disc drive, Silentype printer. Some software, Dos 3.3, Applewriter, Toolkit, Visicalc, etc. £399. Tel: Crewe (0270) 780608.
● PET 3032. With 3022 printer and cassette. Basic 4, Toolkit and Arrow Chips. Very good condition. £550 ono. Winsford (06065) 58083.
● APPLE Graphics Tablet £230. Utopia Tablet software £20. Digitek colour card £40. Bitstik 'Robo 500' £160. Appleworld £10, 3-D Supergraphics £10. Bill Budge's 3-D Graphics system £10. Tel: Tim, 01-263 2562 eve, weekends.
● SHARP MZ-80K: 48k. With hi-res graphics, worth over £100. Also manuals and many games (more than £50). Very little use, £225 ono. 0625 875039. Poynton, Stockport, Cheshire.
● BBC B. Dual double sided 80 track drives; own PSU. Epson MX 80III printer. Wordwise, graphics ROM, disc Doctor, Watford DFS. Lots of books, software etc. £1,000. Tel: St Albans 0727 36016.
● APPLE IIe. 3 Disk IIs, 2 Controllers, Monitor III, extended 80 column card and 32k Microbuffer printer card for sale. Bought Nov 83, upgrading to Apricot. Offers 03596-669.
● TRS-80, Model I, 48k expansion interface, 3 double density disk drives, monitor and heaps of software including Visicalc. £450 ono. Tel: 01-997 7578.
● Calculators: Texas TI 59, magnetic card, programmable, hardly used, immaculate £90. Hewlett Packard HP-34C, constant memory, programmable, perfect condition £38. Both complete with accessories and manuals. Tel: Castle Rising 520.
● TRS80 Model I; 48k, green VDU, lower case, twin 80 track drives, Newdos 80, Scripsit + various programs £650 ono. Tel: Bishops Waltham 3752 evenings only.
● ATARI software discs. Unwanted gifts. Text Wizard word processor £48. Atari world £28. Tel: 0454 774309.
● TRS-80 Model 1 16k Level 2. Including green screen monitor, cassette leads, excellent software, manual and programming books. All in very good condition, £180. Tel: Milton Keynes 78884.
● TRS-80 Model I, Level II. 16k + 32k expansion interface, monitor, new 80-track disk drive, LDos 5.14 operating system, software on disk and tape (includes cassette recorder). Moving hence offers over £425 accepted. Tel: John, 01-947 8442.
● DRAGON 32; disk drive, disks, tape recorder, tapes, printer cable, tape lead, Dragon user until April 1985, Sprite, 100 magazines, joystick, 5 books; worth £650, sell for £450 ono. Tel: (0602) 224046.
● HEWLETT PACKARD HP-41C, + 1 memory module and Math Pac. 4 months old. Guarantee still effective, £150 ono. Tel: 01-318 4201.
● APPLE type system. Twin drives, hi-res green monitor, 64k RAM, with printer £689. Also various add on cards. Tel: Jones on 0435 830680 for further details.
● PROFESSIONAL business system running CPM 2.2, Diablo daisy wheel printer with software including word processing, accounts, database, spreadsheet only £1,850. Jones. Tel: 0435 830680.
● TRS-80 Model 1 48k. Including monitor, expansion interface, disk-drive, TRS DOS and LP VII printer. Plus all manuals, £450 ono. Tel: Portsmouth (0705) 664911 (daytime) contact Colin Reynolds.
● SHARP MZ-80k. Excellent software including Sharp's Pascal, editor/assembler etc. Plus manuals, books and newsletters. As new condition in original box. Offers around £220. Tel: (061) 973 7701.
● NEWBRAIN. Complete with compatible cassette recorder, leads, handbook, beginners guide and tape; £145. Tel: (061) 480 3438, during office hours. Stockport, Cheshire.
● EPSON HX 20. With tape drive, 1 year old, used once a week, £250. 01-681 7356 Scroggs, Croydon area. 178 Croydon Road, Beddington, Surrey.
● SELECTRIC keyboard printer, ex 2741 with hardware/software interface for Z80 micro + P10, runs with Nascom + NAS-SYS, Tandy etc. Previously IBM maintained, excellent working order. Sensible offers to Ian, Ipswich (0473) 831 353.
● SPECTRUM 48k. Interface 1, microdrive, ZX printer, printer paper. Books, ROM Disassembly, Microdrive book, Beginner's M-Code, Hardware manual. Some software, offers around £230. Tel: (0258) 52508 after 6pm or weekends.
● FOR SALE. Video Genie 48k, £140, 12in screen monitor green £50, or part exchange for 2 disc drives suitable for Tandy TRS 80 Model 3, Genie has many extras. Tel: Jim, 0452-731358.
● PET 3032; C2N, green screen, soundbox, Arrow, over £400 software including Apshai, Hitchikers, Dragon's Eye, PetChess, and original Colossal Cave Adventure, £285 or + cash for Apple and disks. Tel: 748 7365.
● GEMINI Multiboard system. CPU, IVC, keyboard, 32k CMos RAM card, Nascom I/O card, PSU + 12 slot card frame, also Gemzap, Gemdebug and Gempen. £350 ono. Tel: Brighton (0273) 506569.
● OSBORNE 1. Excellent condition CP/M, Wordstar, Mailmerge, Supercalc, Basic & CBasic, TV adapter, 10 diskettes, comprehensive manual, £795 ono. Tel: Upminster (04022) 23886.
● OSBORNE 1. Single Density CP/M, MBasic, CBasic, Supercalc, Wordstar, vgc. For quick sale £600 ono. Tel: 0276 21874 after 7pm or weekends.
● SINCLAIR SPECTRUM. With printer and many games including Jetpac, Transam, 3D Deathchase and many others. 16k machine, £130 ono. Tel: Monday to Friday after 6pm. Ask for Nasir on (021) 772 0600.
● SHARP MZ-8A, 48k RAM. Integral green monitor and cassette. Software includes 2 Basics, Home Finance, many games and tapes. House move forces sale, £350 ono. Tel: (01) 654 4556 (Croydon).
● VIC20 and C2N cassette unit, manual, books, presentation programs etc. All in good condition £90. S.E. London. Tel: (01) 635 8095.
● WANTED: TRS80 Model 1, 48k. With at least one disk drive. For sale: Tandy Quickprinter II £30, collected. Seven £4 packs quickprint aluminised paper for £15 post free. 20 Pytchley Drive, Loughborough LE11 2RH.
● ACULAB IEEE to parallel-port decoder type Pet 2 (7-bit); Aculab parallel to RS232 interface type 735P. Offers invited. Tel: Felixstowe (0394) 275378.
● TRS80 Model 1, 48k. RS232 Lodos, Newscript, Telesoft, Tantel, Prestel, adaptor. Green VDU £220, or with two disks £480. Dr. Taylor, 11 Ironbridge Path, Fordham, Cambs CB7 5LJ. Tel: Newmarket 720765.
● VIDEO GENIE, EG3003, 16k, RAM. Built-in cassette, soundbox. Loads of software, Edtasm, Mon 3, Asteroids, Djinn and more. £180 ono. Tel: David, Burntwood (nr Walsall). Tel: (05436) 3729 eves.
● SHARP MZ80A 48k. £110, software includes Basic, Forth, Pascal, Machine Code Loader, Home Finance, Chess, Fender, Space Invaders, £375. 31 Burnhope Road, Barmston, Washington, Tyne and Wear. Tel: 091 4160865.
● SHARP MZ80K; £60 only. Not used much and nothing wrong with it. Repeat £60, only. Critchley, 10 Woodside Avenue, Brighton, BN1 5NF.
● BBC Model B, Zenith green screen monitor, cassette, £60 software (including Lisp, White Knight) £420, ono. Tel: 0703 617214.
● OLIVETTI PRAXIS. 35. Electronic daisywheel typewriter, suitable for adaption to daisywheel printer, £175. Tel: Guildford 223109 (eve).
● OSBORNE double density disks

NUMBERS

Question C: Summary of results for Kaprekar numbers

. . . continued from page 180.

n = 1	1	9
n = 2	(1)	99
	45	55
n = 3	(1)	999 in six seconds, simple program
	297	703
n = 4	(1)	9999 total run time 0.97secs
	2223	7777
	2728	7272
	4950	5050
n = 5	(1)	99999 total run time 3.2secs
	(4879)	95121
	17344	82656
	22222	77778
n = 6	(1)	999999 total run time 4min 10secs
	(5292)	994708
	(38962)	961038
	142857	857143
	148149	851851
	181819	818181
	187110	812890
	208495	791505
	318682	681318
	329967	670033
	351352	648648
	356643	643357
	390313	609687
	461539	538461
	466830	533170
	499500	500500
n = 7	(1)	9999999 total run time 39.5secs
	(627615)	9372385
	4444444	5555556
	4927941	5072059
n = 8	(1)	99999999 total run time 2 hours 3mins
	(5479453)	94520547
	(8161912)	91838088
	11111112	88888888
	13641364	86358636
	16590564	83409436
	19273023	80726977
	19773073	80226927
	24752475	75247525
	25252525	74747475
	30884184	69115816
	36363636	63636364
	38883889	61116111
	44363341	55636659
	44525548	55474452
	49995000	50005000
n = 9	(1)	999999999 total run time 1min 6.7secs
	23467901	765432099
	332999667	667000333
	432432432	567567568

Final comments

There are some significant intriguing patterns of digits and symmetries. In particular, the fact that the total of K-numbers for any n seems to be either 2, 4 8, or 32 indicates that it is possible to generate all the numbers from a smaller exploration still. There is a strong temptation to pursue the problem further . . .



TRANSACTION FILE

with Wordstar, Supcalc, MBasic, CP/M and DBase II. Best offer over £600. Also ITT 2020 with 2 disk drives, best offer over £350. Tel: 0205 69613 after 6pm.

● NASCOM 2, 32k RAM board NAS-SYS3, graphics ROM, documentation. Also Centronics microprinter, hardly used. Will accept best offer for each. C. Thomas 156 Coldharbour Lane, Camberwell, London SE5 9QA.

● S100 NORTH STAR S/D disc controller + Dos + Basic £60. North Star 5·2 upgrade £15. N.S.U.G. discs numbers 7, 14, 35, 40, 44, 46, 49 on four discs £8.50. Tel: (0283) 44549 after 6pm.

● BRITISH Micro Mimi 802. Twin 5in D/S disk drives + monitor + various utilities + manuals, OK1 80 D/M printer. Offers around £500. Tel: 0283 33753 or 0332 382390.

● ACT SIRIUS. 1.2mb disk capacity, MS-DOS, CP/M-86, perfect condition, save £629 on current price, £1,895. Tel: Waltham Cross (Herts) 31157.

● COMMODORE 64 plus C2N data cassette, 5 books including programmers reference guide, 5 games, Simons Basic, 6 months old with extended guarantee, cost over £350, sell £250. Tel: Reading (0734) 664073.

● EPSON MX100. FT III printer, hardly used, original box. Full 132 column and 100 CPS. Tel: Hogarth, Watford 0923 31289.

● CBM 4032; (32k). Cassette deck, 4022 matrix printer with box of paper. All manuals, leads etc, loads of software and books. Condition as new, £495 the lot. Tel: I.O.W. 522564.

● APPLE II Plus, 48k, dual disks, 8088 co-processor, Videx 80 col card, 16k language card, £550. Tel: 027588 5040 after 6pm.

● CBM 8032 and 8050 disk drives, complete with Visicalc, cables, manuals, discs, etc. In perfect working order. Delivered South East, £1,000 the lot. Tel: 0233 31322 (eves, weekends).

● ONLY £220. Dragon 32+ Amber 2400 printer plus loads of books, software including Assembler, Compiler etc. Tel: Fakenham (Norfolk) 4177 evenings after 6pm or weekends.

● COMMODORE 3032. Toolkit, Superchip, soundbox, reset cassette, 4040 drive, 4022 printer. Software, VisiCalc, Wordcraft 80, D.M.S. 100s more, books. Nearest offer to £1,100 gets the lot. Tel: Tony 0532 (Leeds) 454868 day.

● TRS-80 Model III, 48k, 2 disk drives, DOS, manuals, green filter, £850. Tel: 01-892 9940 eves. (Twickenham).

● APPLE II +, 64k disk drive, Z80 softcard, language, parallel interface and 2 colour cards in carrying case. Plus Paper Tiger 305440 printer. Excellent condition. Fully documented. Will separate, £800. Tel: Northwich (0606) 44483.

● ATARI 400, 16k. Cassette recorder, joysticks, £260 worth of software, worth over £500. Best offer over £200. Tel: Marc 01-445 0925 (after 5pm).

● TORCH Z80 disc pack + BBC B nearly new. Perfect software + WordStar, £1,200. Brother HR15 daisywheel printer £300. Discs and extras makes a full word processor package. NW11. Tel: (01) 458 8303.

● FOR QUICK sale, Tandy 32k colour computer, cassette player, cartridge games and books, £75. Also colour graphic printer CGP-115, as new, £80. Tel: Bloxwich (0922) 78549.

● APPLE II + 2 disc drives, monitor, 80 col card, Micronet card, Prism modem, software, £980. Tel: (01) 749 6528.

● VIC-20. Expanded 32k. Stack Vickit-II cassette recorder, printer, much software for business, education, games. Worth over £200, estimated value £850. Want £500 ono. Tel: 0621 741648 after 6pm, Brian Green.

● FOUR DIGITAL cassette tape drives. As Quad unit with controllers. Suit any machine bus or port connection. Full documentation and software. Offers around £250, buyer collects. Tel: Andover (0264) 710636.

● SUPERBRAIN. Twin DS, DD, 320k disk drives. Firt class condition, complete with WordStar, DataStar, DBMS, MBasic + games disk Othello etc. £1,350. Contact Morris (01) 904 5383.

● TRS80 Model 3, 48k. Twin disks, perfect condition, original software. Superscript (word processor), Profile (database), Tandywriter (mailmerge), NewDos 80. Approximately 50 games. Ideal for business/home use, £750 ono. Tel: Laurence Hatfield (07072) 65466 eves.
ed. cost £150. Any reasonable offer. Tel: Staines Middx 58531 eves.

● APPLE II+ 64k. Microsoft Z80, MBasic, CP/M, Videx videoterm, softswitch enhancer and function strip, 2 disk drives £1,250 ono. Also for sale, games and utilities. Tel: Clive 0772 745472 eves.

● TRS80 Model I Level II, 48k. Expansion interface + single disk. Lower case mod. Gnomic ROM 'B' utility. Hi-res GR/SCR monitor, software, manuals, books, £600 the lot. Tel: (01) 530 5332 after 7pm.

● COMMODORE 710B. 10 months old, vgc, 2031LP disk drive, cables £995. Tel: Thanet (0843) 603478.

● SHARP MZ-80K Disks + printer + wdpro + Pascal + Forth + Assembler + utilities + games + manuals + books. Has been extensively used for program development, documentation, word processing. Must sell, moving on. £600 ono. Tel: Banchory 2706.

● SUPERBRAIN II. Quad density with CP/M and MBasic. Little used £950. Also Seikosha GP250X graphic printer £180. Tel: (0865) 57816.

● TRS80 Model 1 48k. Expansion interface, single disk monitor, superutility plus Zen, Accel3, Scripsit, VisiCalc, NewDos 80+ LDos, TRSDos, Instant sort dozens of software disks. New Epson printer MX80F/T1, £780. Tel: (0749) 75783.

● TANDY TRS80 Level 2, 48k, Expansion interface disc drive, monitor, cassette deck, sound amplifier, TRSDos, LDos, NewDos, VisiCalc, Adventure and Arcade games. All manuals, £575. Tel: (061) 980 4660 after 6pm.

● VIC 20, programs, cassette recorder, manuals, £85. Tel: Peter, (01) 802 3946.

● C.G.L. M5 computer. With cassette player and £20 of software, six months old, excellent condition, was £200, sell for £120 ono. Tel: (01) 328 4432 after 5.30pm.

● SHARP MZ80K 48k. In original box, excellent condition. 3 Basics + many games and M/C arcade classics, books, magazines, reset switch and volume control, £230 cash. Tel: Barnsley 763782 (Mick).

● BBC/Prestel Prism acoustic modem and Micronet ROM for only £50. Tel: Milton Keynes (0908) 665806.

● HP75C complete. Purchased Nov '83. With Easymemo program and PPC User Club journals for 1983/4, if wanted. £400 ono. Ray Wearn. Tel: (01) 943 4628 eves, (01) 839 7000 days.

● ITT 2020 APPLE 64k compatible colour computer. Disk drive, 16k RAM, 12in Sanyo monitor, 80-column card. Also Prism modem for (Prestel), software, books, manuals, £650 ono. Tel: Dave, (01) 421 2451, Harrow.

● APPLE II equipment. Disk drive £120, Applesoft card £40, 80 column card £25, disk interface £25, integer £20. Silentype card £25, software Ultima II £15, Space Vikings £12, Airflight Sim II £18. Tel: (0203) 72438.

● SHARP MZ-80K 48k. Perfect condition. Several Basics and extensions. Pascal, Zen, user notes, books, software, dust cover. Offers around £250. Tel: Yateley (Hants) 870094.

● GAMES for Commodore PET 4000. 12 inch screen, worth £100+, 12 games. Includes Petchess (32k), Superglooper, Invaders. All M/C programs for cassette, £45 includes carrycase. Tel: Luton (0582) 65300.

● OSBORNE I. Double density. (2 × 180k) CP/M, WordStar, Supercalc, C/MBasic Microlink, blank disks, games VCSD-P system, Pascal compiler £895. Tel: 0943 602929, John Konrad.

● IDEAL for beginners. Texas T199/4A system. Cassette recorder, blanks, leads. Learning software, manuals, extra books. Extended Basic course. Games software. All new. Tel: (061) 761 1632. Offers. Genuine reason for sale.

● APPLE IIe Datastar software package £170 ono unregistered. Includes Z80 card with 70 column display acts as 64k RAMdisk. With full CP/M op/sys, Datastar, Reportstar, utilities. Fully CP/M compatible, runs all MicroPro. Walters. Tel: 0734 56526, 6pm.

● Easycalc 3D spreadsheet by Handic for Commodore 64 on disk. Hardly used, cost new £99, will accept £50 or swop for a good Database package. Tel: (01) 722 5880 day, (01) 952 2644 eves.

● SIRIUS I. Brand new and boxed, 2·4BM, double sided disks, cost £2,895, will sell for £1,850. Give away price so no silly offers please. Tel: (0670) 829215.

● BRAND new unused Toshiba P1350 printer. Unwanted prize, still boxed, fully guaranteed, 100cps letter quality, 192 cps draft. Retail price £1,495, bargain at £1,245. Superb machine. Tel: Jonathan (025671) 2724 or 3277.

● NASCOM 2, with programmable graphics, 64k, 8-bit ADC and DAC cards. Colour monitor, cassette, noise generator, joystick. Pascal, Basic, games, complete documentation. Offers. Tel: Simon 061 236 3311 ext 2982 day or 061 225 8579 night.

● SWOP my boat for your computer. 18'6" clinker cruiser moored Cornwall, value £500 offered. Sharp MZ711, Commodore 64 or W.H.Y. With drive printer VDU. Cash adjustment either way. Tel: (072681) 4302 (Par).

● WIRELESS WORLD, September 1954 to August 1983. 29 years. believed complete. Some loose pages. What offers, buyer collects. Coulsdon, Surrey. Tel: 07375 52713 eve/weekends.

● MICROVITEC 1446. 14in colour monitor for Apple. Excellent condition, unused, £130. Tel: 0792 60280. Louise Snow, 12 Oakland Road, Mumbles, Swansea, West Glamorgan, S. Wales.

● CENTRONICS 737 printer. Tractor and friction feed. RS232 interface, £250. Tel: Tamworth 895160.

● TRS-80 Model III 48k. Twin disk drive system. Basic, some software, £750 ono. Tel: (0990) 24716. Nigel Pridmore.

● MZ80K (48k). VGC, hardly used, 100+ programs including Chess, Basic, Forth, hundreds of listings, manuals, user notes, etc. Excellent value £260 ono. Tel: John on 01-965 6588 ext 242 during working hours only.

● TRS-80, line printer VIII tractor or friction feed. 80cps Parallel and RS 232 interfaces. Very little used, cost £500 new. Accept £250. Tel: Lodge Hill 42484 (Eves).

● ACT Sirius I, 128k, 1.2mbyte, CPM, MSDOS, Basic, Wordstar, Mailmerge. Buying new house, hence sadly must sell £1,600. Also OK1 Microline 82A, £250. Tel: 0525 377600 ext 59 day, 050785770 weekends. Davey.

● MATRIX PRINTER, 9in, 80 column and 132 compressed. Hardly used, boxed, £200 ono. Osborne 1 portables, 2×100k floppies, 64k RAM and screen, CP/M Wordstar, Supercalc and Basic, £600 ono. Tel: 032945977.

● COLOUR GENIE computer. Microline 80 printer, Parallel printer interface, books, games, utilities and leads. Demonstration available, £250 only. Will not split. Tel: Daniel on Warminster (0985) 212858 after 5pm.

● TRS-80 Model I Level 2. 48k, lower case, monitor, printer VII, and software. Ideal for hobbyist or small business, £450 ono. Tel: 01-950 3621 for more details.

● SHARP MZ80A plus over £100 software. Bargain at £295. Also Sharp dual discs for MZ80K plus expansion box and lots of software. Accept £595 for quick sale. Tel: Wilmslow 532864.

● APPLE II europlus, diskdrive, 9in monitor, 80 colum card, full 64k RAM system software, games and manuals included, £850. Tel: Epsom 26854.

● SPECTRUM 48k computer. Compatible cassette, Sony, £60 of software, practically new, all cables. A complete system ready to go £150 ono. Tel: Rod Crowgey on Gerrards Cross 884262.

● NEWBRAIN AD. Complete with Beginner's Guide, assembler, disassembler, word processor, Chess and many other games/application programs. Also technical manual and complete ROM disassembly listing, £240 ono. Tel: Bath (0225) 27088

● WORD PROCESSOR Supertyper FD85. Efficient professional system, Qume Sprint 3 45cps, Daisywheel printer, tractor feed, cut sheet feeder, dual disks, 520k, manuals, leads. Delivery, good condition, urgent, £950 ono. Tel: 01-626 1515 ext 2214. Robert.

● PHILLIPS P2000C portable computer. Bundled software includes Wordstar, Supercalc, MBasic, twin 640k disk drives, £1450. Tel: (0234) 852942 days or (0234) 857491 eve.

● WANTED Casio FX602 programmable calculator. Must be good condition. All prices considered. Tel: Dunstable 603907.

● COMMODORE 8032 SK. Brand new 8050 disk drive, 4022P tractor printer. All in price, £1200. Will split. Offers accepted. Tel: 01-368 5192 anytime. Terry.

● BBC micro 32k model A with Epson MX80FT III printer, 9in VDU and software, £500. Tel: Halifax 41408.

● SHARP MZ80B 64k with twin discs, printer and software, Wordstar, Calcstar, F/DOS, £950 ono.. Tel: Corsham (Wilts.) 714589 (24 hours).

● EPSON MX80F/T, matrix printer. With RS232 interface + 2k buffer, friction and tractor feed, with cable and paper, £210 ono. Tel: Winchester (0962) 56703 or Esher 64610.

● SHARP MZ-80K. (48k) + MZ-80i/o + MZ-80P3. Good condition. Includes manuals, cables, games, languages and toolkit. Will split, £400 ono. Tel: Ipswich 0473 684957 after 6pm.

TRANSACTION FILE ADVERTISEMENT FORM

All Transaction File ads must be submitted by readers on this form or a photo-copy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by a flat fee of £2.50. Make cheques or POs payable to Personal Computer World. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send form to: Transaction File PCW, 62 Oxford Street, London W1A 2HG.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

ACC NEWS

Rupert Steele has all the info on clubs belonging to the ACC and can give you tips on how to start your own.

Those of you who watch Prestel may well have seen changes afoot in Club Spot. Micro computing activities on Prestel are now grouped together in a single 'Prestel Microcomputing' structure starting on page 456 (comprising several Information Provider nodes). Most of this material will be within a single Prestel Microcomputing CUG (Closed User Group — you'll have to subscribe before you can access the pages). Micronet and Viewfax will be two of the other participants, and ClubSpot should have moved to page 810 as a proper IP, rather than page 8008. The area will then be called 'ClubSpot 810'. Other than that, there should be no immediate changes in the scope and structure of ClubSpot, although it is likely that much of the material will be placed in the Prestel Microcomputing CUG.

ClubSpot is run by the Communications group of the Association of Computer Clubs (ACC). The secretary of the Communications group is Andy Leeder of Church Farm, Stratton St Michael, Norwich NR15 2QB. Contact him to find out about how you can edit your own pages on ClubSpot (usually on behalf of your computer club); he coordinates the names of those attending the ACC's regular editors' conferences. ACC is also building up a directory of local computer clubs in ClubSpot, so drop Andy a line if you would like to see your club's details on Prestel.

ACC database and affiliation

Perhaps I should remind you that the ACC maintains a national list of computer clubs, which is regarded by many as the most up to date available. If you are forming a club, or are involved in a relatively new one, make sure you contact the ACC; as well as putting you on our database (giving your club free publicity) we will send you a free club information kit including advice on setting up and running a computer club, as well as a dummy constitution which could be used as a basis for rules for your club.

As well as being on the ACC database, you can apply for affiliation (which costs £6 per year).

Affiliated clubs can vote in the Governing Council of the Association, and are covered by the ACC's block public liability insurance at no extra charge (write to me for details). We are also in the final stages of negotiating a cheap insurance for club equipment and members' equipment at club meetings — this will be available to affiliated clubs only at an extra (but negligible) cost. There is an ACC sub-committee which has responsibilities to set up new facilities for affiliated clubs; a news sheet is under discussion (any volunteers to help edit? — please write to me).

Public announcement

I should like to thank Commodore for its loan to the ACC of a portable Commodore 64 with large monitor and printer for the operation of the ACC database. This should help us especially at exhibitions, when we put computer users in touch with their local clubs.

Club news

Lots of club news this month. Please remember that it's interesting to read a description about a club's activities as well as its name and address, so if you can send a little information about your club, so much the better.

I have received a newsletter from NAMEBUG (North and Mid Essex BBC Micro Users' Group). It is based in the Chelmsford and Colchester area, meeting in the Witham Sixth Form Centre each month, with more frequent get-togethers of members in each other's homes. NAMEBUG also produces a newsletter. The club has provided data processing facilities for the results of 777 runners in a local 'mini-marathon'. For more information contact the secretary, Andy Purkiss on Witham 515609, or the Vice-Chairman, Dan Glading on Chelmsford 71463 or at 43 Spalding Way, Great Baddow, Chelmsford CM2 7NZ.

A note from Lincolnshire Microprocessor Society of Bishop Grosseteste College, Newlands, Lincoln LN1 3DY (tel: Lincoln 27347) explains that the society was formed in 1979 by Michael Lyne, the chairman. Some of its activities are catered for by the Computer Club of Lincolnshire Microprocessor Society, which is a subsidiary. Its activities consist of a programme of visits, talks and demonstrations about various applications of both micro and mainframe computers, plus regular 'club' meetings on a more informal basis. The club is in contact with the Nottingham branch of the British Computer Society, the Scunthorpe and District Microprocessor Society and the Grantham Computer Group. As well as individual members, the society includes several companies (of various sizes), Lincolnshire County Council and various schools.

Mrs Jane Stokes of 59 Dukes Wood Drive, Gerrards Cross, Buckinghamshire S19 7LT writes to tell me of the Gerrards Cross Computer Club. It meets on the second and fourth Thursday of the month, during term time, at 8pm. It is a general interest club with no bias toward any particular machine. The meeting place (the local Memorial Centre) has a bar on the premises. For further information, or to get full details of coming meetings, contact Jane Stokes, the secretary.

Mr Bob Cooke, of 22 Selwyn Road, Eastbourne, Sussex BN21 1LR writes to tell me of the Eastbourne and District Computer Club. It meets at 7.30pm on the fourth Wednesday of the month at the WRVS centre in Hyde Road, Eastbourne. There is an informal talk at each meeting and various topics are discussed. There is also a monthly newsletter which contains hints, programming tips and a Basic teach-in. Contact Mr Cooke, or call the chairman, Jim Booth, on (0323) 51437.

Next on the list is the Portsmouth Co-operative Computer Club. It meets at 53a Heidelberg Road, Devonshire Square, Southsea, Hants and is interested in communications. Also of interest to the club are Computer-Towns. Contact Mr A H May, 27 Victoria Road North, Southsea, Hants, for further details.

Brian Sheldon writes to describe his club in Lancaster which meets at the Greaves Hotel, Lancaster on alternate Tuesday evenings, from 7.30pm to throwing-out time. At an open day last year in Lancaster Town Hall, it had 70 micros present, which resulted (via photos and write-ups in local papers) in a turn-out of 70-80 members at the subsequent meeting. For more information on the Lancaster Club, contact Brian at 375 Lancaster Road, Torrisholme, Morecambe, Lancs.

Here are some names and addresses of club contacts who have not provided any detailed information:

Manchester Sinclair User Club, 14 Mellor Road, Longsight, Manchester M13 0GD.

Welwyn/Hatfield Basic user Group, Debi Colthorpe, Campus West Library, The Campus, Welwyn Garden City.

Sawbridgeworth Computer Club, Daren White, 26 Bishop's Avenue, Bishop's Stortford, Herts.

Gloucester Spectrum Group, Mr B G Ledbury, 8 Linnet Close, Gloucester GL4 9XA.

Jersey VIC Club, Colin Sansom, 3 Savile Court, Savile Street, St Helier, Jersey.

**To get in contact with the Association of Computer Clubs, whether for a mention here or to find out about affiliation or our other activities, contact: Rupert Steele, 17 Lawrie Park Crescent, London SE26 6HH or tel: (01) 370 0601.

CTUK

Interested in setting up a Computer Town? Why not write for guidelines.

If you're new to computers, and would like some help and support from more experienced hobbyists, then Computer Towns are a good place to start. And if there is no Computer Town near you, why not start one of your own? All you need are a few interested people, a place to meet and a notice to advertise the meetings. A set of guidelines to assist people setting up Computer Towns is available by sending an A4 sae to *PCW*.

COMPUTER TOWN UK! CONTACTS

Chris Woodford
31 Hopley Road
Anslow
Burton-on-Trent
Staffordshire

Alan Hooley
21 Brammay Drive
Tottington
Bury BL8 3HS

Peter J Kiff
2 Ranelagh Grove
St Peter's in Thanet
Broadstairs
Kent CT10 2TE

John Byfield
Moonrakers
The Rutts
Bushey Heath
Herts WD2 1LH

Peter Earthy
46 High Street
Church Stretton
Shropshire SY6 6BX

Brigitte Gordon
18 Purbright Crescent
New Addington
Croydon CR0 0RT

Vernon Gifford
111 Selhurst Road
Croydon
London SE25 6LH

Derek Moody
2 Victoria Terrace
Dorchester
Dorset DT1 1LS

JO Dale
12 Poplar Road
Newtown
Powys SY16 2QS

Ray Skinner
22 Colsterdale Close
High Grange
Billingham
Cleveland

Keith Taylor
Carter Hydraulic Works
Thornbury
Bradford BD3 8HG

Peter Herring
Ordnance Road Library
Ordnance Road
Enfield
Middx

John Stephen Bone
2 Claremont Place
Gateshead
Tyne & Wear NE8 1TL

B J Candy
9 Oakwood Drive
Gloucester Gl3 3JF

Mike Sones
Gayton Library
Gayton Road
Harrow
Middx

John Barton
Ashford Main Library
Church Road
Ashford
Kent

Andrew Holyer
10 Masons Road
Mannings Heath
Horsham
Sussex RH13 6JP

Robin Bradbeer
Polytechnic of
North London
Holloway Road
London N7

Ted Ellerton
25 Beachdale
Winchmore Hill
London N21

John Mileham
RACS
147 Powis Street
London SE18 6JN

Vernon Quaintance
50 Beatrice Avenue
Norbury
London SW16 4UN

J G Batch
Central Library
Clapham Road
Lowestoft NR32 1DR

Brian Taylor
22 Millbrook
Leybourne
Nr Maidstone
Kent ME19 5QJ

Andrew Stoneman
135 Birchdale Avenue
Newcastle-Upon-Tyne

E N Ryan
15 Queens Square
Eastwood
Nottingham NG16 3BJ

Derek Knight or
Bob Carter
Rayners Lane Library
Imperial Drive
Rayners Lane
Middx

Patrick Colley
52 Queensway
Caversham Park
Village
Reading
Berks RG4 0SI

Bill Gibbings
2 Longholme Road
Retford
Notts DN22 6TU

Chris Cooper
110 Church Road
Hanwell
London W7

J M A Kilburn
(Headmaster)
Shawfield Norden
Community Middle
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Shawfield Lane
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Philip Joy
130 Rush Green Road
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R Shipton
17 Woodlands Avenue
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Ruislip
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Paul Maddison
Gardenways
Chilworth
Southampton SO1 7JH

Roger Shears
181 Woodmill Lane
Bitterne Park
Southampton SO2 4PY

Richard Powell
22 Downham Court
South Shields
Tyne & Wear

Mike Perry, Steve
Collas or Dave Lee
The Library
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Alan Potten
14 Foxmede
Rivenhall End
Witham
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Alan Sutcliffe
4 Binfield Road
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Peter Stone or
P Strangman
Computing and Maths
Dept
The Polytechnic
Wulfruna Street
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Tony Cartmell
54 Foregate Street
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Martin Haugh
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Computer Town UK! is a rapidly expanding network of computer literacy centres where members of the public are given free access to all sorts of computer equipment. This is courtesy of those willing to offer time/resources. You can find a Computer Town anywhere — they're often in libraries or schools. The aim is to make micros enjoyable and non-threatening, so axe-grinding of any sort is banned. Guidelines are available for those interested in starting up their own 'Towns. Write to: Computer Town UK!, Personal Computer, *62 Oxford Street, London W1A 2HG. Remember to enclose an A4 SAE for your reply. Please don't ring for information as Computer Town UK! is entirely a spare time activity.*

BENCHMARKS

A listing of the Benchmarks used when evaluating micros is given below. An explanation can be found in the December '83 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130

160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 220
170 FOR L=1 TO 5
180 NEXT L
190 IF K<1000 THEN 140

200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXT L
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)

170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printers' errors, etc.

