

P E R S O N A L

# COMPUTER

EVERY THURSDAY

50p NOV 10-16 1983, Vol 1 No 36

NEWS

THE COMPLETE COMPUTING WEEKLY

**THIS WEEK**

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**FORTH ON THE 81**

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**DRAGON DUO**

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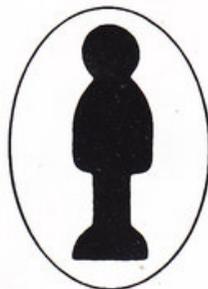
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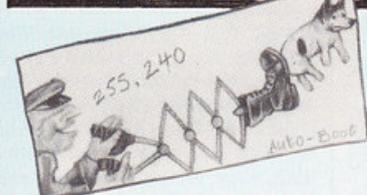
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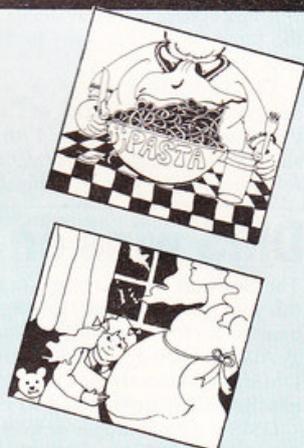
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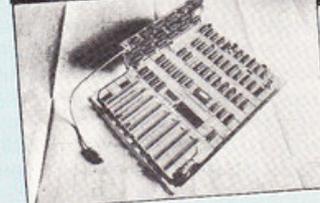
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# ZX83 leads charge

By Geof Wheelwright

While international computer giants mourn the loss of profits brought on by the summer's price war, Sinclair Research is quietly planning the next campaign.

With sales of the Sinclair Spectrum still moving at a pace a good two weeks faster than Sinclair can handle, the Microdrives and joystick/cartridge software interfaces being ordered through the mail at a hefty rate, and the ZX81 apparently gaining a new lease on life in the form of a starter pack — you'd think the company would consider a truce.

Not so. The troops at Sinclair are gearing up for a battle royal on the cheap business micro scene.

A visit to the Sinclair arsenal earlier this month revealed a good deal as to how this strategic planning will affect us civilians — but it all involves understanding a bit of secret military code.

Nigel Searle, Sinclair's managing director, would not comment on whether the planned Sinclair business micro (code-named the ZX-83, then the ZX 84 and — just to confuse the enemy — it has now reverted to ZX 83) will use the CMOS non-volatile RAM technology that's making the Tandy Model 100 and NEC portables into flavour-of-the-month favourites among computer journalists.

This 'no comment' translates into

an informed guess that Sinclair probably will use the CMOS technology.

Nor will Mr Searle say whether the ZX 83 will be sold in the US under the terms of Sinclair's technology licensing agreement with Timex. What he did say, however, was that the technology agreement would not necessarily entitle Timex to have the machine.

According to Mr Searle Timex's agreement allows it access to 'personal computers' — which are defined as machines selling for under \$500 in the US.

Mr Searle has also said that Sinclair wouldn't have spent as much time as it did developing the Microdrive if it wasn't going to consider other uses of Microdrive technology. He declined, however, to discuss whether the Microdrive technology will be used in the ZX 83.

This is a clear indication that the ZX 83 will use Microdrives.

And if these clues aren't enough to start your Sinclair spy-decoder rings spinning, here's the clincher: the Japanese. Although they may sound like two ordinary words to you, they are a veritable battle cry to Sinclair Research.

Sir Clive has got wind that Japanese manufacturers have been frightened off bringing their often beautifully-designed home computers to this country by his 'I can do it



Sinclair troops prepare for the next microcomputer offensive.

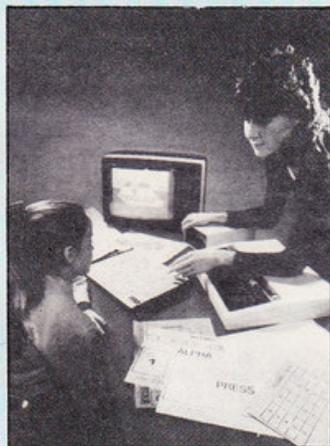
cheaper' approach to the huge under-£200 computer market. And he also knows they now hope to start the long-touted but as yet unseen 'Japanese invasion' in another price bracket.

The Japanese theory (as articulated in recent conversations with their representatives in this country) is this: there is a huge group of people looking for a machine costing more than the average home computer — the price ceiling of which is currently set by the £400 of the BBC micro, but cheaper than the average business machine, which begins at about £1,000.

The Japanese answer to these people is embodied in machines such as NEC's £475 PC-8201A CMOS RAM portable and Sanyo's

£700 MBC-555 IBM-compatible 16-bit machine. They are both different approaches to the problem of staying out of Sir Clive's war-torn Spectrum-price home computer market while steering well clear of IBM's big blue machine.

When it's launched next year — and that date is a much less safe bet — Sinclair's new master weapon looks very much like a portable business computer armed with 16K CMOS RAM (minimum), dual Microdrives, a Liquid Crystal Display screen (a Sinclair flat-screen would be too hard to read), a full-travel keyboard, the ability to run a proper composite video monitor with 80-column screen. It will cost between £400 and £500.



**QWERTY NO MORE** — Early keyboard instruments had large keys that were hit by the player with a gloved fist. Tinkling ivories were a much later development. With computer keyboards it's happening in reverse, but it hasn't reached the stage yet where you'll need gloves — the Concept keyboard takes A-4 sized overlays so that a single depression becomes a complete word or operation. It is intended to make life easier for young children and most of the machines it works with can be found in schools — Spectrum, BBC, RML, Apple, Pet and Vic 20. Depending on the type of machine, it costs between £18 and £25. It is made by Star Microterminals (0962-51422).

## PC Jr jolts its rivals

By Sandra Grandison

After months of intense speculation IBM finally unveiled the PC Junior (code-name Peanut) in the US last week.

The announcement has already given top home computer companies the jitters and in response some have cut their prices. With consumer spending approaching its peak the PC Jr could hurt the industry's Christmas sales if customers decided to wait for it.

The PC Jr comes in two models. The basic model, priced at \$699, is a 64K machine and uses cartridge software. The only unusual feature of the micro is its cordless keyboard that can be used up to 20ft away from the video display. The keyboard uses an infrared system similar to remote control devices for television sets, but a cord can be used. The enhanced version, costing \$1,269, carries a main memory of 128K, has two cartridge slots and provides a disk unit with about 370K.

Both machines run the 8088 processor, with the basic model being upgradable to the enhanced version. Built-in software for the

basic model includes Keyboard Adventure, which uses graphics, colours and sound to highlight the keyboard.

For the upgraded version there's Exploring the IBM PC Jr, a tutorial disk which aims to familiarise you with the keyboard, disk, disk operating system and programming in Basic. And your IBM PC Jr sampler program will help you prepare budgets, write letters, organise files and compile address and phone lists.

IBM also intends to produce a number of PC options. For the basic model there'll be a 64K user memory and display expansion card and a slim-line 360K disk drive.

Other options include a joystick for computer games, a thermal printer and a dozen software packages.

In addition there'll be a communication device that will enable the home computer to receive and transmit information to and from other computers.

An important feature of PC Jr is that it's compatible with IBM PC desk top computers and already several software companies are

rushing to launch new versions of their programs.

The PC Jr could reach British shores by spring 1984. When it arrives the enhanced model could knock Apple off its perch and at the lower end the basic model will be in competition with the Commodore 64.

But Apple could make a comeback with the MacIntosh. A spokesman from Apple UK said: 'Our machine, code-named the MacIntosh, is still a development project and will not be released until it's absolutely ready. It will be fundamentally different.'

Low-end computer maker Oric also plans to cash in on the PC Jr. Barry Muncaster of Oric said: 'We hope to bring out a piece of hardware in parallel with IBM's PC Jr. Any software that runs on their machine will run on ours.'

One response to the PC Jr, that it will actually cause prices to rise, demonstrates the influence of IBM in the computer world. The machines price — high for its specification — will not deter buyers and could drag others in its wake.

## VIEW FROM AMERICA



## PC Junior upsets the Applecart

By Chris Rowley

Decidedly mixed reviews greeted the IBM announcement of the PC Junior last week.

As far as the actual machine went nobody seemed very enthusiastic. IBM watchers noted that IBM had completed a major corporate re-alignment, moving away from the mainframe-only company of the seventies and establishing a position from which to become an information processor to the entire world.

In just two years IBM has produced the PC, the XT, the various XT special like the XT370 and now the PC Jr. Analysts point to the end of the 13-year long Government antitrust suit a couple of years ago as the beginning of the new IBM.

At one extreme some analysts predict a speedy demise for Apple and just about everyone else in a totally IBM-dominated computer market five years down the road.

IBM's new business computers will send Steve Jobs back to Atari sweeping the floors, 'The game's over for Apple' and other such comments filled the air when the XT370 and the PC3270 appeared. Others, however, tended to disagree and pointed to the hardware for their reasons. From the unpleasant chiclets plastic keyboard to the price tag of \$1500 for a 64K single disk drive system means critics found plenty to scoff at when PC Jr finally took the stage. In fact some were left wondering by the whole exercise. Noting that PC Jr won't be available until next spring or summer they questioned whether IBM was not just trying to freeze this year's Christmas micro market, getting would be micro buyers to put off their purchase for six months.

Clearly while PC Jr is not a business machine it sounds vaguely un-exciting as a home machine too. It doesn't do games very well. This is a 'home' micro for someone with a PC in the office who wants to take work home and who is loyal enough to IBM not to buy a Compac portable — or else it's a home computer to someone rather wealthy who is impressed by the IBM logo and reputation.

Apple can be expected to strike back, and have stripped-down Apple IIe's selling for \$500 shortly.

And then of course there is the Macintosh, which will run the Motorola 68000 32-bit chip as a 16-bitter thus offering high speeds, for example allowing bit-mapped graphics without slowing down the applications software. This for just \$2000.

In addition there is a strong rumour that John Sculley may have earned his Gold Marketeer Medal by ordering a reluctant Macintosh development department to make the system PC compatible. Apple has rarely made its own machines compatible with each other in the past let alone compatible with anyone else's but this is the shrewdest move possible because if you compare the rather ordinary PC with the Macintosh it is clear that Apple is streets ahead. The Macintosh with a 5Mb hard disk will probably cost \$3500 and will come with bundled integrated software. The PC XT costs more than that without software.

Other computer makes face different problems. Coleco began getting Adams to the shops but there were still problems with the tape drives. However Coleco does have a golden opportunity if it can make enough machines by Christmas.

Likewise, Commodore finds itself wonderfully situated right now. The Commodore 64 is projected to sell 1.5 million units in the next year and is the clear and obvious winner of 1983's Home Computer Stakes. There are however some annoying flies in Commodore's well deserved ointment. The grim shortage of 1541 disk drives continues into its 11th week for many stores. Since Commodore rejected a batch of 30,000 drives from its Long Island supplier due to a high defect ratio, it has been scrambling to find replacement drives. Now another problem is emerging, namely the shortage of 1701 colour monitors. These nuggets of the nitty gritty have kept Commodore's stock from soaring as one might have expected.

■ See PCN, issue 38, for a full Pro-Test of the Coleco Adam.

## Osborne ok?

Despite all the traumas at Osborne's US headquarters (Issue 29) the company is still determined to produce the Executive II.

According to Mike Healy of Osborne UK, production of the IBM compatible machine should be restored in two to three months time and will sell at dollar sign \$2,495 including a bundle of software.

For UK users who still feel slightly abandoned, C/WP Computers has joined Osborne UK in giving its full support no matter what the outcome is in the US. It will continue to supply software, and maintenance and extended

warranty agreements will continue to be offered for the life of all machines.

Kaypro is aiming to take over the portable market, tempting users with its 10Mb machine. But Osborne UK doesn't admit any threat — Mike Healy said: 'The Kaypro is badly distributed in this country, and won't make any difference to the sales of Osborne machines.'

Back in the US Osborne is still in the throes of recovering under the Chapter 11 bankruptcy laws. It has clinched a deal with Xerox, whereby Xerox will service existing Osborne computers in the US.

## Hard disk gives Tandy more drive

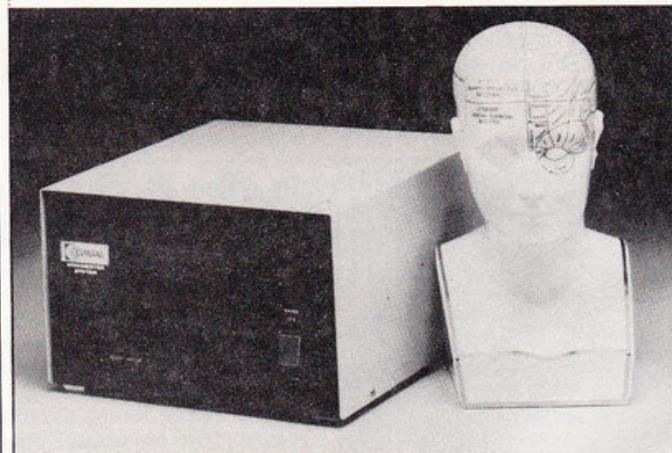
Disk storage options for Tandy users have been increased by Cumana, which has launched Winchester disk drives for the TRS 80 Models III and IV.

Cumana is using the 5¼in hard disks from Rodime — they give you between 5¼Mb and 21Mb per unit, and four drives can be strung

together on a daisy chain connecting cable to provide up to 84Mb.

The drives have a degree of intelligence to control functions like ramp up/down, the stepper motor, and multiple track searches. They are designed to operate with DOSPlus 3.5 and 4.0 and LDOS. The 5Mb model will set you back £1,395.

You can buy them as external units or have them fitted into your machine if it doesn't already have disk drives. External drives come in a box that matches the Tandy silver grey.



5¼in cap size for Cumana's bump-free Winchesters.

## Basic battle

The military two-step that Digital Research and Microsoft are performing around the Basic language has increased in tempo.

DR (0635 35304) has introduced a utility to convert source code produced by Microsoft's MBasic and its own Personal Basic into CBasic compiler source programs. CBasic (the C stands for commercial) is a DR product which it describes as 'better suited to serious business applications' — better than MBasic, that is.

The utility goes by the cumbersome name of M2CBasic. It is not claimed to translate an MBasic program completely, but DR says

that it should handle 90 per cent of the code. Where it can't make the translation it will print out the locations of unconvertible or suspect code. Two thousand lines of code should take it two minutes to process.