London	(Alexandra Pavilion), Electron & BBC Micro User Show. Contact: Database Publications, (061) 456 8383	19-22 July
Edinburgh	(Assembly Rooms), Scottish Personal Computer World Show. Contact: Scottish Industrial & Trade Exbns Ltd, (031) 225 5486	26-28 July
London	(Olympia), Acorn User Exbn. Contact: Computer Market Place Exbns Ltd, (01) 930 1612	16-19 Aug
Manchester	(University), Electron & BBC Micro User Show. Contact: Database Publications, (061) 456 8383	31 Aug-2 Sept
London	(Olympia), Video Software & Computer Games Show. Contact: Link House Magazines Ltd, (01) 686 2599	2-4 Sept
London	(Olympia 2), IBM System User Show. Contact: Robert Mackenzie (01) 837 3699	3-5 Sept
California	(Anaheim Convention Centre), National Software Show. Contact: Philip Russell (800) 732 2300	5-7 Sept
Glasgow	(Anderston Centre), Computer & Software Exbn. Contact: Trade Exbns Scotland, (0764) 4204	11-14 Sept
London	(Olympia 2), Personal Computer World Show. Contact: Montbuild Ltd (01) 486 1951	19-23 Sept

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PROGRAMS

The search is on for a new programs editor and until such a person is installed, I (Tony Hetherington) am in control. Consequently there may be some disruption in processing and acknowledging program submissions so please bear with us.

To help us deal with incoming programs, PCW would appreciate adherence to the following guidelines. Programs should be submitted on cassette or disk and be accompanied by full documentation and a readable listing. Listings should not be more than 80 columns wide. As a matter of policy we will not be printing listings on Sinclair paper as reproduction is not good enough. However do please still include a listing as it's an easy guide to the length of the program. Any Spectrum programs selected for publishing will be reprinted in the office. Commodore 64 owners should use the 'Brackets' program printed in the June issue to make undecipherable control codes understandable.

Programs should, of course, be original and not like one we received recently — a beautiful copy of a program printed in a book; the only difference being the name in the copyright statement.

While sorting through programs for this section I was pleasantly surprised by the general standard, particularly of the games. In some cases these games are better than programs sent in for review by 'so-called' software houses.

This month's selection of games includes Star Scramble for the VIC, Defuse for the Commodore 64 and one called Butterfingers for the UK 101.

The program of the month accolade goes to a more serious BBC application and is a Brainstorm-type program called Mindwaves. Close on its heels for the top spot is a Spectrum database program and finally, what may prove to be a *PCW* world exclusive — a QL program.


Games


Scientific/mathematic


Business


Toolkit/utilities


Educational/Computer Aided Learning



Program of the month
BBC Mindwaves
by Brian Haines

'Mindwaves' is a program for the BBC Micro. It was inspired by the review of Caxton's Brainstorm which appeared in the January issue of *PCW*.

The purpose of Mindwaves is to help the user organise his thoughts and put them in a structured form; this is done by a series of structured headings.

Each heading is a parent for a number of children and so a tree structure is formed. The user moves about the tree at will entering thoughts as they occur; the program structures them into a continuous stream.

The program has many uses ranging from organising the outline of an article, defining the structure of a program, through to creating an address book.

Mindwaves compares favourably with Brainstorm, considering that it's written for the BBC and not a 16-bit CP/M micro. There are a few omissions which include the lack of wild card searches, namesakes and the incorporation of only one printer configuration, the Epson.

However it is still a monster program using nearly all the Beeb's memory. In fact there is only enough space left for a hundred lines — thoughts or addresses of 80 characters' length.

PROGRAMS

```
L.
   10 MODE7
   20 PROCintro
   30 VDU6,3,12,15
   40 PROCdisplay
   50 PROCmenu
   60 END
   70 REM delete lines like this, line 80, and line 90 to save space, and X% can
 be increased to 150 (see line 140)
   80       *************************
   90            PROCintro
  100       *************************
  110 DEFPROCintro
  120 *KEY10|!MRUN|M
  130 ONERRORGOTO30
  140 F%=0:N%=0:E%=0:X%=100:Y%=0:CP%=0
  150 DIMdata$(X%),PAR%(X%),CHILD%(X%),LSIB%(X%),RSIB%(X%),RANK%(X%),FP%(X%)
  160 FORI%=0TOX%:data$(I%)=STRING$(80," "):data$(I%)="":CHILD%(I%)=-1:LSIB%(I%)
=-1:RSIB%(I%)=-1:PAR%(I%)=-1:NEXT
  170 A$=STRING$(80," "):a$=A$:B$=A$
  180 A$="":a$="":B$=""
  190 REPEATINPUTLINE'"What title will you give this sheet?"'A$:UNTILLENA$<81
  200 PROCstore(A$,0,-1,-1,-1,1)
  210 ENDPROC
  220       *********************
  230          PROCheader
  240       *********************
  250 DEFPROCheader(hdr%)
  260 VDU28,0,3,30,0,12
  270 PRINT:hdr%::PROCpp(data$(hdr%),30,3):VDU26
  280 PROCline(3)
  290 ENDPROC
  300      *************************
  310            PROCstore
  320      *************************
  330 DEFPROCstore(text$,par%,child%,lsib%,rsib%,rank%)
  340 data$(F%)=text$:PAR%(F%)=par%:CHILD%(F%)=child%:LSIB%(F%)=lsib%:RSIB%(F%)=
rsib%:RANK%(F%)=rank%
  350 OF%=F%
  360 IFFP%(F%)<1 N%=F%+1 ELSE N%=FP%(F%)
  370 FP%(F%)=N%
  380 F%=N%
  390 IFF%>X% THENPROCinwind:PRINT"Last line used":VDU7,26
  400 ENDPROC
  410       *********************
  420          PROCcmd
  430       *********************
  440 DEFPROCcmd
  450 LOCALI%
  460 FORI%=0TO24:PRINTTAB(31,I%)"|":NEXT
  470 VDU28,32,24,39,0,12
  480 PRINT''"SAVE""LOAD""DIG""CLIMB""DELETE""INSERT""AMEND""ORDER""PR
INT""LIST" "COPY"
  490 PRINT"HUNT" "REPLACE" "PROMOTE""DEMOTE""SPOOL"
  500 VDU26
  510 ENDPROC
  520      *********************
  530           PROCdisplay
  540      *********************
  550 DEFPROCdisplay
  560 VDU23;10,32,0;0;0;
  570 PROCheader(CP%)
  580 PROCline(20)
  590 PROCcmd
  600 VDU28,0,18,30,5,12
  610 k%=CHILD%(CP%)
  620 REPEAT:IFk%>-1 THENPRINT:k%;:PROCpp(data$(k%),30,3):k%=RSIB%(k%)
  630   UNTILk%=-1
  640 VDU26,23;10;0;0;0;
  650 ENDPROC
  660      *********************
  670           PROCline
  680      *********************
  690 DEFPROCline(n%)
  700 PRINTTAB(0,n%)STRING$(30,"_")
  710 ENDPROC
  720      *********************
  730           PROCmenu
  740      *********************
  750 DEFPROCmenu
  760 Y%=9:REPEATPRINTTAB(31,Y%);
  770   *FX4 1
  780   REPEAT
  790     A%=INKEY(0):UNTILA%<>-1
  800   IFA%=138ANDY%<19 Y%=Y%+1:PRINTTAB(31,Y%);
  810   IFA%=139ANDY%>4 Y%=Y%-1:PRINTTAB(31,Y%);
  820   IFA%=135 THEN PROCcommand(Y%):PRINTTAB(31,Y%);
  830   UNTILFALSE
  840 ENDPROC
  850      *********************
  860           PROCcommand
  870      *********************
  880 DEFPROCcommand(n%)
  890 IFn%=4 THEN PROCsave
  900 IFn%=5 THEN PROCload:CP%=0:PROCdisplay
  910 IFn%=6 THEN PROCdio("Please give the new parent number")
  920 IFn%=7 THEN PROCclimb
  930 IFn%=8 THEN PROCdeletethis
  940 IFn%=9 THEN PROCinsert
  950 IFn%=10 THEN PROCamend
  960 IFn%=11 THEN PROCorder
  970 IFn%=12 THEN VDU2,21:PROCprint(0):VDU6,3
  980 IFn%=13 THEN PROCinwind:PRINT"Press S to stop listing":VDU23;10,32,0;0;0;2
8,0,18,30,5,12,14:PROClist(0):PROCinwind:VDU15,26,23;10;0;0;0;
  990 IFn%=14 THEN PROCcopy
 1000 IFn%=15 THEN PROChunt
 1010 IFn%=16 THEN PROCreplace
 1020 IFn%=17 THEN PROCpromote
 1030 IFn%=18 THEN PROCdemote
 1040 IFn%=19 THEN PROCascii
 1050 ENDPROC
 1060      *********************
 1070           PROCpp
 1080      *********************
 1090 DEFPROCpp(text$,width%,offset%)
 1100 IFwidth%-offset%<3 offset%=width%-3
 1110 LOCALI%,J%
 1120 REPEATI%=width%-offset%
 1130   IFMID$(text$,J%+I%,1)<>" "ANDJ%+I%<LENtext$THENREPEAT I%=I%-1:UNTILMID$(
```


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PROGRAMS

```
text$,J%+I%,1)=" "OR1%=0
 1140   IFI%=0 I%=width%-offset%
 1150   PRINTTAB(offset%)MID$(text$,J%,I%):J%=J%+I%
 1160   UNTILJ%>=LENtext$
 1170 ENDPROC
 1180       ************************
 1190             PROCdelete
 1200       ************************
 1210 DEFPROCdelete(n%)
 1220 IFn%=0 THEN ENDPROC
 1230 IFLSIB%(n%)<>-1ANDRSIB%(n%)<>-1 LSIB%(RSIB%(n%))=LSIB%(n%):RSIB%(LSIB%(n%)
)=RSIB%(n%)
 1240 IFLSIB%(n%)<>-1ANDRSIB%(n%)=-1 RSIB%(LSIB%(n%))=-1
 1250 IFLSIB%(n%)=-1ANDRSIB%(n%)<>-1 CHILD%(PAR%(n%))=RSIB%(n%):LSIB%(RSIB%(n%))
=-1
 1260 IFLSIB%(n%)=-1ANDRSIB%(n%)=-1 CHILD%(PAR%(n%))=-1
 1270 FP%(n%)=F%:F%=n%
 1280 IFCHILD%(n%)<>-1 THENPROCfp(CHILD%(n%))
 1290 ENDPROC
 1300       *********************
 1310            PROCfp
 1320       *********************
 1330 DEFPROCfp(n%)
 1340 FP%(n%)=F%:F%=n%
 1350 IFCHILD%(n%)=-1 AND RSIB%(n%)=-1 THEN ENDPROC
 1360 IFCHILD%(n%)<>-1 THENPROCfp(CHILD%(n%))
 1370 IFRSIB%(n%)<>-1 THENPROCfp(RSIB%(n%))
 1380 CHILD%(n%)=-1
 1390 ENDPROC
 1400       *********************
 1410             PROCinsert
 1420       *********************
 1430 DEFPROCinsert
 1440 PROCinwind
 1450 REPEATINPUTLINEa$:UNTILLENa$<81
 1460 IFCHILD%(CP%)=-1 CHILD%(CP%)=F%:PROCstore(a$,CP%,-1,-1,-1,RANK%(CP%)+1):VD
U12,26:PROCdisplay:ENDPROC
 1470 k%=CHILD%(CP%)
 1480 REPEAT:IFk%>-1 lpar%=k%:k%=RSIB%(k%)
 1490   UNTILk%=-1
 1500 RSIB%(lpar%)=F%
 1510 PROCstore(a$,CP%,-1,lpar%,-1,RANK%(CP%)+1):VDU12,26:PROCdisplay:ENDPROC
 1520       *********************
 1530             PROCdig
 1540       *********************
 1550 DEFPROCdig(T$)
 1560 LOCALA%
 1570 PROCinwind
 1580 REPEATPROCpp(T$,30,0):INPUTA%:UNTILPAR%(A%)<>-1
 1590 CP%=A%:VDU12,26:PROCdisplay
 1600 ENDPROC
 1610       *********************
 1620             PROCclimb
 1630       *********************
 1640 DEFPROCclimb
 1650 IFCP%=0 THEN ENDPROC
 1660 CP%=PAR%(CP%):PROCdisplay:ENDPROC
 1670       *********************
 1680          PROCdeletethis
 1690       *********************
 1700 DEFPROCdeletethis
 1710 PROCinwind
 1720 INPUT"Enter the number of the line to be deleted"A%
 1730 VDU12,26
 1740 PROCdelete(A%)
 1750 PROCdisplay
 1760 ENDPROC
 1770       *********************
 1780             PROClist
 1790       *********************
 1800 DEFPROClist(a%)
 1810 PRINT:a%::PROCpp(data$(a%),29,RANK%(a%)*2+1)
 1820 FORA=0TO50:NEXT
 1830 A$=""
 1840 *FX15 1
 1850 IFINKEY(-82)THENPROCinwind:PRINT "Press R to restart" "or E to exit" "or a
ny key to continue":REPEATA$=GET$:UNTILA$<>"S":VDU12,28,0,18,30,5
 1860 IFA$="E" THENENDPROC
 1870 IFA$<>"" THENCLS
 1880 IFA$="R" THENa%=0
 1890 IFCHILD%(a%)=-1 ANDRSIB%(a%)=-1THENENDPROC
 1900 IFCHILD%(a%)<>-1 THENPROClist(CHILD%(a%))
 1910 IFRSIB%(a%)<>-1 THENPROClist(RSIB%(a%))
 1920 ENDPROC
 1930       *********************
 1940            PROCsave
 1950       *********************
 1960 DEFPROCsave
 1970 PROCinwind
 1980 X=OPENOUT("WAVES"+LEFT$(data$(0),5))
 1990 *OPT1,1
 2000 PROCsave2(0)
 2010 K%=F%
 2020 REPEATPRINT#X,K%:K%=FP%(K%):UNTILK%<1
 2030 CLOSE#X
 2040 VDU12,26
 2050 ENDPROC
 2060       *********************
 2070             PROCsave2
 2080       *********************
 2090 DEFPROCsave2(i%)
 2100 PRINT#X,i%,data$(i%),PAR%(i%),CHILD%(i%),LSIB%(i%),RSIB%(i%),RANK%(i%)
 2110 IFCHILD%(i%)=-1 ANDRSIB%(i%)=-1 THENENDPROC
 2120 IFCHILD%(i%)<>-1 THENPROCsave2(CHILD%(i%))
 2130 IFRSIB%(i%)<>-1 THENPROCsave2(RSIB%(i%))
 2140 ENDPROC
 2150       *********************
 2160            PROCorder
 2170       *********************
 2180 DEFPROCorder
 2190 PROCdig("Please give the number of the parent of the lines you wish to ord
er")
 2200 PROCinwind
 2210 IFCHILD%(CP%)=-1 THENPRINT"No descendents":PROCdisplay:ENDPROC
 2220 REPEATINPUT"Give the number of the line to be moved "a%:UNTILPAR%(a%)=CP%A
ND a%<>0
 2230 CLS:REPEATPROCpp("Give the number of the line it should follow, or type '0
 if it is to be first",30,0):INPUTA%
```

PROGRAMS

```
  2240    UNTIL(A$="F" AND CHILD%(CP%)<>a%) OR(VALA$<>0 ANDPAR%(VALA$)=CP%)
  2250 IFRSIB%(a%)<>-1 LSIB%(RSIB%(a%))=LSIB%(a%)
  2260 IFLSIB%(a%)<>-1 RSIB%(LSIB%(a%))=RSIB%(a%)
  2270 IFA$="F" LSIB%(a%)=-1:RSIB%(a%)=CHILD%(CP%):LSIB%(CHILD%(CP%))=a%:CHILD%(C
P%)=a%
  2280 IFA$<>"F" ANDCHILD%(CP%)=a% CHILD%(CP%)=RSIB%(a%)
  2290 IFA$<>"F" LSIB%(a%)=VALA$:RSIB%(a%)=RSIB%(VALA$):t%=RSIB%(VALA$):RSIB%(VAL
A$)=a%:IFt%<>-1 LSIB%(t%)=a%
  2300 VDU12,26:PROCdisplay
  2310 ENDPROC
  2320       ******************
  2330            PROCamend
  2340       ******************
  2350 DEFPROCamend
  2360 PROCinwind
  2370 REPEATINPUT"Which line number ",a%:UNTILPAR%(a%)=CP%
  2380 REPEATCLS:INPUTLINE"New text: "a$:UNTILLENa$<81:data$(a%)=a$
  2390 VDU12,26:PROCdisplay:ENDPROC
  2400       ******************
  2410            PROCload
  2420       ******************
  2430 DEFPROCload
  2440 PROCinwind
  2450 PROCpp("Please give the name of the sheet to be loaded (ignore the 'WAVES'
)",30,0):INPUTLINEA$:A$=LEFT$(A$,5)
  2460 VDU12,30
  2470 *OPT1,1
  2480 X=OPENIN("WAVES"+A$)
  2490 PROCload2(0)
  2500 INPUT#X,F%
  2510 K%=F%
  2520 REPEATINPUT#X,FP%(K%):K%=FP%(K%):UNTILEOF#X:FP%(K%)=-1
  2530 CLOSE#X
  2540 VDU12,26
  2550 ENDPROC
  2560       ******************
  2570            PROCload2
  2580       ******************
  2590 DEFPROCload2(i%)
  2600 INPUT#X,i%,data$(i%),PAR%(i%),CHILD%(i%),LSIB%(i%),RSIB%(i%),RANK%(i%)
  2610 IFCHILD%(i%)=-1 ANDRSIB%(i%)=-1 THENENDPROC
  2620 IFCHILD%(i%)<>-1 THENPROCload2(CHILD%(i%))
  2630 IFRSIB%(i%)<>-1 THENPROCload2(RSIB%(i%))
  2640 ENDPROC
  2650       ******************
  2660            PROCcopy
  2670       ******************
  2680 DEFPROCcopy
  2690 PROCinwind
  2700 REPEATPROCpp("Which line is to be copied?",30,0):INPUTA%:UNTILPAR%(A%)>0
  2710 REPEATPROCdig("Please give the number of its new parent line"):UNTILRANK%(
CP%)=RANK%(A%)-1
  2720 C%=CHILD%(CP%):OC%=-1
  2730 ch%=0:IFC%=-1 ch%=TRUE ELSEREPEAT OC%=C%:C%=RSIB%(C%):UNTILC%=-1
  2740 PROCstore(data$(A%),CP%,-1,OC%,-1,RANK%(CP%)+1)
  2750 IFch% CHILD%(CP%)=OF% ELSERSIB%(OC%)=OF%
  2760 IFCHILD%(A%)>0 THENCHILD%(OF%)=F%:PROCcopy2(CHILD%(A%))
  2770 VDU28,0,18,30,5,12,14:PROClist(0):VDU26,15
  2780 ENDPROC
  2790       **********************
  2800            PROCcopy2
  2810       **********************
  2820 DEFPROCcopy2(n%)
  2830 IFRSIB%(OF%)=F%THENPROCstore(data$(n%),PAR%(OF%),-1,OF%,-1,RANK%(OF%))ELSE
PROCstore(data$(n%),OF%,-1,-1,-1,RANK%(OF%)+1)
  2840 IFCHILD%(n%)>0 THENCHILD%(OF%)=F%:PROCcopy2(CHILD%(n%))
  2850 IFRSIB%(n%)>0 THENRSIB%(OF%)=F%:PROCcopy2(RSIB%(n%))
  2860 ENDPROC
  2870       ******************
  2880            PROCsearch
  2890       ******************
  2900 DEFPROCsearch(I%,A$,B$)
  2910 IFLENdata$(I%)>=LENA$ THENIFINSTR(data$(I%),A$) THEN PROCswitch(I%,A$,B$):
IFFNquestion THEN ENDPROC
  2920 IFCHILD%(I%)=-1 ANDRSIB%(I%)=-1 THENENDPROC
  2930 IFCHILD%(I%)<>-1 THENPROCsearch(CHILD%(I%),A$,B$)
  2940 IFRSIB%(I%)<>-1 THENPROCsearch(RSIB%(I%),A$,B$)
  2950 ENDPROC
  2960       ******************
  2970            FNquestion
  2980       ******************
  2990 DEFFNquestion
  3000 CLS:CP%=PAR%(I%):PROCdisplay:PROCinwind:PROCpp(A$+" FOUND at line "+STR$(I
%)+".  Search this branch further (Y/N)?",30,0)
  3010 *FX15 1
  3020 =GET$="N"
  3030       ******************
  3040            PROChunt
  3050       ******************
  3060 DEFPROChunt
  3070 PROCinwind
  3080 PROCpp("Please give the text to be found",30,0):INPUTA$
  3090 PROCsearch(0,A$,"")
  3100 VDU12,26:PROCdisplay
  3110 ENDPROC
  3120       ******************
  3130            PROCinwind
  3140       ******************
  3150 DEFPROCinwind:VDU28,0,24,30,21,12:ENDPROC
  3160       ******************
  3170            PROCreplace
  3180       ******************
  3190 DEFPROCreplace
  3200 PROCinwind
  3210 PROCpp("Please give the text to be replaced",30,0):INPUTLINEA$
  3220 CLS:PROCpp("Please give the text to be inserted",30,0):INPUTLINEB$
  3230 PROCsearch(0,A$,B$)
  3240 VDU12,26:PROCdisplay
  3250 ENDPROC
  3260       ******************
  3270            PROCswitch
  3280       ******************
  3290 DEFPROCswitch(I%,A$,B$)
  3300 IFB$="" THEN ENDPROC
  3310 data$(I%)=LEFT$(LEFT$(data$(I%),INSTR(data$(I%),A$)-1)+B$+RIGHT$(data$(I%)
,LEN(data$(I%))-INSTR(data$(I%),A$)-LENA$+1),80)
  3320 ENDPROC
  3330       ******************
  3340            PROCprint
```


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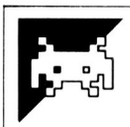
PROGRAMS

```
3350       ******************
3360 DEFPROCprint(a%)
3400 PROCpp(data$(a%),80,RANK%(a%))
3410 IFCHILD%(a%)=-1 ANDRSIB%(a%)=-1THENENDPROC
3420 IFCHILD%(a%)<>-1 THENPROCprint(CHILD%(a%))
3430 IFRSIB%(a%)<>-1 THENPROCprint(RSIB%(a%))
3440 ENDPROC
3450
3460       *********************
3470            PROCpromote
3480       *********************
3490 DEFPROCpromote
3500 PROCinwind
3510 PROCpp("Please give the number of the line to be promoted",30,0):REPEATINP
UTA%:UNTILPAR%(A%)>0
3520 T%=PAR%(A%):S%=RSIB%(T%):IFS%>0THENREPEATT%=S%:S%=RSIB%(S%):UNTILS%=-1
3530 RSIB%(T%)=F%
3540 PROCstore(data$(A%),PAR%(PAR%(A%)),-1,T%,-1,RANK%(A%)-1)
3550 IFCHILD%(A%)>0 THEN CHILD%(OF%)=F%:PROCcopy2(CHILD%(A%))
3560 PROCdelete(A%)
3570 VDU12,26:PROCdisplay
3580 ENDPROC
3590       ***********************
3600            PROCdemote
3610       ***********************
3620 DEFPROCdemote
3630 PROCinwind
3640 PROCpp("Please give the number of the line to be demoted",30,0):REPEATINPU
TA%:UNTILPAR%(A%)>-1AND(LSIB%(A%)>0ORRSIB%(A%)>0):T%=-1:S%=CHILD%(CHILD%(PAR%(A%
)))
3650 IFS%>0 THENREPEATT%=S%:S%=RSIB%(S%):UNTILS%=-1
3660 IFLSIB%(A%)=-1 CHILD%(PAR%(A%))=RSIB%(A%)
3670 PROCstore(data$(A%),CHILD%(PAR%(A%)),-1,T%,-1,RANK%(A%)+1)
3680 IFCHILD%(A%)>0 THEN CHILD%(OF%)=F%:PROCcopy2(CHILD%(A%))
3690 IFT%>0 RSIB%(T%)=OF% ELSECHILD%(CHILD%(PAR%(A%)))=OF%
3700 PROCdelete(A%)
3710 VDU12,26:PROCdisplay
3720 ENDPROC
3730       ****************
3740            PROCascii
3750       ****************
3760 DEFPROCascii
3770 VDU26,12
3780 *SPOOL"asciiwaves"
3790 PROCascii2(0)
3800 *SPOOL
3810 CLS
3820 PROCdisplay
3830 ENDPROC
3840       ****************
3850          PROCascii2
3860       ****************
3870 DEFPROCascii2(n%)
3880 PRINTdata$(n%)
3890 IFCHILD%(n%)<1ANDRSIB%(n%)<1THEN ENDPROC
3900 IFCHILD%(n%)>0THENPROCascii2(CHILD%(n%))
3910 IFRSIB%(n%)>0THENPROCascii2(RSIB%(n%))
3920 ENDPROC
```



Commodore 64 Defuse

by Greg Bernatek

This is a very good example of mine-field-type games where the object is to move about a grid in order to defuse bombs. Your progress is hindered by the fact that you can't walk on a square more than once and are killed if you touch a skull. However walking over a flag collects you a bonus.

As you move through the game's levels, the challenging aspect is how the number of bombs and skulls increases. To add to your enjoyment the 64 accompanies your exploits by playing 'The Entertainer'.

There is a bonus screen which appears inbetween each level, and here you must drop your man onto the only bottom row flag or a life will be lost.

The game requires a joystick plugged into port one; your man can move diagonally as well as in the four standard directions. The fire button is used to drop him in the bonus game.

At the end of the game you are given a rating which ranges from 'poor' to 'supernatural'.

```
10 REM         DEFUSE!
20 REM G. BERNATEK  11.1.84
30 POKE 52,48:POKE 56,48:CLR:PRINT"□"
40 POKE53280,0:POKE53281,0
50 REM SWITCH IN CHARACTER SET
60 GOSUB 9000
80 REM INITIALISE VARIABLES
85 FLAG=0
90 GOSUB 10000
110 REM DISPLAY TITLE PAGE
120 GOSUB 11000:GOSUB8500:REM GRID ON SCREEN
130 PRINT A0$;A1$
140 PRINT"■■■
```

PROGRAMS

```
210 REM ENTER HERE FROM TITLES
220 C=0:POKE5+6,0:POKE5+24,15:POKE5+5,11:POKE5+4,0
230 GOSUB8600
240 REM TIME TICKS AWAY.....
250 TM=TM-1:IFTM=-1THENTM=0:C=0:GOSUB16300:GOTO230:REM DEATH MARCH
270 M9=PEEK(JV):M9=15-(M9AND15)
290 IFM9=1THEN5000:REM UP
300 IFM9=2THEN5200:REM DOWN
310 IFM9=4THEN5300:REM LEFT
320 IFM9=8THEN5400:REM RIGHT
330 IFM9=5THEN5500:REM UP & LEFT
340 IFM9=6THEN5600:REM DOWN & LEFT
350 IFM9=9THEN5700:REM UP & RIGHT
360 IFM9=10THEN5800:REM DOWN & RIGHT
370 IFPEEK(MP)<>65ANDPEEK(MP)<>32THENGOSUB7700
380 IFS1>HITHENHI=S1
390 GOSUB 8510
400 IFERR=1THENERR=0:GOTO7000:REM SKULL
405 IFERR=2THENERR=0:GOTO12000
410 POKEMP,80:POKEMP+1,81:POKEMP+40,82:POKEMP+41,83
420 GOTO240
3000 REM DELETE MAN OLD POSITION
3010 POKEMP,32:POKEMP+1,32:POKEMP+40,32:POKEMP+41,32
3050 RETURN
4000 REM INSTRUCTIONS FOR GAME
4005 POKE53272,23
4010 PRINT"■                    ¯_/¯ !                "
4020 PRINT"  ⌐AME ⌐NSTRUCTIONS"
4030 PRINT"  ──────────────"
4040 PRINT:PRINT"  ⌐OU PLAY THE PART OF A BOMB DEFUSING■"
4050 PRINT" EXPERT.  ⌐OUR MAN CAN MOVE IN ANY OF THE"
4060 PRINT" EIGHT DIRECTIONS WITH THE AID OF A JOY-"
4070 PRINT" STICK PLUGGED INTO PORT ONE."
4080 PRINT"■■  ⌐HERE ARE TWO STAGES TO THIS GAME.     "
4090 PRINT"1] ⌐HE BOMB DEFUSING GRID.  ⌐OUR MAN MUST "
4100 PRINT" REACH THE BOMB BEFORE TIME RUNS OUT!"
4110 PRINT"■■■■       ¯RESS '¬¬¯' FOR NEXT PAGE.        "
4120 IFPEEK(JV)<>239THEN4120
4125 PRINT"■■ ⌐HE AMOUNT OF BOMBS TO BE DEFUSED DEPE-"
4127 PRINT" NDS UPON WHAT SHEET YOU ARE ON !          "
4130 PRINT"■2] ⌐HE FLAG DETECT STAGE. ¯ROP YOUR MAN "
4140 PRINT" ONTO THE FLAG, STANDING AMONGST THE     "
4150 PRINT" SKULLS. ⌐F YOU FALL ONTO A SKULL......."
4160 PRINT"■ ⌐HE GAME STARTS WITH THREE LIVES, BUT  "
4170 PRINT" UPON REACHING SHEET FIVE OR SHEET TEN   "
4180 PRINT" AN EXTRA ONE IS AWARDED."
4190 PRINT"■■■■       ¯RESS '¬¬¯' FOR NEXT PAGE.        "
4200 IFPEEK(JV)<>239THEN4200
4205 POKE53272,29
4210 PRINT"■■   OBSTACLES AND SCORING."
4220 PRINT"  ──────────────────────────"
4230 PRINT"■■  ¯_"
4240 PRINT"  ¯⌐ ..............  100 X TIME REMAINING."
4250 PRINT"■   ⌐\"
4260 PRINT"   \/ ..............  100 X TIME REMAINING."
4270 PRINT"■  L\"
4280 PRINT"  /¯ ..............  MINUS ONE LIFE."
4290 PRINT"■■   BONUS POINTS AWARDED FOR COMPLETING"
4300 PRINT" EACH SHEET. IT GETS HARDER & HARDER !"
4310 PRINT"■■■       'FIRE' RETURNS TO TITLE PAGE.     "
4320 IFPEEK(JV)<>239THEN4320
4390 GOTO120
5000 REM MOVE UP
5010 IFPEEK(MP-80)>57THENGOSUB3000:MP=MP-80:GOSUB7770
5050 GOTO370
5200 REM MOVE DOWN
5210 IFPEEK(MP+80)<>32THENGOSUB3000:MP=MP+80:GOSUB7770
5250 GOTO370
5300 REM MOVE LEFT
5310 IFPEEK(MP-2)<>32THENGOSUB3000:MP=MP-2:GOSUB7770
5350 GOTO370
5400 REM MOVE RIGHT
5410 IFPEEK(MP+2)<>32THENGOSUB3000:MP=MP+2:GOSUB7770
5450 GOTO370
5500 REM MOVE UP & LEFT
5510 IFPEEK(MP-82)>57THENGOSUB3000:MP=MP-82:GOSUB7770
5550 GOTO370
5600 REM MOVE DOWN & LEFT
5610 IFPEEK(MP+78)<>32THENGOSUB3000:MP=MP+78:GOSUB7770
5650 GOTO370
5700 REM MOVE UP & RIGHT
5710 IFPEEK(MP-78)>57THENGOSUB3000:MP=MP-78:GOSUB7770
5750 GOTO370
5800 REM MOVE DOWN & RIGHT
5810 IFPEEK(MP+82)<>32THENGOSUB3000:MP=MP+82:GOSUB7770
5850 GOTO370
6000 REM END OF GAME
6010 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■G A M E  O V E R"
6020 FORI=1TO2000:NEXT
6030 PRINT"■■■■■■■■■■■■■■SCORE :";S1;"■■RATING : ";
6035 FORI=1TO900:NEXT
6040 IFS1<5000THENPRINT"POOR"
6050 IFS1<10000ANDS1>5000THENPRINT"FAIR"
6060 IFS1<20000ANDS1>10000THENPRINT"AVERAGE"
6070 IFS1<30000ANDS1>20000THENPRINT"GOOD"
6080 IFS1<40000ANDS1>30000THENPRINT"V. GOOD"
6090 IFS1<50000ANDS1>40000THENPRINT"EXCELLENT"
6100 IFS1<60000ANDS1>50000THENPRINT"SUPURB"
6110 IFS1>70000ANDS1<60000THENPRINT"KING"
6115 IFS1>80000ANDS1<70000THENPRINT"MASTER"
6120 IFS1<90000ANDS1>80000THENPRINT"EMPORER"
6125 IFS1>100000THENPRINT"SUPERNATURAL"
6130 POKE5+4,0:POKE5+1,40:POKE5+4,17
6140 FORI=1TO5000:NEXT:GOTO90
7000 REM WHOOPS! RAN INTO A SKULL!
7030 GOSUB16500:REM DEATH MARCH !
7040 POKEMP,80:POKEMP+1,81:POKEMP+40,82:POKEMP+41,83
7050 GOTO240
7700 REM MAN'S NEW POS.
7710 IFPEEK(MP)=69THENS1=S1+(TM*10):RETURN:REM FLAG
7720 IFPEEK(MP)=76THENERR=1:RETURN
7730 IFPEEK(MP)=72THENS1=S1+(TM*10):D=D+1:TM=45:IFS1>HITHENHI=S1
7740 IFD=LVTHENGOSUB8500:D=0:ERR=2:RETURN
7750 IFPEEK(MP)=72THENPOKEMP,80:POKEMP+1,81:POKEMP+40,82:POKEMP+41,83:GOSUB8680
7760 RETURN
7770 REM PLAY NEXT NOTE OF JINGLE
7780 C=C+1:IFC=82THENC=0
7790 POKE5+4,0:POKE5+1,TU(C):POKE5+4,17
```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PROGRAMS

```
7999 RETURN
8500 REM PRINT SCORES
8510 PRINT"■■■■■■■■■1 UP■■■■■■■TIME■■■■■■■■■ HI "
8520 PRINTTAB(6);S1;TAB(18);TM;"■■ ";TAB(29);HI
8530 PRINT"■■■■■■SHEET:";LV;"■■■■■■■■■■■■■■■LIVES:";L
8590 RETURN
8600 REM SET UP SCREEN PHASE#1
8601 PRINT"■"
8605 GOSUB11000:GOSUB8500
8610 MP=1483:POKEMP,80:POKEMP+1,81:POKEMP+40,82:POKEMP+41,83
8620 FORI=1TO(LV*2)
8630 X=INT(RND(1)*960)+1024
8635 Y=INT(RND(1)*960)+1024
8640 IFPEEK(X)<>65THEN8630
8645 IFPEEK(Y)<>65THEN8635
8650 POKEX,76:POKEX+1,77:POKEX+40,78:POKEX+41,79
8660 POKEY,69:POKEY+1,70:POKEY+40,67:POKEY+41,71
8670 NEXT I
8680 Z=INT(RND(1)*960)+1024
8690 IFPEEK(Z)<>65THEN8680
8700 POKEZ,72:POKEZ+1,73:POKEZ+40,74:POKEZ+41,75
8800 RETURN
9000 REM MOVE CHARACTER ROM INTO RAM
9001 REM    AT $3000  (12288 DEC)
9010 FOR I=832 TO 860:READ A:POKE I,A
9020 NEXT I
9030 POKE 56334,PEEK(56334)AND254
9040 POKE 1,PEEK(1)AND251
9050 SYS832
9060 POKE 1,PEEK(1)OR4
9070 POKE 56334,PEEK(56334)OR1
9080 FOR I=12808 TO 12991
9090 READ A:POKE I,A:NEXT I
9100 FOR I=12672 TO 12751
9110 READ A:POKE I,A:NEXT I
9120 POKE 53272,29
9190 RETURN
10000 REM VARIABLES
10010 A0$="■■■■■■ ■■■■■■■■■■■■■■■
```

PROGRAMS

```
16550 POKES+6,0:POKES+5,11
16560 TM=45
16570 L=L-1:IFL=0THEN6000
16590 RETURN
20000 REM   DATA FOR M/C ROUTINE THAT
20001 REM MOVES CHARACTER SET INTO RAM
20010 DATA62,8,160,0,173,0,208,141,0,48,238,69,3,238,72,3,136,208,241,238
20020 DATA70,3,238,73,3,202,208,232,96
21000 REM    CHARACTER DATA
21010 REM
21020 REM        GRID
21030 DATA0,127,127,127,127,127,127,127
21040 DATA0,254,254,254,254,254,254,254
21050 DATA127,127,127,127,127,127,127,127
21060 DATA254,254,254,254,254,254,254,254
21070 REM        FLAG
21080 DATA0,127,127,127,126,120,112,124
21090 DATA0,254,230,134,6,6,6,6
21100 DATA6,198,198,198,198,198,198,198
21110 REM        T.N.T.
21120 DATA0,127,111,118,94,110,124,120
21130 DATA0,254,246,110,122,110,62,30
21140 DATA112,96,96,96,112,120,126,127
21150 DATA14,6,6,6,14,30,126,254
21160 REM        SKULL
21170 DATA0,120,96,70,70,96,113,124
21180 DATA0,30,6,98,98,6,142,62
21190 DATA124,102,67,96,124,96,67,111
21200 DATA62,102,194,6,62,6,194,246
21210 REM      MAN (REV)
21220 DATA0,120,114,98,113,125,120,112
21230 DATA0,30,78,70,142,190,30,14
21240 DATA112,120,120,121,121,113,97,127
21250 DATA14,30,30,158,158,142,134,254
21260 REM      MAN (NON-REV)
21270 DATA0,7,13,29,14,2,7,15
21280 DATA0,224,176,184,112,64,224,240
21290 DATA15,7,7,6,6,14,30,0
21300 DATA240,224,224,96,96,112,120,0
21310 REM      NUMBERS 0-9
21320 DATA60,126,102,102,102,126,60,0
21330 DATA56,120,120,56,56,124,124,0
21340 DATA60,126,6,60,96,126,126,0
21350 DATA60,126,6,30,6,126,60,0
21360 DATA96,96,96,108,126,62,12,0
21370 DATA62,126,96,126,6,126,124,0
21380 DATA62,126,96,126,102,126,124,0
21390 DATA126,126,14,28,28,56,56,0
21400 DATA60,126,102,60,102,126,60,0
21410 DATA60,126,102,62,6,126,60,0
22000 REM  DATA FOR GAME JINGLE
22005 REM   READ INTO ARRAY TU
22010 DATA33,37,39,42,67,42,67,42,67
22020 DATA67,75,79,84,67,75,85,63,75,67
22030 DATA37,39,42,67,42,67,42,67
22040 DATA56,53,50,47,56,67,84,75,67,56,75
22050 DATA37,39,42,67,42,67,42,67
22060 DATA67,75,79,84,67,75,85,63,75,67
22070 DATA67,75,84,67,75,84,67,75,67,84,67,75,84,67,75,67,84,67,75,84,63
22080 DATA75,67,50,33
22100 REM  DATA FOR DEATH JINGLE
22110 REM   READ INTO ARRAY DM
22120 DATA16,195,550,15,210,600,10,143,800,11,218,250,12,143,250,11,218,250
22130 DATA10,143,250,9,247,250,10,143,700

READY.
```



UK101 Butterfingers

by Bill Pollard

'Butterfingers' is a delightfully simple but addictive game featuring Charlie the Clown.