M2CBasic runs under CP/M, CP/M-86, and Concurrent CP/M, as well as IBM's Microsoft-supplied PC DOS. It occupies 64K of memory but scratch files will take this up to 94K in use.

It will cost £97 when it becomes available through DR's dealers later this month — but if you buy it with CBasic the extra cost will be only £30.

## Hilderbay hooking in

If you're shopping around for devices enabling your micro to communicate with other systems Hilderbay (01-485 1059) has a new modem and multiplexer for you to look at.

Selling at £71.30 the modem can originate a call or start a two-way conversation and it can respond to a call from another computer. Data transmission is 1200/75 baud.

The modem is designed to be connected directly to the telephone network and different frequencies can be used for transmitting and receiving. However, an RS232 serial card will be necessary extra.

Communications software is available to make an Apple II/IIe into a terminal. And an adaptor which allows the modem to be used as an acoustic coupler will be available at a later date.

For £94.30 you can pick up an RS232 multiplexer which allows a computer to communicate with up to four RS232 devices. You can switch between devices by sending a special sequence of characters.

Hilderbay has also produced some new software for Apple users. At £86.25 each there's Access, a database management package, and Master Maths which will get you to the O-level stage. For £23 you can get Mr &, a set of utilities to help you with Basic programming.

# XT gets a rival

The first IBM XT-compatible micro is about to arrive in the UK — and it's portable.

Eagle Computer's Spirit XL matches the high-capacity version of IBM's PC by including a 10Mb hard disk, has memory up to 640K, and offers MSDOS and CP/M-86. It falls heavily on the borderline of portability — 33lbs.

It costs £4,200 — the IBM XT is £4,858 — and is expected to be available in the UK at the end of this month. The Spirit XL's rapid deployment comes about through a deal Eagle of California has struck with Geveke Electronics (04862-26331) which will take over distribution of Eagle's systems in the UK, Holland and France. Eagle wittily refers to it as the Eagle leaving the nest.

Besides the Spirit XL, Geveke will be selling the Eagle PC which checks in at £1,699 in a single-drive version. Like the Spirit it is built around an 8088 but its main memory starts at 64K, expandable to 512K. It has 750 by 352 pixel graphics in monochrome, with a colour adaptor as an optional extra.

You can configure the Eagle PC with single or twin floppies, or with hard disk storage up to 32Mb.

The Spirit XL has a 9in screen and



Looking for a perch in the UK — Eagle's Spirit XL portable.

a keyboard that Eagle claims has the best features of IBM's with several improvements. It also includes colour graphics as a standard feature — the built-in monitor is monochrome but the Spirit is capable of driving this and a colour monitor simultaneously, with the colour image reproduced in eight levels of intensity on the monochrome screen. The machine has two serial ports and one parallel, with four IBM-compatible hardware slots.

There are 'a small number' of Eagle machines in the UK already,

according to Eagle president Ron Mickwee; an audio-visual specialist called Mediatech had been distributing Eagle systems until the deal with Geveke. Geveke says that it will service any existing Eagle dealers who want to carry on, as well as talking to its own network of dealers.

So Eagle users should see continuity of service, and new users will find dealers capable of giving good support, Geveke says. Eagle Computer itself seems to be riding out the US micro scene disturbances without difficulty.

## Acornsoft doubles up

Acornsoft has unveiled its 'unique' dual format disk system to allow all its future disk software to be read by both 40 and 80 track drives. It will also be changing any current software to this system as well.

The dual format system comes on

the disks and is located on track one, probably in the !BOOT file, as this can be read by both systems. On receiving shift/break the system attempts to read one of the tracks above track one on the 80 track side, and if an error occurs it will assume a 40 track disk.

The reason for the dual format system, according to Acornsoft, is that BBC micro users are upgrading to 80 track drives.

# HP puts £10m into software

Hewlett-Packard announced plans last week to open a £10 million research and development facility near Bristol, which could speed up the configuring of software for the HP-150 micro (PCN, issue 30).

The new business micro, with its touch-sensitive screen as an alternative to the mouse technology, and 3in floppy disk drives, is due for release in this country early next year and it will be closely followed by the opening of HP's first major R&D facility outside the US in the new year.

Although Hewlett-Packard managing director David Baldwin wasn't too specific about the type of research that will be undertaken at the new facility, it was clear that software development for the HP-150 will be high on the company's priority list.

Configuring popular software packages to run under the 'HP-Touch' system (and on the 3in floppies) will require constant work and there's a good chance the new Bristol facility will be doing that work.

Mr Baldwin said the R&D

centre will concentrate on 'computer science' and 'some development of software'.

'We have not spelled out specifically what the program will be just yet,' said Mr Baldwin. He added that hardware development and 'the seed corn of fifth generation computers' will also be high on the list of things for researchers to investigate in the new labs.

HP's move was praised by Trade and Industry Minister Norman Tebbit, who welcomed the new facility and the 50 research jobs it will bring initially to the Bristol area. He also took the occasion to blow the trumpet for the United Kingdom.

'The decision by the Hewlett-Packard company to establish its first major research and development centre outside the United States here in the UK confirms Britain as the free world's second most important base for high technology industry,' said the Minister.

HP's existing headquarters in Berkshire was one of the first to be opened in the UK by a multinational computer company.



**HANDY PORTABLE** — Olivetti has joined the ranks of Tandy and NEC with its own portable called the M10. About the size of an A4 sheet of paper the M10 has a pop-up, 40 x 8 display screen, query keyboard and 32K ROM which contains the Basic interpreter, text editor, address book and diary. Two versions of the machine will be available — an 8K model at £499 or 24K at £699. You can get your first glimpse of the M10 plus its add-ons at Compec '83, Olympia London.

# Maintenance fears grow

The state of micro maintenance gets a firm thumbs down from a survey of 600 users in Western Europe.

Worse, the situation is deteriorating — as the price of hardware falls the costs of labour and training are rising, and the problems of getting prompt and competent maintenance will worsen.

This is one conclusion of 'Maintaining the Personal Computer', the report published by market research firm IPI from its survey of users in the UK, France, and West Germany. The three major problems identified by users were response and repair times, electro-mechanical failures, and the competence of maintenance personnel.

Many respondents complained of an apparent shortage of engineers and the inadequacy of their training. David Lyons, representing IPI in this country, said the level of training for engineers had dropped in recent years and engineers, less qualified than in former days, were now expected to work on a wider range of equipment.

Ninety per cent of respondents expected someone to appear on site

within eight hours of a call. If the micro was returned to a depot, they expected it back the same day.

The report names IBM, DEC and Apple as the three leading PCS sellers and compares their maintenance policies.

IBM comes off badly, with only a return-to-depot service, unless you want to pay extra for a local IBM dealer's engineer to call and fix your PC.

DEC, on the other hand, does not leave maintenance to a third party, offering a choice of service levels. It also has a fast response option offering repairs within four hours for an extra 25 per cent of the standing maintenance charge.

Apple relies on General Computer Systems for its maintenance arrangements and all warranty work is done via the dealer.

Olivetti has an interesting option which looks towards self-reliance. For £100 a year, it will replace the PC boards for you but you have to decide which ones need to be replaced.

Respondents cited reliability as their primary reason for choosing a particular micro.



**PORTABLE NETWORKING** — Televideo has moved into go-anywhere multi-user computing with its new TelePorter portable machine. The machine weighs 25lbs and plugs into the company's networking system. It costs £1,351.25 and comes with a Z80 processor, 64K RAM, one 5 1/4 in disk drive, a SuperMouse for graphics applications and two RS232 ports. Free software that comes with the machine includes a word processing package, financial spreadsheet, TeleChart, and the GSX-80 graphics systems extension. Contact Encotel Systems Ltd, 01-686 9687.

## Hyperion gets chassis for add-ons

The IBM-compatible portable Hyperion will now play host to a free-standing expansion chassis.

Bytec Gulfstream, the manufacturer of the Hyperion, has announced the Hyperion EX. It will

contain up to seven IBM cards for memory expansion, networks and special communications.

The storage heater-like unit can also contain a five or ten Mb Winchester disk system. Four Hyperions can share it in a local area network or via modems and telephone lines. The empty unit is expected to cost around £1200. Bytec has also announced the popular Lotus 1-2-3, a combined spreadsheet and graphics system, for the Hyperion.

## SOFTWARE NEWS

### Business

**DR:** Can the leopard successfully change its spots? Digital Research, producer of CP/M and many other items of systems software, has launched its first applications package. DR Graph is a menu-driven package that runs with GSX, the graphics extension to CP/M, and aims to help business users transform dull figures into living graphic output. DR is on 0635 35304.

**TELEVIDEO:** Encotel (01-680 9687) has a similar product, Teledraw, available for the Televideo personal computers including the Teleporter. It costs £164. Digital Research, backing a number of horses, has agreed with Televideo to enhance the package.

**IBM, SIRIUS:** The Bristol Software Factory's Silicon Office has already been enhanced by the addition of a financial management system. This joins ledgers and controls, word processing and office filing in the package which costs £1,390 and runs on the IBM and Sirius machines. Information from 0272 735022. Microsoft (07535 59951) has released another version of Multiplan, its spreadsheet program, to take advantage of 128K systems. Existing users will pay

£20 for the update, new customers £199.

**COLOUR GENIE, DRAGON, NEWBRAIN:** For the 32K Colour Genie DC Kent (0773 872244) has released Knominal as the base for its financial package system, for £25. The Dragon Dungeon (0335 42529) has published Cash Flow and Catalogue, Sort and Mail for the Dragon. Backing the Newbrain revival Elstree Computer Centre (01-953 6921) has added packages for hoteliers, chemists, and doctors to its range of business software.

### Education

**BBC:** Book publisher Shiva (0270 629440) has moved into the software field and plans over the next six months to produce tapes and books that will form a child's introduction to mathematics. The first four tapes, for the BBC B, concentrate on numeracy and logical thought; they cost £14.95 each.

**ELECTRON:** For children from three to 11 years old Acornsoft has produced eight packages supported by brochures and notes for the guidance of parents and teachers. Each one costs £9.95; they run on the BBC micro but Electron versions should be available next month.

## PCN rounds up the software releases.

**SPECTRUM:** Computer Tutor's motto — 'Makes fun out of learning' — sounds promising; its products come under the collective name Clever Clogs and the first three units are due in the shops soon. Again it is aiming at younger children, as long as they have a 48K Spectrum. The tapes cost £6.50 each. Computer Tutor is on 0480 213969.

### Games

**SPECTRUM:** Software producers seem to be rallying round Currah's Microspeech synthesis unit — Bugbyte, Digital Fantasia, Artic and Ultimate have verbal versions of games out for the Spectrum.

**BBC, 64, DRAGON:** But the standard visual approach continues to attract new companies. Alligata has opened in Sheffield (0742 686040) with games for the BBC, Commodore 64, and Dragon. It also has Alligatacalc, a spreadsheet for the BBC, a database for the Dragon, and others. Prices start at £5.95. Choplifter, Seafox. The games cost £29.95 each.

**SPECTRUM, BBC:** Elephant Software (06286 2292) has released Kosmik Pirate for the 48K Spectrum for £5.65. Computer-solve (01-390 5135) has Mrs

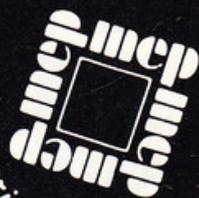
Mopp for the same machine, and Birdie Barrage, a golfing game, for the BBC — the prices are £5.50 and £7.95.

**64, VIC:** For the Commodore 64 J Morrison Micros (0532 480987) has produced Vultures, a 'galaxian' type game, costing £6.95. For the 64 and the Vic 20 Mogul, a recent arrival from the US, offers Annihilator at £5.99. Mondatta (01-377 0806) is aiming at users of the 64 with Taxman and Supercopier, each £5.65, and buyers will automatically enter a draw for a disk drive and printer. Audiogenic (0734 595647) has three new cartridges and one disk-based game for the 64: Serpentine, **TI:** Stainless Software of Stockport may have chosen the wrong time to launch games and other programs for the Texas Instruments 99/4A. Its catalogue now includes 96 titles, and the prices run from £5 to £19.75.

### Systems Software

**CP/M:** The third edition of the CP/M Software Finder will be published by Digital Research later this month, containing information on 2,000 packages.

**UNIX:** Into a higher division, Aston Technology is putting Redwood's Unix software products on its Crystal 68000 range.



These materials have been developed  
by the Microelectronics Education Programme  
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PNI

# US fires first Salvo

By Shirley Fawcett

At last a show without end users and hardly any hardware in sight. That was the feeling among the industry stalwarts gathered in San Francisco for the National Software Show, a production held in a posh hall down at the more dubious end of town and featuring nothing but yards and yards of micro software.

Too much of it, many dealers were complaining. One reason for the trade-only format of the show was the feeling among dealers that they just couldn't hope to keep up with the conveyor belt of new product releases. As a result most new products would never reach the local computer stores, they said.

It was chiefly the smaller software houses that were there, showing their wares in the San Francisco sunshine. There was no sign of Microsoft or Digital Research or most of the big names, but there were some pretty classy products being launched all the same, supporting the old belief that the real innovations come from the smaller companies.

One star of the show was F-1, a do-everything micro operating system that pulls apart and plugs together to handle anything from a single-user, single-task job to full-blown networking systems. It came

from Multi-Solutions of New Jersey, and it was getting a lot of attention from hardware manufacturers and systems houses.

F-1 could be configured as a real-time control system, said Robert Knight, the man who wrote it, and who wrote the language in which it's written. Or it could be made to behave like Unix or a Concurrent CP/M system. It could handle virtually any type of file and read or write to CP/M, MSDOS, Unix, and all sorts of other files. It might also take between 4K and 80K of memory, depending on how ambitious a system you need.

Another sample of mainframe software thinking came in the shape of Salvo, from Dallas-based Software Automation, billed as a fourth generation language for micros. The Salvo package runs on the IBM PC and contains a relational database with an English-style query language that will double as an applications generator. The language also has limited artificial intelligence capabilities and can guess at the file required when the user gets the name wrong.

Salvo is due to appear in the UK in January when Software Automation's UK office should be opening. It is priced in the US at \$495, or \$595 for the 'programmers' version

which brings such features as colour and brightness enhancements.

Operating system compatibility was a hot topic at the show. From Touchstone Software came Mimix II, a CP/M emulation package for the Fortune 32:16 micro. Company president Larry Dingus said that this version of Mimix resides on the Fortune's Z80-based communications board, and it lets users of what are nominally Unix-controlled systems run CP/M software, use CP/M data, and extract data from Unix files.