The object of the game is to help Charlie juggle balls by moving his arms left and right. The game speeds up when you score 100; a score of 250 points is rewarded by knives being thrown at you.

If you accidentally drop a ball, the game comes to an end.

Butterfingers uses an interesting technique to move the balls in an arc above the clown's head. The POKE locations for the path of each ball are read into array A in lines 2500-2520, making it easy to POKE the balls on and off the screen which is all done in line 80.

The highest score achieved to date is by our referee and stands at an incredible 350. In his own words: 'Beat that!'

```
OK
LIST

 1 REM ***      BUTTERFINGERS      ***
 2 REM *** (c) 1983 Bill Pollard ***
 3 REM ***   and Martin Beeby.    ***
 4 :
 5 POKE530,1:GOSUB 4000
 6 KE=57088:DI=30
 7 PRINTCHR$(12):POKE53325,32
 8 L=53790:P=2
 9 OF=0:GOSUB500
 10 DIM P(2),D(2),F(2),A(20,2),C(2)
 20 K1=7:K2=13:K3=19:GOSUB 2500
 50 FOR T=0 TO 2:D(T)=1:NEXT
 52 P(0)=INT(RND(1)*4)
 54 P(1)=INT(RND(1)*7)
 56 P(2)=INT(RND(1)*10)
```


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PROGRAMS

```
 57 :
 58 REM *** MAIN LOOP ***
 60 FORT=0TO2:F(T)=0:GOSUB 200
 70 IF P(T)+D(T)<0 THEN 2010
 75 IF A(P(T)+D(T),T)=999 THEN 2010
 80 POKE A(P(T),T),32:P(T)=P(T)+D(T):POKE A(P(T),T),C(T)
 85 FORQ=1TODI:NEXT
 90 NEXT:GOTO 60
198 :
199 REM *** KEYBOARD SCAN ***
200 POKEKE,127:K=PEEK(KE)
210 IFK=255THEN450
220 IFK=127THEN300
230 IFK=191THEN400
240 RETURN
298 :
299 REM *** MOVE ARMS LEFT ***
300 IF P=1 THEN 450
310 ON P GOSUB 800,820,840:P=P-1:L=L-2
320 ON P GOSUB 860,870,880:GOTO 450
398 :
399 REM *** MOVE ARMS RIGHT ***
400 IF P=3 THEN 450
410 ON P GOSUB 800,820,840:P=P+1:L=L+2
420 ON P GOSUB 860,870,880:GOTO 450
448 :
449 REM *** SEE IF A BALL HAS BEEN DROPPED ***
450 P1=PEEK(L-64):P2=PEEK(L-53):IFP1=32ANDP2=32THEN:RETURN
460 FOR Q=0 TO 2
465 IF P1=C(Q)THEND(Q)=1:GOSUB 2000
470 IF P2=C(Q)THEND(Q)=-1:GOSUB 2000
480 NEXT Q:RETURN
499 :
500 REM *** DRAW MAN ***
510 RESTORE:FOR T=1 TO 31:READ X,Y,Z:GOSUB600:NEXT
520 Z=161:Y=3:FOR X=0 TO 11:GOSUB 600:NEXT
530 Y=4:FOR X=3 TO 7:GOSUB600:NEXT
540 Y=5:FOR X=3 TO 7:GOSUB600:NEXT
550 X=3:FOR Y=6 TO 9:GOSUB600:NEXT
560 X=7:FOR Y=6 TO 9:GOSUB600:NEXT
570 X=5:Y=4:Z=67:GOSUB600
595 RETURN
598 :
599 REM *** PLOT CHR Z AT X,Y ***
600 POKE53662+0F+X+Y*64,Z:RETURN
798 :
799 REM *** ERASE ARMS (LEFT) ***
800 POKE L,32:POKE L+1,32:POKE L+65,32
810 POKE L+11,32:POKE L+12,32:RETURN
818 :
819 REM *** ERASE ARMS (CENTRE) ***
820 POKEL,32:POKEL+64,32:POKEL+11,32:POKEL+75,32:RETURN
838 :
839 REM *** ERASE ARMS (RIGHT) ***
840 POKE L,32:POKE L-1,32:POKEL+11,32:POKE L+10,32:POKEL+74,32
850 RETURN
858 :
859 REM *** DRAW ARMS (LEFT) ***
860 POKE L,177:POKE L+1,178:POKE L+65,177
865 POKE L+11,177:POKE L+12,178:POKEL+66,161:RETURN
868 :
869 REM *** DRAW ARMS (CENTRE) ***
870 POKEL,161:POKEL+64,161:POKEL+11,161:POKEL+75,161:RETURN
878 :
879 REM *** DRAW ARMS (RIGHT) ***
880 POKE L,175:POKE L-1,176:POKEL+11,175:POKE L+10,176:POKEL+74,175
890 POKEL+73,161:RETURN
898 :
899 REM *** DATA FOR CLOWN ***
900 DATA 3,0,184,4,0,187,5,0,187,6,0,187,7,0,184,3,1,123,4,1,172
910 DATA 5,1,9,6,1,166,7,1,124,0,2,161,11,2,161
920 DATA 4,6,175,6,6,177,1,9,154,2,9,158,9,9,154,8,9,158
930 DATA 4,2,235,2,8,176,4,8,178,5,2,232,8,8,178
940 DATA 6,8,176,6,2,234,0,9,150,10,9,150,11,9,144,-1,9,144
950 DATA -2,9,4,12,9,4
998 :
999 REM *** DATA FOR FIRST SET OF BALLS ***
1000 DATA 4,7,4,6,6,5,7,5,8,5,9,5,10,6,11,7
1010 DATA 2,7,2,6,3,5,4,4,5,3,6,2,7,2,8,2,9,2,10,3,11,4,12,5,13,6
1012 DATA 13,7
1020 DATA 0,7,0,6,0,5,1,4,2,3,3,2,4,1,5,0,6,0,7,0,8,0,9,0,10,0,11,1
1030 DATA 12,2,13,3,14,4,15,5,15,6,15,7
1040 DATA111,181,182
1048 :
1049 REM *** DATA FOR SECOND SET OF BALLS ***
1050 DATA4,7,4,6,6,5,9,5,10,6,11,7
1060 DATA2,7,3,5,4,4,6,3,8,2,10,3,11,4,12,5,13,7
1070 DATA0,7,0,5,1,4,2,3,5,1,6,0,8,0,10,0,11,1,13,3,14,4,15,5,15,7
1080 DATA232,252,226
1088 :
1089 REM *** DATA FOR THIRD SET OF BALLS ***
1090 DATA4,7,6,5,9,5,11,7
1100 DATA2,7,4,4,6,3,8,3,11,4,13,7
1110 DATA0,7,0,5,2,3,4,1,7,0,10,1,12,3,14,5,15,7
1120 DATA21,19,236
1998 :
1999 REM *** CHANGE SCORE & DIFFICULTY ***
2000 SC=SC+1:DI=DI-.5
2005 IF SC=100 THEN GOSUB 3000
2006 IF SC=250 THEN GOSUB 3500
2007 RETURN
```

PROGRAMS

```
2010 Q=A(P(T),T)
2020 POKEQ,32
2030 FORW=1TO8:Q=Q+64:Z=PEEK(Q):POKEQ,C(T):FORE=1TO50:NEXT
2040 POKEQ,Z:NEXT
2045 POKEQ,C(T)
2050 PRINTSPC(10)"YOU DROPPED IT, BUTTERFINGERS!"
2055 FOR T=1 TO 1000:NEXT
2060 PRINT:PRINTSPC(15)"Your score is:";SC
2065 FOR T=1 TO 1000:NEXT
2080 PRINT:PRINTSPC(10)"Press SPACE to play again";
2081 X=18:Y=-1:Z=32:GOSUB600
2090 POKE11,0:POKE12,253:X=USR(X):IFPEEK(531)=32THENRUN6
2100 END
2498 :
2499 REM *** READ DATA FOR BALLS INTO ARRAYS ***
2500 FOR Z=0 TO K1:READ X,Y:A(Z,0)=53276+X+64*Y:NEXT:A(K1+1,0)=999
2510 FOR Z=0 TO K2:READ X,Y:A(Z,1)=53276+X+64*Y:NEXT:A(K2+1,1)=999
2520 FOR Z=0 TO K3:READ X,Y:A(Z,2)=53276+X+64*Y:NEXT:A(K3+1,2)=999
2530 FOR Z=0 TO 2:READ C(Z):NEXT:RETURN
2998 :
2999 REM *** CHANGE TO SECOND SET OF BALLS ***
3000 FORZ=0TO2:POKEA(P(Z),Z),32:P(Z)=INT(RND(1)*3):D(Z)=1
3005 F(Z)=0:NEXT
3010 K1=5:K2=8:K3=12:GOSUB2500:DI=30:RETURN
3498 :
3499 REM *** CHANGE TO THIRD SET OF BALLS ***
3500 FORZ=0TO2:POKEA(P(Z),Z),32:P(Z)=INT(RND(1)*2):D(Z)=1:F(Z)=0:NEXT
3510 K1=3:K2=5:K3=8:GOSUB2500:DI=100:RETURN
3998 :
3999 REM *** TITLE PAGE & INSTRUCTIONS ***
4000 PRINTCHR$(12):PRINT:PRINT:PRINT
4010 PRINTSPC(13)"**********************"
4020 PRINTSPC(13)"** BUTTERFINGERS **"
4030 PRINTSPC(13)"**********************"
4035 X=-17:Y=1:Z=32:GOSUB600
4040 OF=0:GOSUB500
4050 FOR T=1 TO 4000:NEXT
4125 POKE 519,0:POKE520,0
4130 PRINT"Program by :     ";:FORT=1TO1000:NEXT
4140 PRINT"BILL POLLARD"
4150 FOR T=1 TO 1000:NEXT:PRINT"                          &"
4160 FOR T=1 TO 1000:NEXT:PRINT"                    MARTIN BEEBY"
4161 FOR T=1 TO 1000:NEXT
4165 X=-17:Z=32:Y=-3:GOSUB600
4180 POKE519,0:POKE520,12:INPUT"Instructions ";A$
4190 IFLEFT$(A$,1)="N"THENRETURN
4198 :
4199 REM *** INSTRUCTIONS ***
4200 PRINTCHR$(12):PRINT"       **  BUTTERFINGERS  **"
4210 PRINT:PRINT"     Help Charlie the clown to juggle !"
4220 PRINT:PRINT"  Use '1' to move his arms left"
4230 PRINT"  Use '2' to move his arms right"
4240 PRINT:PRINT:PRINTSPC(8)"Press SPACE to play"
4250 X=-17:Y=4:Z=32:OF=0:GOSUB600
4260 OF=15:GOSUB500
4270 GOTO2090
OK
```

QL Clock
by Andrew Pepper

'Clock' is a simple program which displays an analogue and digital clock on the QL screen. It must be run in TV mode: that is, after resetting or switching on the QL, select F2.

When run, you will be asked for the time of day in HHMMSS format: type in the current time in 12-hour clock format. For example, if the time is 8:32:40 in the evening type: 083240.

After this has been entered a real-time clock will be displayed. To terminate this program type CTRL+SPACE.

```
100 MODE 8
110 PAPER 2:INK 7
120 CLS
130 CSIZE 3,1
140 AT 9,1:PRINT"Clock 1.0";
150 CSIZE 0,0
160 AT 10,5:PRINT Andrew Pepper";
170 INK 5
180 AT 8,7:PRINT"Enter time (HHMMSS):                    ";
190 AT 29,7
200 INPUT t$
210 IF LEN(t$) <> 6 THEN GO TO 180
220 hr = t$(1 TO 2)
230 mn = t$(3 TO 4)
240 se = t$(5 TO 6)
250 oh=hr:om=mn:os=se
260 SDATE 1984,6,3,hr,mn,se
270 INK 4:CLS:CSIZE 2,1
290 FILL 0
300 t = 0
310 CSIZE 0,0
```


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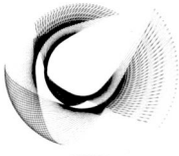

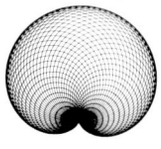

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PROGRAMS

```
315 INK 4:FILL 1:CIRCLE 86,47,35:FILL 0
317 INK 4,7
320 FOR i = PI/6 TO 2*PI STEP PI/6
330 t = t + 1
340 IF t > 12 THEN GO TO 370
350 x = 32*SIN(i) : y = 30*COS(i)
360 CURSOR x+85,y+50,0,0:PRINT t;
370 END FOR i
372 CIRCLE 86,47,35
380 CSIZE 2,1
385 INK 7
387 drwhr
390 updig:drwsc:drwhr:drwmn
400 GO TO 390
410 DEFine PROCedure updig
420 LOCal t$
430 t$ = DATE$
440 BEEP 100,10
450 IF t$ = DATE$ THEN GO TO 450
460 hr = t$(13 TO 14): mn = t$(16 TO 17): se = t$(19 TO 20)
470 hr = hr + mn/60
480 AT 14,0:PRINT t$(12 TO 20);
490 BEEP 100,20
500 END DEFine
510 DEFine PROCedure drwhr
520 LOCal i
530 h = -1
540 i = oh*PI/6:drwln i,4:i = hr*PI/6:drwln i,7:oh=hr
550 h = 0
560 END DEFine
570 DEFine PROCedure drwmn
580 LOCal i
590 i=om*PI/30:drwln i,4:i=mn*PI/30:drwln i,7:om=mn
600 END DEFine
610 DEFine PROCedure drwsc
620 LOCal i
630 i=os*PI/30:drwln i,4:i=se*PI/30:drwln i,7:os=se
640 END DEFine
650 DEFine PROCedure drwln(i,c)
660 LOCal x,y
670 INK c
680 x=25*SIN(i):y=24*COS(i)
690 IF h THEN x = 20*SIN(i) : y = 18*COS(i)
700 LINE 85,50 TO x+85,y+50
710 END DEFine
```



Spectrum File
by Damhaut Marc

PCW program referees are normally a calm bunch and it's rare to find a program that has them dancing round the keyboard. This is such a program and is, in our referee's own words, 'Brilliant'.

'Spectrum File is a very well-written general purpose database; fast and easily adaptable with good use of the Spectrum's capabilities.' I can't follow that so I'll let you type it in and see for yourself.

Spectrum File instructions

Spectrum File handles files on a 48k Spectrum. With it you can create, search, fill, change, print and copy forms. The file can be up to 31k in size but only the used part is saved to tape. The program is menu-driven and an explanation of each of the 10 options follows below.

1 Design file

Your first task is to define your file which may contain as many forms as you want, each made up of as many items as you want. Select 1 on the main menu and design your file. Each item contains three parts: its name followed by a colon, and points which will be replaced by letters during the filling-in. For example,

NAME: .....
FIRSTNAME: .....
CITY: .....
STREET:..... NUMBER: ...
JOB: ..... ↑

Use cursor keys to move around on the screen — CAPS LOCK, DELETE keys work. As the computer scans the screen from top to bottom, you can speed up its search by entering a space followed by '↑' after your last item. Items must be separated by one or more spaces. Apart from this, items may be anywhere on the screen. Press ENTER when this operation is finished. If you have made an error, the cursor will move to your 'mistake'.

REM: You must put enough points in an item to contain your information, plus a character for the retrieve specifications (see 'Search').

After the scanning period (which can last up to a minute according to your file), the computer shows you the maximum number of forms you will be allowed to use. Then press ENTER to return to the menu.

2 Add

Once you have created a file, you can

store your information in it. With the add function, you fill in the blank form with the information you want to keep then add that filled-in form to the file.

Select 2 on the main menu. A blank form should appear, the points being replaced by a blue background.

The 'Ready' at the bottom of the screen says you can enter a form (press ENTER or a letter) or return to the menu (press SPACE or STOP).

You can only write on the blue background (use cursor keys DELETE, CAPS LOCK). EDIT cancels all instructions.

You can go to item number n by pressing both SHIFT keys followed by n.

Q means + 10
W means + 20
For example, to go to item number

3	Press	CAPS SHIFT SYMBOL SHIFT	3
9			9
15			Q5
27			W7
20			W0

Press ENTER to enter this form.

You will be able to come back to this function later to add new forms. If you make an error use the UPDATE function (3).

3 Search/update

Select 3 on the main menu to search one or more items in your file. Enter your retrieve specifications in the items.

For example, if you want to see the form of Mister White enter White in the item 'NAME'.

The first character may be
< : less than
> : more than
: different
For example, NAME:
AGE: <19
SCHOOL:
CITY: LONDON
will give you all students less than 19 years of age who live in London.

Leaving the form empty will give you all forms.

The first character of a retrieve specification mustn't be a space!

Press ENTER to start search.

When a form is found the program displays it. Press ENTER to continue search, 'u' to update this form (see Add), SPACE or STOP to return to the menu and 'c' to send a copy of the screen to the printer.

When all forms have been found the program returns to the menu.

4 Sort out

This part of the program sorts out your file according to one item. If you want to sort or compare numbers, they must have the same number of figures.

5 Remove

Select 5 if you want to cancel forms of your file. Use the retrieve specifications in the same way as the search function.

Removing forms will change the order of the forms so sort them out again if necessary.

6 Save

Select 6 if you want to save your file on tape. Only the used part of the file (f$) will be saved.

7 Print

This prints reports on the screen and sends them to the printer. First, enter the retrieve specifications and then the print specifications. Each print specification contains a letter (p or l) followed by a figure (1-9). The figure determines the order in which the items will be printed. With a 'p', the following item will be printed on the same line; with an 'l', the cursor will go to the next line (after this item).

For example, to print out address labels enter:
NAME:p1
FIRST NAME:l2
CITY:p5 ZIP:l6
STREET:p3 NUMBER:l4

8 Load

This loads a file previously saved on tape.

9 End

If your file needs to be saved you will be allowed to return to the menu.

10 Change design

Select 0 if you want to change the order of items on the screen. Move the cursor (with 5-6-7-8) to the first letter of the item. Press 't' to take it and 'p' to put it anywhere on the screen. Pressing 'u' will cause all the items to move up a character, 'd' to go down.

If the screen scrolls it will be disturbed. Press ENTER to return to menu and then come back to change design.

Changing design does not change the number of the items.

In order to make the program compatible with ZX Microdrives, change lines 6020 and 8020 according to the new syntax.

If you want to create a new file formed by some forms of the old one, use the remove function then save the new file.

Enter the program then save it with SAVE "S FILE" LINE 1

Finally a note about the listing. The 'P' in lines 320, 350, 355, 360, 370, 410 and 1800 represents CHR$(143); graphics shift 8. Similarly the 'U' in lines 7510-7610 are the user-defined graphics 'u', CHR$(164).

```
  10 DEF FN a()=PEEK 23627+256*PEEK 23628
  20 DEF FN e()=PEEK 23641+256*PEEK 23642
  30 POKE 23675,81: POKE 23676,255
  40 RESTORE
  50 DATA 255,129,129,129,129,129,129,255
  60 FOR i=USR "u" TO USR "u"+7: READ a: POKE i,a: NEXT i
 100 BORDER 0: PAPER 0: INK 7: BRIGHT 0: OVER 0: FLASH 0: CLEAR 65520
 105 LET di=0: LET help=130: LET l$="--------------------------------": LET s=0:
 LET fi=0: LET fc=0: POKE 23609,255: POKE 23562,1
 110 PRINT AT 5,4;"SPECTRUM FILE";AT 6,4;"_____________";AT 15,13; 1983 DAMHAU
T Marc"
 120 GO SUB 900
```


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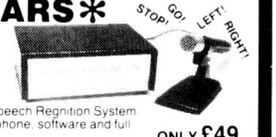

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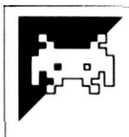
PROGRAMS

```
  130 CLS
  140 PRINT AT 5,11;"MAIN MENU";AT 6,11;"_________"
  150 PRINT : PRINT "!0! CHANGE DESIGN   !5! REMOVE"'"!1! DESIGN FILE     !6! SAV
E"'"!2! ADD              !7! PRINT"'"!3! SEARCH/UPDATE   !8! LOAD"'"!4! SORT OUT
       !9! END"
  160 INPUT "Select function : ";a: POKE 23658,0
  170 IF a<0 OR a>9 THEN  GO TO 160
  180 IF (a=0 OR a>1 AND a<8) AND NOT fi THEN  PRINT AT 20,10; FLASH 1;"  NO FILE
  ": GO TO 160
  185 IF (a=1 OR a=8) AND fi THEN  PRINT AT 18,0;"The present file will be killed
.": GO SUB 800: IF re THEN  PRINT AT 18,0,,,,,,,,: GO TO 160
  190 BRIGHT 1: INK 0: CLS : BRIGHT 0: INK 7: IF a THEN  GO TO INT a*1000
  195 GO TO 7500
  200 REM print format
  205 FOR i=1 TO di: PRINT  BRIGHT 1; PAPER 0; INK 7;AT a(1,i),a(2,i);m$(a(3,i) T
O a(4,i));":";
  210 DIM g$(a(7,i)): PRINT  PAPER 1;g$;: NEXT i
  220 RETURN
  299 REM ENTER
  300 LET ntp=0: PAPER 8: INK 7: BRIGHT 8: IF a=1 THEN  LET x=0: LET y=x: GO TO 3
20
  310 LET y=a(5,1): LET x=a(6,1)
  320 PRINT AT y,x; OVER 1;"p"
  325 LET ax=x: LET ay=y
  330 LET a$=INKEY$: IF NOT LEN a$ OR CODE a$>127 THEN  GO TO 330
  339 IF a$>CHR$ 7 AND a$<CHR$ 12 THEN  LET x=x+((a$=CHR$ 9) AND x<32)-((a$=CHR$
8) AND x): LET y=y+((a$=CHR$ 10) AND y<21)-((a$=CHR$ 11) AND y): GO TO 410
  340 IF a$=CHR$ 7 AND a<>1 THEN  PRINT AT y,x;" ": GO SUB 200: GO TO 310
  344 IF a$=CHR$ 14 THEN  GO TO 1800
  345 IF a$=CHR$ 6 THEN  POKE 23658,8*(NOT PEEK 23658): GO TO 380
  350 IF a$=CHR$ 13 THEN  PRINT AT y,x; OVER 1;"p": RETURN
  355 IF ATTR (y,x)>63 THEN  PRINT AT y,x; OVER 1;"p": LET x=x+1: GO TO 365
  360 IF a$=CHR$ 12 THEN  LET x=x-((x>0) AND ATTR (y,x-(x>0))<63): PRINT AT y,x;"
  ";CHR$ 8;"p" AND x=ax: GO TO 410
  362 BEEP .005,13: PRINT AT y,x;a$: LET x=x+1
  365 IF x=32 THEN  LET x=0: LET y=y+(y<21)
  370 PRINT AT y,x; OVER 1;"p"
  380 IF NOT LEN INKEY$ OR PEEK 23558<2 THEN  GO TO 325
  390 GO TO 380
  410 PRINT AT ay,ax; OVER 1;"p": GO TO 365
  499 REM print
  500 LET p=1
  510 FOR i=1 TO di: PRINT  PAPER 8;AT a(5,i),a(6,i);f$(w,p TO p+a(7,i)-1): LET p
  =p+a(7,i): NEXT i
  520 RETURN
  599 REM search-set up z$
  610 GO SUB 200: GO SUB 300
  620 LET p=0: LET z$="1": FOR i=1 TO di: LET l=a(5,i): LET c=a(6,i)-1: LET ap=p:
  LET p=p+a(7,i)
  625 DIM w$(a(7,i)): GO SUB 1900: IF a$=" " THEN  GO TO 710
  627 LET w$(1)=a$
  630 FOR j=2 TO a(7,i): GO SUB 1900: LET w$(j)=a$: NEXT j
  640 IF w$(1)=" " THEN  GO TO 710
  650 LET z$=z$+" AND f$(w,"+STR$ (ap+1)+(( TO "+STR$ p) AND ap+1<>p)+")"
  660 IF w$(1)=">" THEN  LET z$=z$+">": LET w$=w$(2 TO ): GO TO 700
  670 IF w$(1)="<" THEN  LET z$=z$+"<": LET w$=w$(2 TO ): GO TO 700
  680 IF w$(1)="#" THEN  LET z$=z$+"<>": LET w$=w$(2 TO ): GO TO 700
  690 LET z$=z$+"="
  700 LET z$=z$+""""+w$+""""
  710 NEXT i: IF LEN z$>1 THEN  LET z$=z$(3 TO )
  720 RETURN
  800 REM  RETURN
  810 PRINT '"Press R to return to menu"'"or ENTER to continue.": PAUSE 0: LET re
=(INKEY$="r")+(INKEY$="R"): RETURN
  899 REM WAIT
  900 PRINT AT 21,0;"Press any key to continue."
  910 PAUSE 0
  920 RETURN
 1000 CLS : LET fi=0: LET s=1: PRINT #1;AT 0,0;1$'"DESIGN FILE"
 1010 GO SUB 300
 1130 LET f1=0: LET le=1: LET ch=0: LET di=0: LET fc=0
 1140 FOR l=0 TO 21: FOR c=0 TO 31
 1150 LET a$=SCREEN$ (l,c): IF a$="^" THEN  GO TO 1240
 1160 LET p=(a$=" ")+(a$=":")*2+(a$=".")*3: LET f1=f1*(a$<>":")
 1190 IF NOT p THEN  LET p=4: LET f1=1
 1200 IF (p=4 AND ch=3) OR (p=1 AND ch=2) OR (p=3 AND (ch=1 OR ch=4)) OR (p=2 AND
  (ch=2 OR ch=3)) THEN  GO TO 1990
 1220 IF p=2 THEN  LET di=di+1
 1225 IF f1 THEN  LET le=le+1
 1230 LET ch=p: NEXT c: NEXT l: LET c=c-1: LET l=l-1
 1240 IF p=2 OR p=4 OR f1 THEN  GO TO 1990
 1250 IF NOT di THEN  LET fi=0: GO TO 130
 1260 DIM m$(le): DIM a(8,di): LET pi=1: LET p=0: LET l=0: LET c=-1: LET e=0
 1270 GO SUB 1900: IF e THEN  GO TO 1400
 1280 IF a$=" " THEN  GO TO 1270
 1290 LET p=p+1: LET a(1,pi)=l: LET a(2,pi)=c: LET a(3,pi)=p: LET m$(p)=a$
 1300 GO SUB 1900: IF e THEN  GO TO 1400
 1310 IF a$<>":" THEN  LET p=p+1: LET m$(p)=a$: GO TO 1300
 1320 LET a(4,pi)=p: LET a(5,pi)=l: LET a(6,pi)=c+1: LET ndp=0
 1330 GO SUB 1900: IF e THEN  GO TO 1400
 1340 IF a$<>" " THEN  LET ntp=ntp+1: LET ndp=ndp+1: GO TO 1330
 1350 LET a(7,pi)=ndp: LET a(8,pi)=ntp: LET pi=pi+1
 1360 GO TO 1270
 1400 CLS : LET nf=INT ((30000-di*50)/ntp): PRINT AT 5,0;"Maximum number of forms
 :";nf
 1410 DIM f$(nf,ntp): LET fi=1
 1420 GO SUB 900: GO TO 130
 1800 LET t=0: PRINT AT y,x; OVER 1;"p"
 1810 IF NOT di THEN  GO TO 300
 1820 LET a$=INKEY$: IF a$="q" THEN  LET t=10*(di>=10): GO TO 1820
 1825 IF a$="w" THEN  LET t=20*(di>=20): GO TO 1820
 1830 IF CODE a$<49-t/10 OR CODE a$>48+di-t THEN  GO TO 1820
 1840 LET x=a(6,VAL a$+t): LET y=a(5,VAL a$+t)
 1850 IF INKEY$="" THEN  GO TO 320
 1860 GO TO 1850
 1900 LET c=c+1: IF c=32 THEN  LET c=0: LET l=l+1: IF l=22 THEN  LET e=1: RETURN
 1910 LET a$=SCREEN$ (l,c): IF a$="^" THEN  LET e=1
 1920 RETURN
 1990 LET x=c: LET y=l: BEEP .2,0: GO SUB 320: GO TO 1100
 2000 PRINT #1;AT 0,0;1$'"ADD"
 2010 GO SUB 200: PRINT #1;AT 1,27;"Ready"
 2020 IF NOT LEN INKEY$ THEN  GO TO 2020
 2030 IF INKEY$=" STOP " OR INKEY$=" " THEN  GO TO 130
 2040 PRINT #1;AT 1,27,: IF fc>=nf THEN  CLS : PRINT  FLASH 1;" FILE COMPLETE ":
 BEEP 1,0: GO TO 140
 2050 LET s=1: LET fc=fc+1: PRINT #1;AT 1,4;"FORM ";fc;"/";nf;AT 1,22;INT ((fc-1)
 /nf*100);"%"
 2060 GO SUB 300
 2070 GO SUB 2150
```