The company is also due to announce an MSDOS emulator for Unix systems at Comdex this month and a front-end to Unix in the first quarter of next year.

Advanced DB Master, a new \$595 high capacity IBM version of Stoneware's Apple-based information management system, made its debut at the show. Add-ons to existing products were also there in force. From Software Arts (known best for TK Solver, launched earlier this year) came news of more applications packages for use with TK Solver — a building design and construction package will be ready in January, said marketing manager Carol Vallone, and electrical engineering and statistical packages are in the pipeline for early next

year.

Sensible Designs of San Diego launched dProgrammer, an applications generator for use with dBase II. There were also several graphics packages for the IBM PC launched at the show.

From a new US software publishing company, IMSI, came 4-Point Graphics, a \$195 package for graphics designers or business people who want to create presentation slides. And Time Arts took the wraps off Easel, a similar product that relies on a digitised pen and a tablet for input. 4-Point Graphics will work with a keyboard, a mouse, a touch-sensitive screen or a bit-pad.

Finally, something completely different came from Human Edge Software in the shape of a blend of psychological theory and expert systems techniques; it is intended to make super executives out of ordinary business folk. The company's packages, Management Edge and Sales Edge, get the user to rate him or herself, the business opportunities, or employees, and the situation itself on psychological scales such as aggression. These packages (for IBM and Apple systems) are claimed to produce the perfect strategy for business and sales success. A snip at \$250 apiece.

## Thoroughbred enters race

With the IBM PC XT approaching its first anniversary in March 1984, a US company has decided to widen the machine's scope and has produced a piece of software called the Thoroughbred/OS.

Thoroughbred/OS has multi-user capabilities which means the PC XT will be able to run more than one application simultaneously. Current users need not buy any

additional custom boards to upgrade their machines to multi-user compatibility because all the necessary hardware is already there.

SMC Software Systems says that its operating system outperforms other multi-user operating systems such as Unix which is now being implemented on several popular business machines.

The new multi-user operating system supports the full line of Thoroughbred Software and comes with Business Basic, which contains all the arithmetic functions needed for writing business applications.

## dBase debate

The first meeting of a planned dBase II user group will be held on November 16 at the Royal Garden Hotel, Kensington, London W8 at 10.30am.

The pre-lunch session will in-

clude election of a chairman, appointment of a committee to include dealers and software designers, news from Ashton Tate, and a question and answer session.

Further enquiries should be directed to David Imberg, at Ashton Tate, on 0908 568866.

## New modes of being emerge for Dragon and Spectrum

Modes for the Spectrum and Dragon are due to come into fashion from Softek.

They include an as-yet unchristened program which provides the Spectrum with another mode. Once you have loaded the Softek cassette it gives you 64 characters to the line instead of 32.

Mode 5 is for the Dragon. The

micro itself comes with four modes, and this fifth will let you mix text and graphics on the same screen.

It also gives you lower case letters — another thing the Dragon doesn't do, and you can change the character set to include foreign alphabets. All for £6.95 from Boots, Laskys, or direct from the company on 01-240 1422.

## Zita survives

The Andromeda Zita has bounced back from the financial crisis that overtook British micro maker ITCS this summer.

The Zita portables are on sale again, from the newly formed Zita Microsystems (0784 63212) which has risen from the ashes of ITCS. To confirm its recovery Zita plans to launch an IBM-compatible portable at Compec later this month.

ITCS was to a large extent dragged down by its manufacturing arm; a spokesman for Zita said: 'It couldn't actually produce the unit, it failed to meet demand.' Zita aims to avoid a repetition by subcontracting manufacture of the

machines to specialist micro builders, and it has also found international backing to fund the recovery.

ITCS founder David Lewis-Pryce is still involved in the company, 'in the background', the spokesman said, and Bill Bignell is now managing director.

Luggage micros remain popular, and the Zita systems still look competitive. A system with 128K, twin 500K floppies, and bundled software nominally worth £2,000 will set you back £1,595 plus VAT. The existing systems software feature Z80 CP/M and 16-bit CP/M-86 options, and the Zita-E executive systems also have a real-time clock.



The Zita portable — a UK survivor thanks to international backing.

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# PCN Charts

This top 30 games list is compiled from both independent and multiple sources across the nation. It reflects what's happening in high streets in the two weeks up to October 27 and, like the micro charts, does not take account of mail order sales. The micro charts this week show the number of machines sold in the same two-week period so they tell the story in the high street between October 14 and October 27.

## GAMES

### Top Thirty

		GAME TITLE	PUBLISHER	MACHINE	PRICE
▲	1 (2)	Kong	Ocean	Spectrum	£5.95
▲	2 (6)	Manic Miner	Bug Byte	Spectrum	£5.95
▼	3 (1)	Jet Pac	Ultimate	Spectrum	£5.50
▶	4 (4)	Zoom	Imagine	Spectrum	£5.50
▲	5 (8)	Hobbit	Melbourne	Spectrum	£14.95
▼	6 (5)	Penetrator	Melbourne	Spectrum	£6.95
▲	7 (10)	Harrier Attack	Martech/Durell	Oric	£7.95
▼	8 (3)	Flight	Psion	Spectrum	£5.95
▲	9 (30)	Gridrunner	Llamasoft	CMB64	£7.95
▲	10 (13)	Arcadia	Imagine	Vic 20	£5.50
▲	11 (21)	Devil of the Deep	Shepherd	Spectrum	£5.95
▼	12 (11)	Jumbo Jet Pilot	Thorn/EMI	Atari	£29.95
▼	13 (9)	Horace and the Spiders	Psion/Melbourne	Spectrum	£5.95
▲	14 (27)	Hovver/Bovver	Llamasoft	CBM 64	£7.50
▲	15 (17)	Zip Zap	Imagine	Spectrum	£5.50
▲	16 (—)	Golf	C/Rentals	Spectrum	£5.95
▲	17 (—)	Scrabble	Psion/LG.	Spectrum	£5.95
▲	18 (19)	Football Manager	Addictive	Spectrum	£5.95
▼	19 (16)	Yomp	Virgin	Spectrum	£5.95
▲	20 (23)	Tranz AM	Ultimate	Spectrum	£5.50
▲	21 (—)	3D Deep Space	Postern	Acorn	£8.00
▲	22 (24)	Monsters in hell	Softek	Spectrum	£6.00
▼	23 (22)	Xenon 1	IJK	Oric	£8.50
▲	24 (—)	Xadom	Quicksilva	Spectrum	£6.95
▼	25 (18)	Hall of Things	Crystal	Spectrum	£7.50
▲	26 (—)	Blue Max	Synapse	Atari	£27.95
▲	27 (—)	Cookie	Ultimate	Spectrum	£5.50
▼	28 (20)	Heathrow ATC	Hewson	Spectrum	£5.50
▼	29 (13)	Pool	CDS	Spectrum	£5.95
▲	30 (—)	Hunchback	Superior	Acorn	£7.95

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# PCN Charts

Neither mail order nor deposit-only orders are included in these listings. The prices quoted are for the no-frills models and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and, like the games, is updated every alternate week.

PCN Charts are compiled exclusively for us by MRIB (Computers), London, (01) 408 0250.

## HARDWARE

### Top Twenty up to £1,000

MODEL	PRICE	DISTRIBUTOR
▶ 1 (1) Spectrum	£99	(SI)
▲ 2 (3) CBM 64	£229	(CO)
▲ 3 (4) BBC B	£399	(AC)
▼ 4 (2) Vic 20	£140	(CO)
▲ 5 (6) Texas/99/4A	£99	(TI)
▼ 6 (5) Oric 1	£99	(OR)
▶ 7 (7) Dragon 32	£170	(DD)
▲ 8 (9) ZX 81	£45	(SI)
▲ 9 (12) Atari 400	£150	(AT)
▼ 10 (8) Atari 800	£300	(AT)
▶ 11 (11) Colour Genie	£168	(LO)
▼ 12 (10) Sharp MZ80A	£349	(SH)
▲ 13 (14) Aquarius	£70	(MA)
▲ 14 (15) Lynx 48/96	£225	(CA)
▲ 15 (16) CGLM 5	£150	(SO)
▲ 16 (17) Sharp MZ700	£240	(SH)
▲ 17 (20) Apple IIe	£969	(AP)
▶ 18 (18) Epson HX20	£472	(EP)
▶ 19 (19) Nascom 3	£349	(NA)
▼ 20 (13) Tandy Colour	£240	(TA)

### Top Ten over £1,000

▲ 1 (2) Act Sirius	£2,525	(ACT)
▼ 2 (1) IBM PC	£2,390	(IBM)
▲ 3 (10) Apple III	£2,780	(AP)
▼ 4 (3) DEC Rainbow	£2,714	(DEC)
▼ 5 (4) Commodore 8000 series	£1,200	(CO)
▲ 6 (7) Epson QX10	£1,995	(EP)
▼ 7 (5) HP86A	£1,438	(HP)
▶ 8 (8) British Micro	£1,495	(BM)
▼ 9 (6) Olivetti M20	£2,400	(OL)
▼ 10 (9) Ajile	£2,995	(AJ)

AC Acorn Computers. ACT — ACT. AJ — Anderson Jacobson. AP — Apple Computer. AT — Atari International. BM — British Micro CA — Computers. CO — Commodore. DEC — Digital. DR — Dragon Data. EP — Epson. HP — Hewlett Packard IBM — IBM. LO — Lowe Electronics. LL — Lucas Logic. MA — Mattel. OL — Olivetti. OR — Oric. SH — Sharp. SI — Sinclair. SO — Sord. TA — Tandy. TI — Texas Instruments.



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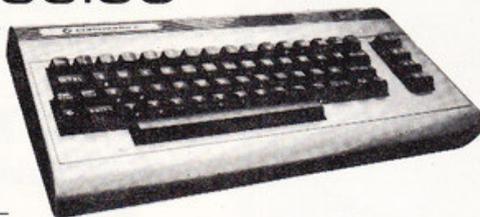
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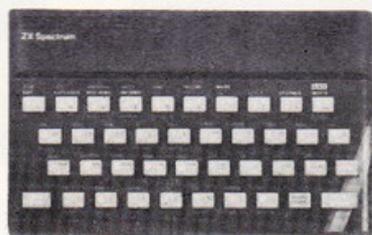
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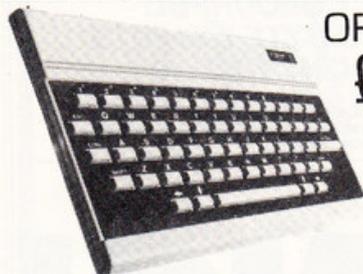
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## Oric's Zodiac solution

I have just solved the G M Philips version of ZODIAC. If any reader is stuck at any point and would like help ask him to send a stamped addressed envelope to 199 Aldfrid Place, Newton Aycliffe, Co Durham DL5 4QG, and I would be glad to help.

It is the 48K Oric version.  
*Stephen Vallis,  
Co Durham.*

## A consumer's criticism

On a recent shopping trip my mum and I went into shops to get 'hands on experience' with home computers. Having been into computers for three to four years, I had some idea of what I was looking for, and I'd been giving my mum some advice! However, we soon realised there were more problems in computer sections of shops than were mentioned in previous *Random Accesses*.

In one shop there were nine popular computers in a small room. The Sharp was turned off, the Ataris and TI had cartridge demo software *RUN*ing on them, which soon became boring, and all the other computers had kids writing two-line programs.

The computers were arranged so the VDUs were face level, and the keyboards waist level, very awkward, and involving a lot of head movement. We were about to ask the

### PCN £10 Star Letter



assistant about the computers when we heard him answer a man inquiring about educational software for a micro: 'I expect so, I'm not sure, have a look on that shelf over there'.

In the next shop, an electrical equipment shop, the display of five micros was not significantly more roomy, but the displays were nearer to the keyboard, and the shop only allowed children accompanied by parents to play with the machines — a slightly controversial approach, but it worked. The assistant established our needs,

# RANDOM



Don't carry a **LOAD** on your shoulders, unburden yourself on *PCN's* letters page.

showed us the Commodore 64, explained the machine's facilities, and was not stumped by Simon's Basic.

In the light of this, here's some advice to shops:

Spread out computers. Place computers in comfortable positions.

Devise some way to prevent the idling two-line program players.

Train your assistants well, and find someone who is keen.

*David R Heath-Whyte,  
Chalgrove, Oxford.*

## Prototype Elan had us fooled

In your mention of the Elan computers when reporting the PCW Show (Issue 31), you state the demonstration was produced by a video tape recorder.

This is not true. The capabilities of the Elan Enterprise have never been demonstrated by use of a video tape recorder. At the PCW Show and elsewhere the demonstrations were being produced by prototype computers containing circuitry directly equivalent to that of the Elan Enterprise 64.

Because of the complex circuitry of the computer, which is implemented using custom chips in the production model, the prototypes contained standard chips which could not fit in the standard box. These were separately mounted and connected to the computer keyboard units by cable. No secret was made of this.

Of course, all demonstrations (which were programs contained in EPROM) were controlled from the computer keyboards.

This makes me wonder if your faith in us is such that you expect us not only to create home computers with outstanding features, but also to design video tape recorders the like of which has never been known.

*Robert Madge,  
Elan Computers, London.*

*Our apologies, but on the final point, we live in hope — Ed.*

## Basic takes a beating

I have some sympathy with Messrs Kramer and Daldey (Issue 30). However, I feel they are both missing the point.

Someone, somewhere, has decreed that most micros should use Basic, indeed, they have it in ROM so you are stuck with it. This language was designed as a simple language for beginners. It is quite true it is difficult to use without a lot of POKES, but this is a reflection on the limitations of the language. I carefully picked a machine on which I can use various languages.

As for the manuals, the Vic-20 one is pretty useless. Sure it tells you what to do, but it gives no clue why you should do it. I suspect manual writers are out of date on what's going on in schools. My youngest son was introduced to micros three years ago when he was seven. His reaction when shown a Vic-20 manual was to chuck it in the bin. The best manuals I have seen are those for the Sharp M280B and the Dragon (though the latter contained a long errata list).

*R H Hill,  
Woodford Green, Essex.*

## Timely warning saves the day

May I express our gratitude to your excellent magazine for your article giving information of the hardware changes in the Sinclair Spectrum (Issue 32).

Our company, which has been established three years and caters for the specialist market of amateur radio and short-wave listeners, has just launched a system using the Spectrum for decoding and displaying morse code and radio-teletype signals. The system depends upon the use of the EAR socket on the Spectrum. Our nationwide advertising campaign had just been published in the specialist press, and we had commenced receiving orders and enquiries when we read your article. Imagine our horror when having tracked down an Issue 3 machine we discovered our system was not compatible with it.