PROGRAMS

```
2080 GO TO 2010
2150 LET p=1: FOR i=1 TO di: LET l=a(5,i): LET c=a(6,i)-1
2160 FOR j=1 TO a(7,i): GO SUB 1900: LET f$(fc,p)=a$: LET p=p+1
2170 NEXT j: NEXT i
2180 RETURN
3000 PRINT #1;AT 0,0;l$'"SEARCH/UPDATE"
3020 GO SUB 600
3120 LET ff=0
3200 FOR w=1 TO fc: PRINT #1;AT 1,27;w
3210 IF VAL z$ THEN  LET ff=ff+1: GO SUB 500: PAUSE 0: IF INKEY$="u" THEN  LET s
=1: LET ofc=fc: LET fc=w: GO SUB 300: GO SUB 2150: LET fc=ofc
3215 IF INKEY$="z" THEN  COPY
3220 IF INKEY$=" STOP " OR INKEY$=" " THEN  GO TO 3240
3230 NEXT w
3240 CLS : PRINT AT 5,2;"FORMS FOUND : ";ff: GO SUB 900: GO TO 130
4000 INPUT #1;AT 10,0;(l$)'"SORT";AT 0,0;"According to which item do you  want t
o sort out the file ?"'"(1-";(di);")";w
4010 IF w<1 OR w>di THEN  GO TO 4000
4020 PRINT #1;AT 0,0;l$'"SORTING..."
4030 LET r=0: FOR i=1 TO fc-1: IF f$(i,a(8,w)-a(7,w)+1 TO a(8,w))>f$(i+1,a(8,w)-
a(7,w)+1 TO a(8,w)) THEN  LET e$=f$(i): LET f$(i)=f$(i+1): LET f$(i+1)=e$: LET r
=1
4040 NEXT i: IF r THEN  GO TO 4030
4050 LET s=1: GO TO 130
5000 PRINT #1;AT 0,0;l$'"REMOVE"
5010 GO SUB 600
5020 LET w=0: LET ff=0
5030 LET w=w+1: IF w>fc THEN  CLS : PRINT AT 5,0;"FORMS REMOVED : ";ff: GO SUB 9
00: GO TO 130
5040 PRINT #1;AT 1,20;w;"   ";ff: IF VAL z$ THEN  LET ff=ff+1: LET f$(w)=f$(fc):
 LET f$(fc)="": LET fc=fc-1: IF fc THEN  GO TO 5040
5050 GO TO 5030
6000 GO SUB 6100
6010 PRINT AT 5,0;"Saving..."
6020 SAVE a$ DATA v(): LET co=198: GO SUB 9500: SAVE a$ CODE x+8,v(4)*fc: SAVE a
$ DATA a(): SAVE a$ DATA m$()
6030 LET s=0: GO TO 130
6100 INPUT "Enter tape name : "; LINE a$: IF a$="" OR LEN a$>10 THEN  GO TO 6100
6110 DIM v(4): LET v(1)=fc: LET v(2)=nf: LET v(3)=di: LET v(4)=LEN f$(1)
6120 RETURN
7000 PRINT #1;AT 0,0;l$'"PRINT";AT 1,10;"SEARCH"
7030 GO SUB 600: PRINT #1;AT 1,10;"PRINT SPECIFICATIONS": GO SUB 200: GO SUB 300
7040 DIM p$(di,2): FOR i=1 TO di: LET l=a(5,i): LET c=a(6,i)-1: GO SUB 1900: LET
 p$(i,1)=CHR$ ((a$="p")+(a$="1")*2)
7050 IF CODE p$(i,1) THEN  GO SUB 1900: IF a$>"0" AND a$<="9" THEN  LET p$(VAL a
$,2)=CHR$ i
7070 NEXT i
7080 CLS : INPUT "Number of copy ? ";nu'"Number of line between copies ? ";nl
7090 FOR w=1 TO fc: IF NOT VAL z$ THEN  GO TO 7120
7100 FOR j=1 TO nu: FOR m=1 TO di: LET i=CODE p$(m,2): IF i<>32 THEN  IF CODE p$
(i,1) THEN  PRINT f$(w,a(8,i)-a(7,i)+1 TO a(8,i));" ";: LPRINT f$(w,a(8,i)-a(7,i
)+1 TO a(8,i));" ";: IF CODE p$(i,1)=2 THEN  PRINT CHR$ 13;: LPRINT CHR$ 13;
7110 NEXT m: FOR i=1 TO nl: PRINT CHR$ 13;: LPRINT CHR$ 13;: NEXT i: NEXT j
7120 NEXT w
7200 PRINT TAB 29;"END"'': GO SUB 900: GO TO 130
7500 LET x=0: LET y=x: POKE 23658,0
7510 PRINT #1;AT 0,0;l$'"CHANGE DESIGN": GO SUB 200: LET s=1: LET t=0: LET s$="U
": PRINT AT y,x; OVER 1;"U": LET ax=x: LET ay=y
7520 PRINT  OVER 1;AT y,x;s$;AT ay,ax;s$: LET ax=x: LET ay=y
7530 LET a$=INKEY$: IF NOT LEN a$ THEN  GO TO 7530
7540 IF a$>"4" AND a$<"9" THEN  LET x=x+(a$="8" AND x<31)-(a$="5" AND x): LET y=
y+(a$="6" AND y<21)-(a$="7" AND y): GO TO 7520
7550 IF a$="d" THEN  FOR i=1 TO di: LET a(1,i)=a(1,i)+(a(1,i)<21): LET a(5,i)=a(
5,i)+(a(5,i)<21): NEXT i: CLS : GO TO 7510
7560 IF a$="u" THEN  FOR i=1 TO di: LET a(1,i)=a(1,i)-(a(1,i)>0): LET a(5,i)=a(5
,i)-(a(5,i)>0): NEXT i: CLS : GO TO 7510
7580 IF a$=CHR$ 13 THEN  GO TO 130
7590 IF a$="p" THEN  GO TO 7700
7595 IF t THEN  GO TO 7530
7600 FOR i=1 TO di: IF a(1,i)<>y OR a(2,i)<>x THEN  NEXT i: GO TO 7530
7610 LET t=1: DIM s$(a(4,i)-a(3,i)+a(7,i)+2): LET s$(1)="U": LET s$(LEN s$)="U":
 LET s$(a(4,i)-a(3,i)+2)="U": PRINT AT y+(x=31),(x+1)*(x<>31); OVER 1;s$(2 TO ):
 GO TO 7520
7700 IF NOT t THEN  GO TO 7530
7710 LET t=0: LET a(1,i)=y: LET a(2,i)=x
7720 LET x=x+a(4,i)-a(3,i)+2: LET a(5,i)=y+(INT (x-32)/32)+1-(x>=16): LET a(6,i)
=x-INT (x/32)*32: CLS : GO TO 7510
8000 INPUT "Enter tape name : "; LINE a$
8010 PRINT AT 5,0; FLASH 1;"START TAPE THEN PRESS ANY KEY.": PAUSE 0: PRINT AT 5
,0;"loading...",,
8020 LOAD a$ DATA v(): DIM f$(v(2),v(4)): LET co=198: GO SUB 9500: LOAD a$ CODE
x+8: LOAD a$ DATA a(): LOAD a$ DATA m$()
8025 LET fc=v(1): LET nf=v(2): LET di=v(3)
8030 LET fi=1: GO TO 130
9000 IF s THEN  PRINT AT 10,10; FLASH 1;" WARNING "'' FLASH 0;"The informations
 you have just  entered will be lost.": GO SUB 800: IF re THEN  GO TO 130
9010 CLS : STOP
9500 LET x=FN a()
9510 LET p=PEEK x
9520 IF p=co THEN  RETURN
9530 IF p>=96 AND p<=127 THEN  LET x=x+6: GO TO 9510
9540 IF p>=160 AND p<=191 THEN  GO TO 9600
9550 IF (p>=128 AND p<=159) OR (p>=64 AND p<=95) OR (p>=192 AND p<=223) THEN  LE
T x=x+PEEK (x+1)+256*PEEK (x+2)+3: GO TO 9510
9560 IF x>=224 THEN  LET x=x+19: GO TO 9510
9600 LET x=x+1: IF PEEK x>128 THEN  LET x=x+6: GO TO 9510
9610 GO TO 9600
```



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PROGRAMS

RETURN — fire laser
F7 — drop bombs

Printed in two parts, the first part consists of an initialisation program followed by the main program. The initialisation program should be typed in and saved before the main program.

One final instruction: press the top function key to play again when 'game over' is displayed — I hope this doesn't happen too quickly.

```
10 POKE36879,10:POKE56,28:POKE52,28:PRINT"■"
20 PRINT"■■■■    STAR SCRAMBLE    ■":A$="■■DATA ERROR "
30 PRINT"■■■INITIALISATION.":PRINT"■■LOADING DATA..■■■"
50 T=0:FORJ=7168TO7375:READA:T=T+A:POKEJ,A:NEXT:IFT<>23234THENPRINTA$"100-220":S
TOP
55 T=0:FORJ=7552TO7631:READA:T=T+A:POKEJ,A:NEXT:IFT<>12074THENPRINTA$"300-340":S
TOP
56 FORJ=7424TO7431:POKEJ,0:NEXT
57 T=0:FORJ=7500TO7537:READA:T=T+A:POKEJ,A:NEXT:IFT<>5298THENPRINTA$"400-410":ST
OP
60 PRINT"■■■■■NOW LOAD MAIN PROGRAM":END
100 DATA40,40,172,171,171,170,175,48,12,43,43,171,172,168,172,48
110 DATA44,168,171,170,43,43,42,12,60,102,219,219,102,60,66,129
120 DATA126,153,255,126,24,24,60,126,128,96,112,56,94,78,78,255
130 DATA223,85,213,85,223,0,255,102,8,8,28,28,62,62,54,34
140 DATA0,129,66,60,90,255,126,60,60,90,126,102,126,36,66,231
150 DATA223,149,213,85,223,0,255,126,0,254,254,12,6,3,3,3
160 DATA1,15,31,7,6,12,248,248,128,240,248,0,0,0,0,0
170 DATA0,0,16,48,12,14,6,0,0,0,0,0,219,0,0,0
180 DATA11,13,57,39,118,221,183,217,64,192,172,96,208,116,216,190
190 DATA219,78,53,107,23,57,11,1,219,172,120,228,184,224,112,192
200 DATA170,170,170,170,170,170,170,170,170,170,234,251,59,12,12,0
210 DATA0,0,192,195,179,190,174,170,171,171,171,171,171,171,255,255
220 DATA182,219,166,111,182,219,119,109,53,96,253,224,224,253,96,53
300 DATA124,254,206,214,214,230,254,124,28,60,12,12,12,12,62,62
310 DATA124,254,134,62,124,192,254,254,124,254,198,28,28,198,254,124
320 DATA12,28,60,108,254,254,12,12,254,254,192,252,254,6,254,124
330 DATA124,254,192,252,254,198,254,124,254,254,12,24,48,48,48,48
340 DATA124,254,198,124,254,198,254,124,124,254,198,254,126,6,254,124
400 DATA169,19,32,210,255,169,29,32,210,255,169,13,32,210,255,162,0,169,29,32,21
0,255
410 DATA169,20,32,210,255,169,13,32,210,255,232,224,21,208,236,96

READY.
1 GOSUB600:GOSUB700
30 ONVAL(MID$(TI$,4,1))+1GOSUB50,82,83,84,250,260,70,82,83,81:GOTO85
50 AB=1:BC=2:GR=20:GS=22:TS=21:H=13:GOSUB150:RETURN
70 BC=2:GR=23:TS=23:GS=23:WW=17:GOSUB150:RETURN
81 H=14:GOSUB150:RETURN
82 H=12:GOSUB150:RETURN
83 H=11:GOSUB150:RETURN
84 BC=6:H=10:GOSUB150:RETURN
85 GOSUB220:POKEV4,200:SYS7500:IFM<>0THENPOKES1-M-1,32:POKES2-M-1,32:POKES3-M-1,
32:M=0
90 IFPEEK(S1)<>32THENGOSUB800
92 POKES1,13:POKES2,12:POKES3,11:POKEC1,1:POKEC2,1:POKEC3,1:POKES3-1,32
95 PRINT"■■■SCORE■";SC;TAB(17)SS:POKE646,H:GOTO30
150 B=RND(1):C=RND(1)
153 IFB<CCTHENJJ=JJ+1:GOTO160
156 JJ=JJ-1
160 IFC<CCTHENG=G+1:GOTO170
163 G=G-1
170 IFJJ+G>WWTHENJJ=JJ-1:G=G-1
173 IFJJ<2THENJJ=2
176 IFG<1THENG=1
180 FORK=1TOJJ:POKE8185-22*K,GR:NEXT:POKE8185-22*K,GS
181 IFB>.5THENPOKE8185-22*K,RND(1)*4+3:POKE38905-22*K,BC
184 GOSUB360:FORK=1TOG:POKE7701+22*K,GR:NEXT:POKE7701+22*K,TS
185 IFC>DDTHENPOKE7767+22*K,RND(1)*4+7:POKE38487+22*K,7
190 GOSUB900:RETURN
220 AA=PEEK(J1):GETA$
224 IF(AAAND4)=0ORA$="J"THENM=-22:S1=S1+M:S2=S2+M:S3=S3+M:C1=C1+M:C2=C2+M:C3=C3+
M:RETURN
228 IF(AAAND8)=0ORA$="M"THENM=22:S1=S1+M:S2=S2+M:S3=S3+M:C1=C1+M:C2=C2+M:C3=C3+M
:RETURN
231 IFDI=1THENRETURN
232 IF(AAAND32)=0ORA$=CHR$(13)THENGOSUB300:RETURN
236 IFA$="■"THENGOSUB330
249 RETURN
250 AR=25:AC=10:DI=1:BO=0:LR=0:GOTO270
260 AR=RND(1)*3:AC=9:DI=0
270 RR=INT(RND(1)*22):POKE8185-RR*22,AR:POKE38905-RR*22,AC:POKEV4,250:RETURN
300 FORJ=S1+1TOS1+12:JN=PEEK(J)
301 IFJN=7THENLR=0
302 IFJN=8THENBO=0
303 IFJN<11THENSC=SC+JN*50:POKEJ,24:POKEJ+30720,15:J=S1+13:GOTO315
304 IFJN>10ANDJN<32THENJ=S1+13:GOTO315
305 POKEJ,15:POKEJ+30720,3:POKEV2,160+J/200
315 NEXT:POKEV2,0
320 FORJ=S1+1TOS1+12:JN=PEEK(J):IFJN<15ANDJN<24THENJ=S1+12:GOTO325
322 POKEJ,32
325 NEXT:RETURN
330 NB=S1+1:FORJ=1TO15:JN=PEEK(NB):IFJN<32ANDJN>10THENJ=16:GOTO350
331 POKENB,14:POKENB+30720,3:POKEV3,600-NB/20
334 IFJN<11THENPOKEV1+3,150:POKENB+30720,15:POKENB,24:J=16:SC=SC+JN*50:FORY=1TO4
0:NEXT
335 IFJN=7THENLR=0
336 IFJN=8THENBO=0
340 DATA1,23,23,23,22,22,22,22,22,22,22,22,22,22,22
345 POKENB,32
350 READA:NB=NB+A:NEXT:POKEV3,0:RESTORE:RETURN
360 IFLR=0THENLR=8185-22*K:POKELR,7:POKELR+30720,7:MA=0:RETURN
370 LR=LR-1:MA=MA+1:IFMA<3*RND(1)+11THENRETURN
371 LH=PEEK(LR-22):IFLH>10ANDLH<14THENPOKELR,32:MA=0:LR=0:GOSUB800
372 IFMA>20ORLH<32THENMA=0:LR=0:RETURN
373 POKELR,32:LR=LR-22
375 POKELR,7:POKELR+30720,7:RETURN
600 JJ=5:G=5:CC=.5:DD=.9:WW=15:SS=3:TI$="000000"
620 J1=37151:J2=37152:J3=37154:V1=36874:V2=36875:V3=36876:V4=36877:VV=36878
650 S1=7907:S2=7906:S3=7905:C1=38627:C2=38626:C3=38625:POKEVV,PEEK(VV)AND15OR(16
*8)
690 RETURN
700 PRINT"■":POKE36879,10:POKE36869,255:POKE649,1:POKE650,128
710 POKEJ1,0:POKEVV,6:POKEVV,PEEK(VV)AND15OR(16*8):RETURN
800 BO=0:EN=0:FORJ=180TO220STEP.7
810 POKES3-1,32:POKEV1,64+J/2:POKEV4,400-J
820 RC=9+RND(1)*7:RS=RND(1)*16:POKES1,24:POKES2,24:POKES3,18:POKES1-21,17
```

PROGRAMS

```
822 POKEC1-21,RC:POKEC1,RC:POKEC2,RC:POKEC3,RC
825 POKES1+1,19:POKES1-22,24:POKES2-22,24:POKES3-22,16
826 POKEC1+1,RC:POKEC1-22,RC:POKEC2-22,RC:POKEC3-22,RC
828 POKEVV,PEEK(VV)AND150R(RS*16):NEXT:POKEV1,0:POKEV4,0
830 LR=0:SS=SS-1:IFSS>0THENPRINT"■":GOSUB650:RETURN
840 PRINT"■■■
```

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PROGRAMS

navigation with speed = 0.
Type (3) for elevation: followed by + or − elevation and the number of degrees (0-9). A '+' elevation gives a + depth while '−' elevation gives negative depth: that is, brings the submarine closer to the surface.
Type (4) for map: long range map (& = docking station).
Type (5) for damage report: above 60% the respective part of the ship will become inoperative. When a particular function does not work an * is shown instead of a : next to respective information on the screen.
Type (6) for torpedoes: followed by a direction (0-7). These have a speed of 10 m/s. Therefore, if HMS Conqueror is moving faster than this the two may collide causing harmful damage.
Type (7) for missiles: HMS Conqueror's most powerful weapon. These require a direction and distance.

Intelligence has reported that an invasion is not imminent so time is on your side. Our intelligence service will update the estimated number of ships left every time you redock at a base, but this is not 100% accurate.

A speed of 10 m/s will cause the submarine to move 1/10th of a quadrant per 'second'.

Damage caused by depth charges or helicopters will decrease with depth.

All directions are made using a 0-7 scale. Each represents 45°. Therefore, direction 5 is equal to 225° (from the top). A quick reference guide is found at the bottom left-hand corner of your console.

Good luck, and remember you are our last chance.

```
1 CLS:RANDOM:POKE16396,165
2 CLEAR430:DEFINTA-F,S-Z:DEFSTRG-O:DIMG(9,9),Z(10,2),Y(9,9,2),O(5),T(10,2),S(4)
3 PRINT@340,"HMS CONQUEROR":PRINT@404,STRING$(13,131)
4 G(0,0)="A":G(1,0)="A":G(0,1)="A":G(1,1)="A":G(2,0)="A":G(1,2)="B":G(0,4)="D":G
(0,5)="A":G(0,6)="B":G(5,0)="A":G(6,0)="A":G(7,0)="A":G(6,1)="A":G(5,1)="C":G(7,
1)="B"
5 DATA200,175,150,120,100,75,50,50,30,20
6 FORX=9TO0STEP-1:READZ:Z=Z+55:FORY=9TOXSTEP-1:FORT=XTO9:IFY(Y,T,0)=0THENY(Y,T,0
)=1:IFLEN(G(Y,T))=0THENG(Y,T)=" "+CHR$(Z)ELSEG(Y,T)=G(Y,T)+CHR$(Z)
7 NEXT:NEXT:NEXT:PRINT@779,"ENTER DIFFICULTY LEVEL (0-9)":I=INKEY$
8 I=INKEY$:IFI=""THENBELSEDI=VAL(I):PRINT@779,CHR$(30);:S=RND(DI*1.5)+DI*3.5+40:
FORX=1TOS
9 Z=RND(10)-1:Y=RND(10)-1:T=RND(5):IFLEFT$(G(Z,Y),1)="A"THEN9
10 IFRIGHT$(G(Z,Y),1)="1"THENIFT=1THEN9ELSEF=1:G(Z,Y)=LEFT$(G(Z,Y),LEN(G(Z,Y))-1
)
11 G(Z,Y)=G(Z,Y)+RIGHT$(STR$(T),1):IFF=1THENF=0:G(Z,Y)=G(Z,Y)+"1"
12 NEXTX:ES=S+(RND(3)-2)*RND(3):PRINT@970,"BY G.SEYMOUR 1982";
13 P1=0:P2=0:P3=0:P4=0:P5=0:P6=0:P7=0:EN=4000:OX%=250:TF=32:MI%=10:DA=0:H="#####
":D=0:S1=0:EL=0:D1=5:D(1)="SUB":D(2)="AIR":D(3)="DET":D(4)="BAT":D(5)="GUN":HI="
 * ":X9=5:Y9=8:PX=X9:PY=Y9:P3=0:H6=" ##% ":R=1:H7=CHR$(191):MK="II":L=CHR$(30)
14 X1=RND(10)-1:Y1=RND(10)-1:IFLEFT$(G(X1,Y1),1)<>" "ORLEN(G(X1,Y1))>2THEN14
15 '
16 DP=ASC(MID$(G(X1,Y1),2,1))-55:PRINT@970,L;:H2="(+)":H5=STRING$(2,H7)
17 GOSUB56:GOSUB18:GOSUB31:GOSUB79:F=1:GOTO89
18 F=0
19 FORX2=X1-1TOX1+1:FORY2=Y1-1TOY1+1:IFX2=X1ANDY2=Y1THEN30
20 IFX2>9ORX2<0ORY2<0ORY2>9THENPRINT@(56+(X2-X1)*4)+(4+(Y2-Y1))*64,"XXXX";:GOTO3
0
21 G2=LEFT$(G(X2,Y2),1):IFG2=" "THEN24
22 IFG2="A"THENPRINT@(56+(X2-X1)*4)+(4+(Y2-Y1))*64,H7"LA"H7;:GOTO24
23 PRINT@(56+(X2-X1)*4)+(4+(Y2-Y1))*64,H7"DK"H7;
24 Y(X2,Y2,1)=1
25 G2=RIGHT$(G(X2,Y2),LEN(G(X2,Y2))-2)
26 IFLEN(G2)=0THEN30
27 FORX3=1TOLEN(G2)
28 X4=RND(8)+111+(X2-X1)*8:Y4=RND(3)+11+(Y2-Y1)*3:IFPOINT(X4,Y4)=0ORPEEK(15360+I
NT(X4/2)+INT(Y4/3)*64)<128THEN28ELSERESET(X4,Y4)
29 NEXTX3:IFRIGHT$(G2,1)="1"THENF=1
30 NEXTY2:NEXTX2:RETURN
31 G=RIGHT$(G(X1,Y1),LEN(G(X1,Y1))-2)
32 G1=LEFT$(G(X1,Y1),1):FORX=0TO9:FORY=0TO9:IFRND(25/>24ANDX<>X9ORY<>Y9)ANDG1="
 "THENY(X,Y,0)=2ELSEY(X,Y,0)=0
33 NEXTY:NEXTX
34 GOSUB124:G1=LEFT$(G1,1):IFG1=" "THEN39
35 IFG1="A"THENFORX=1TO8:FORY=1TO8:Y(X,Y,0)=1:GOSUB55:PRINT@X8,H5;:NEXTY:NEXT:R
ETURN
36 IFG1="B"THENFORX=0TO4:FORY=0TO4:Y(X,Y,0)=1:NEXTY:NEXTX:Y(X,Y,0)=3:GOTO39
37 IFG1="C"THENFORX=9TO5STEP-1:FORY=0TO4:Y(X,Y,0)=1:NEXTY:NEXTX:Y(X,Y,0)=3:GOTO3
9
38 IFG1="D"THENFORX=0TO4:FORY=9TO5STEP-1:Y(X,Y,0)=1:NEXTY:NEXTX:Y(X,Y,0)=3
39 Z(0,0)=0:F=0:IFG=""THEN44
40 Z(0,0)=LEN(G):FORX=1TOLEN(G):G1=MID$(G,X,1)
41 X2=RND(10)-1:Y2=RND(10)-1:IFY(X2,Y2,0)<>0OR(X2=X9ANDY2=Y9)THEN41
42 Z(X,0)=VAL(G1):Z(X,1)=X2:Z(X,2)=Y2:Y(X2,Y2,0)=VAL(G1)+4:IFG1="1"THENF=1
43 NEXTX
44 RETURN
45 F4=-1:PRINT@442,"MAP";:FORY=0TO9:X=0:GOSUB55:PRINT@X8,CHR$(222);:FORX=0TO9
46 GOSUB55:G=LEFT$(G(X,Y),1):IFG=" "THEN51
47 IFG="A"THENPRINT@X8,H5;:GOTO52
48 IFG="B"THENPRINT@X8,CHR$(143)CHR$(132)"&";:GOTO52
49 IFG="C"THENPRINT@X8,"&"CHR$(136)CHR$(143);:GOTO52
50 IFG="D"THENPRINT@X8,CHR$(188)CHR$(132)"&";:GOTO52
51 W=LEN(G(X,Y))*2:IFY(X,Y,1)<>0THENPRINT@X8,STR$(W);
52 NEXTX:IFF4=1THENPRINT@442,"MAP";ELSEPRINT@442,"
53 F4=-F4:NEXTY:I=INKEY$
54 I=INKEY$:IFI=""THEN54ELSERETURN
55 X8=(Y+2)*64+(X*3)+17:RETURN
56 '
57 C=FRE(J):PRINT@0,CHR$(215)"HMS COnQUEROR"L;:FORC=1TO10:T(C,0)=9:NEXTC:C=0:I=C
HR$(222):J=CHR$(207)
58 PRINT@64,J"+++0++1++2++3++4++5++6++7++8++9+++"J;
59 PRINT@128,"ENERGY :"USINGH;EN;:PRINT"  0+"I"+0   SONAR REPORT";
60 PRINT@192,"   02  :"USINGH;OX%;:PRINT"  1+"I"+1   "STRING$(12,H7);
61 PRINT@256,"TORPD'S:"USINGH;TP;:PRINT"  2+"I"+2   "STRING$(4,H7)"    "STRING$(
4,H7);
62 PRINT@320,"MISS'L :"USINGH;MI%;:PRINT"  3+"I"+3   "STRING$(12,H7);
63 PRINT@384,STRING$(13,58)"  4+"I"+4"J;
64 PRINT@448,"HEAD'G :"USINGH;D*45;:PRINT"  5+"I"+5"J;
65 PRINT@512,"SPEED  :"USINGH;S1;:PRINT"  6+"I"+6 DEPTH IN THIS ";
66 PRINT@576,"ELVAT'N:"USINGH;EL;:PRINT"  7+"I"+7 QUAD'T: "USINGH;DP;:PRINT" ";
67 PRINT@640,"DEPTH  :"USINGH;D1;:PRINT"  8+"I"+8 QUAD'T:"USING"##";X1;:PRINT","
USING"##";Y1;:PRINT"  ";
68 PRINT@704,"CONDITION      9+"I"+9"J;
69 PRINT@768,J"+++0++1++2++3++4++5++6++7++8++9+++"J;
70 PRINT@832,"   7  0  1";
```

PROGRAMS

```
71 PRINT@896,"   6  +  2"CHR$(246);
72 PRINT@960,"   5  4  3";
73 IFS(1)>60THENPRINT@263,"*";
74 IFS(2)>60THENPRINT@327,"*";
75 IFS(3)>60THENPRINT@519,"*";
76 IFS(4)>60THENPRINT@583,"*";
77 IFES<>0THENPRINT@817,"LATEST ESTIMATE";:PRINT@878,"NO OF SHIPS ="USINGH;ES;
78 RETURN
79 X=0:FORY=0TO9:X=0:GOSUB55:PRINT@X8,CHR$(222);:FORX=0TO9:GOSUB55:Z=Y(X,Y,0):ON
Z+1GOTO88,80,81,82,83,83,84,85,86,87
80 PRINT@X8,H5;:GOTO88
81 PRINT@X8,H1;:GOTO88
82 PRINT@X8,"X=X";:GOTO88
83 PRINT@X8,O(1);:GOTO88
84 PRINT@X8,O(2);:GOTO88
85 PRINT@X8,O(3);:GOTO88
86 PRINT@X8,O(4);:GOTO88
87 PRINT@X8,O(5);
88 NEXTX:NEXTY:RETURN
89 IFZ(0,0)=0THENI="GREEN"ELSEI="RED"
90 IFD1=0THENI="SURFACED":DX%=DX%-3*(DX%<248):IFS1=0THENPRINT@200,USINGH;DX%;
91 IFEN<10000RDX%<50THENI="BAD !!"
92 IFF9=1THENI="DOCKED"ELSEGOTO94
93 EN=EN+INT((4019-EN)/20):DX%=DX%+INT((254-DX%)/5):TP=TP+INT((33-TP)/2):MI%=MI%
+INT((12-MI%)/3):PRINT@136,USINGH;EN;:PRINT@200,USINGH;DX%;:PRINT@328,USINGH;MI%
;:PRINT@264,USINGH;TP;
94 PRINT@770,USING"%       %";I;:PRINT@648,USINGH;D1;
95 R=-R:IFR=1THEN99ELSEFORX=1TO4:S(X)=S(X)/1.01:NEXTX:DA=0:IFS(1)>60THENPRINT@26
3,"*";:DA=1ELSEPRINT@263,":";
96 IFS(2)>60THENPRINT@327,"*";:DA=DA+1ELSEPRINT@327,":";
97 IFS(3)>60THENPRINT@519,"*";:DA=DA+1ELSEPRINT@519,":";
98 IFS(4)<=60THENPRINT@583,":";:ELSEDA=DA+1:PRINT@583,"*";:IFDA=4THEN267
99 X=X9:Y=Y9:GOSUB55:PRINT@X8,H2;:IFFDANDY(X,Y,0)=FC+4THENFORX3=1TO20:NEXT:PRINT
@X8,O(FC);:ELSEFD=0
100 ONF6GOSUB137,166,156,145,167,147,168
101 IFF6=0THENGOSUB153
102 IFF5=0THEN129
103 C=F5:FORX3=1TO10:IFT(X3,0)=9THEN107ELSEC=C-1:X=T(X3,1):Y=T(X3,2):GOSUB55:PRI
NT@X8," + ";:IFY(X,Y,0)<>0THEN108ELSEIFX9=XANDY9=YTHEN115
104 Z1=T(X3,0):GOSUB119:GOSUB55:PRINT@X8,"   ";:PRINT@((Y9+2)*64+(X9*3)+17),H2;:
X=X+Z2:Y=Y+Z3:IFX<0ORY<0ORX>9ORY>9THEN114ELSEIFY(X,Y,0)<>0THEN108
105 IFX9=XANDY9=YTHEN115
106 T(X3,1)=X:T(X3,2)=Y:GOSUB55:PRINT@X8," + ";
107 IFC=0THEN129ELSENEXTX3:GOTO129
108 A=Y(X,Y,0):IFA=1THENGOSUB55:PRINT@X8,H5;:GOTO114ELSEIFA=3THENGOSUB55:PRINT@X
8,"X=X";:GOTO114ELSEIFA=2THENGOSUB55:PRINT@X8,H5;:FORX2=1TO25:NEXT:GOTO113
109 A=A-4:IFZ(0,0)=0THEN113ELSEFORZ=1TOZ(0,0)
110 X4=Z(Z,1):X2=Z(Z,2):IFX4<>XORX2<>YORA<>Z(Z,0)THENNEXTZ:GOTO113
111 S=S-1:B=Z(0,0):FORX2=0TO2:Z(Z,X2)=Z(B,X2):NEXTX2:Z(0,0)=B-1:GOSUB128:GOSUB55
:PRINT@X8,"-=-";
112 GOSUB124:GOSUB126:IFA=0THEN113ELSEG(X1,Y1)=G1+G
113 Y(X,Y,0)=0:GOSUB55:PRINT@X8,"   ";
114 T(X3,0)=9:F5=F5-1:GOTO107
115 X7=14:GOSUB55:PRINT@X8,H5;:FORZ=1TO10:NEXTZ:PRINT@X8,H2;:GOSUB250:GOTO114
116 F3=0:FORX=1TO50:J=INKEY$:IFJ=""THEN118
117 IFASC(J)>47ANDASC(J)<58THENRETURN
118 NEXTX:F3=1:RETURN
119 Z2=0:Z3=0:IFZ1>0ANDZ1<4THENZ2=1
120 IFZ1>4ANDZ1<8THENZ2=-1
121 IFZ1>2ANDZ1<6THENZ3=1
122 IFZ1<2ORZ1=7THENZ3=-1
123 RETURN
124 G=RIGHT$(G(X1,Y1),LEN(G(X1,Y1))-2):G1=LEFT$(G(X1,Y1),2)
125 RETURN
126 IFLEN(G)=0THENA=0:RETURNELSEFORZ=1TOLEN(G):IFVAL(MID$(G,Z,1))<>ATHENNEXTZ:A=
0:RETURNELSEG=LEFT$(G,Z-1)+RIGHT$(G,LEN(G)-Z):RETURN
127 FORX3=1TO25:NEXTX3:RETURN
128 PRINT@920,L"DESTROYED";:RETURN
129 GOSUB210:X=X9:Y=Y9:GOSUB55:PRINT@X8,H2;:IFS1=0THEN89ELSEFD=0:F9=0:Z1=D:GOSUB
119:PRINT@X8,"   ";:P1=Z2*S1/10+PX:P2=Z3*S1/10+PY:IFABS(P1-PX)>ABS(P2-PY)THENP3=
P1-PXELSEP3=P2-PY
130 P4=(P1-PX)/P3:P5=(P2-PY)/P3:FORX4=0TOP3STEPSGN(P3):P7=PX+X4*P4:P6=PY+X4*P5:I
FINT(P7)>9ORINT(P7)<0ORINT(P6)>9ORINT(P6)<0THENX9=P7:Y9=P6:PX=P7:PY=P6:GOTO197
131 IFY(P7,P6,0)<>0THENX=P7:Y=P6:GOTO182
132 NEXTX4:PX=P1:PY=P2:X9=INT(P1):Y9=INT(P2):X=X9:Y=Y9:IFX>9ORY>9ORX<0ORY<0THEN1
97ELSEGOSUB55:PRINT@X8,H2;
133 EN=EN-ABS(Z2*S1/7)-ABS(Z3*S1/7):DX%=DX%-2:IFEN<0THEN259ELSEIFDX%<0THEN261
134 PRINT@136,USINGH;EN;:PRINT@200,USINGH;DX%;
135 D1=D1+(EL*S1/30):IFD1<0THEND1=0ELSEIFD1>DPTHEN266
136 GOTO89
137 IFS(3)>60THENF6=0:PRINT@920,L"NAVIGATION INOPERATIVE";:RETURNELSEIFF7<>2THEN
F7=1
138 ONF7GOTO139,142
139 PRINT@980,L"DIRECTION ?";
140 GOSUB116:IFF3=0ANDVAL(J)<8THENF7=2:F8=VAL(J)
141 RETURN
142 PRINT@980,L"ENGINE SPEED (0-9)?";
143 GOSUB116:IFF3=0THENF6=0:D=F8:S1=VAL(J)*2.5:F7=0:PRINT@520,USINGH;S1;:PRINT@4
56,USINGH;D*45;
144 RETURN
145 F6=0:IFZ(0,0)<>0THENPRINT@920,L"NO RECORDS DURING COMBAT,SIR.";:RETURNELSEGO
SUB45:GOSUB79
146 PRINT@442,"   ";:RETURN
147 IFS(1)>60THENPRINT@920,L"TORPEDOES INOPERATIVE";:F6=0:RETURNELSEIFF5=10THENP
RINT@980,L"SORRY CAPTAIN : NOT READY";:F6=0:RETURNELSEIFD1>50THENPRINT@920,L"SOR
RY CAPTAIN ,TOO DEEP";:F6=0:RETURN
148 IFTP=0THENPRINT@920,L"NO TORPEDOES LEFT SIR";:F6=0:RETURN
149 PRINT@980,L"DIRECTION ?";:GOSUB116:IFF3=1THENRETURN
150 IFVAL(J)>7THENRETURNELSEF6=0:F5=F5+1
151 TP=TP-1:PRINT@264,USINGH;TP;:Z1=VAL(J):GOSUB119:FORF6=1TO10:IFT(F6,0)=9THENT
(F6,0)=VAL(J):T(F6,1)=X9+Z2:T(F6,2)=Y9+Z3ELSENEXTF6:F6=0:RETURN
152 IFT(F6,1)>9ORT(F6,1)<0ORT(F6,2)>9ORT(F6,2)<0THENT(F6,0)=9:F6=0:RETURNELSEF6=
0:RETURN
153 PRINT@845,CHR$(202);:F7=0:PRINT@980,L"COMMAND :-";:GOSUB116
154 IFF3=1THENF6=0:RETURNELSEIFVAL(J)>7THENF3=1:F6=0:RETURNELSEF6=VAL(J):IFF6=10
RF6=3THENPRINT@845,"NAVIGATION";ELSEIFF6=4THENPRINT@845,"RECORDS";ELSEIFF6=6THEN
PRINT@845,"TORPEDOES";ELSEIFF6=7THENPRINT@845,"MISSILES";
155 RETURN
156 IFS(4)>60THENPRINT@920,L"ELEVATORS STUCK";:F6=0:RETURN
157 IFF7=0THENF7=1
158 ONF7GOTO159,164
159 PRINT@980,L"ELEVATION  + OR - ?";
160 FORX3=1TO50:J=INKEY$:IFJ=""THENNEXTX3:RETURNELSEIFJ="+"ORJ="-"ORJ="."THEN15
161 NEXTX3:RETURN
162 IFJ=";"THENJ="+"
163 F8=(ASC(J)-44)*-1:F7=2:RETURN
164 PRINT@980,L;"NO OF DEGREES ?";:GOSUB116:IFF3=1THENRETURN
165 F6=0:F7=0:EL=VAL(J)*F8:PRINT@584,USINGH;EL;:RETURN
166 PRINT@920,L"FAST STOP";:EN=EN*13/15:S1=0:PRINT@520,USINGH;S1;:F6=0:F7=0:PRIN
T@136,USINGH;EN;:RETURN
167 PRINT@920,"TORP";USINGH6;S(1);:PRINT"M;SS";USINGH6;S(2);:PRINT"NAVIG";USINGH
6;S(3);:PRINT"DEPTH";USINGH6;S(4);:F6=0:RETURN
```