We found no consolation in the letter from Sinclair that we, among others, were guilty of making certain assumptions about the Spectrum which were completely unsupported and undocumented by them. We always mask irrelevant bits in our programs, but this one is *relevant*. For such a statement to be 'supported' I would expect the manual to contain more information than:

'D6 is the value at the EAR socket' . . . and 'sometimes, though, the Spectrum hardware might get in the way.'

We believe the Spectrum would be very poorly supported by software, if the only programs were those created solely from their documentation.

Thank you, *PCN*, for without your timely article we would have had many dissatisfied customers, and almost certainly a financial disaster. We managed a holding operation until we solved the problem.

*G E Mason,  
RADSOFT, Sunderland.*

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**Write to:** Routine Inquiries, *Personal Computer News*, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

## Oric-1 ROM revisited

**Q** If you run the following program, it displays a part of the Oric's ROM, including the ERROR messages and the commands.

```
10 FOR X = 49386 to 60122
20 C = PEEK(X)
30 PRINT CHR$(C);
40 IF C < 100 THEN NEXT
50 PRINT:PRINT
60 NEXT
```

I have 3 questions: the program shows three commands that are not in on the Oric *ie* INVERSE, NORMAL and AUTO — how come? Can these be accessed by an m/c routine or by pokes or by CALLing the code?

How does the Oric work? Does it read the ROM into RAM for the keywords and if so where? I've seen a program to change the keywords and error messages on the Vic-20 so is it possible on the Oric-1?

Is there any way to change the border colour on the Oric?

Nick Paul,  
Dyfed, Wales.

**A**UTO is part of the ORIC's command set: it's not used to automatically number your program lines as with machines like the BBC, but to make a program RUN automatically once its LOADED. It's used like this:

```
CSAVE"NAME",AUTO.
```

The other two commands will give SYNTAX ERROR if you try to use them. Some say this is because Oric began the ROM using the Basic from Tangerine, and as they then used serial attributes to set colour these commands became redundant but were never removed from the ROM.

To change the error messages is not easy, but here are a few pointers. The first thing you would have to do is devise a machine code routine for error trapping. This would get an error code from somewhere, possibly the accumulator, or it may be pointed to by the X and Y registers, but we don't have the exact information.

Your routine would then enter a loop wherein it took the

ASCII characters for the message you wanted, put them in turn into the accumulator, and then called the routine at F57B (which prints a character from the accumulator).

You will have to terminate your ASCII string somehow say with a null, and trap this in the loop.

To make your Oric jump into your routine when an error was encountered, you would have to DOKE 001B with the start address of your routine. 001B is where the Oric branches to when a Basic program stops — due to an error or a control-C, so it's useful for program protection as well.

The Oric ROM lies between addresses C000 and FFFF, it is not read into RAM; what you are probably thinking of here is that the character sets (ASCII and teletext) are read into RAM on boot-up. Exactly where these are depends both on the size of your RAM and whether or not you've used GRAB or RELEASE.

The border area you refer to is not able to be changed in any way as far as we know.

## Building a bigger vic-20

**Q** I am in need of some advice about expanding my Vic 20. I have a cassette unit and super expander cartridge. As finances are limited I am seeking the cheapest way to expand the memory and capabilities of the machine.

Also, is there any chance of printing a photograph of what the inside of the Vic 20 looks like. I am intensely curious about it but cannot touch mine until the guarantee runs out. I have in mind the possibility of some vacant chip sockets which might be filled to upgrade the machine to something like the 64.

Can you tell me how to go about setting up data files using my Vic? The two manuals I've got appear to be very sketchy on the subject?

R S Thorndycroft,  
Portsmouth, Hants.

**A** Unfortunately, by plumping for the super expander cartridge first you are somewhat limited now for cheap memory expansion. Although as a stand-alone unit the super expander is excellent value

offering both extra memory, and extra high resolution graphics and sound commands, it does mean that when you buy more memory you are committed to buying a motherboard too.

This is because the super expander does not duplicate the cartridge port. There are now a number of very cheap RAMpacks on the market, including one for 64K. Things to look for are switchable packs which allow you to reconfigure the set-up to different memory sizes at the flick of a switch.

If you want to use the super expander as well you need the motherboard which should also be switchable for convenience. You're probably looking at something like a £60 bill for these two items.

On the question of expanding the abilities of the Vic, once you have the memory you can do virtually anything you wish.

In the US the word is that the Vic is still outselling the 64 because there is so much software and so many peripherals available that virtually any application is possible.

As for opening up your Vic, save yourself the trouble. There are no empty ROM sockets inside . . . the cartridge port is the only way to expand — hence the need for a motherboard. Upgrading the Vic to a 64 is out of the question and is a fine lesson in not judging by appearances as there are several major differences.

Not least of these is the far superior dedicated graphics chip in the 64 which gives the sprite graphics facility, and the equally superior sound chip.

Finally, it is not that the manuals are sketchy on the subject of data files so much as that there's not a great deal to say on the subject.

To open a file to cassette use the following: OPEN 1,1,1. The first number is the file number, the second the device number and the third tells the Vic that you will be writing to tape.

You can give each file a name in the same way as you do with programs: OPEN 1,1,1, "YOUR DATA".

To get your information on tape use the PRINT# statement followed by the file number (1) then your data. The data can be in literal form *ie* PRINT#1, "This is the data", or in variable

form *ie* PRINT-1, A\$B\$, C, D.

To output a list of data simply use a FOR. . . NEXT loop but each item should be followed by a carriage return (PRINT# 1, CHR\$(13)). When you have finished writing data, make sure you close the file with a CLOSE1 statement.

To get the information off the tape simply open the file again but this time use command number 0 to tell the Vic you will be reading data (OPEN 1,1,0, YOUR DATA). You can then read the data either in individual characters with the GET# command, or in strings with the INPUT# command. Simple, isn't it?

## A Brother for your Spectrum

**Q** I have a 48K Spectrum and am considering buying the Brother EP-22 to use both as a typewriter and as a computer printer. The printer has a built-in RS232C type serial interface. What do I need to connect my Spectrum to this printer and where do I get it?

S Fifer,  
Enfield, Middx.

**A** First of all, it's theoretically possible to interface almost anything to almost anything else.

But the problem is turning the micro's output into something that the output device — printer, typewriter, hair dryer — can understand. The Spectrum on its own has neither a Centronics or RS232 interface, and therefore as far as printers are concerned can communicate with precious else but the ZX Printer.

But all is not lost — Sinclair's own Interface 1 has an RS232, and there are a number of Centronics interfaces on the market for the Spectrum.

Now you have your 'sending' end sorted out, you next have to think about your receiving end. In the case of the Brother, this is easy, as its RS232 will allow kit to receive data from a Spectrum with Interface 1.

So when you buy your Brother, buy it from a dealer who's willing to make up the correct cable for you. In fact, in a lot of cases, it's best to buy from the dealer who's willing to make up the cables you need, and sell them along with whatever you're buying.



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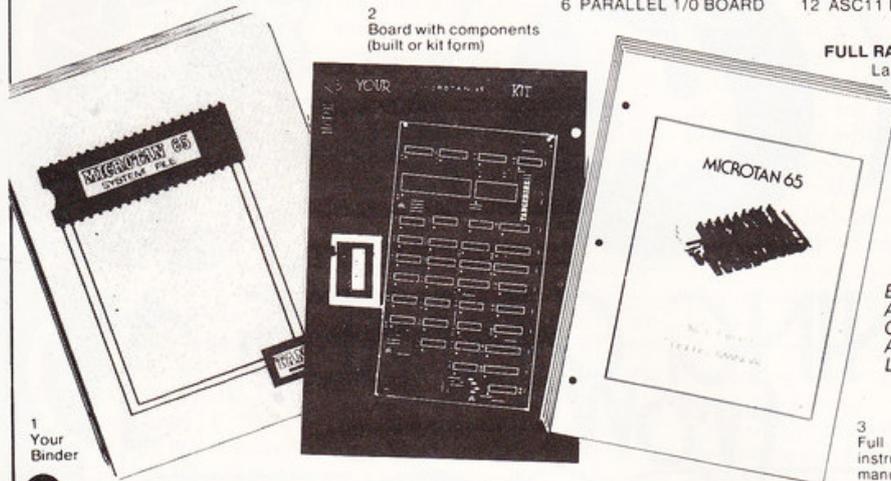
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## Putting copyright on your Oric-1

The suggestion by A Hutton in PCN Issue 35 for obtaining the copyright symbol in a REM statement was an excellent one.

There is, however, no need for the relatively 'hit and miss' process of attempting to PLOT CHR\$(96) at the appropriate position on the screen.

All that is required is to type the desired line without the copyright symbol and, after executing RETURN as a direct command, PRINT CHR\$(96).

The desired line should then be copied into memory using CONTROL A up to the point where the copyright symbol is to be inserted. The cursor can then be repositioned over the copyright symbol, which has been printed on the screen, by use of the cursor keys and then copied with CONTROL A.

Finally, the cursor keys should be used to move the cursor back to the next character in the REM line and copying continued to the end of the line.

D J Farmer,  
Rugby,  
Warwickshire.

## HIRES routines in the Oric-1 ROM

In PCN, issue 34, Routine Inquiries, Matthew Villard wanted to know the addresses of certain Oric ROM routines. The HIRES routines can be found as follows.

Routine	Address
CURSET	#EBDF
CURMOV	#EBE2
DRAW	#EBE5
CIRCLE	#EBE8
PATTERN	#EBEB
CHAR	#EBEE
POINT	#EBF1
FILL	#EBFA

Parameters are passed through

the PARAMS area. This area is a set of 2-byte registers starting at #2E1 eg CURSET X,Y,FB is translated as follows.

X is deposited in #2E1,#2E2  
Y is deposited in #2E3,#2E4  
FB deposited in #2E5,#2E6

As all these have maximum values of less than 255, the high byte in each case is zero. The value passed back in POINT can be found in #2E1,#2E2 on return.

(The source of all these details is the FORTH cassette with the optional HIRES routine)

Andrew McDermott,  
Faringdon,  
Oxon.

## Taking the stripes off the Lynx

Some Lynx owners may have experienced problems with obtaining a stable TV picture. On my black and white portable, the problem is wavy verticals and frame tearing at the top of the screen.

The picture can be much improved by changing the values in two registers of the 6845 CRTIC chip. The two are: R3, Synch Width and R4, Vertical total.

To alter R3 run:

```
10 OUT &86,3
20 OUT &87,N
```

with differing values of N

To alter R4 run:

```
10 OUT &86,4
20 OUT &87,P
```

with differing values of P.

On my TV set the best values are N=6 and P=74.

Bob Towers,  
Hamilton,  
Scotland.

## A DIM view of byte arrays

When writing data storage programs for the BBC and Electron computers, it is often more economical on memory to use byte arrays than Basic arrays for string storage. It would be handy to dimension a number of byte arrays and put the start addresses into a Basic integer array. However, this cannot be done directly. That is, the program below will not work, because of the bad DIM at 30.

```
10 DIM address%(50)
20 FOR stores=0 TO 50
30 DIM address%(stores) 100
40 NEXT
```

However, it will with the addi-

tion of  
25 DIM temp 100  
30 address%(stores)=temp  
Apparently, and fortunately in this instance, there is no error generated when a byte array is re-dimensioned.

J W Penfold,  
Benfleet,  
Essex.

## Make your BBC program safer

Methods which protect programs from being listed on the BBC microcomputer and which rely on inserting a character to turn off the VDU, can always be defeated by listing the program from a line after the one with the special character in it. An alternative protection mechanism, without this fault, is outlined below.

1 Find the value of TOP for the program to be protected.

2 Insert the statement: LOMEM=(value of top)+20 at the start of the program.

3 Find the new value of TOP, on hex.

4 Type in: ?(TOP-1)=0

5 Type in: \*SAVE "NAME"  
EOO new value of TOP in Hex BD2C.

(EOO is the value of page on a cassette system and BD2C is the action address of RUN in Basic 1)

6 In Basic 1, at least, the program can be loaded and RUN by typing: \*RUN "NAME". Otherwise the program can be loaded and run as normal but cannot be listed.

D J Pilling,  
Blackpool,  
Lancs.

## Vic-20 machine code routines

Here are some routines that a Vic-20 machine code enthusiast may find useful.

What follows is a brief description.

1 &D1AA This converts a floating point number in the floating point accumulator into an integer held in standard low/high byte format in the Y register and the A register.

2 &D391 This converts an integer held in the Y and A registers into a floating point number and puts it into the floating point accumulator. It is exactly the opposite to the first routine.

These two routines are useful because the argument to the

USR(X) function is placed in the floating point accumulator. These routines therefore allow you to easily pass a parameter to a piece of your own code, and also pass one out to Basic, since the result given to Basic is whatever number is left in the floating point accumulator on returning from your machine code routine.

3 &DDDD This routine takes the floating point number held in the floating point accumulator and converts it into an ASCII string, starting at &0100. The end of the string is marked by a zero byte. The number is not printed, however, so unless someone knows of a routine to do this, the following machine code routine can be used.

```
LDX #&00      ;Initialise X reg
                ;digit
LDA &0100,X   ;Load
                ;accumulator
                ;from location
                ;plus X
INX           ;Next char
JSR &FFD2    ;Print the ACII
                ;char in A
BNE digit    ;If char is not
                ;zero then next
                ;char
```

Andrew Dilley,  
Godalming,  
Surrey.

## OLD features on new machines

One of the features sadly lacking on the Dragon 32 is the ability to OLD a program, once it has been NEWED. When using machine code, it is very easy to cause a program crash and lose many hours work. The program below, is a short machine code routine which will reinstate any program that has been NEWED, or crashed in any other way, providing that the power supply has not been interrupted.

The routine will bring back a lost program on entry of EXEC 32750. However, the program will not work if a new Basic line has been entered or a new variable assigned.

```
10 CLEAR 200,32749
20 DATA
   158,25,189,131,48,2,159,
   27,159,29,159,31,57
30 FORT=1 TO 14
40 READ
   A:POKE32749+T,A
50 NEXT T
Andrew Williams,  
Southport,  
Merseyside.
```

A lookalike, soundalike Torch, but Susan Curran finds plenty to distinguish it from the old flame.

# How bright the Tiger?

Contrary to the received wisdom of a year or two ago, the 8-bit business micro is not dead yet. The Epson QX-10 has hit the best-seller lists, and on a more modest scale Cambridge is making a name for itself as the home of 8-bit multiprocessor colour communicating micros.