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PROGRAMS

```
168 IFS(2)>60THENPRINT@920,L"MISSILES INOPERATIVE";:F6=0:RETURNELSEIFD1>50THENPRI
NT@920,L"MISSILES WILL NOT FIRE AT THIS DEPTH";:F6=0:RETURN
169 IFMI%=0THENPRINT@920,"NO MISSILES LEFT SIR";:F6=0:RETURN
170 IFF7=1THEN174
171 PRINT@980,"MISSILE DIRECTION ?";:GOSUB116:IFF3=1THENRETURN
172 IFVAL(J)>8THENRETURN
173 F8=VAL(J):F7=1:RETURN
174 PRINT@980,L"DISTANCE ?";:GOSUB116:IFF3=1THENRETURN
175 F7=0
176 MI%=MI%-1:PRINT@328,USINGH;MI%;:PRINT@920,L"MISSILE LAUNCHED";:Z1=F8:GOSUB11
9:X=X9+Z2*VAL(J):Y=Y9+Z3*VAL(J):IFX>90RX<0ORY>9ORY<0THENF6=0:RETURNELSEIFY(X,Y,0
)=0THENF6=0:RETURN
177 X7=Y(X,Y,0):Y(X,Y,0)=0:IFX7<5THENGOSUB55:FORX2=0TO20:PRINT@X8,"***";:PRINT@X
8,"(#)";:PRINT@X8,"   ";:NEXT:F6=0:RETURN
178 GOSUB124
179 A=X7-4:GOSUB126:IFA=0THENF6=0:PRINT@920,L"MISSILE MISSED";:RETURN
180 FORX2=1TOZ(0,0):IFA<>Z(X2,0)ORX<>Z(X2,1)ORY<>Z(X2,2)THENNEXTX2:F6=0:PRINT@92
0,L"MISSILE JAMMED";:RETURN
181 G(X1,Y1)=G1+G:GOSUB55:FORX3=0TO20:PRINT@X8,H5;:PRINT@X8,"###";:PRINT@X8,"
";:NEXTX3:S=S-1:PRINT@920,L"OBJECTIVE HIT";:X8=Z(0,0):FORY=0TO2:Z(X2,Y)=Z(X8,Y):
NEXT:Z(0,0)=X8-1:F6=0:RETURN
182 X3=Y(X,Y,0):ONX3GOTO183,186,189:GOTO194
183 GOSUB55:FORX3=1TO20:PRINT@X8,"***";:FORZ=1TO25:NEXT:PRINT@X8,H5;:FORZ=1TO20:
NEXT:PRINT@X8,H2;:NEXT
184 PRINT@915,L"HMS CONQUEROR HAS BEACHED AND BROKEN HER HULL";
185 GOTO254
186 GOSUB55:FORX3=1TO20:PRINT@X8,H2;:PRINT@X8,H1;:NEXT
187 Y(X,Y,0)=0:PRINT@X8,H2;
188 X7=20:GOSUB250:PX=P7:PY=P6:Y9=PY:X9=PX:F6=2:GOTO133
189 S1=0:X=X-Z2:Y=Y-Z3:PY=Y:PX=X:Y9=Y:X9=X:GOSUB55:PRINT@X8,H2;:IFD1=0THENF9=1EL
SEPRINT@920,L"TOO DEEP TO DOCK";:GOTO193
190 PRINT@920,L;
191 IFS=0THEN262
192 ES=S+(RND(3)-2)*RND(3):IFES<0THENES=RND(3)
193 PRINT@520,USINGH;S1;:PRINT@891,USINGH;ES;:GOTO133
194 IFD1<5THENGOSUB55:FORX7=1TO100:PRINT@X8,H2;:PRINT@X8,0;Y(X,Y,0)-4;:NEXT:PRI
NT@X8,H5;:PRINT@920,L"COLLISION";:FORX3=0TO50:NEXT:GOTO254
195 IFX4-ABS(P3)>0THEN132
196 FD=1:FC=Y(X,Y,0)-4:GOTO133
197 Z(0,0)=0
198 PRINT@910,L"ENTERING NEW QUADRANT ";
199 IFX9>9THENX1=X1+1:X9=0:GOTO201
200 IFX9<0THENX1=X1-1:X9=9
201 IFY9>9THENY1=Y1+1:Y9=0:GOTO203
202 IFY9<0THENY1=Y1-1:Y9=9
203 IFY1>9ORY1<0ORX1>9ORX1<0THEN207
204 PY=Y9:PX=X9:G=G(X1,Y1):DF=ASC(MID$(G,2,1))-55
205 F5=0:FORX=0TO50:NEXT:GOSUB56:PRINT@910,"ENTERING NEW QUADRANT "X1","Y1;
206 GOSUB18:GOSUB31:GOSUB79:PRINT@910,L;:GOTO89
207 FORX=0TO9:PRINT@539,"RED ALERT";:FORY=0TO120:NEXT:PRINT@539,"         ";:FOR
Y=0TO120:NEXT:NEXT
208 PRINT@594,"SUPERIOR ENEMY FORCES !!";
209 FORX=0TO1500:NEXT:PRINT@670,"UNDER ATTACK !";:FORX=1TO1500:NEXT:GOTO209
210 IFZ(0,0)=0THEN235
211 FB=FB+1:IFFB>Z(0,0)THENFB=1
212 X7=Z(FB,0):ONX7GOTO213,220:GOTO228
213 Z8=Z(FB,1):Z9=Z(FB,2):X=Z8:Y=Z9:GOSUB55:PRINT@X8,"   ";:Y(X,Y,0)=0
214 A1=X9-Z8:Z8=Z8+SGN(INT(A1/3)):A1=Y9-Z9:Z9=Z9+SGN(INT(A1/3))
215 IFY(Z8,Z9,0)=0THEN217ELSEIFY(Z8,Z9,0)<>0ANDZ9<>Z(FB,2)THENZ9=Z(FB,2)ELSEIFY(
Z8,Z9,0)<>0THENZ8=Z(FB,1)
216 IFZ8<>Z(FB,1)ORZ9<>Z(FB,2)THEN215
217 X=Z8:Y=Z9:GOSUB55:PRINT@X8,0(1);:Z(FB,1)=X:Z(FB,2)=Y:Y(X,Y,0)=Z(FB,0)+4
218 X=ABS(X9-Z8):Y=ABS(Y9-Z9):IFX=0ORY=0ORY=XTHEN246
219 RETURN
220 Z8=Z(FB,1):Z9=Z(FB,2):X=Z8:Y=Z9:GOSUB55:PRINT@X8,"   ";:Y(X,Y,0)=0
221 Z8=Z8-SGN(X9-Z8):IFZ8>9THENZ8=9ELSEIFZ8<0THENZ8=0
222 Z9=Z9-SGN(Y9-Z9):IFZ9>9THENZ9=9ELSEIFZ9<0THENZ9=0
223 IFY(Z8,Z9,0)=0THEN225ELSEIFY(Z8,Z9,0)<>0ANDZ(FB,2)<>Z9THENZ9=Z(FB,2)ELSEIFY(
Z8,Z9,0)<>0THENZ8=Z(FB,1)
224 IFZ8<>Z(FB,1)ORZ9<>Z(FB,2)THEN223
225 X=Z8:Y=Z9:GOSUB55:PRINT@X8,0(2);:Z(FB,1)=X:Z(FB,2)=Y:Y(X,Y,0)=Z(FB,0)+4
226 IFRND(10)>8THENPRINT@920,L"UNDER HELICOPTER ATTACK";:X7=12/INT((D1/20)+1):GO
SUB250
227 RETURN
228 Z8=Z(FB,1):Z9=Z(FB,2):X=Z8:Y=Z9:GOSUB55:PRINT@X8,"   ";:Y(X,Y,0)=0
229 A1=X9-Z8:Z8=Z8+SGN(INT(A1/3)):A1=Y9-Z9:Z9=Z9+SGN(INT(A1/3))
230 IFY(Z8,Z9,0)=0THEN232ELSEIFY(Z8,Z9,0)<>0ANDZ9<>Z(FB,2)THENZ9=Z(FB,2)ELSEIFY(
Z8,Z9,0)<>0THENZ8=Z(FB,1)
231 IFZ8<>Z(FB,1)ORZ9<>Z(FB,2)THEN230
232 X=Z8:Y=Z9:GOSUB55:PRINT@X8,0(Z(FB,0));:Z(FB,1)=X:Z(FB,2)=Y:Y(X,Y,0)=Z(FB,0)+
4
233 IF(ABS(X9-X)>3ORABS(Y9-Y)>3)ORRND(10)<3THENRETURN
234 PRINT@920,L"UNDER DEPTH CHARGE ATTACK";:X7=6/(D1/10+.5)*(Z(FB,0)-2)+1.5:GOSU
B250:RETURN
235 IFRND(10)<6ORF=1THENRETURN
236 FORX2=X1-1TOX1+1:FORY2=Y1-1TOY1+1:IFX2>90RX2<0ORY2>90RY2<0OR(X1=Y2ANDY1=Y2)T
HEN238
237 IFRIGHT$(G(X2,Y2),1)="1"THEN239
238 NEXT:NEXT:F=1:RETURN
239 X=4+(X2-X1)*4:Y=4+(Y2-Y1)*4:X=X-(X=8):Y=Y-(Y=8):IFY(X,Y,0)<>0THEN238ELSEG=G
,Y2)=LEFT$(G(X2,Y2),LEN(G(X2,Y2))-1):G(X1,Y1)=G(X1,Y1)+"1"
240 A1=(5&+(X2-X1)*4)+(4+(Y2-Y1))*64:PRINT@A1,H5;H7;
241 G=G(X2,Y2):G1=RIGHT$(G,LEN(G)-2):IFLEFT$(G,1)<>" "THENIFLEFT$(G,1)="A"THEN26
INT@A1+1,"LA";ELSEPRINT@A1+1,"DK";
242 IFG1=""THEN245ELSEFORX3=1TOLEN(G1)
243 X4=RND(8)+111+(X2-X1)*8:Y4=RND(3)+11+(Y2-Y1)*3:IFPOINT(X4,Y4)=0ORPEEK(INT(X
INT(X4/2)+INT(Y4/3)*64)<128THEN243ELSERESET(X4,Y4)
244 NEXTX3
245 Y(X,Y,0)=5:Z(0,0)=1:Z(1,0)=1:Z(1,1)=X:Z(1,2)=Y:F7=A5:GOSUB55:PRINT@X8,0(1);:
F=1:RETURN
246 X=SGN(X9-Z8):Y=SGN(Y9-Z9):IFF5=100RRND(10)<6THENRETURN
247 X7=0
248 IFX=0ANDY=-1THEN249ELSEIFX=1ANDY=-1THENX7=1ELSEIFX=1ANDY=0THENX7=2ELSEIFX=1A
NDY=1THENX7=3ELSEIFX=0ANDY=1THENX7=4ELSEIFX=-1ANDY=1THENX7=5ELSEIFX=-1ANDY=0THEN
X7=6ELSEIFX=-1ANDY=-1THENX7=7
249 X=Z8+X:Y=Z9+Y:GOSUB55:PRINT@X8," + ";:F5=F5+1:FORC=1TO10:IFT(C,0)=9THENT(C,0
)=X7:T(C,1)=X:T(C,2)=Y:PRINT@920,L"UNDER TORPEDO ATTACK";:C=0:RETURNELSENEXTC:G
0:RETURN
250 X7=X7*(D1+6)/15:FORX=1TOX7/4:Y=RND(4):S(Y)=INT((100-S(Y))/6)+S(Y)
251 NEXTX:IFRND(2)=1THENEN=EN-X7*(RND(10)+8)ELSEOX%=OX%-X7*(RND(2)+1)
252 IFEN<0THEN259ELSEIFOX%<0THEN261
253 PRINT@136,USINGH;EN;:PRINT@200,USINGH;OX%;:RETURN
254 IFAZ=5THEN258ELSEFORX=145TO721STEP64:PRINT@X,STRING$(30,46);:NEXT:PRINT@202,
"ALTHOUGH HMS CONQUEROR";:PRINT@466,"HAS BEEN DESTROYED";:PRINT@530,"YOUR PREVIA
E LAUNCH HAS";:PRINT@594,"MANAGED TO TAKE YOU TO NAVAL";:PRINT@658,"HEADQUARTER
WHERE HMS";
255 PRINT@722,"CONQUEROR MK"MK" AWAITS";
256 MK=MK+"I":F9=1:D=0:S1=0:EL=0:D1=5:X9=6:Y9=5:PX=X9:PY=Y9:X1=0:Y1=6:AZ=AZ+1:S(
1)=0:S(2)=0:S(3)=0:S(4)=0:D1=0:EN=4000:OX%=250:TP=32:MI%=10:J=INKEY$:F6=0:F7=0:F
5=0:F6=0
257 FORX=1TO6500:NEXT:GOTO15
258 PRINT@920,L"YOU DIDN'T MAKE IT THAT TIME";:FORX=1TO6500:NEXT:RUN
```

```
259 PRINT@920,L"NO ENERGY LEFT SIR";
260 FORX=0TO14:FORY=0TO31:PRINT@X*64+Y,"+";:PRINT@X*64+63-Y,"+";:NEXTY:NEXTX:PRI
NT@960,L;:GOTO254
261 PRINT@920,L"YOU ALL SUFFOCATE:BETTER LUCK NEXT TIME";:FORX=1TO6500:NEXT:RUN
262 PRINT@920,L"COMMUNIDUE :CONGRATULATIONS CAPTAIN";:PRINT@990,L"OUR COUNTRY IS
 SAFE AGAIN !!";
263 FORX=1TO2500:NEXT:IFAZ=0THENJ="YOU HAVE BEEN MADE ADMIRAL"ELSEIFAZ=1THENJ="D
UE TO LOSSES YOU HAVE ONLY BEEN MADE FLEET COMMANDER"ELSEJ="DUE TO HEAVY LOSSES
SUSTAINED YOU HAVE REMAINED CAPTAIN"
264 PRINT:FORX=1TO20:PRINTSTRING$(64,166);:NEXT:PRINTSTRING$(63,191);:POKE16383,
191:PRINT@512,J;L:PRINT@448,L;:PRINT@576,L;:FORX=1TO4500:NEXT:PRINT@512,L"YOUR N
EW CAMPAIGN STARTS NOW ";
265 FORX=1TO2500:NEXT:RUN
266 PRINT@920,L"HMS CONQUEROR HAS CRASHED ON THE BOTTOM";:PRINT@990,"THERE WERE
NO SURVIVORS";:FORX=1TO6500:NEXT:RUN
267 PRINT@920,L"THE SHIP IS BREAKING UP SIR";:PRINT@980,L"      SHE CAN'T TAKE AN
Y MORE";:FORX=1TO3000:NEXT:CLS:FORX=1TO3000:NEXT
268 IFRND(3)=2THEN258ELSE254
```

Spectrum Payday

by G J Edmonds

'Payday' is a novel computer board game for two to six players, the object being to accumulate the most money by the end of the year.

The year is divided into 12 months, and each month is represented by one circuit of the board which is further divided into 31 squares, or days.

Scattered throughout the board are 'Buy' squares, on which you may buy articles with the hope that you'll land on a 'Sell' square by the end of the month, thereby selling your purchase and making lots of money. Any buy must be sold before the end of the month or it will be lost. Finally there are the dreaded 'Post' squares, on which you usually receive expensive bills although good news occasionally comes this way.

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I wish you luck with this one. My dismal efforts were all too realistic: I staggered from one payday to the next without a penny to my name.

As you will see from the listing, this program uses user-defined graphics. To help you, a list of graphics used is supplied, plus the letter you should type in (in graphics mode) to get them.

```
    USER DEFINED GRAPHICS

A   
B   
C   ST
D   SE
E   BU
F   Y
G   
H   IT
I   IR
J   
K   PO
L   LL
M   P
N   AV
O   OR
P   Y
Q   Q
R   R
S   S
T   T
U   U

  1 REM PAYDAY !!!!
 10 CLEAR
 15 CLS
 20 GO SUB 9500
 30 GO TO 9750
 35 LET w=0
 40 PRINT AT 1,23;"No. of";AT 2
,24;"players?";AT 3,25;"(2-6)":
INPUT p$
 41 LET k=LEN p$
 42 LET e=CODE p$
 43 IF k=1 THEN  GO TO 45
 44 GO TO 46
 45 IF e>=50 AND e<=54 THEN  GO
 TO 50
 46 PRINT AT 11,25; INK 4; PAPE
R 6; FLASH 1;"ERROR": BEEP .75,-
20
 47 FOR j=1 TO 150: NEXT j
 48 GO SUB 8940
 49 GO TO 40
 50 LET p=VAL p$
 60 FOR n=1 TO 10: BEEP .2,n: N
EXT n
 70 PRINT AT 12,24;"LENGTH?";AT
 14,24;"Quickie";AT 15,24;"Mediu
m";AT 16,24;"Long"
 80 IF INKEY$="q" THEN  LET w=3
: GO TO 120
 90 IF INKEY$="m" THEN  LET w=6
: GO TO 120
 100 IF INKEY$="1" THEN  LET w=1
2: GO TO 120
 110 GO TO 80
 120 BEEP 1,0: GO SUB 8500: GO S
UB 8900
 130 FOR n=1 TO p
 132 GO SUB 8900
 133 GO TO 800
 135 PRINT AT 19,16;m
 136 IF m=0 THEN  PRINT AT 19,17
;" "
 140 IF z(n)=1 THEN  LET z(n)=0:
 GO TO 600
 150 IF u(n)=1 THEN  GO TO 600
 160 PRINT AT 0,24;"PLAYER ";n
 170 PRINT AT x(n),y(n); INK n;"
"
 180 PRINT AT 1,23; INK 2;"Cash
=";AT 2,25; INK 2;"#";c(n)
 190 PRINT AT 3,23; INK 4;"Loan
=";AT 4,25; INK 4;"#";l(n)
 200 PRINT AT 5,23; INK 5;"Savin
gs =";AT 6,25; INK 5;"#";s(n)
 210 IF a(n)=0 THEN  GO TO 250
 220 PRINT AT 7,23; INK 3;"YOUR
BUY"
 230 PRINT AT 8,23; INK 1;"COST"
;AT 8,28; INK 1;"SELL"
 240 PRINT AT 9,23;b(n);AT 9,28;
v(n)
 250 REM throw and move
 260 PRINT AT 11,25; INK 4;"PRES
S";AT 12,24; INK 4;"ANY KEY";AT
13,27; INK 4;"TO";AT 14,25; INK
4;"THROW"
 270 RANDOMIZE
 280 LET d=INT (RND*6)+1
 290 IF INKEY$<>"" THEN  GO TO 3
01
 300 GO TO 280
 301 FOR f=1 TO 20: BEEP .01,f:
NEXT f: GO SUB 8940
 302 IF d=6 AND m>0 THEN  GO TO
304
 303 GO TO 313
 304 PRINT AT 11,24;"You've";AT
12,24;"won the";AT 13,24;"premiu
m";AT 14,25;"bonds"
 305 FOR j=1 TO (m/5)
 306 LET c(n)=c(n)+5
 307 PRINT AT 2,26; INK 2;c(n)
 308 BEEP .05,30
 309 NEXT j
 310 LET m=0: PRINT AT 19,16;m;"
"
 311 FOR f=1 TO 125: NEXT f
 312 GO SUB 8940
 313 PRINT AT 11,26; INK 1;"You"
;AT 12,25; INK 1;"threw";AT 13,2
6; INK 1;"a "id
 314 FOR f=1 TO 225: NEXT f
 315 GO SUB 8940
 320 FOR f=1 TO d
 330 PRINT AT x(n),y(n);"  "
 340 LET y(n)=y(n)+1
 350 IF y(n)>19 THEN  LET y(n)=1
: LET x(n)=x(n)+4
 360 IF x(n)=18 AND y(n)=10 THEN
 GO TO 5500
 370 PRINT AT x(n),y(n); INK n;"
"
 380 BEEP .2,y(n)
 390 NEXT f
 400 FOR f=1 TO p
 410 PRINT AT x(f),y(f); INK f;"
"
 420 NEXT f
 430 IF x(n)>=6 AND y(n)=1 THEN
 GO TO 1500
 440 IF x(n)=2 AND y(n)=4 OR x(n
)=2 AND y(n)=10 OR x(n)=2 AND y(
n)=16 OR x(n)=6 AND y(n)=13 OR x
(n)=10 AND y(n)=7 OR x(n)=10 AND
 y(n)=16 OR x(n)=14 AND y(n)=4 O
R x(n)=14 AND y(n)=10 THEN  GO T
O 7000
 450 IF x(n)=2 AND y(n)=13 OR x(
```


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PROGRAMS

```
n)=6 AND y(n)=16 OR x(n)=10 AND
y(n)=4 OR x(n)=14 AND y(n)=13 TH
EN  GO TO 4100
 460 IF x(n)=6 AND y(n)=7 OR x(n
)=10 AND y(n)=10 OR x(n)=10 AND
y(n)=19 OR x(n)=18 AND y(n)=7 TH
EN  GO TO 2800
 470 IF x(n)=2 AND y(n)=7 THEN
GO TO 1700
 480 IF x(n)=2 AND y(n)=19 THEN
 GO TO 2000
 490 IF x(n)=6 AND y(n)=4 THEN
GO TO 1900
 500 IF x(n)=6 AND y(n)=10 THEN
 GO TO 6400
 510 IF x(n)=6 AND y(n)=19 THEN
 GO TO 2700
 520 IF x(n)=10 AND y(n)=13 THEN
  GO TO 2500
 530 IF x(n)=14 AND y(n)=7 THEN
 GO TO 1100
 540 IF x(n)=14 AND y(n)=16 THEN
  GO TO 3200
 550 IF x(n)=14 AND y(n)=19 THEN
  GO TO 3500
 560 IF x(n)=18 AND y(n)=4 THEN
 GO TO 1000
 600 NEXT n
 605 GO TO 130
 607 REM deposit savings?
 610 GO SUB 8940
 615 IF c(n)<=0 THEN  GO TO 600
 620 PRINT AT 11,24; INK 4;"Do y
ou";AT 12,24; INK 4;"wish to";AT
 13,24; INK 4;"deposit";AT 14,25
; INK 4;"any";AT 15,24; INK 4;"s
avings";AT 16,25; INK 4;"(y/n)"
 630 IF INKEY$="n" THEN  GO TO 3
000
 640 IF INKEY$="y" THEN  GO TO 6
60
 650 GO TO 630
 660 GO SUB 8940
 670 PRINT AT 11,25;"INPUT";AT 1
2,24;"AMOUNT";AT 13,24;"MULT OF"
;AT 14,25;"FIVE"; INPUT q$
 671 LET ab=0
 672 LET k=LEN q$
 673 FOR f=1 TO k
 674 LET k$=q$(f TO f)
 675 LET r=CODE k$
 676 IF r>=48 AND r<=57 THEN  LE
T ab=ab+1
 677 NEXT f
 678 IF ab<>k THEN  GO TO 680
 679 GO TO 684
 680 PRINT AT 17,25; INK 4; PAPE
R 6; FLASH 1;"ERROR": BEEP .75,-
20
 681 FOR j=1 TO 150: NEXT j
 682 GO SUB 8940
 683 GO TO 670
 684 LET q=VAL q$
 685 IF q>c(n) THEN  GO TO 680
 686 LET an=(q/5)
 687 LET an=INT an
 688 IF (an*5)<>q THEN  GO TO 68
0
 690 FOR j=1 TO (q/5)
 700 LET s(n)=s(n)+5
 710 LET c(n)=c(n)-5
 720 PRINT AT 2,26; INK 2;c(n);"
";AT 6,26; INK 5;s(n)
 730 BEEP .05,30
 740 NEXT j
 750 GO SUB 8940
 760 GO TO 5000
 800 LET q=0
 810 FOR j=1 TO p
 820 IF u(j)=1 THEN  LET q=q+1
 830 NEXT j
 840 IF q=p THEN  GO TO 4900
 850 GO TO 135
1000 REM miss a turn
1010 GO SUB 8940
1020 FOR j=0 TO -20 STEP -1: BEE
P .075,j: NEXT j
1030 PRINT AT 11,25; INK 1;"BANK
";AT 12,24; INK 1;"HOLIDAY";AT 1
4,24; INK 5;"miss a";AT 15,25; I
NK 5;"turn"
1040 LET z(n)=1
1050 FOR j=-20 TO 0: BEEP .075,j
: NEXT j
1060 FOR j=1 TO 125: NEXT j
1070 GO TO 610
1100 REM family allowance
1110 GO SUB 8940
1120 BEEP .3,0: BEEP .3,1: BEEP
.3,2: BEEP .3,-1
1130 PRINT AT 11,24; INK 2;"FAMI
LY";AT 12,24; INK 2;"BENEFIT"
1135 PRINT AT 14,24;"#5 per";AT
15,25;"child"
1140 FOR f=1 TO 150: NEXT f
1150 GO SUB 8940
1160 PRINT AT 11,25; INK 4;"PRES
S";AT 12,24; INK 4;"ANY KEY";AT
13,24; INK 4;"FOR NO.";AT 14,24;
 INK 4;"OF KIDS"
1170 RANDOMIZE
1180 LET ih=INT (RND*6)+1
1190 IF INKEY$<>"" THEN  GO TO 1
210
1200 GO TO 1180
1210 FOR f=1 TO 20: BEEP .05,f:
NEXT f
1220 GO SUB 8940
1230 PRINT AT 11,26;"You";AT 12,
24;"have ";ih;AT 13,25;"kids";AT
 15,26; INK 3;"#";ih*5;AT 16,24;
 INK 3;"benefit"
1235 IF ih=1 THEN  PRINT AT 13,2
8;""
1240 LET ih=ih*5
1250 FOR j=1 TO ih
1260 LET c(n)=c(n)+1
1270 PRINT AT 2,26; INK 2;c(n)
1280 BEEP .05,30
1290 NEXT j
1295 FOR f=1 TO 125: NEXT f
1300 GO TO 610
1500 REM sweet sunday
1510 GO SUB 8940
1520 PRINT AT 11,25; INK 1;"S";A
T 11,26; INK 2;"W";AT 11,27; INK
 3;"E";AT 11,28; INK 4;"E";AT 11
,29; INK 5;"T";AT 12,24; INK 6;"
S";AT 12,25; INK 0;"U";AT 12,26;
 INK 1;"N";AT 12,27; INK 2;"D";A
T 12,28; INK 3;"A";AT 12,29; INK
 4;"Y"
1530 FOR j=0 TO 60 STEP 4: BEEP
.05,j: NEXT j
1540 FOR f=1 TO 125: NEXT f
1560 GO TO 610
1700 REM inheritence
1710 GO SUB 8940
1720 INK 3
1730 PRINT AT 11,25;"DEATH";AT 1
2,25;"OF AN";AT 13,25;"UNCLE"
1740 INK 5
1750 PRINT AT 15,26;"You";AT 16,
24;"inherit";AT 17,25;"#100"
1760 INK 0
1770 FOR j=1 TO 20
1780 LET c(n)=c(n)+5
1790 PRINT AT 2,26; INK 2;c(n)
1795 BEEP .05,30
1800 NEXT j
1805 FOR f=1 TO 100: NEXT f
1810 GO TO 610
1900 REM reward
1910 GO SUB 8940
1920 INK 5
1930 PRINT AT 11,24;"REWARD";AT
12,26;"FOR";AT 13,24;"FINDING";A
T 14,24;"A RING";AT 15,25; INK 4
;"#100"
1940 GO TO 1760
2000 REM company for the weekend
2010 GO SUB 8940
2020 PRINT AT 11,24;"COMPANY";AT
 12,24;"FOR THE";AT 13,24;"WEEKE
ND";AT 14,24; INK 2;"pay #50"
2025 LET i=50
2030 IF c(n)<i THEN  GO TO 2050
2040 GO TO 2070
2050 IF (c(n)+s(n)-50)<i THEN  G
O TO 2150
2060 GO TO 2250
2070 FOR j=1 TO (i/5)
2080 LET c(n)=c(n)-5
2090 PRINT AT 2,26; INK 2;c(n);"
"
2100 BEEP .05,30
2110 NEXT j
2113 FOR f=1 TO 125: NEXT f
2115 IF u(n)=1 THEN  GO TO 3000
2120 GO TO 610
2150 FOR j=1 TO 5
2160 LET c(n)=1(n)+100
2170 LET c(n)=c(n)+100
2180 PRINT AT 4,26; INK 4;l(n)
2190 PRINT AT 2,26; INK 2;c(n)
2200 BEEP .05,30
2210 NEXT j
2220 GO TO 2030
2250 FOR j=1 TO (s(n)/5)
2260 LET s(n)=s(n)-5
2265 LET c(n)=c(n)+5
2270 PRINT AT 6,26; INK 5;s(n);"
"
2275 PRINT AT 2,26; INK 2;c(n)
2280 BEEP .05,30
2290 NEXT j
2400 FOR j=1 TO 10
2410 LET c(n)=c(n)-5
2420 PRINT AT 2,26; INK 2;c(n);"
"
2430 BEEP .05,30
2440 NEXT j
2450 GO TO 2070
2500 REM rent
2510 GO SUB 8940
2520 INK 3
2530 PRINT AT 11,25;"RENT";AT 12
,24;"PAYMENT";AT 13,26;"#50"
2540 INK 0
2545 LET i=50
2550 GO TO 2030
2700 REM dress
2710 GO SUB 8940
2720 INK 5
2730 PRINT AT 11,24;"WEDDING";AT
 12,24;"INVITE";AT 14,26;"new";A
T 15,25;"dress";AT 16,24;"pay #4
0"
2740 INK 0
2750 LET i=40
2760 GO TO 2030
2800 REM sell
2805 GO SUB 8940
2810 FOR j=1 TO 60: BEEP .01,j:
NEXT j
2820 IF a(n)=0 THEN  PRINT AT 11
,24;"NOTHING";AT 12,24;"TO SELL"
: FOR j=1 TO 100: NEXT j: GO TO
610
2830 INK 3
2840 PRINT AT 11,24;"YOU'VE";AT
12,25;"SOLD";AT 13,25;"YOUR";AT
14,24;"BUY !!!"
2850 FOR j=1 TO (v(n)/5)
2860 LET c(n)=c(n)+5
2870 PRINT AT 2,26; INK 2;c(n)
2880 BEEP .05,30
2890 NEXT j
2900 LET a(n)=0
2910 INK 0
2920 FOR f=7 TO 9
2930 FOR j=23 TO 31
2940 PRINT AT f,j;" "
2950 NEXT j
2960 NEXT f
2965 FOR f=1 TO 125: NEXT f
2970 GO TO 610
3000 REM pay off loan
3005 GO SUB 8940
3010 IF l(n)=0 THEN  GO TO 600
3015 IF c(n)=0 THEN  GO TO 600
3020 PRINT AT 11,24;"Pay off";AT
 12,25;"loan"
3030 IF c(n)=l(n) THEN  GO TO 3
100
3040 FOR j=1 TO (c(n)/5)
3050 LET l(n)=l(n)-5: LET c(n)=c
(n)-5
3060 PRINT AT 4,26; INK 4;l(n);"
";AT 2,26; INK 2;c(n);" "
3070 BEEP .05,30
3080 NEXT j
3090 GO TO 3150
3100 FOR j=1 TO (l(n)/5)
3110 LET l(n)=l(n)-5: LET c(n)=c
(n)-5
3120 PRINT AT 4,26; INK 4;l(n);"
";AT 2,26; INK 2;c(n);" "
3130 BEEP .05,30
3140 NEXT j
3145 FOR f=1 TO 50: NEXT f
3150 GO SUB 8940
3160 GO TO 600
3200 REM premium bonds
3210 GO SUB 8940
3215 IF q>0 THEN  GO TO 610
3220 INK 1
3230 PRINT AT 11,26;"All";AT 12,
24;"players";AT 13,24;"pay #50";
AT 14,25;"to";AT 15,24;"premium"
;AT 16,25;"bonds"
3240 INK 0
3245 FOR f=1 TO p
3250 IF f=n THEN  GO TO 3270
3251 IF c(f)<50 THEN  GO TO 3253
3252 GO TO 3255
3253 IF (c(f)+s(f)-50)<50 THEN
GO TO 3257
3254 GO TO 3260
3255 LET c(f)=c(f)-50
3256 GO TO 3270
3257 LET l(f)=l(f)+500
3258 LET c(f)=c(f)+500
3259 GO TO 3255
3260 LET c(f)=c(f)+s(f)
3261 LET s(f)=0
3262 LET c(f)=c(f)-50
3263 GO TO 3255
3270 NEXT f
3280 FOR j=1 TO ((p*50)/10)
3290 LET m=m+10
3300 PRINT AT 19,16;m
```

PROGRAMS

```
3310 BEEP .05,30
3320 NEXT j
3322 FOR f=1 TO 125: NEXT f
3324 LET i=50
3325 GO TO 2030
3500 REM birthday
3510 GO SUB 8940
3515 IF q>0 THEN  GO TO 610
3520 INK 4
3530 PRINT AT 11,25;"IT IS";AT 1
2,25;"YOUR";AT 13,24;"BIRTHDAY"
3540 INK 2
3550 PRINT AT 15,25;"Each";AT 16
,24;"player";AT 17,25;"pays";AT
18,24;" you #50"
3560 INK 0
3570 FOR j=1 TO p
3580 IF  j=n THEN  GO TO 4000
3590 IF c(j)<50 THEN  GO TO 3610
3600 GO TO 3630
3610 IF (c(j)+s(j)-50)<50 THEN
GO TO 3710
3620 GO TO 3910
3630 LET c(j)=c(j)-50
3640 GO TO 4000
3710 LET l(j)=l(j)+500
3720 LET c(j)=c(j)+500
3730 GO TO 3630
3910 LET c(j)=c(j)+s(j)
3920 LET s(j)=0
3930 LET c(j)=c(j)-50
3940 GO TO 3630
4000 NEXT j
4010 FOR j=1 TO (((p-1)*50)/10)
4020 LET c(n)=c(n)+10
4030 PRINT AT 2,26; INK 2;c(n)
4040 BEEP .05,30
4050 NEXT j
4055 FOR f=1 TO 125: NEXT f
4060 GO TO 610
4100 REM buy
4110 GO SUB 8940
4130 IF a(n)=1 THEN  PRINT AT 11
,24;"NOTHING";AT 12,24;"TO BUY!"
: FOR f=30 TO 0 STEP -2: BEEP .1
,f: NEXT f: FOR f=1 TO 100: NEXT
 f: GO TO 610
4140 BEEP .25,0: BEEP .35,7
4150 FOR f=1 TO 2
4160 BEEP .15,5: BEEP .15,4: BEE
P .15,7: BEEP .25,12: BEEP .25,7
4170 NEXT f
4180 BEEP .15,5: BEEP .15,4: BEE
P .15,5: BEEP .5,12
4190 GO SUB 4500
4200 INK 1
4210 PRINT AT 11,25;"Would";AT 1
2,24;"you";AT 13,24;"like to";AT
14,24;"buy the";AT 15,24;".....
.."
4220 FOR f=1 TO 100: NEXT f
4230 GO SUB 8940
4250 PRINT AT 11,24; INK 3;a$
4270 PRINT AT 13,24;"COST=";AT 1
4,25;"#";b(n);AT 16,24;"VALUE=";
AT 17,25;"#";v(n);AT 19,24; INK
4;"BUY y/n"
4280 IF INKEY$="n" THEN  LET a(n
)=0: GO TO 610
4290 IF INKEY$="y" THEN  LET a(n
)=1: GO TO 4310
4300 GO TO 4280
4305 FOR j=-20 TO 60: BEEP .05,j
: NEXT j
4310 INK 4
4315 GO SUB 8940
4317 RANDOMIZE
4320 LET mo=INT (RND*p)+1
4330 PRINT AT 11,24;"PLAYER";mo;
AT 12,24;"HAS WON";AT 13,26;"THE
";AT 14,24;"EXTRAS";AT 15,24;"OF
 #";com: INK 0
4340 IF mo=n THEN  GO TO 4370
4350 LET c(mo)=c(mo)+com
4360 GO TO 4420
4370 FOR j=1 TO (com/5)
4380 LET c(n)=c(n)+5
4390 PRINT AT 2,26; INK 2;c(n)
4400 BEEP .05,30
4410 NEXT j
4420 LET i=b(n)
4430 GO TO 2030
4500 REM data for buys
4510 RESTORE 4600
4520 LET buy=INT (RND*20)+1
4530 FOR j=1 TO buy
4540 READ a$,b(n),v(n),com
4550 NEXT j
4590 RETURN
4600 DATA "CARAVAN",1100,1600,11
0
4610 DATA "TRACTOR",950,1400,95
4620 DATA " CHEST ",200,550,20
4630 DATA " SAUNA ",900,1200,70
4640 DATA " RING  ",350,600,35
4650 DATA " LOTUS ",800,1200,80
4660 DATA " BOAT  ",1500,1800,15
0
4670 DATA " HI-FI ",150,400,30
4680 DATA " HORSE ",700,1400,70
4690 DATA " VASE  ",300,650,30
4700 DATA "BENTLEY",1200,2000,15
0
4710 DATA "BOTTLES",350,600,50
4720 DATA " COINS ",500,900,50
4730 DATA "SHARES ",500,900,50
4740 DATA "STAMPS ",350,600,50
4750 DATA " LAND  ",1000,2500,10
0
4760 DATA " CLOCK ",250,450,30
4770 DATA "RECORDS",100,200,15
4780 DATA " GOLD  ",1700,3000,20
0
4790 DATA "STATUE ",500,800,70
4900 REM finish
4910 FOR f=0 TO 21
4920 FOR j=23 TO 31
4930 PRINT AT f,j;" "
4940 NEXT j
4950 NEXT f
4960 INK 1
4970 PRINT AT 1,26;"All";AT 2,24
;"players";AT 3,25;"have";AT 4,2
3;"finished"
4975 INK 4
4980 PRINT AT 9,23;"PRESS ANY";A
T 10,24;"KEY FOR";AT 11,25;"FINA
L";AT 12,24;"SCORES"
4990 IF INKEY$="" THEN  GO TO 49
90
5000 FOR f=0 TO 12
5010 FOR j=23 TO 31
5020 PRINT AT f,j;" "
5030 NEXT j
5040 NEXT f
5050 FOR f=-60 TO 60: BEEP .01,f
: NEXT f
5060 FOR j=1 TO p
5070 LET c(j)=c(j)+s(j)-l(j)
5080 NEXT j
5090 INK 0
5100 PRINT AT 2,23; INK 1;"Playe
r 1"
5110 PRINT AT 3,24;"= #";c(1)
5120 PRINT AT 5,23; INK 2;"Playe
r 2"
5130 PRINT AT 6,24;"= #";c(2)
5140 IF p=2 THEN  GO TO 5300
5150 PRINT AT 8,23; INK 3;"Playe
r 3"
5160 PRINT AT 9,24;"= #";c(3)
5170 IF p=3 THEN  GO TO 5300
5180 PRINT AT 11,23; INK 4;"Play
er 4"
5190 PRINT AT 12,24;"= #";c(4)
5200 IF p=4 THEN  GO TO 5300
5210 PRINT AT 14,23; INK 5;"Play
er 5"
5220 PRINT AT 15,24;"= #";c(5)
5230 IF p=5 THEN  GO TO 5300
5240 PRINT AT 17,23; INK 6;"Play
er 6"
5250 PRINT AT 18,24;"= #";c(6)
5300 FOR f=60 TO -60 STEP -1: BE
EP .01,f: NEXT f
5310 PRINT AT 20,24; INK 1;"ANOT
HER";AT 21,23;"GAME? y/n"
5320 IF INKEY$="n" THEN  STOP
5330 IF INKEY$="y" THEN  GO TO 1
0
5340 GO TO 5320
5500 REM payday
5510 GO SUB 8940
5520 LET x(n)=2: LET y(n)=1
5530 PRINT AT x(n),y(n); INK n;"
£"
5540 PRINT AT 11,24; INK 2;"PAYD
AY"
5545 FOR f=-40 TO 60: BEEP .03,f
: NEXT f
5550 LET o(n)=o(n)+1
5560 IF o(n)=w THEN  LET u(n)=1:
 GO TO 5580
5570 GO TO 5670
5580 PRINT AT 13,26;"You";AT 14,
25;"have";AT 15,25;"done";AT 16,
26;"the";AT 17,24;"course"
5590 FOR j=1 TO 10: BEEP .5,j: N
EXT j
5600 IF u(n)=1 AND q=0 THEN  GO
TO 5615
5610 GO TO 5670
5615 GO SUB 8940
5616 INK 5
5617 PRINT AT 11,24;"You are";AT
 12,26;"the";AT 13,25;"first";AT
 14,24;"finish";AT 17,24; INK 4;
"COLLECT";AT 18,25;"#100"
5620 FOR j=1 TO 20
5630 LET c(n)=c(n)+5
5640 PRINT AT 2,26; INK 2;c(n)
5650 BEEP .05,30
5660 NEXT j
5665 FOR f=1 TO 100: NEXT f
5670 GO SUB 8940
5680 INK 3
5690 PRINT AT 11,24;"COLLECT";AT
 12,24;"MONTHLY";AT 13,24;"SALAR
Y";AT 14,24;"OF #325"
5695 INK 0
5700 FOR j=1 TO 65
5710 LET c(n)=c(n)+5
5720 PRINT AT 2,26; INK 2;c(n)
5730 BEEP .05,30
5740 NEXT j
5750 GO SUB 8940
5760 IF s(n)=0 THEN  GO TO 6190
5770 LET int=s(n)/10
5780 LET int=INT int
5790 PRINT AT 11,24;"COLLECT";AT
 12,24;"INTEREST";AT 13,26;"ON";A
T 14,24;"SAVINGS";AT 15,25;"#";i
nt
5800 FOR j=1 TO (int/5)
5810 LET c(n)=c(n)+5
5820 PRINT AT 2,26; INK 2;c(n)
5830 BEEP .05,30
5840 NEXT j
5850 FOR f=1 TO 150: NEXT f
5860 GO SUB 8940
5870 IF u(n)=1 THEN  GO TO 6190
5875 INK 0
5880 PRINT AT 11,24;"Do you";AT
12,24;"wish to";AT 13,24;"remove
";AT 14,26;"any";AT 15,24;"savin
gs";AT 16,26; INK 2;"(y/n)"
5890 IF INKEY$="n" THEN  GO TO 6
190
5900 IF INKEY$="y" THEN  GO TO 5
920
5910 GO TO 5890
5920 GO SUB 8940
5930 PRINT AT 11,25;"INPUT";AT 1
2,24;"AMOUNT";AT 13,24;"MULT OF"
;AT 14,25;"FIVE": INPUT q$
5940 LET ab=0
5950 LET k=LEN q$
5960 FOR f=1 TO k
5970 LET k$=q$(f TO f)
5980 LET r=CODE k$
5990 IF r>=48 AND r<=57 THEN  LE
T ab=ab+1
6000 NEXT f
6010 IF ab<>k THEN  GO TO 6030
6020 GO TO 6070
6030 PRINT AT 17,25; INK 4; PAPE
R 6; FLASH 1;"ERROR": BEEP .75,-
20
6040 FOR j=1 TO 150: NEXT j
6050 GO SUB 8940
6060 GO TO 5930
6070 LET q=VAL q$
6080 IF q>s(n) THEN  GO TO 6030
6090 LET an=q/5
6100 LET an=INT an
6110 IF (an*5)<>q THEN  GO TO 60
30
6120 FOR j=1 TO (q/5)
6130 LET s(n)=s(n)-5
6140 LET c(n)=c(n)+5
6150 PRINT AT 2,26; INK 2;c(n);A
T 6,26; INK 5;s(n);" "
6160 BEEP .05,30
6170 NEXT j
6180 GO SUB 8940
6190 IF a(n)=1 THEN  PRINT AT 11
,24;"You've";AT 12,25;"lost";AT
13,25;"your";AT 14,26;"buy": LET
 a(n)=0: FOR j=-10 TO 10 STEP 2:
 BEEP .1,j: NEXT j: GO SUB 8940
6191 FOR f=7 TO 9
6192 FOR j=23 TO 31
6193 PRINT AT f,j;" "
6194 NEXT j
6195 NEXT f
6200 IF u(n)=1 AND l(n)=0 THEN
GO TO 600
6210 IF u(n)=0 AND l(n)=0 THEN
GO TO 610
6220 INK 3
6230 PRINT AT 11,26;"PAY";AT 12,
24;"INTEREST";AT 13,24;"ON LOAN"
6240 LET loan=l(n)/10
6250 LET loan=INT loan
6260 PRINT AT 14,25;"#";loan
6270 INK 0
6280 LET i=loan
6290 GO TO 2030
6400 REM casino
6410 GO SUB 8940
6420 IF q>0 THEN  GO TO 610
6421 PRINT AT 15,24; INK 1; PAPE
```


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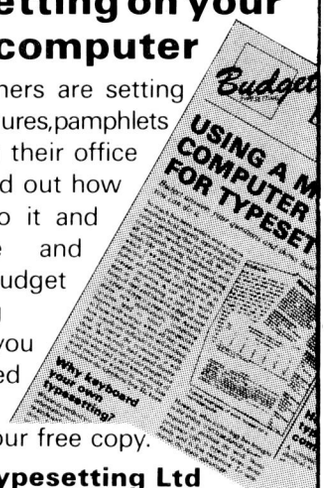