A pretty limited class, one might think, and it's hardly any wonder that Torch should have grumped when its neighbour H/H came up with the lookalike, soundalike Tiger. In fact there are plenty of differences between the two machines — different secondary processors, for a start — but there are real similarities, too.

Though this is H/H's first computer, it isn't the proverbial two-men-and-a-dog new computer company, but a fairly large and established manufacturer of electronic audio equipment. The Tiger's design was bought in from Tangerine, but the machine has been assembled by H/H. The first prototypes saw the light of day in the summer, but H/H didn't offer the machine for review until it was in production, and the model I looked at is a production version.

It's a three microprocessor computer. A Z80A running at a nifty 4MHz does the main processing and gives access to the inevitable CP/M based business software. That has 64K of RAM, of course, plus a small (0.5K) CMOS RAM used to hold phone numbers and similar rarely-changing information.

There's a 6809 — better known as the graphics-oriented chip inside the Dragon 32 — as an Input/Output controller, with 2K of RAM to itself. And there's a mighty 96K of RAM dedicated to the graphics, with an NEC 7220, a very highly regarded new chip, to control it. This makes for a comparatively speedy CP/M machine with exceptional colour graphics capability built in. There's also a built-in auto-dial, auto-answer modem, which gives access to Prestel, and makes for easy computer-to-computer communications.

## Presentation

The Tiger arrived exactly when promised, in two large cardboard cartons, and with a mountain of software. It's a departure from the normal three-box design. Instead, there's a keyboard and processor unit, looking rather like an oversized Dragon or BBC micro, and a separate combined monitor and disk unit.

This is a strange and, to me, rather puzzling choice. It gives the machine a massive footprint, for a start. Even when the CPU/keyboard is pushed as far under the monitor as it will go (it still sticks out a fair bit), the configuration takes up 79 cm from front to back. It's going to need a desk to itself.

The CPU is elegant and low, with a

nicely raked keyboard, but it's too slim to hold any expansion boards. But to be fair, the Tiger comes with most of the extras you might want built in. The drive/monitor unit takes up, if anything, less space than it would if it held a main board and an expansion cage, and the two need to be linked by three separate cables: one for the VDU, one for the disks, and one for the power supply.

All the ports are located at the back of the CPU unit, except for the disk connectors (three, allowing for expansion) which snake from its underside — again, rather BBC-like. There's a cassette port, which is very unusual on a business machine, and once more like the Torch — though on that it's handy for BBC software. There's also the option of a UHF controller, so you could, if you wished, carry the CPU unit home and use it as a home computer. However, the Tiger isn't portable in the conventional sense: the CPU unit alone weighs a hefty 13lb.

Both cases are finished in a creamy beige, and the general design is solid and pleasing. The box even included a 'Tiger Care' impregnated cloth for wiping the computer clean.

The machine has minimal options for expansion — or contraction — at the

## 'It comes with most of the extras built in'

moment. The dual floppy colour version is standard, though it's possible to add either further 5¼in or IBM-compatible 8in floppies, or a hard disk to it. It comes complete with CP/M, but without any applications software included in the price.

## Documentation

Tiger's approach centres around presenting a nicely finished product, with all the loose ends tied up before it hits the market. The Programmers' Manual wasn't complete at the time of review, but the User Guide and Reference Manual both came in a finished form. There's also a very slim document which describes the demonstration graphics programs included on the system disk.

The User Guide is a clearly written effort aimed at putting across the basics to a naive audience. It includes pictures and diagrams, and gives the basic information needed to get the system working. The Reference Manual is aimed at high-level programmers and other more sophisticated users, and contains enough information on CP/M and on the graphics commands to get a Basic programmer

started. Again it's well written, and working from it I had no trouble using the graphics capabilities from Basic. However, it's short on technical information, which is where the Programmers' Guide will presumably come into the picture.

H/H isn't a secretive company: the sales brochure contains a larger colour picture of the neat main board, with all components labelled and described. I went back to them with a few queries, and received clear and lengthy instructions over the phone.

Both these guides are excellent examples of their kind, as are Tiger's software manuals. They are all spiral bound, with appealing and reasonably robust blue covers.

## Keyboard

The main keypad is a creamy beige to match the computer casing, while the cursor control/numeric keypad is slightly darker. The ten functions stand out a mile: eight of them are brightly coloured in the eight screen colours. Outside programs they are used for changing foreground and background colours, and it's easy to tell which controls which colour.

There's a sensible, and not unduly expansive, key layout, with caps lock (which locks down mechanically, as on a typewriter — a nice touch) and shift lock (with an associated light), keys in the conventional places, and a couple of extra screen controls. It was disappointing to discover, however, that the entire keyboard is hard, so not even the function keys can be reprogrammed. That is, they can be read by application programs, but they can't be programmed to return a string of commands.

The character set isn't large by current standards, and both hash and pounds keys returned the same code which doesn't generate a pounds sign on my printer. Otherwise, it's a pleasant keyboard with positive feel.

The reset button is sensibly and safely located on the underside of the CPU unit. There's a type-ahead buffer, which worked, albeit sometimes unpredictably, in the word processing package.

## Display

Display is the Tiger's strong point. There's a large and clear 14in colour screen, with the standard eight teletext colours all coming across brightly. This version was reputedly coated with long-persistence phosphor (available as an option for graphics applications) but it behaved quite normally for text and was slightly flickery for graphics, so perhaps this wasn't really the case.

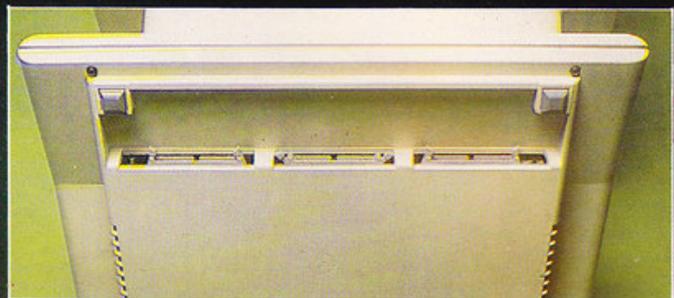
I had no trouble working with my back to a window, so I didn't try to adjust the contrast, which is a tricky business involv-



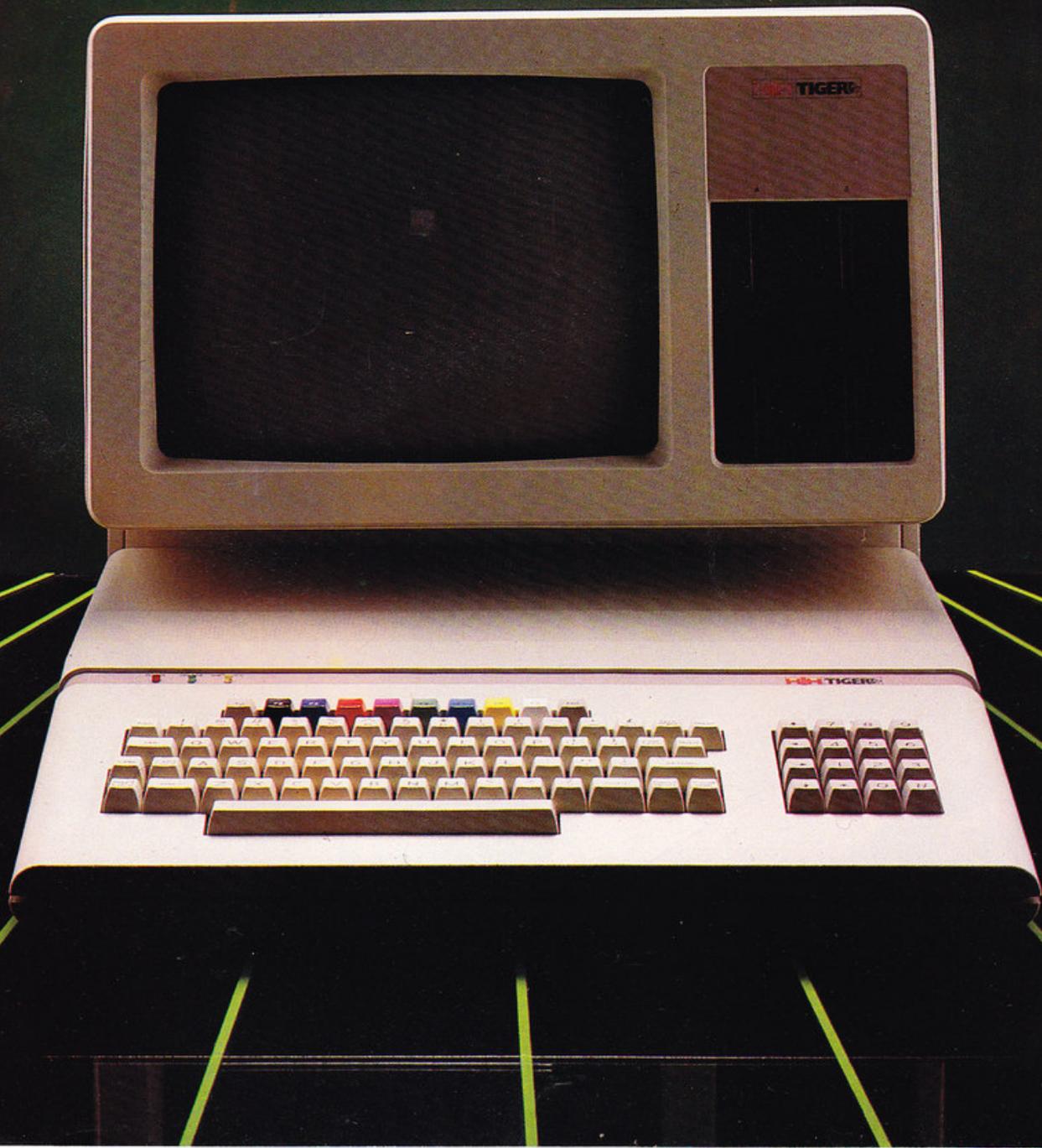
The most obvious visual feature of the Tiger is its large 'footprint' (the surface area occupied on the desk-top). Some of this bulk is apparent in the rear view (above). The colourful function keys are eye-catching (below) but not as interesting as the design might indicate. They cannot be programmed to return a string of commands; they can only be 'read' by the application programs.



The rear of the CPU snuggles in against the combined VDU/disk drive unit — most of the necessary connectors are located here.



The three disk drive connectors are under the front of keyboard.



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◀18 ing a screwdriver. No other controls are provided, and the screen can't be tilted, though I didn't find this a problem.

Three modes are available: 80 × 24 text, teletext-type 40 × 24 text, and graphics. The full colour range is available in both modes, and the teletext attributes can be set in either serial or parallel, so there's no need to leave gaps on the screen when changing them, as there is with the BBC/Torch.

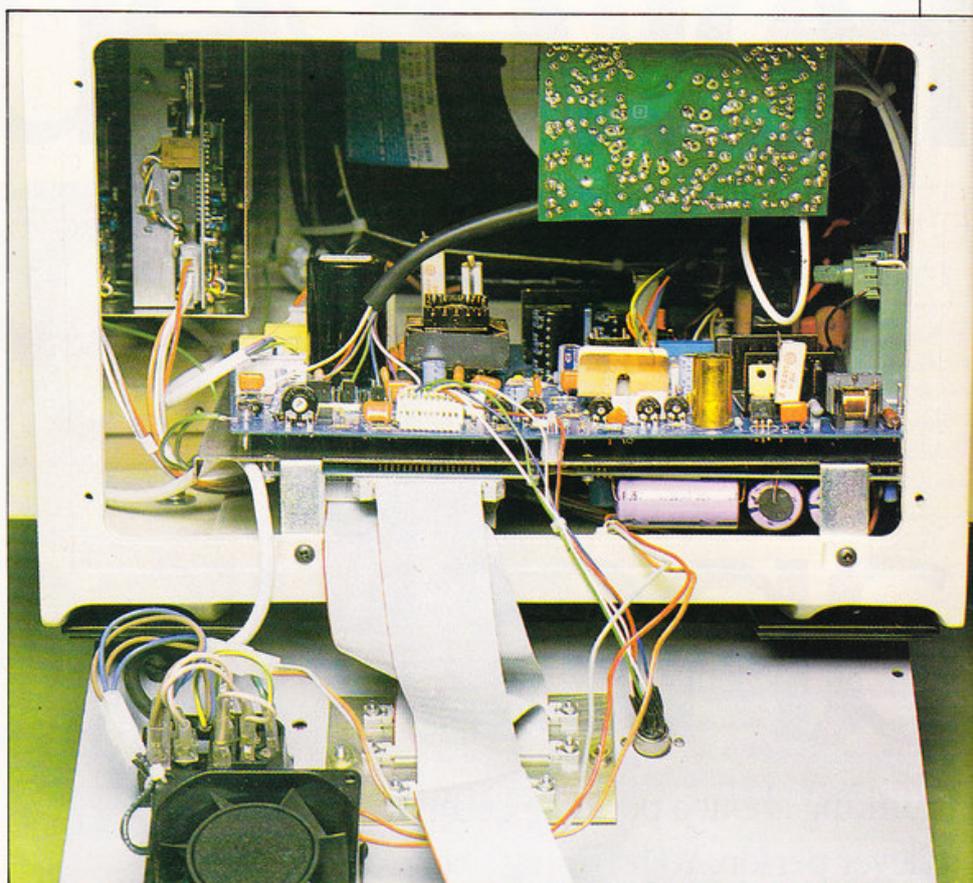
The character set is clear and pleasant, and there are mosaic graphics, but no little men, copyright signs or other extras. It isn't possible, as far as I could tell, to redefine or add to the character set.

One interesting possibility is to set up

## 'The display is the Tiger's strong point'

two displays, one to show graphics and the other to hold a text screen while developing a graphics program. This is quite feasible if a second VDU port is fitted as an option.

In graphics mode a square 512 × 512 pixel area of the screen is used, leaving a large black border. All graphics commands are given by reference to pixel addresses, and the screen is numbered fairly conventionally from the bottom left-hand corner. The graphics commands provided via the 7220 include line and point drawing, circle and rectangle fill and outline, and a rather awkward way of



incorporating text.

There's a pattern register which can be used to fill areas with patterns or to simplify producing intermediate shades, and shapes can be rotated.

The most powerful features are the pan

and zoom commands. It's possible to enlarge any area of the display up to 16 times, and then to pan across giving pixel address to locate the display area. This feature is shown to good effect in the otherwise rather pedestrian demos that come on the CP/M disk. A special graphics demo disk provided some exciting examples.

Naturally, all eight colours can be used at any position on the screen, so there's no difficulty in producing very detailed multi-coloured graphics. All the graphics commands are given by ASCII sequences when in graphics mode, and I managed to access them from the unexpanded Microsoft Basic, using rather clumsy strings of PRINT commands.

A serious user would obviously need purpose-written software, but this pretty basic method produced displays which were written and updated at a very acceptable speed.

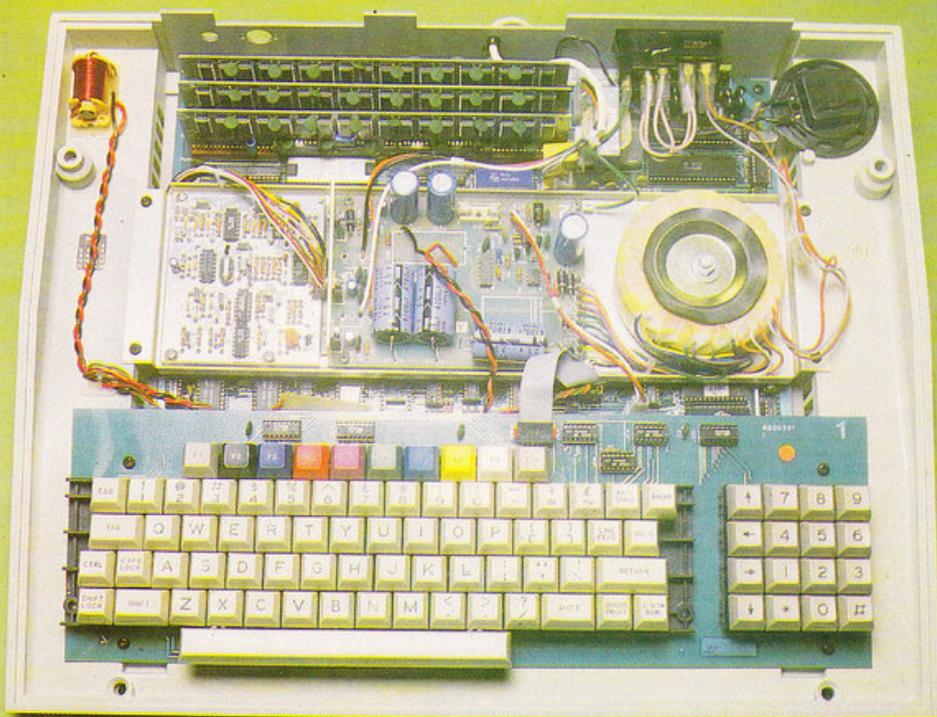
### Storage

The drives are Mitsubishi-made, and very high capacity: 1 megabyte unformatted, and around 720K formatted. I found them a little noisy during access, but very reliable. The fan incorporated in the display/drive unit was, in contrast, commendably quiet.

### Software

Tiger has a very strong policy on software. All the dozen or so packages arrived in Tigerbyte-labelled boxes with Tiger-oriented names on them: Tigerword, Tigercount, Tigerlist and so on. Inside many of them were unadulterated Peach-tree manuals with quite different names,

**The VDU unit (above) needs a fan to keep the tube and twin drives cool. Unfortunately, the silence generated by the fan can be drowned by the rather noisy drives. The three processors and associated RAM are housed in the keyboard unit (below).**



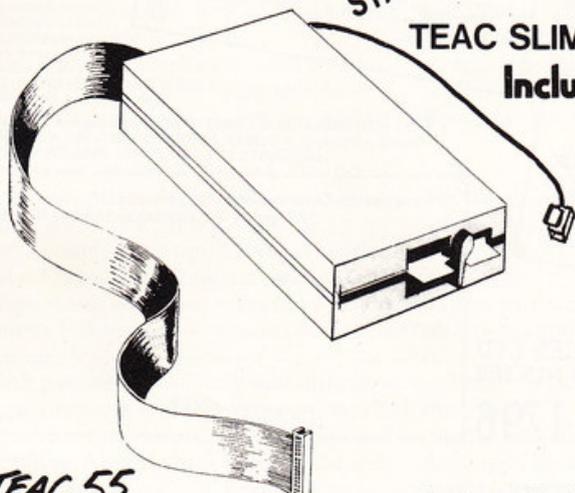
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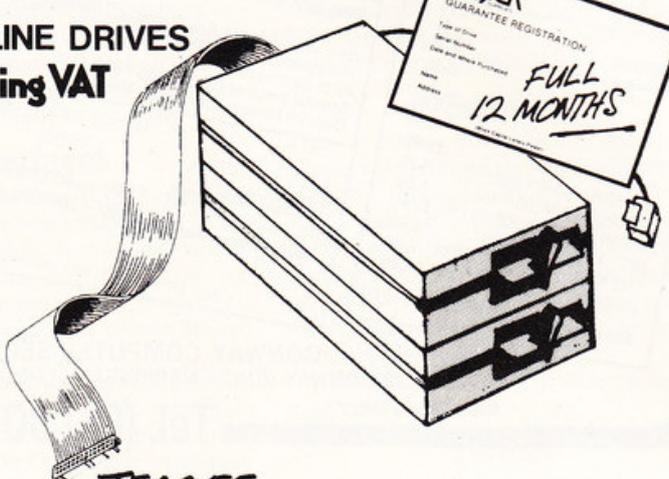
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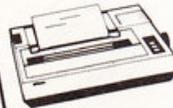
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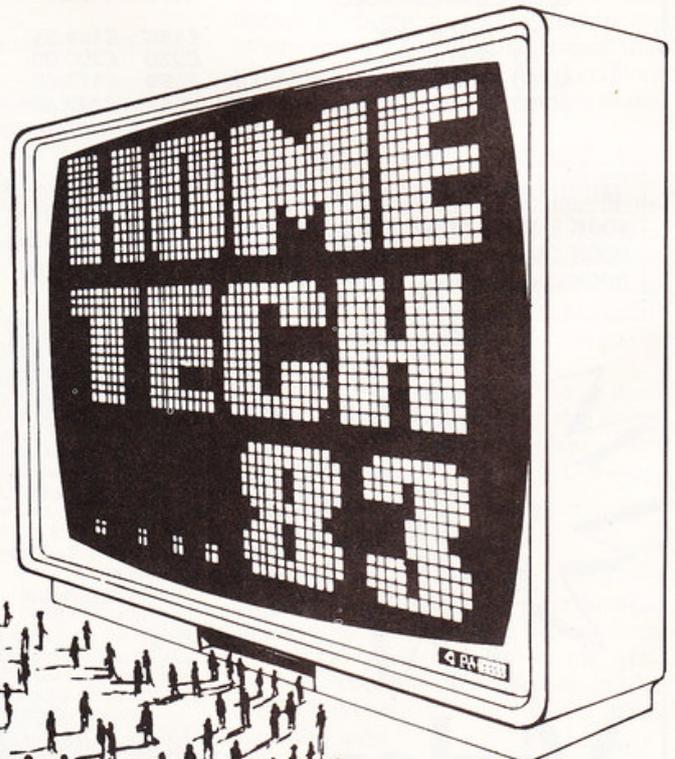
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but when it came to the floppies Tiger had gone back to work, and every one was neatly wrapped in a sealed polythene bag, and encased in the regulation pale blue and white.

By far the biggest stack was of Peachtree software, including Peachtext, a Spelling Proofreader, Mailing List Manager, Inventory Management, and a complete set of accounting ledgers. Peachtree produces beautiful manuals in cloth-covered ring binders, encased in green library cases. Inside, they are all clearly written and properly anglicised. There was even found an apology when a command demanded an American spelling.

The packages have been properly adopted to use the Tiger keyboard, with clear plastic function key overlays provided for a couple.

The accounting software wasn't tested though it looked very competent: the payroll included statutory sick pay and so on. Peachtext/Tigerword, which I hadn't encountered before, proved to be a pleasant surprise. It has a clear editing screen, good commands, and a lot of power, though it's not quite up to Wordstar standard in handling long documents. The main problem with this — and to a lesser extent with Wordstar — was on the screen handling.

Both packages obviously had difficulty making proper use of the screen memory, and rewrote the screen continually instead of scrolling. Moving backwards in the text was a particular problem. Peachtext swaps regularly between a text screen and an editing status screen, and with 96K to play with it seemed a little ridiculous that it couldn't hold both in memory instead of rewriting on each swap. The rewrites were fairly fast, but not fast enough; the program otherwise responded very promptly.

Tigerplan appears to be an implementation of Sapphire's MARS spreadsheet/management reporting/business graphics system, and this worked well. There was also the inevitable Microsoft Basic, version 5.2.2., and Tiger's own Prestel program which has, a few touches that Torch's lacks. No obvious gaps, but the communications software, Prestel apart, is admittedly not yet anywhere near Torch's standard.

All the software packages seemed to be sensible choices, and when I mentioned packages not originally included — Wordstar, BBC Basic — to Tiger, copies of these too turned up in short order.

However, it may be that most would-be buyers will want to know which well-known package Tigerword, say, is, before forking out several hundred pounds.

Tiger is really an applications micro, and languages lag behind business packages, but the Microsoft standards — Cobol, Fortran, Pascal — should all appear shortly, and probably Forth too. As it's a standard CP/M machine and can take programs straight off standard format 8in disks, there should be no problem in obtaining any CP/M software.

Graphics software is obviously crucial.

Digital's GSX package was almost-but-not-quite ready at the time of review, but the well-established mini-based GINO-F was up and running.

A demo came in time for review, with the real thing promised a few days later. As I'm no Fortran programmer (GINO's a set of fortran subroutines), the demo did fine. GINO covers a wide range of business graphics and CAD territory, and can handle shape mirroring, rotation, scaling, shearing (that is, perspective effects) and 3-D.

The demos worked fast and impressively, and the package should pack enough power to make the Tiger a good choice for designers.

None of the software except CP/M is free, and this is an obvious drawback at a time when bundled software is becoming more and more common. Maybe Tiger will rethink this strategy and offer at least the Basic with the machine before long.

## Interfaces

The usual Centronics and RS232 interfaces are standard, and there's also an IEEE 488 — for Winchesters etc — and networking interfaces, a light pen port and the aforementioned cassette port. The latter is clearly an anomaly, and few users will need it.

There's a jack plug to the phone, as with the Torch. You just plug into a suitable phone socket, and tell the computer to get dialling. This makes the Tiger extremely easy to use as a Prestel terminal, and it should be just as good for electronic mail once the software has been developed. In short, a very good range of interfaces which will fulfill all normal requirements.

## In use

There's not a great deal more to say about the Tiger in use: when you're not in graphics mode, it's a pretty standard CP/M machine. Nothing amazing has been done to make it user-friendly, though it has some nice touches like an inbuilt clock, the CMOS memory — which can be rewritten after adjusting a security switch — and a commendably short start-up routine.

After the eccentricities and occasional exasperations of the Torch, it has an air of competent solidity about it.

Though business software has been running on 8-bit micros for years — and this generation of packages is very well proven — 64K of RAM does seem a limitation by today's standards, and one which the high-capacity disks don't altogether compensate for. In conventional use, this RAM limitation is far more significant than the extra processing power which 16-bit machines give. The provision of the separate graphics RAM means that a little more than usual is freed for applications use, but there's no easy way to expand the machine in this direction.

Tiger has conspicuously not gone for the virtual disk approach used in some other new machines like the Miracle. The machine works fast, but the need for comparatively frequent (compared to 16-biters) disk access will certainly slow down large-scale applications.

## Support

Tiger is clearly going all out for a solid image, carried right through software and support services. The company has appointed around 70 dealers, allocated machines to them, and carried out dealer training before even sending machines for review — a welcome touch in a market where many trumpeted machines aren't even working in prototype.

Both machine and software reeked of quality.

## Verdict

Obviously 8-bit colour graphic communicating micros aren't everyone's cup of tea, and with this mix of capabilities the Tiger is markedly more expensive than a very basic CP/M machine, even though it compares favourably with most such machines expanded to support colour graphics.

Tiger would make a superb upmarket executive machine, the Rover of the micro world perhaps, particularly with its Prestel capability. And it has obvious appeal for designers, advertising firms and other people who can make full use of this level of graphics capability.

Not a machine that's likely to take over the micro market, then, but an excellent choice if you're looking for a computer with colour graphics, Prestel, and reliability for mainstream business applications.

### SPECIFICATION

<b>Prices (ex VAT)</b>	Standard Tiger incl 2 floppies, colour monitor, graphics and communications capabilities £2,795, 1 MB expansion disk (external) £490, 2 MB expansion disks (external) £775
<b>Processors</b>	Z80A (4MHz) plus 6809 I/O processor (2 MHz) plus 7220 graphics processor.
<b>RAM</b>	64K with Z80, 2K with 6809, 96K with 7220, making total 164K, plus 0.5K CMOS RAM with battery back-up. 62K available to CP/M.
<b>ROM</b>	2K with Z80, 16K with 6809
<b>Text screen</b>	80 x 24 or teletext-type 40 x 24, 8 colours
<b>Graphics screen</b>	512 x 512 pixels, 8 colours
<b>Keyboard</b>	88 keys, in unit with cpu, numeric/cursor pad, 10 function keys
<b>Storage</b>	2 x 1 MB (unformatted) floppies
<b>Interfaces</b>	RS232, Centronics parallel, IEEE 488, networking, light pen, cassette, disk expansion (5¼in or 8in), optional UHF or additional video monitor
<b>Operating system</b>	CP/M
<b>Distributor</b>	HH Microcomputers, Viking Way, Bar Hill, Cambridge 0954-81140

A simple electronics exercise can add sound to your Newbrain. Theo Kampermann is your guide.

# Sound on the brain

**W**ith the Newbrain now officially back from the dead, owners of the machine should be sure of some support for their micro. But even if the amount of hardware and software available for the micro starts to increase, it is liable to do so slowly.

There are simple add ons you can build yourself, and enterprising Newbrain owners have begun to write their own software. The device described here will allow you to produce simple sounds from your Newbrain, and in the near future PCN will be celebrating the return of the Newbrain by telling you how to write your own word processing program for it.

First, a word of warning. Make sure the series resistor you use is at least 390 ohm, as anything less is liable to damage your printer output. You should also make sure that you get the connections right, and that you make them neatly, avoiding short-circuits. Again, you could do quite a bit of damage, and it may be some time yet before the Newbrain servicing network gets properly cranked up again.