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PROGRAMS

```
R 6: FLASH 1:"CASINO"
6422 FOR j=60 TO 0 STEP -4: BEEP
.05,j: NEXT j
6423 FOR j=1 TO 150: NEXT j
6424 GO SUB 8940
6430 FOR h=1 TO p
6440 PRINT AT 11,24; INK h;"PLAY
ER";h
6450 PRINT AT 13,25;"INPUT";AT 1
4,25;"GUESS";AT 15,25; INK 5;"(1
-6)": INPUT g$
6455 LET k=LEN g$
6460 LET e=CODE g$
6470 IF k=1 THEN GO TO 6490
6480 GO TO 6500
6490 IF e>=49 AND e<=54 THEN GO
TO 6520
6500 PRINT AT 17,25; INK 4; PAPE
R 6; FLASH 1;"ERROR": BEEP .75,-
20
6505 FOR j=1 TO 125: NEXT j
6507 GO SUB 8940
6510 GO TO 6440
6520 LET t(h)=VAL g$
6525 FOR j=1 TO 10: BEEP .15,j:
NEXT j
6530 GO SUB 8940
6535 NEXT h
6540 INK 4
6550 PRINT AT 11,25;"Press";AT 1
2,24;"any key";AT 13,26;"to";AT
14,25;"throw"
6560 RANDOMIZE
6570 LET cas=INT (RND*6)+1
6580 IF INKEY$<>"" THEN GO TO 6
600
6590 GO TO 6560
6600 FOR f=1 TO 30: BEEP .05,f:
NEXT f
6605 GO SUB 8940
6610 INK 2
6620 PRINT AT 11,24;"A ";cas;" W
AS";AT 12,24;"THROWN"
6625 FOR f=1 TO 125: NEXT f
6625 INK 0
6630 FOR h=1 TO p
6640 IF t(h)=cas AND h=n THEN G
O TO 6670
6650 IF t(h)=cas THEN LET c(n)=
c(h)+250: PRINT AT 14,24; INK h;
"Player";h;AT 15,24;"has won";AT
16,25;"#250": FOR j=1 TO 60: BE
EP .01,j: NEXT j: FOR j=1 TO 200
: NEXT j: GO SUB 8940
6660 NEXT h
6665 GO TO 6730
6670 PRINT AT 14,24; INK h;"Play
er";h;AT 15,24;"has won";AT 16,2
5;"#250"
6675 FOR j=1 TO 50
6680 LET c(n)=c(n)+5
6690 PRINT AT 2,26; INK 2;c(n)
6700 BEEP .05,30
6710 NEXT j
6720 GO SUB 8940
6725 GO TO 6660
6730 GO SUB 8940
6740 GO TO 610
7000 REM post
7010 GO SUB 8940
7020 GO SUB 8000
7030 IF ty=1 THEN FOR f=10 TO 0
STEP -1: BEEP .3,f: NEXT f: LET
i=ca: GO TO 7100
7040 IF ty=2 THEN FOR f=0 TO 10
: BEEP .3,f: NEXT f: GO TO 7150
7050 IF ty=3 THEN FOR f=60 TO -
60 STEP -6: BEEP .3,f: NEXT f: G
O TO 7300
7060 IF ty=4 THEN FOR f=-30 TO
30 STEP 3: BEEP .3,f: NEXT f: GO
TO 7500
7070 IF ty=5 THEN FOR f=30 TO -
30 STEP -3: BEEP .3,f: NEXT f: G
O TO 7600
7100 INK 1
7110 PRINT AT 11,24;b$;AT 12,24;
c$;AT 13,24;d$;AT 14,24;e$;AT 16
,25;"#";AT 16,26;ca
7120 INK 0
7130 GO TO 2030
7150 INK 2
7160 PRINT AT 11,24;b$;AT 12,24;
c$;AT 13,24;d$;AT 14,24;e$;AT 16
,25;"#";AT 16,26;ca
7170 INK 0
7180 FOR f=1 TO (ca/5)
7190 LET c(n)=c(n)+5
7200 PRINT AT 2,25; INK 2;c(n)
7210 BEEP .05,30
7220 NEXT f
7230 FOR f=1 TO 150: NEXT f
7240 GO SUB 8940
7250 GO TO 610
7300 INK 3
7310 PRINT AT 11,24;b$;AT 12,24;
c$
7320 INK 0
7330 IF s(n)=0 AND a(n)=0 THEN
PRINT AT 14,24;"but it";AT 15,24
;"doesn't";AT 16,24;"effect";AT
17,26;"you": FOR f=1 TO 175: NEX
T f: GO SUB 8940: GO TO 610
7340 FOR f=1 TO 150: NEXT f
7350 GO SUB 8940
7360 IF s(n)=0 THEN GO TO 7440
7370 PRINT AT 11,24;"Savings";AT
12,24;"cut by";AT 13,25;"half"
7380 FOR f=1 TO ((s(n)*2)/5)
7390 LET s(n)=s(n)-5
7400 PRINT AT 6,26; INK 5;s(n);"
"
7410 BEEP .05,30
7420 NEXT f
7425 FOR f=1 TO 150: NEXT f
7430 GO SUB 8940
7440 IF a(n)=0 THEN GO TO 610
7450 LET b(n)=b(n)/2: LET v(n)=b
(n)
7460 PRINT AT 11,25;"Sell";AT 12
,24;"BUY for";AT 13,25;"half";AT
14,25; INK 4;"COST"
7470 GO TO 2850
7500 INK 4
7510 PRINT AT 11,24;b$;AT 12,24;
c$;AT 13,24;d$
7515 INK 0
7520 IF a(n)=0 THEN PRINT AT 15
,24;"but it";AT 16,24;"doesn't";
AT 17,24;"effect";AT 18,26;"you"
: FOR f=1 TO 175: NEXT f: GO SUB
8940: GO TO 610
7530 PRINT AT 15,25;"Sell";AT 16
,24;"BUY at";AT 17,24;"double";A
T 18,25; INK 4;"COST"
7540 LET b(n)=b(n)*2: LET v(n)=b
(n)
7550 GO TO 2850
7600 INK 5
7610 PRINT AT 11,24;b$;AT 12,24;
c$
7620 INK 0
7630 IF a(n)=0 THEN GO TO 7520
7640 LET b(n)=b(n)/2: LET v(n)=b
(n)
7650 PRINT AT 14,25;"Sell";AT 15
,24;"BUY for";AT 16,25;"half";AT
17,25; INK 4;"COST"
8000 REM data for letters
8010 RESTORE 8070
8020 LET let=INT (RND*33)+1
8030 FOR j=1 TO let
8040 READ b$,c$,d$,e$,ca,ty
8050 NEXT j
8060 RETURN
8070 DATA " HOME","REPAIR"," BIL
L","pay",25,1
8080 DATA " CAR","REPAIR"," BIL
L","pay",25,1
8090 DATA " BANK"," ERROR"," ","
COLLECT",20,2
8100 DATA " GAS"," BILL"," ","p
ay",25,1
8110 DATA " CAR","REPAIR"," BIL
L","pay",75,1
8120 DATA " POOLS","  WIN"," ","
COLLECT",750,2
8130 DATA " DAD"," NEWS"," ","
",0,3
8140 DATA " CAR","REPAIR"," BIL
L","pay",150,1
8150 DATA " RATES"," BILL"," ","
pay",250,1
8160 DATA "LOTTERY","  WIN"," ",
"COLLECT",100,2
8170 DATA "CREDIT"," CARD","ACCO
UNT","pay",30,1
8180 DATA " HOME","REPAIR"," BIL
L","pay",500,1
8190 DATA "LOTTERY","  WIN"," ",
"COLLECT",20,2
8200 DATA "FAMILY"," BILLS"," ",
"pay",50,1
8210 DATA " HOME","REPAIR"," BIL
L","pay",50,1
8220 DATA " POOLS","  WIN"," ","
COLLECT",150,2
8230 DATA "CREDIT"," CARD","ACCO
UNT","pay",150,1
8240 DATA "CREDIT"," CARD","ACCO
UNT","pay",60,1
8250 DATA "RAFFLE"," PRIZE"," ",
"COLLECT",100,2
8260 DATA "DOUBLE"," YOUR"," MON
EY","  ",0,4
8270 DATA " PHONE"," BILL"," ","
pay",15,1
8280 DATA "CREDIT"," CARD","ACCO
UNT","pay",800,1
8290 DATA "  TAX","REBATE"," ","
COLLECT",150,2
8300 DATA " HOME","REPAIR"," BIL
L","pay",15,1
8310 DATA " GAS"," BILL"," ","p
ay",20,1
8320 DATA "UNCLE'S","LEGACY"," "
,"COLLECT",500,2
8330 DATA " DAD","  BUY"," ","
",0,5
8340 DATA "FAMILY"," BILLS"," ",
"pay",90,1
8350 DATA "HOLIDAY"," BILL"," ",
"pay",50,1
8360 DATA "WINDFALL"," "," ","COL
LECT",50,2
8370 DATA " HOME","REPAIR"," BIL
L","pay",35,1
8380 DATA "  CAR","REPAIR"," BIL
L","pay",50,1
8390 DATA "RAFFLE"," PRIZE"," ",
"COLLECT",50,2
8500 REM set up variables
8510 DIM c(p)
8520 DIM l(p)
8530 DIM a(p)
8540 DIM x(p)
8550 DIM y(p)
8560 DIM s(p)
8570 DIM t(p)
8580 DIM b(p)
8590 DIM v(p)
8610 DIM z(p)
8620 DIM u(p)
8630 DIM o(p)
8700 FOR n=1 TO p
8710 LET c(n)=375
8720 LET l(n)=0
8730 LET a(n)=0
8740 LET x(n)=2
8750 LET y(n)=1
8760 LET s(n)=0
8770 LET t(n)=0
8780 LET b(n)=0
8790 LET v(n)=0
8810 LET z(n)=0
8820 LET u(n)=0
8830 LET o(n)=0
8840 NEXT n
8850 LET m=0
8899 RETURN
8900 FOR j=0 TO 9
8910 PRINT AT j,23;"          "
8920 NEXT j
8940 FOR j=11 TO 19
8950 PRINT AT j,24;"          "
8970 NEXT j
8990 RETURN
9000 REM set up screen
9010 PRINT AT 1,0; INK 4;" SUPRI "
9020 PLOT 4,11: DRAW 0,161: DRAW
160,0: DRAW 0,-161: DRAW -160,0
9030 PLOT 5,12: DRAW 0,159: DRAW
 166,0: DRAW 0,-159: DRAW -166,0
9040 PLOT 27,12: DRAW 0,159: PLO
T 28,12: DRAW 0,159
9050 PLOT 51,12: DRAW 0,159: PLO
T 52,12: DRAW 0,159
9060 PLOT 75,12: DRAW 0,159: PLO
T 76,12: DRAW 0,159
9070 PLOT 99,12: DRAW 0,159: PLO
T 100,12: DRAW 0,159
9080 PLOT 123,12: DRAW 0,159: PL
OT 124,12: DRAW 0,159
9090 PLOT 147,12: DRAW 0,159: PL
OT 148,12: DRAW 0,159
9100 PLOT 5,139: DRAW 166,0: PLO
T 5,140: DRAW 166,0
9110 PLOT 5,107: DRAW 166,0: PLO
T 5,108: DRAW 166,0
9120 PLOT 5,75: DRAW 166,0: PLOT
 5,76: DRAW 166,0
9130 PLOT 5,43: DRAW 166,0: PLOT
 5,44: DRAW 166,0
9140 PLOT 176,0: DRAW 0,175: PLO
T 178,0: DRAW 0,175: PLOT 180,0:
 DRAW 0,175: PLOT 182,0: DRAW 0,
175
9150 INK 2
9160 PRINT AT 1,4;"1";AT 1,7;"2"
;AT 1,10;"3";AT 1,13;"4";AT 1,16
;"5";AT 1,19;"6"
9170 PRINT AT 5,1;"7";AT 5,4;"8"
;AT 5,7;"9";AT 5,10;"10";AT 5,13
;"11";AT 5,16;"12";AT 5,19;"1"
9180 PRINT AT 9,1;"14";AT 9,4;"1
5";AT 9,7;"16";AT 9,10;"17";AT 9
,13;"18";AT 9,16;"19";AT 9,19;"2
0"
9190 PRINT AT 13,1;"21";AT 13,4;
"22";AT 13,7;"23";AT 13,10;"24";
AT 13,13;"25";AT 13,16;"26";AT 1
3,19;"27"
```

```
9200 PRINT AT 17,1;"28";AT 17,4;
"29";AT 17,7;"30"
9210 FOR f=17 TO 19
9220 FOR n=10 TO 11
9230 PRINT AT f,n; INK 4;"■"
9240 NEXT n
9250 NEXT f
9260 PRINT AT 17,10; INK 2; PAPE
R 4;"31"
9270 INK 5: LET z$="POS"
9280 PRINT AT 3,4;z$;AT 3,10;z$;
AT 3,16;z$;AT 7,13;z$;AT 11,7;z$
;AT 11,16;z$;AT 15,4;z$;AT 15,10
;z$
9290 INK 1: LET y$="BO"
9300 PRINT AT 3,13;y$;AT 7,16;y$
;AT 11,4;y$;AT 15,13;y$
9310 INK 5: LET x$="SELL"
9320 PRINT AT 7,7;x$;AT 11,10;x$
;AT 11,19;x$;AT 19,7;x$
9330 PRINT AT 19,9; INK 0; PAPER
 6;" PAYDAY "
9340 INK 0
9350 PLOT 123,12: DRAW  OVER 1;0
,30: PLOT 124,12: DRAW  OVER 1;0
,30: PLOT 147,12: DRAW  OVER 1;0
,30: PLOT 148,12: DRAW  OVER 1;0
,30
9360 PRINT AT 17,13;"PREMIUM";AT
 18,14;"BONDS =";AT 19,15;"#"
9370 PLOT 187,11: DRAW 0,80: DRA
W 65,0: DRAW 0,-80: DRAW -65,0:
PLOT 188,12: DRAW 0,78: DRAW 63,
0: DRAW 0,-78: DRAW -63,0
9380 GO TO 40
9500 REM graphics
9510 RESTORE 9570
9520 FOR n=1 TO 16: READ p$: REM
 16 characters
9530 FOR f=0 TO 7: REM read char
acter into 8 bytes
9540 READ a: POKE USR p$+f,a
9550 NEXT f
9560 NEXT n
9565 RETURN
9570 DATA "▄",0,0,0,128,64,248,2
54,24
9580 DATA "▟",0,0,0,15,28,63,127
,127
9590 DATA "SI",0,238,132,132,228,
36,36,228
9600 DATA "SE",0,238,136,136,238,
40,40,238
9610 DATA "BU",0,202,170,170,234,
170,170,206
9620 DATA "Y",0,130,68,40,16,16,
16,16
9630 DATA " C",0,3,2,2,3,0,0,3
9640 DATA "TP",0,187,18,19,146,14
6,146,146
9650 DATA "IR",0,187,169,185,177,
169,169,169
9660 DATA "  ",0,128,0,0,0,0,0
9670 DATA "PU",0,238,170,234,138,
138,138,142
9680 DATA "LL",0,136,136,136,136,
136,136,238
9690 DATA " P",0,7,5,7,4,4,4,4
9700 DATA "AY",0,117,85,117,87,82
,82,82
9710 DATA "IR",0,78,106,110,106,1
06,106,74
9720 DATA "Y ",0,160,160,160,224,
64,64,64
9730 REM title screen
9755 PAPER 7: INK 0: BRIGHT 1: C
LS
9760 FOR n=1 TO 6
9770 PRINT AT 6,1; INK n;"▀▄  ▄▀▀▀▄▀▀▀▄
▀▄  ▄▀▀▀▄▀▀▀▄
▀▄  ▄▀▀▀▄▀▀▀▄
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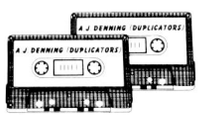

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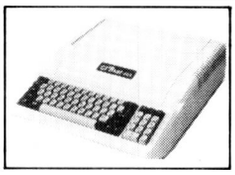

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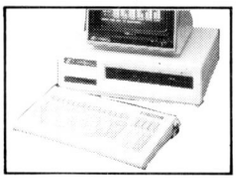

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MANUFACTURER	PRODUCT	ISSUE
A		
Acorn	Speech System	January 1984
Acorn	Electron	October 1983
Acorn	BBC Micro	January 1982
Acorn	Teletext Adaptor	April 1984
Acorn	BBC Speech Chips	April 1983
ACT	Apricot	October 1983
ACT	Sirius 1	February 1982
Adman Electronics	Adman Speech Synthesiser	January 1984
AGF	Programmable Joystick	December 1983
AMS	Disc Drive : 3in	January 1984
Apple	Lisa	July 1983
Apple	III	May 1982
Apple	Macintosh	March 1984
B		
British Micro	Mimi 801	July 1982
Brother	EP44	April 1984
C		
C/WP	Cortex	December 1983
Camputers	Lynx	March 1983
Canon	AS-100	December 1983
Canon	CX-1	November 1982
Canon	X-07	March 1984
Casio	PB-100	May 1983
Casio	fx-9000p	February 1983
Casio	602p	May 1982
Casio	FP-10 Printer	April 1982
Coleco	Adam	April 1984
Commodore	715	January 1984
Commodore	64	May 1983
Compudata	Tulipsystem 1	October 1983
Conchess	Monarch/Ambassador/ Escourter	March 1983
Corvus	Concept	March 1983
Currah	Microspeech Unit	January 1984
D		
Dacom Systems	Buzzbox	January 1984
DCP Microdevelopments	Speech Pack	August 1982
Digihurst	Microsight 1	October 1983
Digital Equipment	Rainbow 100	November 1982
Dragon Data Ltd	Dragon 32	August 1982
E		
Eaca International	Colour Genie	June 1983
Electroni-Kit	FX System	November 1983
Electroplay	My Talking Computer	November 1983
Epson	QX-10	July 1983
Epson	HX-20	December 1982
Epson	FX-80	July 1983
Epson	PX-8	June 1984
F		
Ferranti	Argus PPC	November 1983
Fidelity	Prestige	February 1983
Fortune	Fortune 32:16	August 1983
Future	FX20	October 1983
G		
Gavilan	Gavilan MC	February 1984
GCE	Vectrex System	August 1983
GCS	Ferrett	June 1984
Gemini	Multiboard	February 1982
GRiD	Compass	June 1984
Gulfstream	Hyperion	October 1983
H		
Hewlett-Packard	HP-75C	November 1982
Hewlett-Packard	15C and 16C	September 1982
H		
Hewlett-Packard	HP86	October 1982
Hewlett-Packard	HP-125	April 1982
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High Tech Electronics	Sid 1 Colour Board	April 1982
Hitachi	MB16001	June 1983
Hitachi	Peach	May 1982
I		
IBM	9000 Instrumentation Computer	March 1983
IBM	PC Junior	March 1984
Ikon	Hobbit	January 1984
IO Research Ltd	Pluto	December 1982
J		
Jonos	Jonos	April 1984
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L		
LSI	M-Four	April 1983
M		
Magus Computer Systems Ltd	Add-On Graphics Board	September 1983
Mannesmann Tally	MT160L Dot-Matrix Printer	August 1983
Mattel	Aquarius	November 1983
Microwriter Ltd	Microwriter	September 1982
Milton Bradley	Phantom	July 1983
Monroe	Monroe 8820	April 1982
Motorola	MC68000	December 1982
Multitech	Micro-Professor II	September 1983
N		
NCR	Decision Mate V	August 1983
NEC	PC-8201A	December 1983
NEC	APC	September 1983
Notting Dale Itec	G007 Graphics Module	March 1983
Novag	Constellation	October 1983
O		
Olivetti	M20	September 1982
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Osborne	Executive	July 1983
P		
Positron	9000	October 1982
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Robocom Ltd	Bit Stik	November 1982
S		
Sage	II	February 1983
Scisys	Chess Champion Mark 5	January 1983
Semi-Tech	Pied Piper	September 1983
Sharp	MZ-700	February 1984
Sharp	PC1251	February 1983
Sharp	PC1500	June 1982
Sharp	MZ-80A	June 1982
Sharp	MZ-80A	April 1984
Shelton Instruments	Sig/Net	April 1983
Sinclair	Microdrive	October 1983
Sinclair	ZX Spectrum	June 1982
Sinclair	ZX81 Printer	January 1982
SMT	Goupil-3	December 1983
Sord	M5	August 1983
Sord	Exleigh Expert	August 1982
Spectravideo	SV-318 and SV-328	March 1984
T		
Tandata	Homedeck	April 1984

T

Tandy	MC-10	November 1983
Tandy	Model 100	August 1983
Texas Instruments	TI Professional	May 1983
Texas Instruments	TI-88	July 1982
Texas Instruments	TI-99/4A	March 1982
Texas Instruments	TI-59	January 1983
Torch Computers	Torch	January 1983
Tradecom	Newbrain AD	July 1982
Tycom	Microframe	January 1984

W X

Walters Microsystems	120 Printer	December 1982
Watanabe	Personal Plotter	February 1982
Wave Mate	Bullet	February 1984
William Stuart Systems	Chatterbox	January 1984
Wren Computers	Wren	April 1984
Xerox	16/8	February 1984
Xerox	820	January 1982

SOFTWARE

PROGRAM	ISSUE
1-2-3	April 1984
1-2-3	November 1983
1982 Database Roundup	December 1982
1983 Database Roundup	December 1983
1983 Spreadsheet Roundup	December 1983
A	
Accountancy Programs (General)	June 1983
Aquila	September 1982
B	
Benchmarks Explained (Reference Article)	January 1984
Beta	August 1983
Brainstorm	February 1984
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C	
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Color Scarfman	December 1982
Condor Database	November 1982
D	
Databases (Choosing One)	March 1982
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E40	September 1982
Ecalc	July 1983
Everyman	February 1984
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Falc	January 1984
Financial Director	June 1983
FMS80	April 1982
Freqout	February 1982
H	
Homeword	February 1984
HP41-C Text Editor	November 1982
Home Accounts/Finance Manager	January 1984

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I L		
Information Management		April 1984
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M		
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Master Planner		October 1983
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Micro FCS		October 1983
Micropen		May 1983
Microscript		May 1983
Microtax		July 1983
MS-DOS & CP/M-86		October 1982
MS-DOS 2		May 1983
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Peachcalc		March 1984
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Petspeed		April 1983
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Rescue		April 1983
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S		
Sage 400 (Accounting)		October 1983
Scred		August 1983
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Search and Find		December 1983
Select		September 1982
Silicon Office		July 1982
System Builder		June 1984
Software Various		April 1984
Superdeflex		January 1983