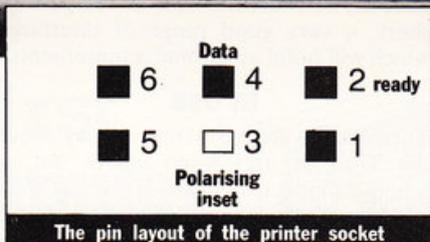
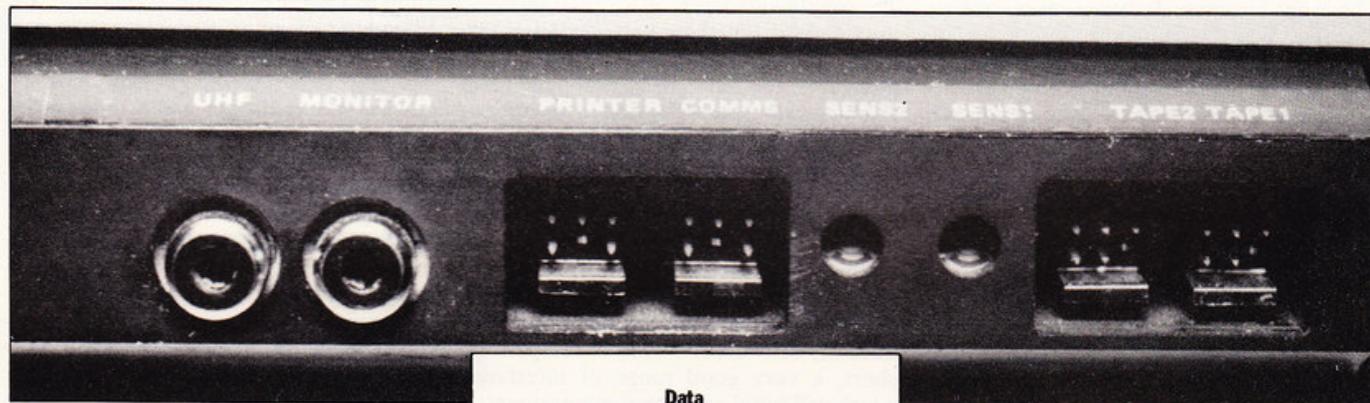
Figures 1 and 2 show the basic wiring diagram. Figure 1 shows how you wire up the circuit with only the 390 ohm resistor, while figure 2 shows the variable resistance/volume control wired in series with the resistor.

The variable resistor should be 0 ohm to

use that. Or you can use the cassette interface cable. Obviously it's best to use a spare, just in case anything goes wrong.

To use the cassette cable, take out the little white pin from the connector so that you can place it in the communications or printer connector. The chassis connection of the Remote plug then acts as connector pin 4, while the chassis connection of the Mic plug is pin 6. You then need to wire in your resistors, making sure you've put them in the right part of the cable, and connect up your speaker. A small 8 ohm speaker of the sort used in pocket radios should fit the bill.

Now you're ready to roll, apart from the fact that you're going to need software to



**E**ven after the recent — and much publicised — problems with the Newbrain, you probably still think your micro was a sound investment. But it's unlikely that you've thought much about getting sound out of your investment. Oddly enough, this is possible, and is also fairly easy.

The way you do it is to use the printer output, hooked up to a small speaker, to produce the sound. You can vary the baud rate on the Newbrain, and if you do this through the add-on device described here, you can vary the notes produced. If you wire it up with only the 390 ohm resistor, the system will still work, but in this case you won't be able to vary the volume level.

However, if you add a small variable resistor you'll be able to compose your masterpieces discreetly until you're ready for a full-blown concert career.

any size you like, although the larger the variation, the easier it will be to fine-tune your volume output. In effect, what you're doing by wiring the two in series is producing a variable resistor of 390 ohm upwards.

Figure 3 shows the pin layout of the Newbrain's serial outputs. So effectively your task is to wire the various bits of paraphernalia up to pins 4 and 6. Connector pin 6 is ground, while 4 is data.

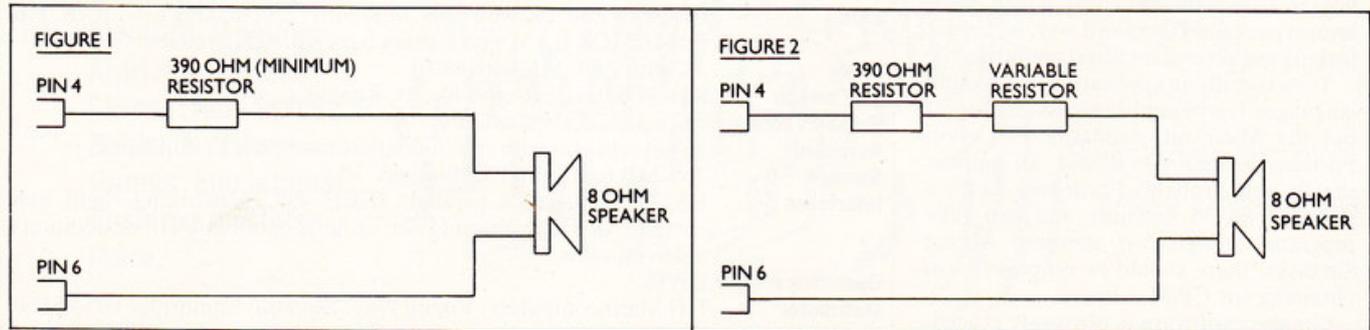
There are two ways you could make the link-up. If you're the proud owner of the legendary Newbrain printer cable, you can

control the notes you play. Try the following subroutine:  
 60000 OPENOUT #69,8 "1500"  
 60010 FOR I = 1 TO 100  
 60020 PUT #69, 169  
 60030 NEXT I  
 60040 CLOSE #69

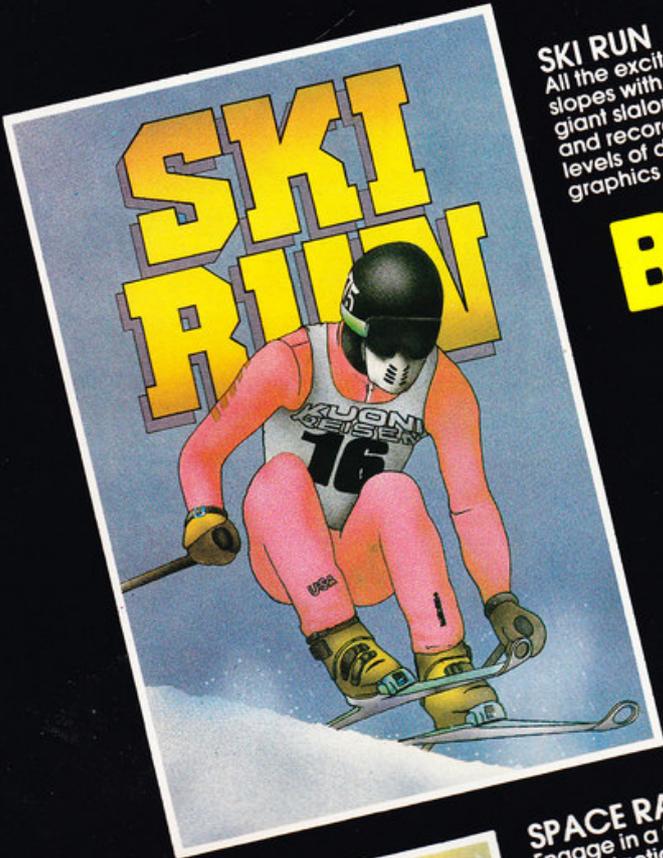
In the above program the 1500 in line 60000 is the baud rate, while 8 is the printer and 9 the communications connector. The numbers in line 60010 specify the length, while 169 in 60020 is the output byte.

In order to vary your output you can play with the baud rate, the number put into the stream and the length of the tone. Using 169 for the output byte gives you many transitions per byte while 0-255 sounds completely different.

With a little thought about the software you should be able to produce quite a number of simple but varied tunes.



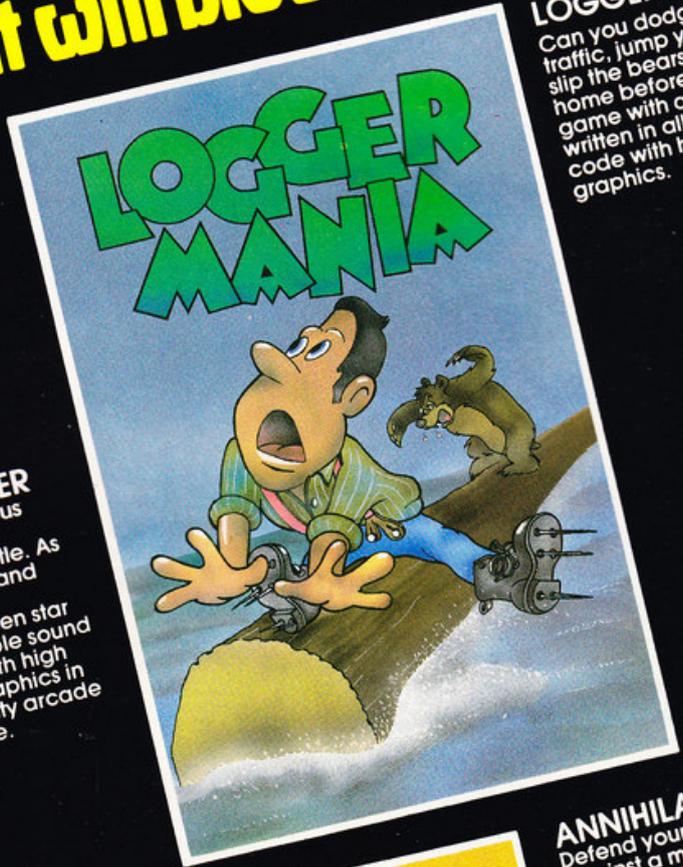
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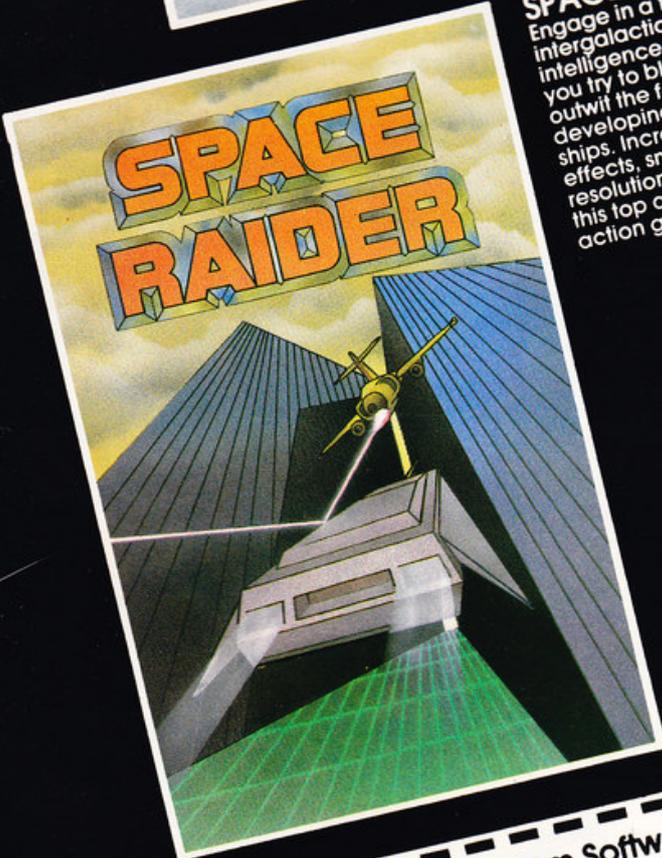
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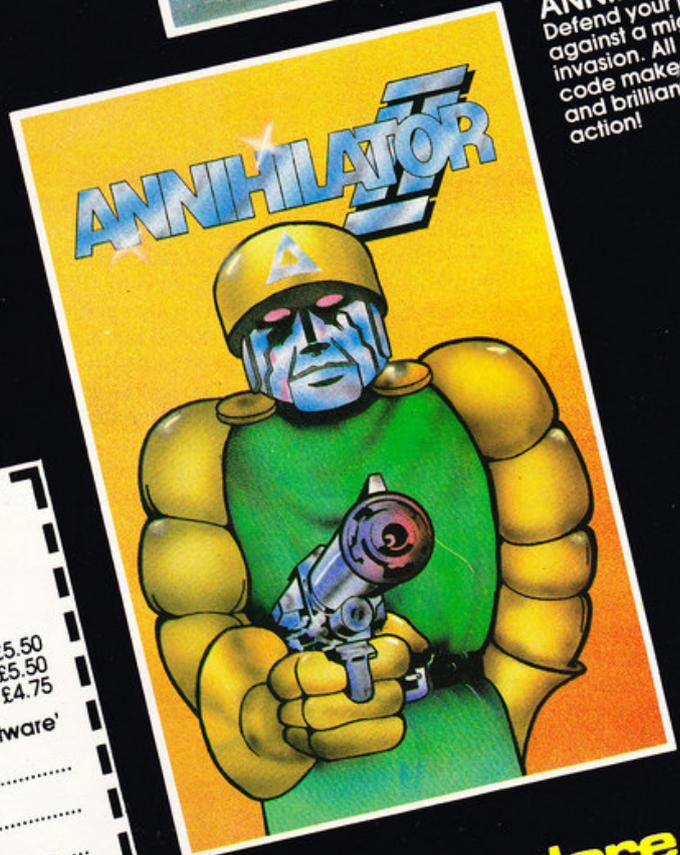
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Paul Giblett concludes the list of \*FX commands on the BBC, begun last week.

# Star command



**200,n** Controls action on memory after an event which is Escape or Break, n = 0-enables Escape key, 1-disables Escape key, 2-Wipe memory between &400 and &7FFF on Break, except for the zero byte of each page. This is useful as a software protection device, as the program will be destroyed.

**201,n** Controls the Keyboard, n = 0-enables keyboard, 1-disables keyboard, except for Break.

**202,n** Allows software control of the keyboard mode (and alters the LEDs), n = 0-shift lock and caps lock on, 16-shift lock on, 32-caps lock on, 48-lower case, ie both off.

**210,n** Controls sound output, n = 0-enables sound generator, 1-disables sound generator — no more monotonous games jingles!

**211,n** Selects channel number for production of bell tone (CTRL G, VDU 7 and copy when not in edit mode), n = 0-3.

**212,n** Selects envelope/volume for bell tone. This is controlled from n in a rather complicated manner, as  $n = 120 - 8(x - 1)$ , where x is the normal volume/envelope parameter in the SOUND command. Thus \*FX212,208 will cause bell to be at volume - 10. Note if the value in n is not divisible by 8, bell will not function at all.