Superfile		January 1983
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The Financial Planner		December 1983
The Spreadsheet		September 1983
TK! Solver		February 1984
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View		August 1983
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Visi Calc		June 1983
Visuall		February 1984
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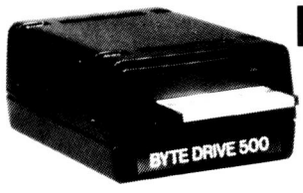

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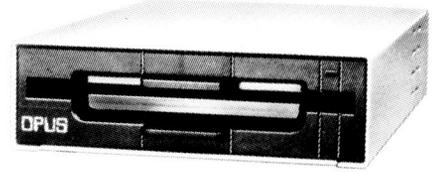

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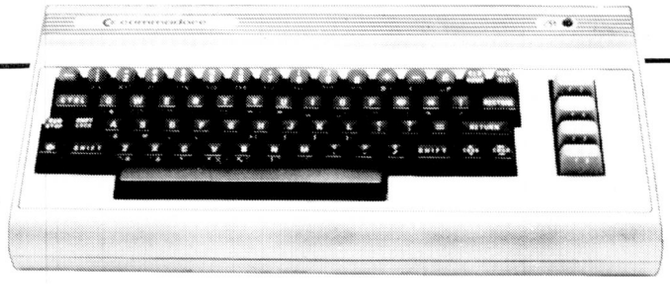

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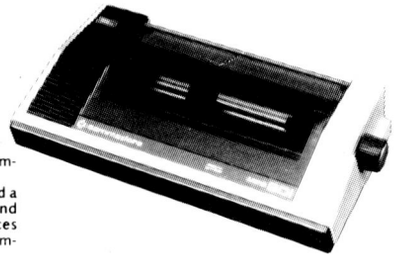

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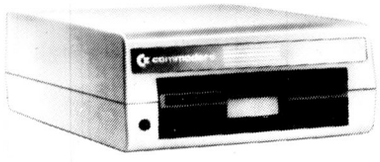

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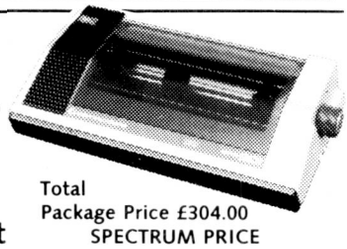

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Britains No.1 Weekly Software Chart


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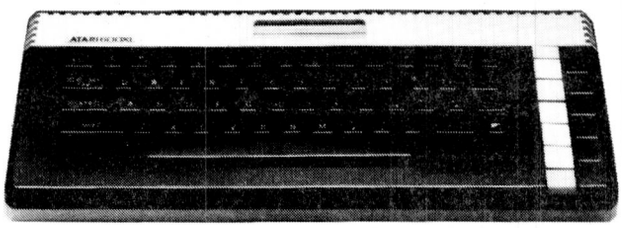

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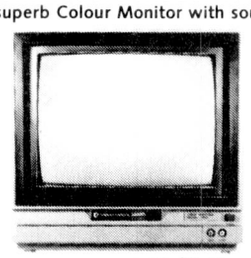

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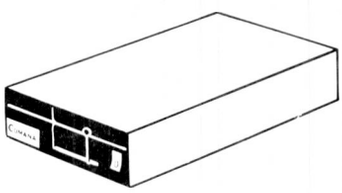

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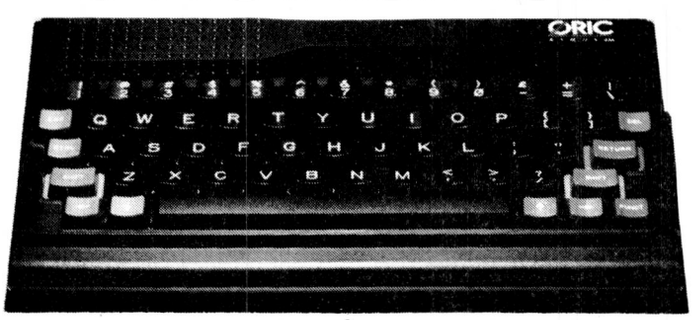

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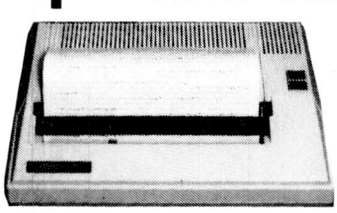

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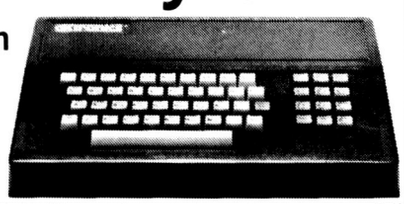

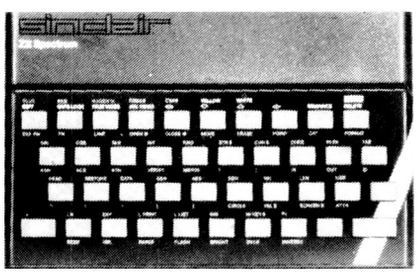

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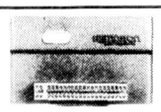



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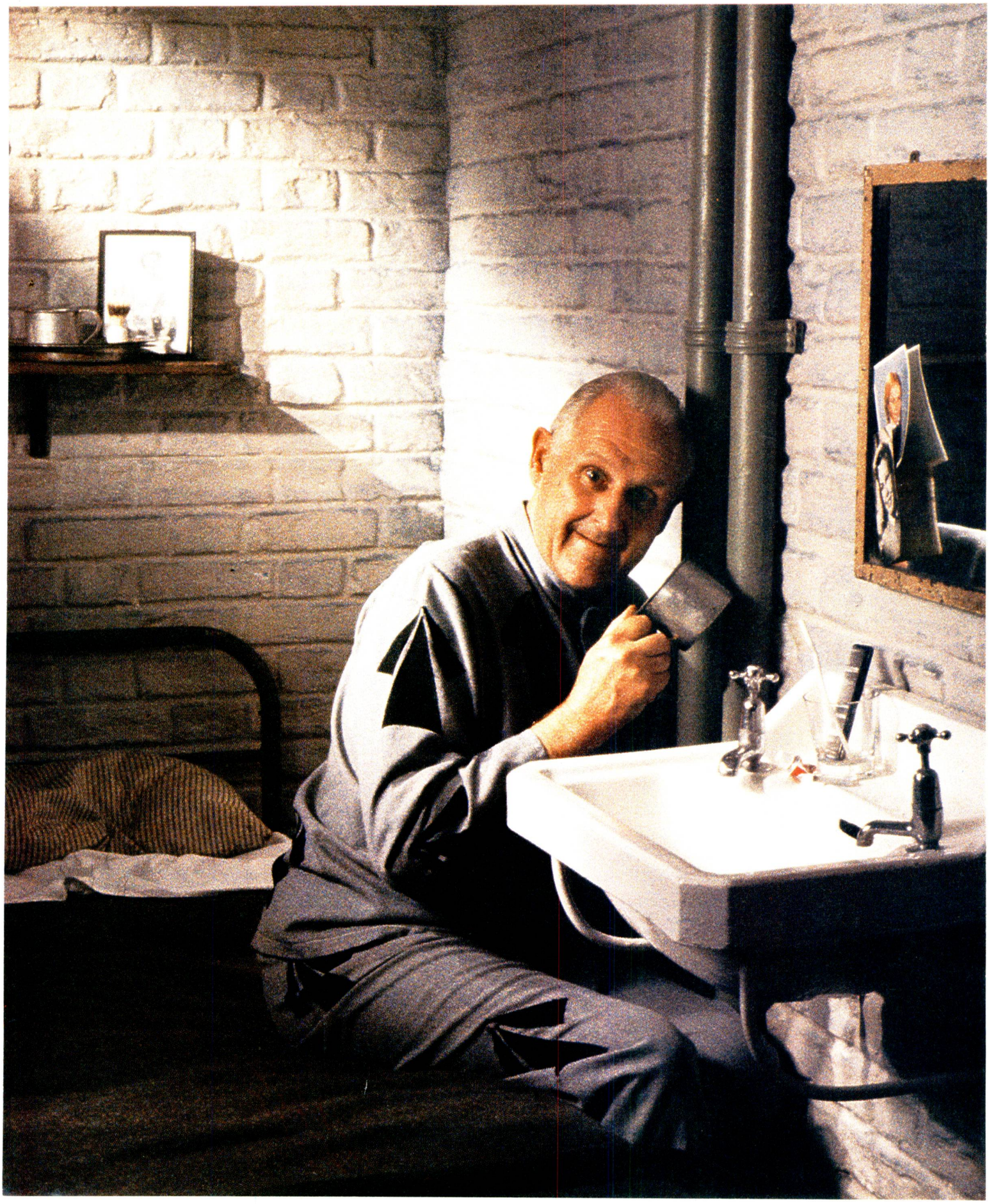

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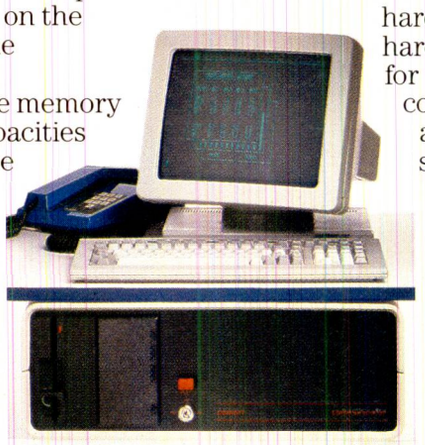
The astonishing success of Comart Communicator multi-user systems is largely because they *don't* imprison you in this way and allow you to share computer power and performance among all the key members of your staff.

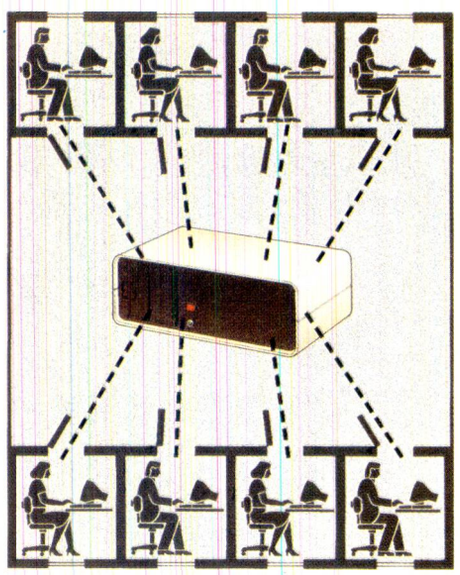
To be specific, up to nine users can share the same processing unit and data storage facilities whilst making economic use of expensive peripherals such as printers, plotters and tape back-up units. Each extra user shares access to the system merely by the addition of a simple VDU and keyboard. All of which represents a big saving over buying a complete computer for each.

The Communicator range of 15 models provides everything you could want in a microcomputer system. Depending on the number of users, the complexity of your applications and the memory size and storage capacities required, you can be assured of finding precisely the system you need – and pay only for that. The Communicator now comes with the new Intel 286 powerhouse 32-bit processor as well as the established 8 and 16 bit models. There's also a choice of memory from 64K-1Mb and of storage capacities on floppy disks or 5, 20 or 40Mb integral Winchester disk drives.



The great difference with the Communicator range, of course, is its modular design.

You can stay right up with the latest technologies or expand and upgrade your current systems, simply with the change of a circuit board or two. Add-on modules can also provide additional storage and back-up. The Communicator's modularity ensures your investment is safe, because when in the future you decide you want to share computer power with more users, you can simply expand your system without writing off the cost and starting all over again.



From 1-9 users can share a Communicator 'multi-user' system.

It may not surprise you to know that the Communicator hardware is among the hardest around, working for thousands of prudent companies worldwide – and having met the stringent requirements of the CCTA – that includes the Government.

But however tough the hardware, it's the software which enables you to use it, so it's good to know that the Communicator gives you access to all the business and commercial standards such as Word Processing, Financial Planning, Accounting Suites, Database Management and Stock Control, plus communications to IBM and ICL mainframes. And also far beyond with specialist suppliers providing 'industry-specific' software.

As a nice bonus, Communicators also come with the very latest operating systems, including Digital Research's multi-user Concurrent CP/M which enables you to switch from up to four programs simultaneously so your secretary won't have to clear the screen or save work on disk when you need an urgent report updated or a fast printout.

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Nightingale is by far the most versatile modem available, at the price, for either home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) alongside 300/300 baud full duplex for communication between the Apple and other computers, including bulletin boards.

Nightingale will operate at both European and Bell frequencies for compatibility with CCITT and American systems.

The state-of-the-art modem chip technology employed in Nightingale requires minimal support circuitry resulting in low power consumption, low cost, high quality and extreme reliability.

Nightingale being 'hard wired' is not subject to the noise interference errors common to outdated acoustically coupled devices. In addition Nightingale features a simple self test facility for easy installation, and utilises a fully buffered RS 423/232 serial interface.

However, to use such a versatile modem to its fullest potential with the Apple, you will require a multi-baud rate serial interface card and communications software. This is where Pace can offer a total solution, a variety of packages that will allow you to access Prestel and Micronet, rummage through bulletin boards and chat to other Apple users. Imagine full Prestel graphics and text, double height characters, page tagging and many other features.

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Nightingale itself, for the Apple and other computers, is just £119 + VAT.

For further details of the range of software and interfaces available from Pace please write or telephone for a comprehensive fact sheet.

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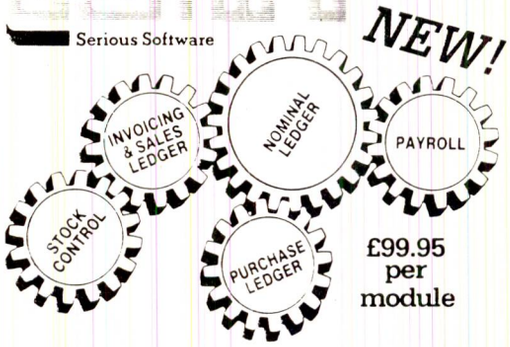

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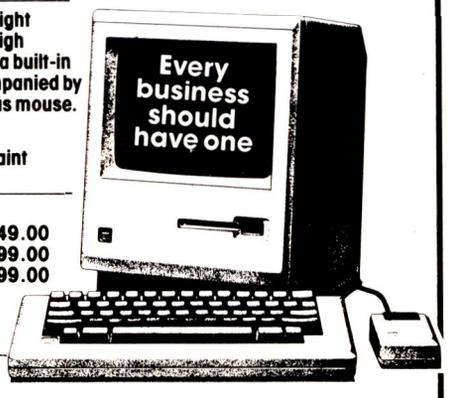

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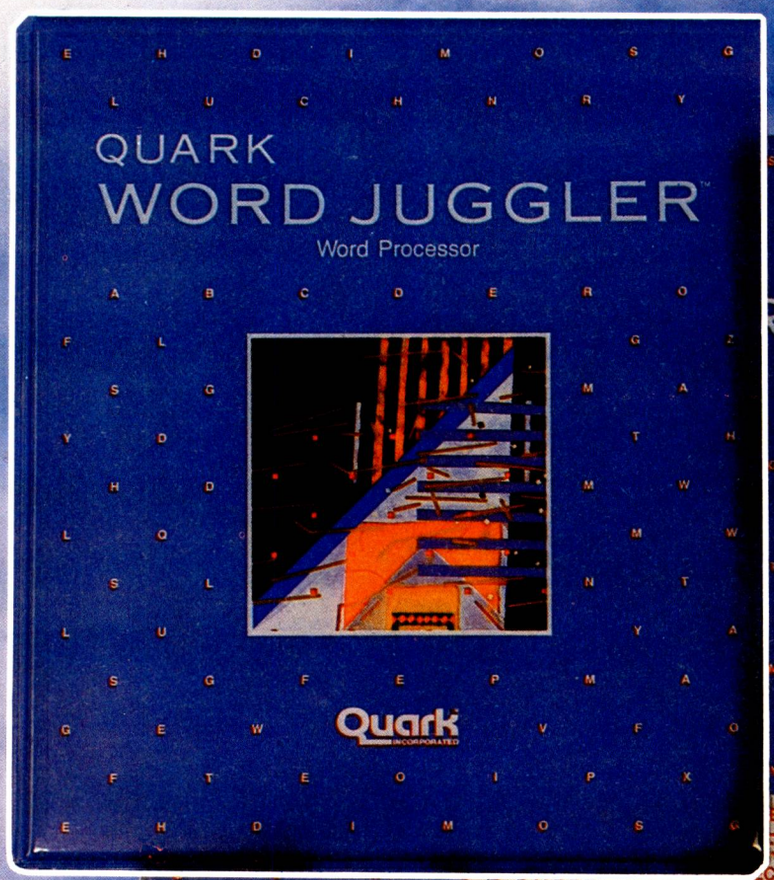

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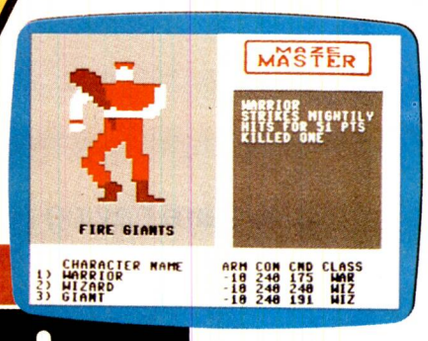

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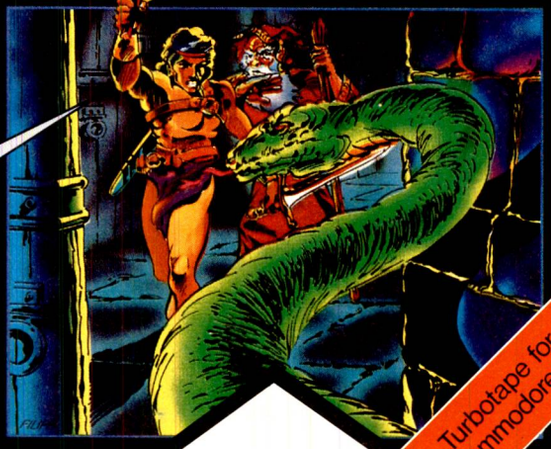

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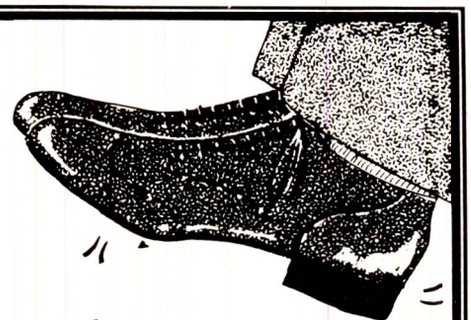

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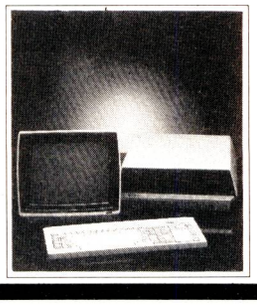

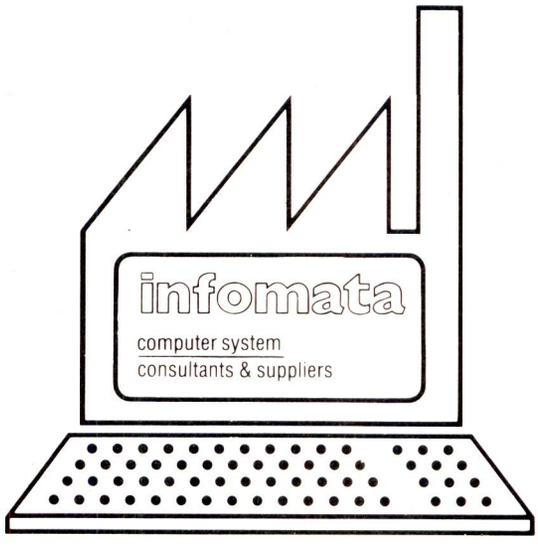

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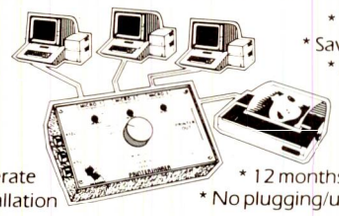

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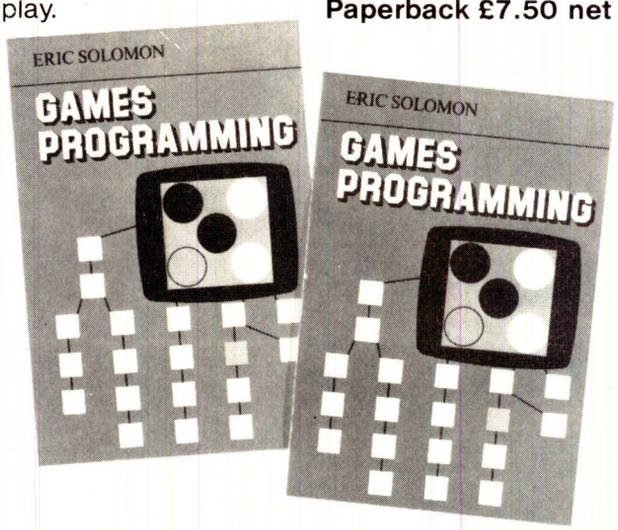

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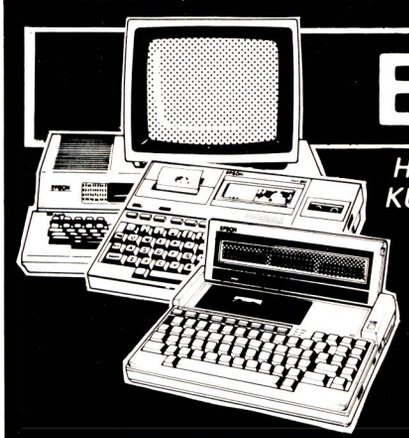

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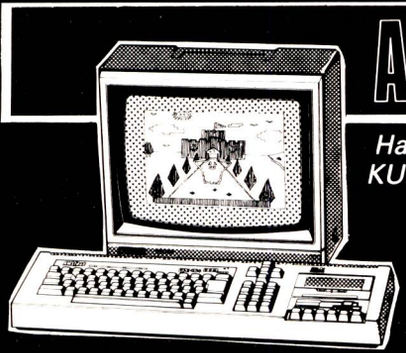

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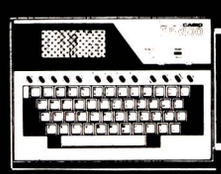

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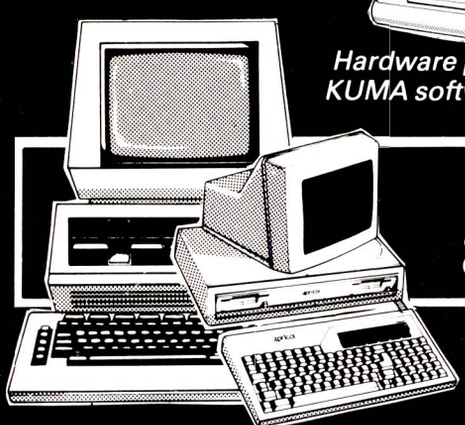

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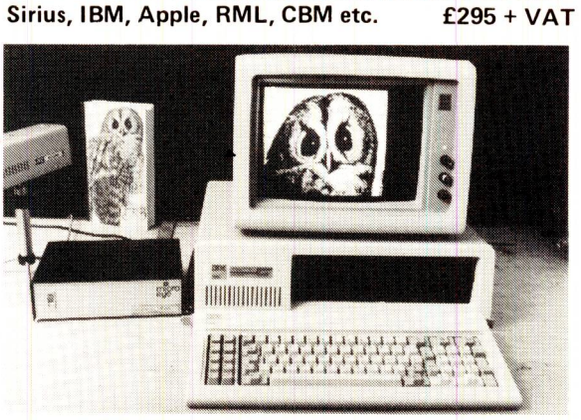

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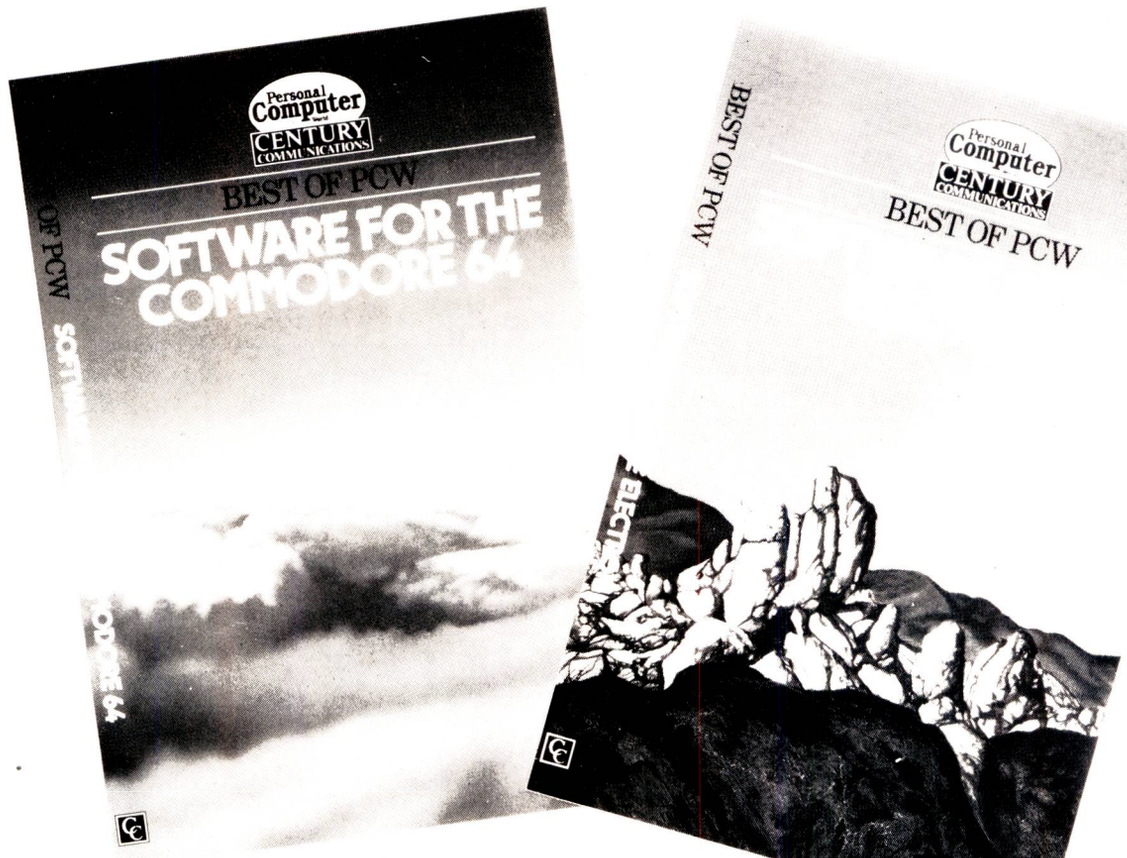

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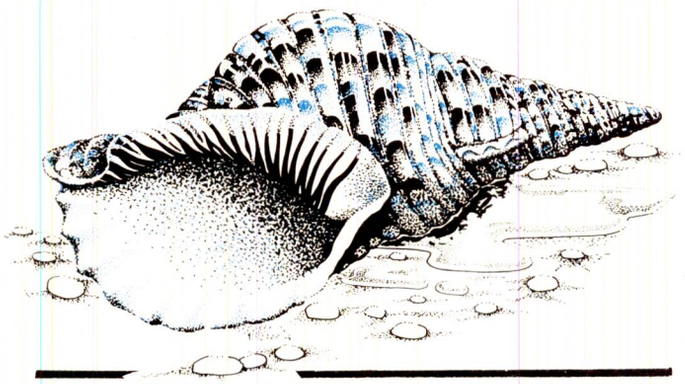

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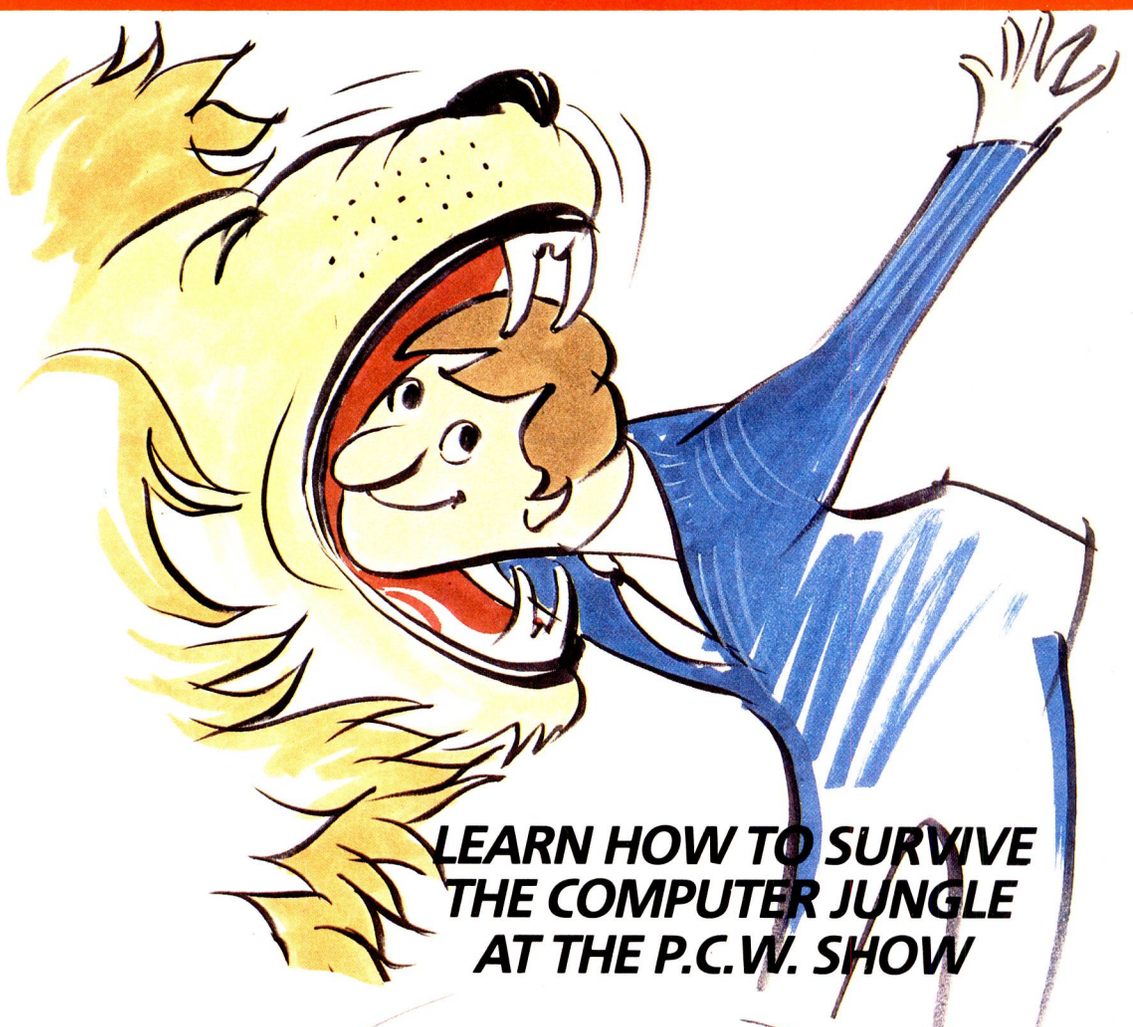

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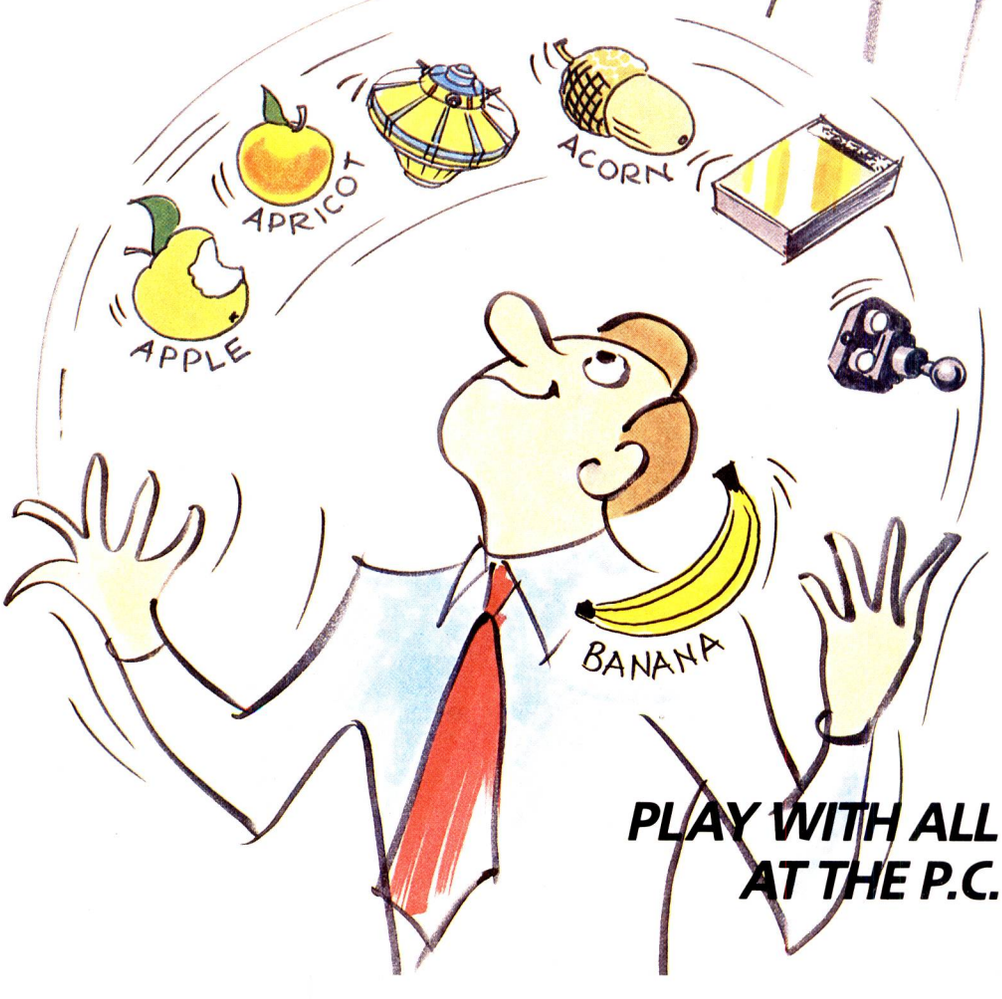

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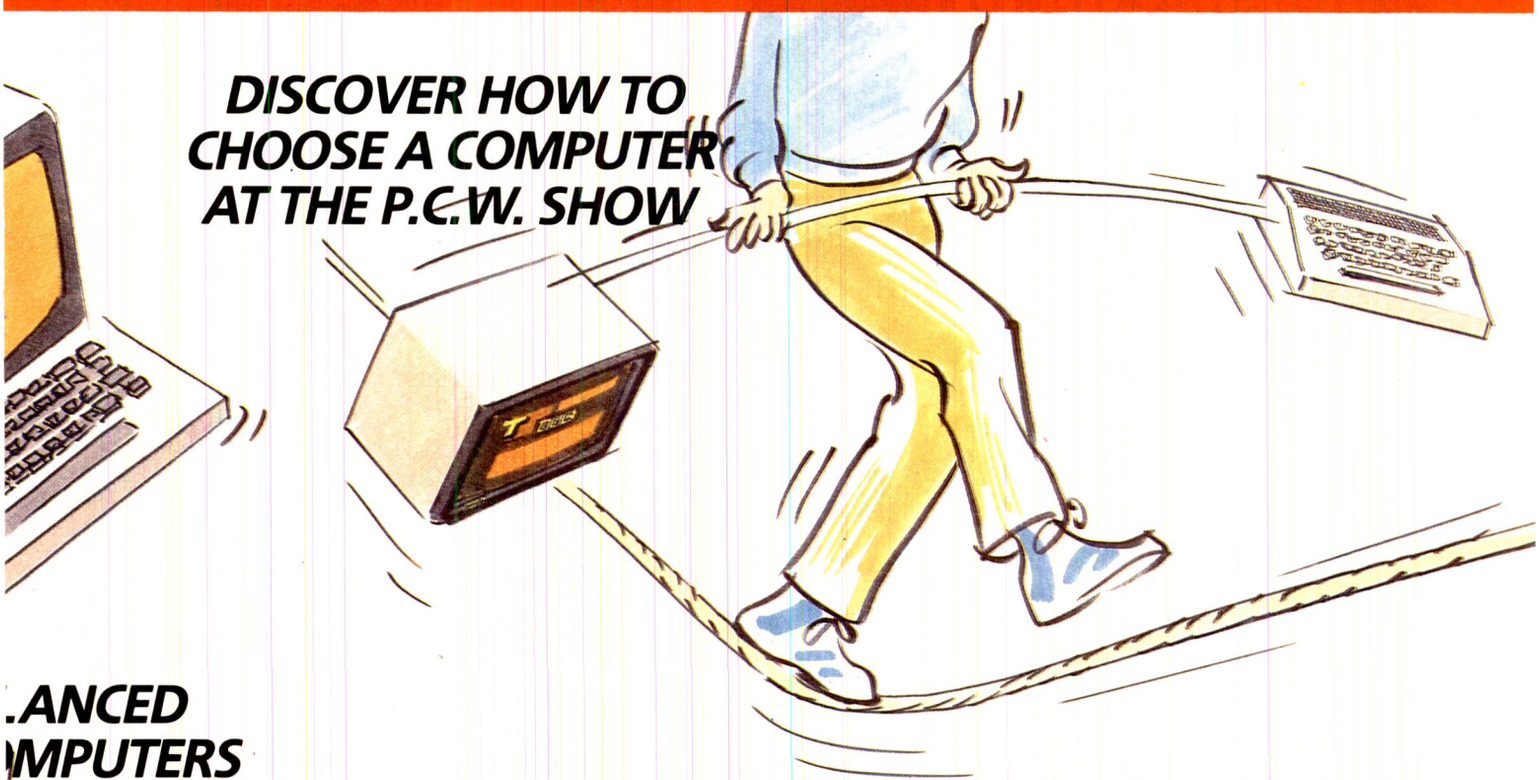

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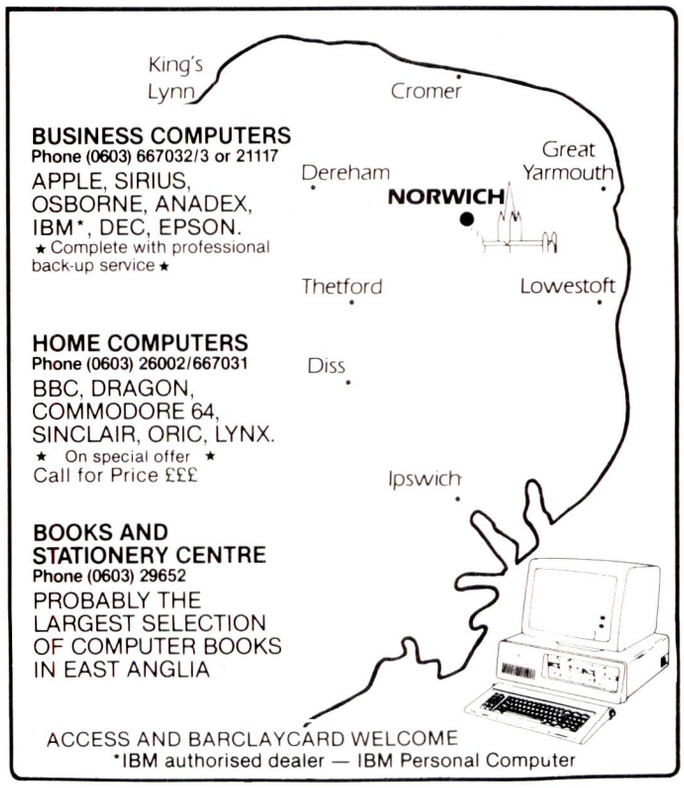

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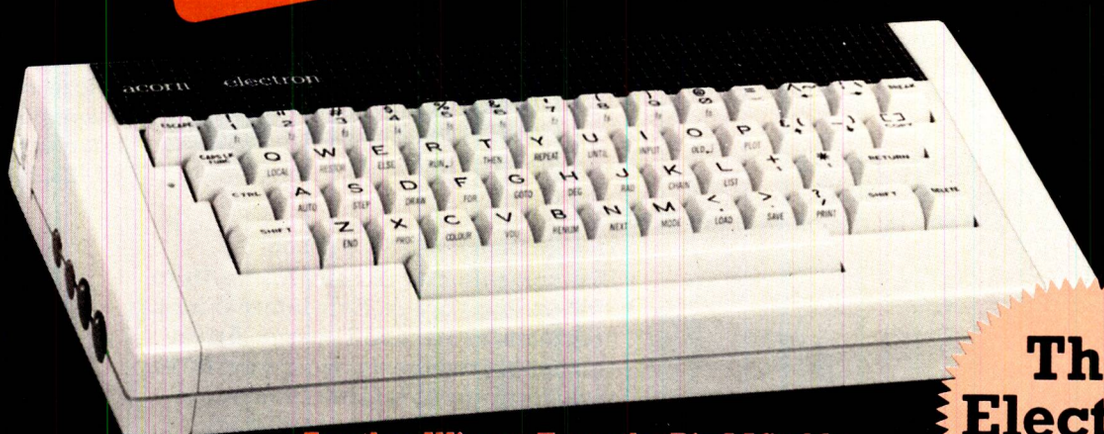

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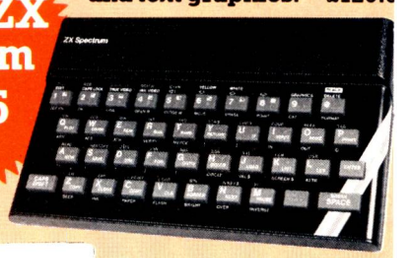



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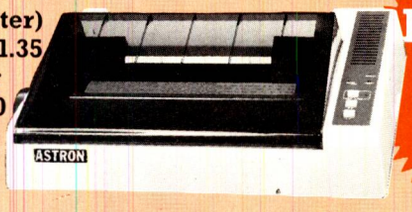

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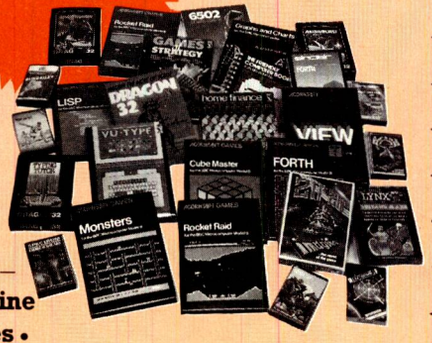



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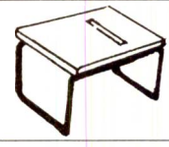

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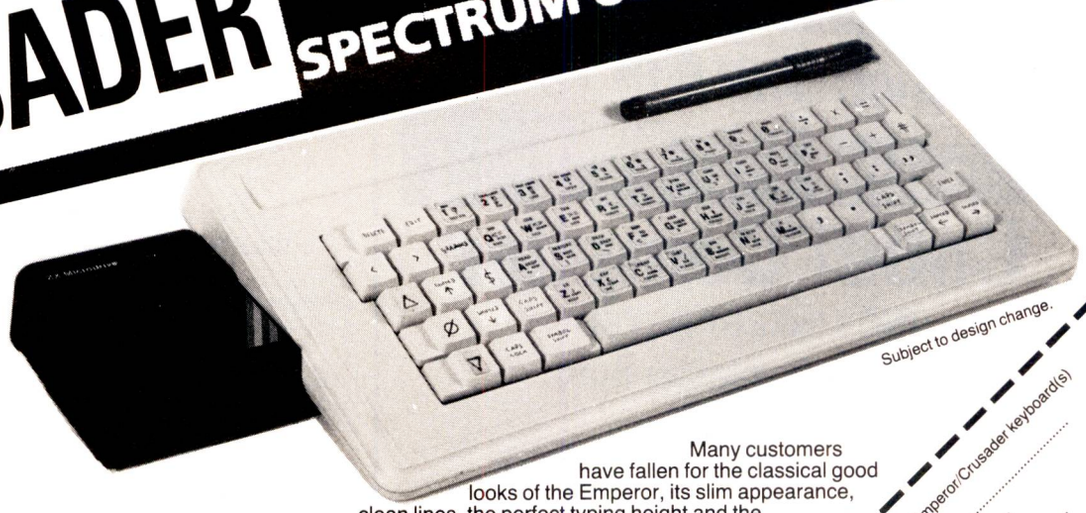

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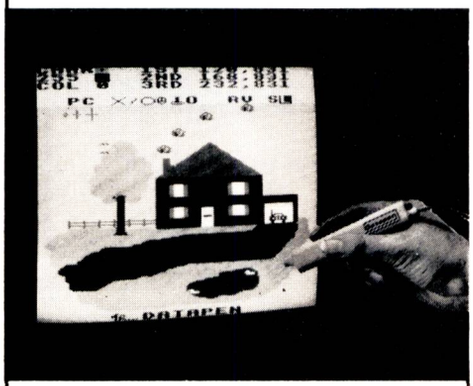

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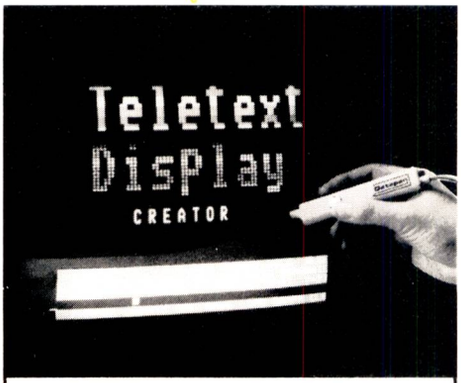

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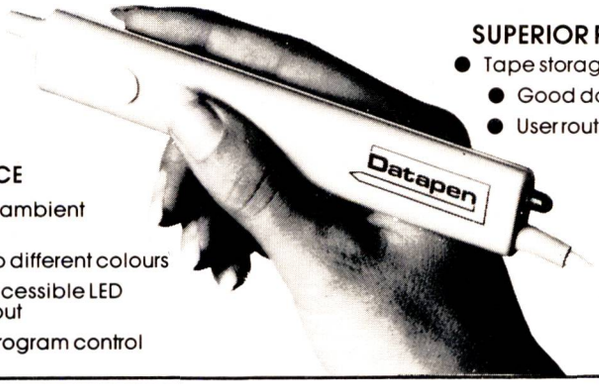

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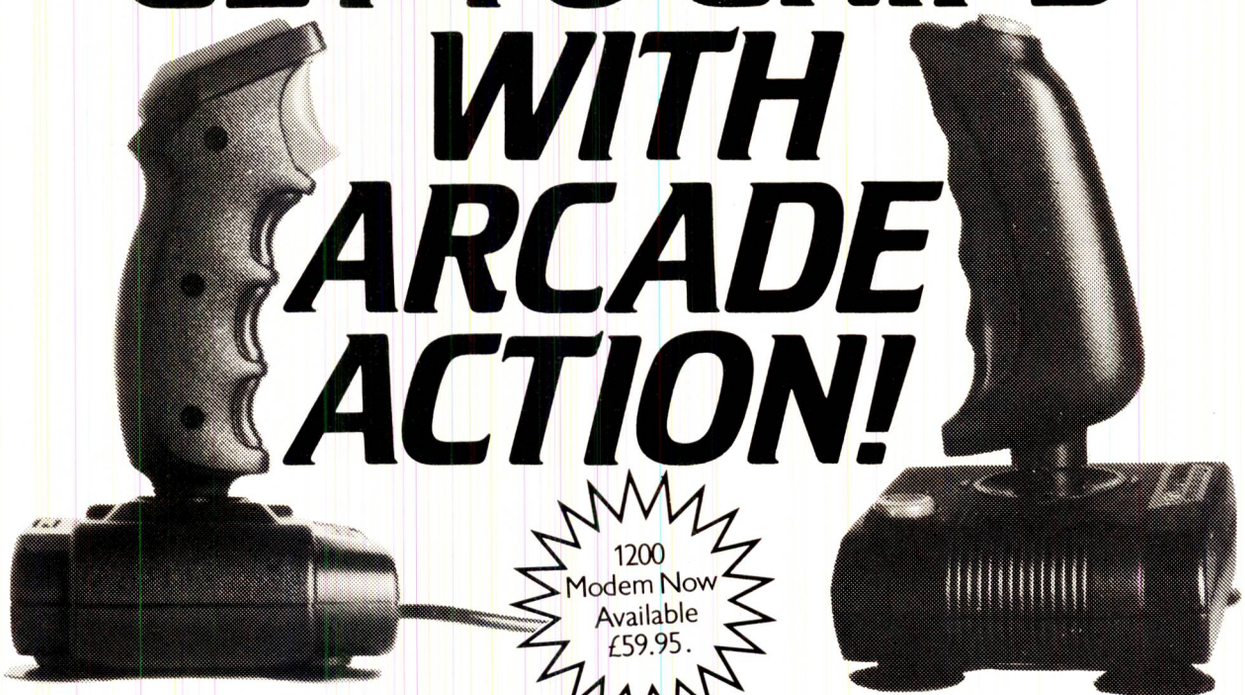

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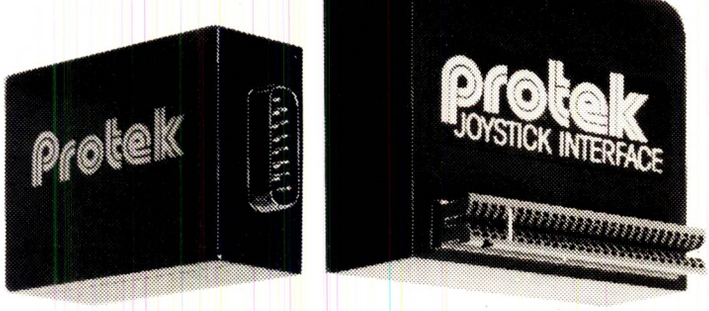

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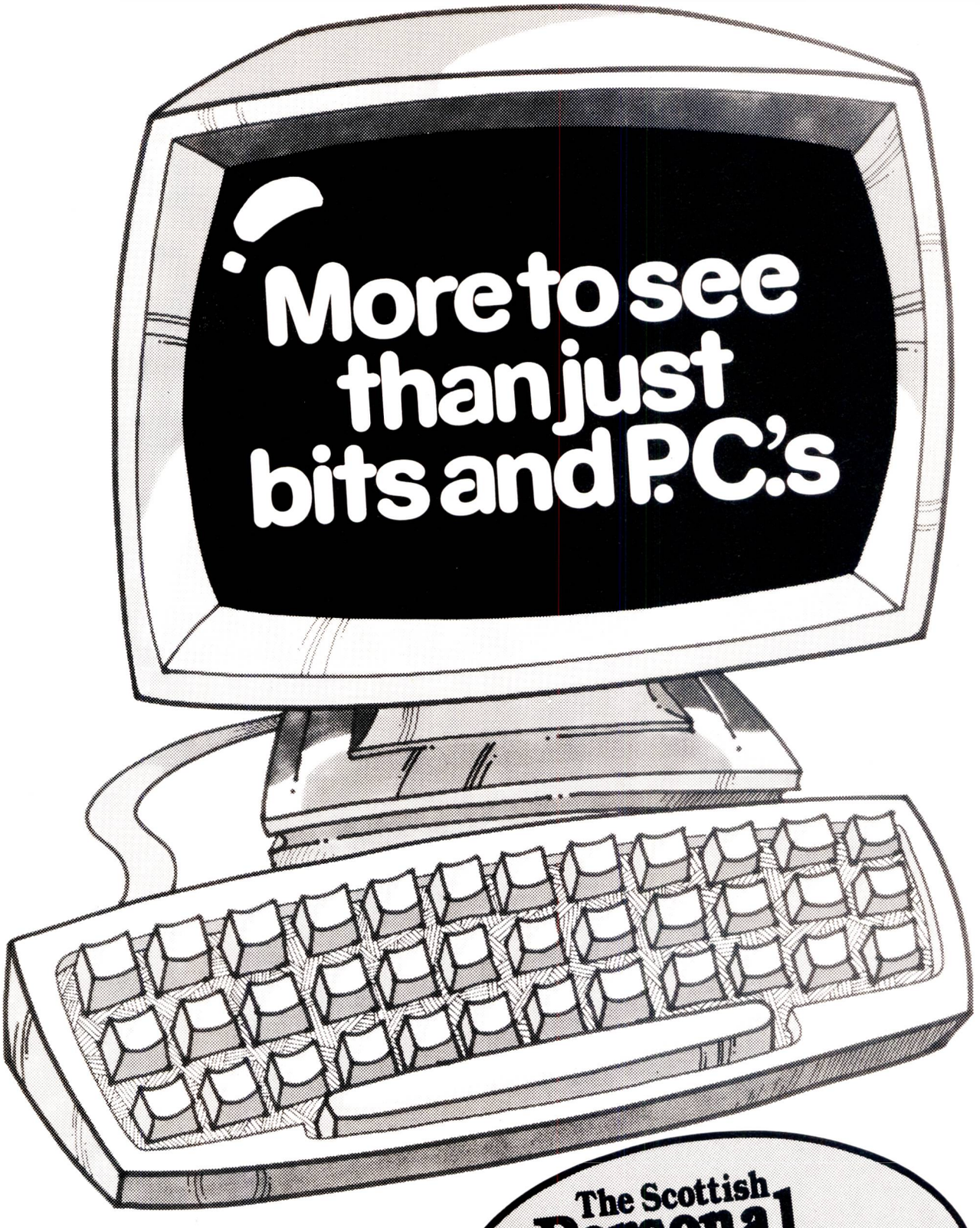

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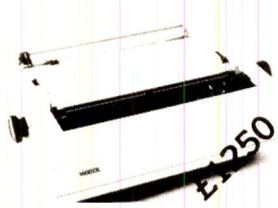

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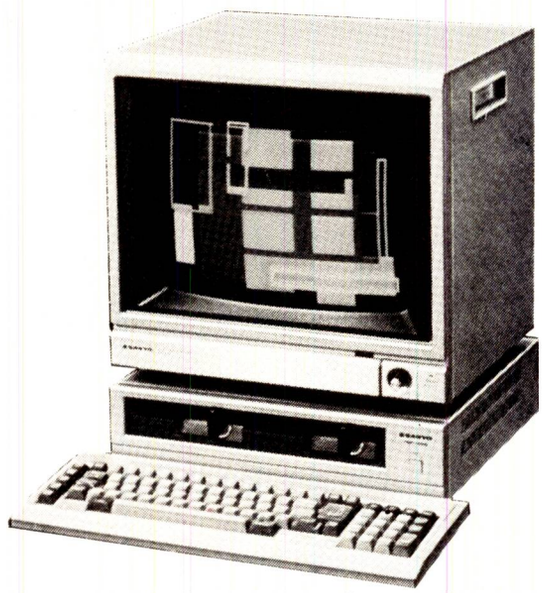

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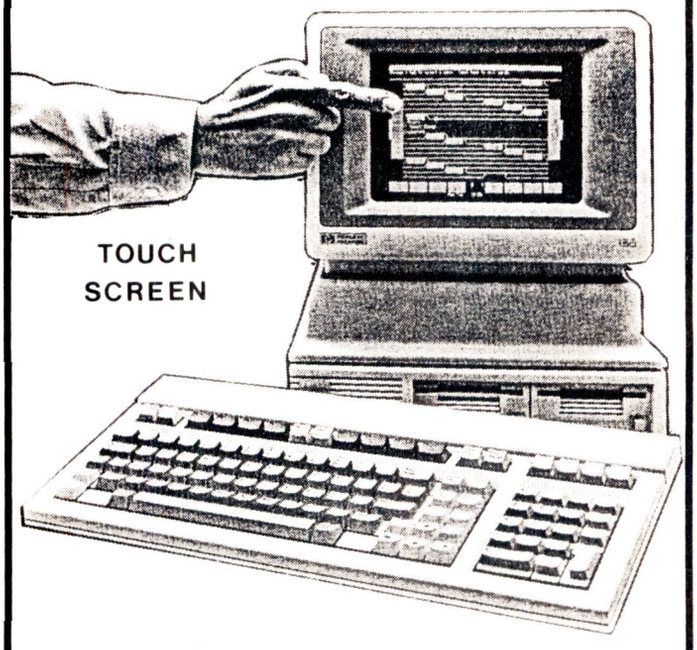

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DASH-80	.73	2.4	6.6	6.5	7.0	12.7	20.2	34.3
IBM PC	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0
APRICOT	1.5	4.8	10.4	10.8	12.2	22.8	35.5	34.0
SIRIUS	1.7	5.4	11.1	11.5	13.6	26.2	40.1	29.0

DISK BENCHMARKS

DBM1	DBM2	DBM3	DBM4	DBM5
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3.8	21.2	20.8	12.7	10.4
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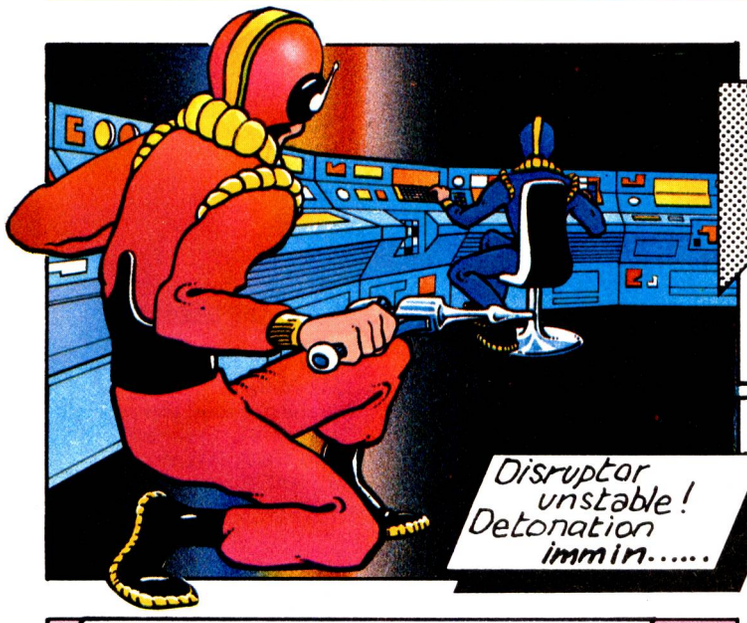

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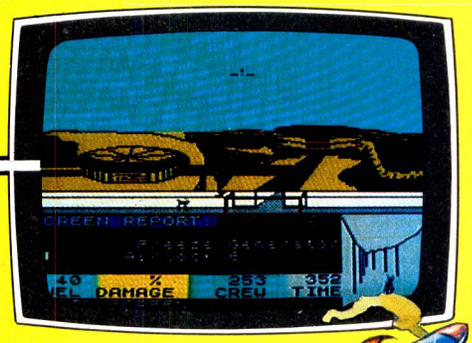

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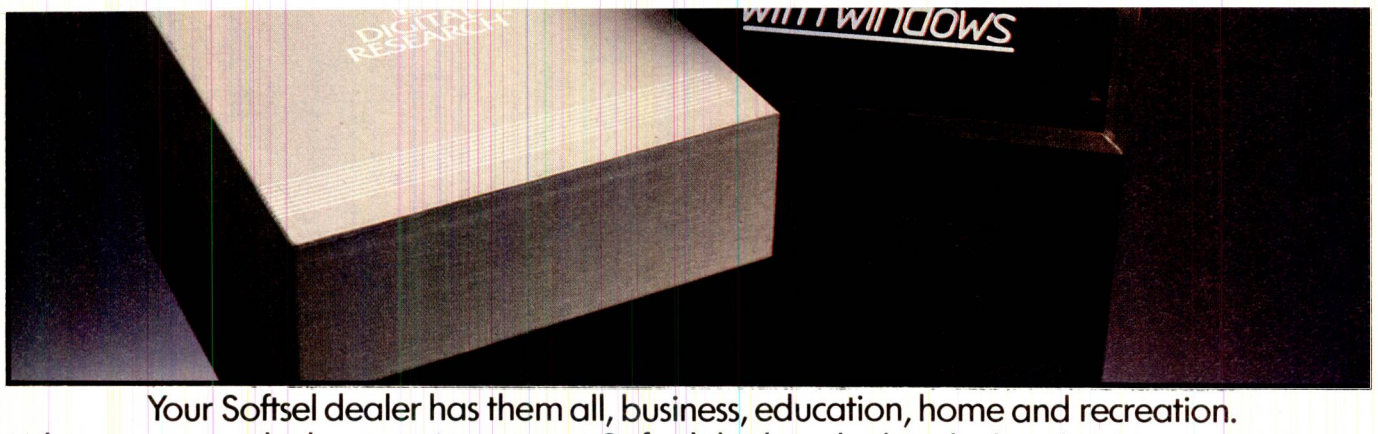

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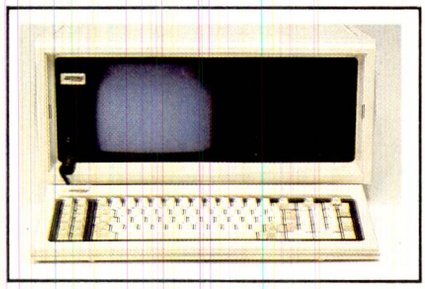



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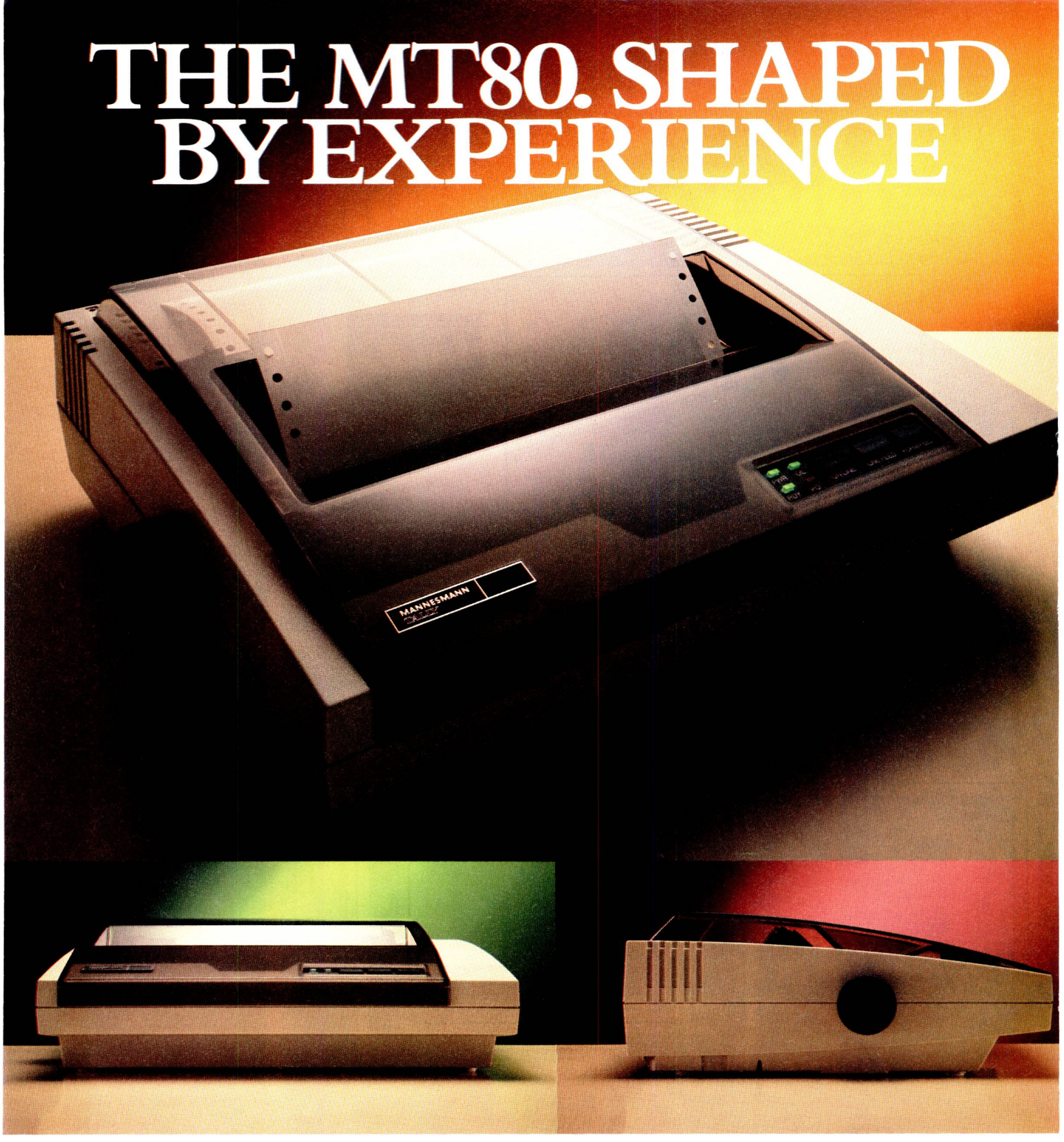

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CHIP CHAT

ChipChat would like to quash the malicious rumours that are circulating about Sinclair's wonderbug machine, the QL.

1 The QL is not the first computer available in weekly parts (first you get the keyboard, then the operating system, then a bit more of the operating system followed by some of the manuals, then even more of the operating system . . .).

2 Sir Clive is not trying to sell a million QLs before one is delivered.

3 QL does not mean 'a long queue and an L of a wait'.

4 The 28 days promised delivery time was not calculated using a QL.

5 The phrase 'random access microdrives' does not mean that they only work part of the time.

6 The QL experience will not be repeated in the production of Sinclair's town car, and it's untrue that the car will be sold without wheels which will be available separately in strict rotation. Neither will the car be sold only by post.

★ ★ ★

A certain magazine catering only for Macintosh readers has sent a letter to its subscribers informing them that the magazine will remain bi-monthly 'until the support base of Macintosh products begins to flourish'. Could it be that it is short of material (or plastic)?

★ ★ ★

Walls, of ice cream fame, has entered the computer market with its new 'Megabyte' ice lolly, with the slogan: 'Get your hardware around our software'. We at ChipChat are keeping cool about this, but are only thankful that Walls didn't discover words such as POKE, PEEK and RAM.

BLUDNERS

John F Cowie regrets that there was an error in his letter 'Golden crypts' published in July's TJ's Workshop.

The information supplied by British Telecom was incorrect. Telecom Gold does not support the 8-bit ASCII set, only the 7-bit set, some of which are reserved for special functions.

The complete list can be obtained from BT, but anyone wishing to use the encryption technique should use characters 32-122.

The only awkward character in this range is 64 (the @ character). This should be trapped and a 7 (Bell character) substituted before transmission. The reverse, of course, should be done before decryption.

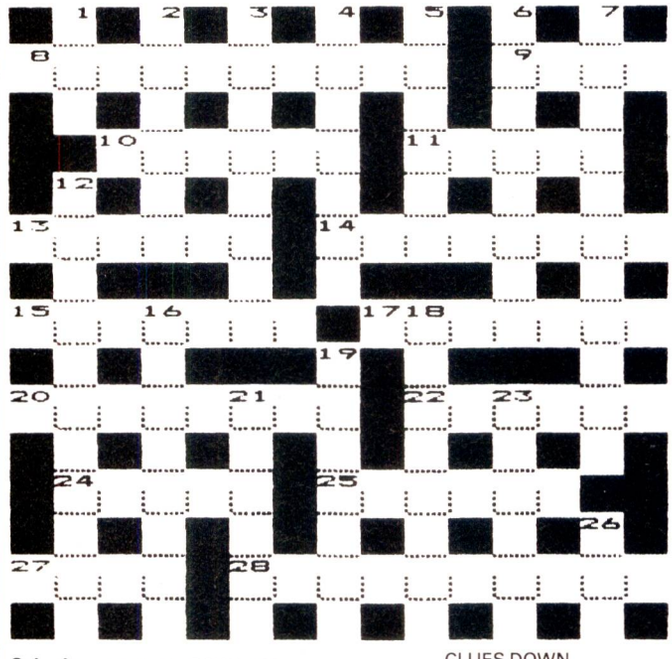
For the benefit of any eagle-eyed readers who noticed two June crossword winners (one in July, one this month), Jenkins of Fulham was in fact May's winner.



Commodore's quality control improves!

Actually, this frazzled VIC 20 belongs to Rudi Westfold who claims that it was blackened and melted by a fire at his home and then swamped by firemen's hoses, but it still worked. Rudi is putting on a brave face, but he would like to hear from anyone who really knows how to vandalise a VIC.

PRIZE CROSSWORD



Submit your entry to *PCW* by 19 August. You could win £10!

CLUES ACROSS

8 Printer routine to conceal tip (6,4)
9 It indicates colours (4)
10 What's fashion to the modern miss? Communication devices! (6)
11 Failure—but programmer finally in the money (5)
13 Particle's snap point (6)
14 Reagan quietly disposed of in the computer's memory! (8)
15 Moves the display of old documents (7)
17 I cut from state to interface (7)
20 It identifies tool handle (8)
22 Regular boyfriends not flashing! (6)
24 Laces undone in climb (5)
25 Three times the Oric crashes but nothing is lost (6)
27 Statement obtained with love (4)
28 It enables film actors to have their say in *PCW* (10)

CLUES DOWN

1 Bobby West before your very eyes! (3)
2 Deal, for example, in shares or trusts (6)
3 Put Capone in jail—not outside! (8)
4 They swear audibly, these blinking characters! (7)
5 Blank characters step on board (6)
6 Two states at odd times (3,3,2)
7 Mechanic reproduced verse in program instructions (7,4)
12 Takeaway computer technology for listeners (3,4,4)
16 The one at the controls is possibly Carmen Hill (8)
18 Visually displayed corn seen being sifted (2-6)
19 Move pointer for right stereo mix (7)
21 C$="BASKET-WEAVERS": Answer$=RIGHT$(C$,5) +MID$(C$,5,1) (6)
23 Key of English space shuttle (6)
26 Drive home with broken arm (3)

June winner: J Huddleston, Radley, Abingdon, Oxon.

June solutions:

SOLUTIONS ACROSS

8 Megabyte 9 Anodes 10 Flag 11 Exits 12 Axis 13 Lingo 15 Castor oil 18 Version 19 Textual 22 Keyboards 24 Array 26 Dial 28 Torch 29 Boot 30 Toggle 31 Spectrum

SOLUTIONS DOWN

1 Real-time 2 Wang 3 Hyper 4 Decimal 5 Cassettes 6 Nova 7 Gemini 14 Gosub 16 Rotor 17 Royalties 20 Analogue 21 Address 23 Editor 25 Chief 27 Logo 29 Bits

Send your entries to: *PCW*, Prize Crossword, 62 Oxford Street, London W1A 2HG



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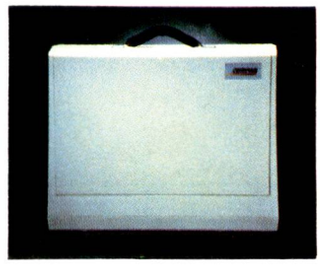

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