**213,n** Selects pitch of bell tone, n = 0-255 as for SOUND.

**214,n** Selects duration of bell tone, n = 0-255 as for SOUND (remember 255 is continuous!)

**219,n** Sets TAB key to produce ASCII code n when depressed. There seems to be a peculiarity here, as ASCII codes for capitals produce the lower case equivalent and vice versa. Thus \*FX219,65 gives 'a', and \*FX219,97 gives 'A'. Non alphabet characters seem to be unaffected.

**220,n** Sets key which produces ASCII code n to act as Escape ie change escape code from 27 to n. The Escape key will then produce ASCII 27 without escape eg \*FX220,69 sets 'E' to act as Escape.

**224** Cancels VDU queue. Many of the VDU commands require a number of

following bytes eg VDU23 requires 9. This call cancels the bytes already received.

**225,n, 226,n, 227,n and 228,n** This group of four calls affects the operation of the red function keys. These keys are able to produce four values each: function key alone, shift—function, CTRL—function, shift — CTRL — function. Normally function keys alone are programmable by \*KEY, shift — function produces the Teletext codes 128 onwards, CTRL — function produces the Teletext control codes 144 onwards and shift — CTRL — function is not set. It is possible to set the function keys to produce any character for any of these four. These calls set the base code, that is the code produced by F0 and each subsequent key produces the next code. **225,n** sets the base code for function keys to n (also disabling string storing ability), **226,n** sets base code for Shift-function to n, **227,n** sets base code for CTRL-function to n, **228,n** sets base code for shift-CTRL-function to n.

Note — if \*FX4,2 is used to enable the cursor keys as function keys, they will act in a similar manner, but a 'hole' is left at F<sub>10</sub> since Shift-Break and CTRL-Break have other special functions.

**229,n** Sets action of Escape key, n = 0-generates Escape event, 1-produces ASCII 27 only, no Escape.

**230,n** Selects action on buffers storage on Escape event, n = 0-flush all internal

buffers, 1-Preserve buffers.

**231,n** Sets action on a 6522 IRQ, n = 0 disables interrupts. These must then be dealt with by a user-supplied routine pointed at by the USERV. n = 255-enables interrupts.

**232,n** As above for 6850 IRQs.

**247,n, 248,n and 249,n** These three calls may be used to set a vector through which the MOS will move whenever a Break occurs, ie a jump instruction may be placed here to a user-supplied break handling routine, eg \*FX247,76/\*FX248,0/\*FX249,14 = JMP&0E00. If the user routine ends with RTS the normal MOS break handler will also be executed.

**252,n** Selects the number of the SWR to be entered after the next Break, over-riding the priority of SWR15.

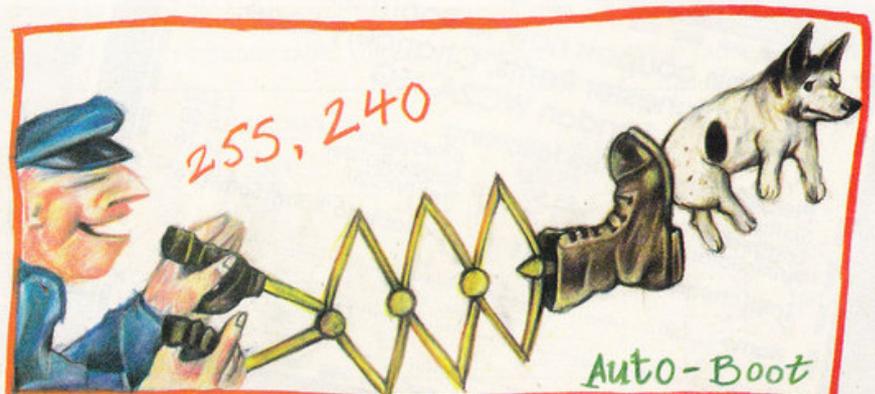
**254,n** Selects memory size after next break, n = 0-16K, 255-32K. This is useful for simulating a model A machine.

**255,n** This call mimics the DIL switches at the bottom right of the keyboard (fitted with the DFS). These control several 'start up' options. The byte given as n acts as a 'bit switch'.

Byte	Bits							
n	7	6	5	4	3	2	1	0
Bits 0 and 1 are unassigned by Acorn, while bits 5, 6 and 7 control the screen mode entered after Break.								
5	6	7	Mode					
0	0	0	7					
0	0	1	6					
0	1	0	5					
0	1	1	4					
1	0	0	3					
1	0	1	2					
1	1	0	1					
1	1	1	0					

Bits 2 and 3 select the disk drive type, while bit 4 sets the Auto-Boot type; bit set = Auto-Boot on Break, not set = Auto-Boot on Shift-Break. Thus \*FX255,240 will select Auto-Boot on Break and mode 0.

This last group of calls will not be reset by CTRL-Break, only a subsequent \*FX call or a power down will alter the values.



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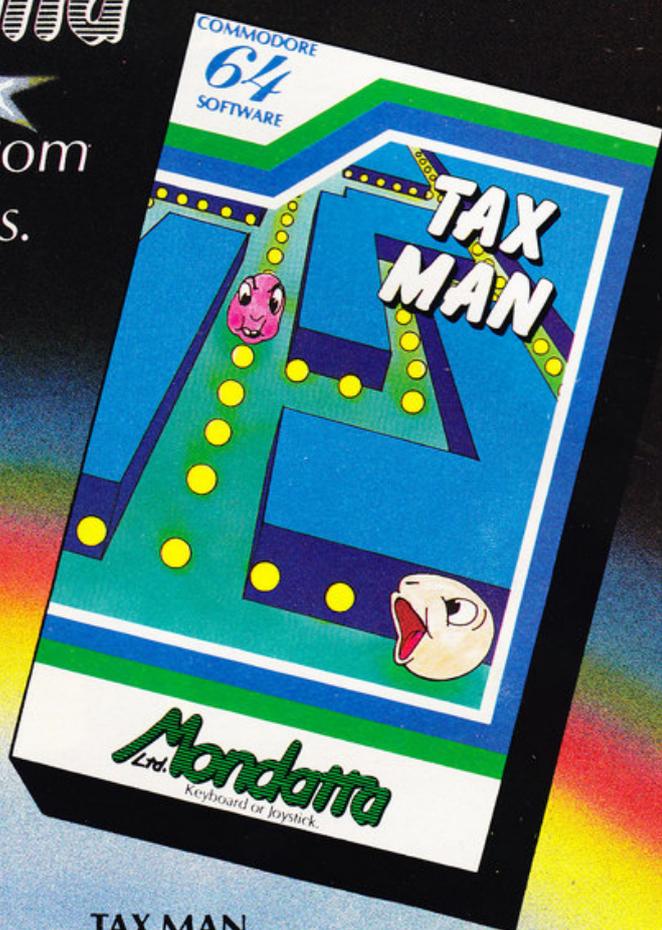
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Ted Ball examines his new Forth computer after changing the Basic for a ZX81-Forth ROM.

# New life for ZX81



**T**he ZX81 is a good cheap computer for beginners, but it has many limitations and a lot of people go on to buy another computer after a few months. If you're one of the people with a ZX81 gathering dust in the back of a cupboard you now have an opportunity to give it a new lease of life as a Forth computer instead of a Basic computer by installing the ZX81-Forth ROM from David Husband.

## Features

ZX81-Forth is similar to FIGForth and Forth-79 in its fundamental features but follows neither standard exactly. It gives you the usual Reverse Polish Notation and the colon definitions you expect in Forth, but the built-in dictionary includes a mixture of words from FIGForth and Forth-79 — although not the complete vocabulary of either — and it also has some non-standard words.

ZX81-Forth does not give a full standard version of Forth because it is specialised for multi-tasking and there's not enough ROM space to fit in a full standard version as well as the multi-tasking facilities.

Multi-tasking allows you to put in several programs that appear to run simultaneously. Its main use is to control external hardware (remember the early Sinclair advertisements that suggested you could use a ZX80 for running a power station?). What actually happens is that there is a scheduling system in ZX81-Forth that cycles round all the tasks, allowing each one to run for a short time, but this is done so fast that the tasks appear to be done at once.

To make the scheduling more flexible ZX81-Forth includes a real-time clock that you can use when setting up tasks, so you can specify when the task starts and how often it repeats.

An important omission from ZX81-Forth is that it does not allow you to read from and write to input and output ports.

You can include hex machine code in Forth words, so you can write your own Port I/O routines, or you could use memory-mapped I/O devices, but ZX81-Forth would be easier to use for controlling hardware if Port I/O routines were built in.

As well as giving you Forth instead of Basic the new ROM changes several other things in the ZX81. ZX81-Forth uses the ASCII character set instead of the ZX81's old non-standard character set, and you have to type all words in full instead of having single-key entry for keywords.

As well as Slow and Fast modes ZX81-Forth has another, Auto, which starts in Slow mode but switches to Fast if the program takes more than a quarter of a second to execute. There is also a different format for entering and editing programs which uses a split screen, programs being typed into the upper part of the screen and immediate commands typed into the lower part.

## Documentation

The documentation is a 71-page manual that gives instructions for fitting the ROM and for using ZX81-Forth.

The sections on using ZX81-Forth are clearly written and include many examples to show how the various features work. Although the manual assumes you will be using a textbook to learn the language it explains its fundamentals in addition to the special features of ZX81-Forth, so you can get started without a textbook. There's a table of contents, but no index or list of Forth words and commands, so it can be difficult to find the definition of any particular word.

## Getting started

You can buy ZX81-Forth either as a ROM chip which you fit yourself or in a ready-converted computer. The instructions for fitting the ROM are adequate for anyone with a little hardware experience.

If the Basic ROM is plugged into a 28-pin

socket you just replace it with the Forth ROM. But if the Basic ROM is soldered to the board it has to be unsoldered (very carefully if you want it to work afterwards) and a socket soldered in to take the Forth ROM.

The manual shows what you should see on the screen when the ROM has been installed correctly, and it gives some hints on what might be wrong if the computer does not work properly.

Once the new ROM is fitted you have to learn how to use ZX81-Forth, but it is not difficult with the aid of the manual and a suitable textbook.

## In use

The system used for entering and editing programs is a lot more complicated than in ZX81 Basic, but it does not take long to get used to it. The main difference is that programs have to be typed directly into the upper part of the screen, without line numbers, and for editing you use the cursor keys to move the program listing around on the screen.

Programs in ZX81-Forth execute at high speed, generally between 100 and 300 times the speed of ZX81 Basic. It is this that makes multi-tasking possible, and you can have about ten background tasks running before the screen display and the response to the keyboard become too slow to make it feasible to type in more.

## Reliability

I couldn't find anything wrong in the actual Forth, but there are two problems with the editor. The first is if you insert characters into a full program line you will lose the same number of characters off the right hand end of the line instead of having them move to the beginning of the next. The second problem is that it's not possible to backspace past a space in the lower part of the screen.

## Verdict

ZX81-Forth is non-standard, but its basic features are close enough to FIGForth and Forth-79 to make it easy to use if you are used to one of the standard forms, or to move on to a standard if you start with ZX81-Forth. However, its multi-tasking capabilities make it more useful for converting the ZX81 into a hardware controller than for learning or using Forth.

The ROM is well worth the price if you have a practical application for it, or even just to get some more use out of a superannuated ZX81.

### RATING

Features

Documentation

Performance

Usability

Reliability

Overall value



**Name** ZX81-Forth **Application** Programming language **System** ZX81 with 16k RAMpack **Price** £28.75 **Publisher** David Husband, 2 Gorleston Road, Branksome, Poole, Dorset BH12 1NW **Format** EPROM.

David Janda tries out an Oric extension monitor, and examines its relative excellences.

Every micro user at some time may wonder how the machine works — what's going on inside the thing? The best way to discover this is to use software that is designed for that purpose: assemblers, disassemblers and toolkits.

The Oric-1 has a number of utilities available, some of which were reviewed by Max Phillips in *PCN*, issue 25. As can be seen, not all of them made the grade, indeed some would hinder rather than help you.

At the last PCW show, I had the opportunity to meet members of the Tangerine Users Group (TUG), who were showing off some software from a company called Kenema Associates. One of the pieces of software was the Oric-1 Extension Monitor for the 48K Oric-1, which they claim 'is the most powerful extension monitor for the Oric-1'. After using the product for some time, I am inclined to believe that their claim is true.

### Features

The Extension Monitor (Exmon) is a machine code utility which enables you to test and debug machine code programs. The package consists of a number of commands for testing and debugging machine code, a 6502 disassembler and a hexadecimal/decimal calculator, all of which takes up only 6K.

There are a number of memory display and modification commands available and it is possible to alter registers as well as RAM locations. As for altering RAM, a number of commands are allocated to this task. First it is possible to display single bytes and, if you wish, alter them. The memory fill command will enable you to fill a block of memory with a hex value between 00 and FF. It is also possible to use the command to fill an area with an ASCII string starting from the first location pointed to.

Memory search is also catered for, and it is possible to either search for a byte string or a character string. Once found the address will be displayed and pressing a key will continue the search. At this stage I should mention that pressing the escape key normally terminates the command being executed and control is returned to the command mode where a > is displayed.

Memory move and memory relocate are also catered for, but with memory relocate care should be taken as the code to be relocated may contain data which may be interpreted by the relocate subroutine as 6502 instructions.

The debugging commands are varied. There are commands which run machine code programs and set breakpoints. Up to eight breakpoints may be set (in RAM only), and when a machine code program is run any breakpoint that it comes across will halt the program and display the breakpoint address, A,X,Y,K,P register contents, breakpoint number and a disassembly of the instruction at the address. Pressing C after a breakpoint has been reached will continue the program until the end or another breakpoint.

Single step is provided and it has a number of variations as do most of the Exmon commands. The result of using the single-step command is a display similar to that seen when a breakpoint is reached, but with the addition that the next instruction to be executed is disassembled if at a breakpoint.

Also, two types of listing may be used, a hex/ASCII dump, or a 6502 disassembly. With both of these commands it is possible to display continuously or within a specified range.

## Exmon exponent



Peter Schrank

A feature not normally found in many monitors is a hex/decimal calculator. The one in Exmon allows you to perform simple arithmetic in the two bases, including integer division and remainder.

### Presentation

For your money you get the Exmon cassette, which is in one of those book-type cases, and a shoddy-looking 14-page manual. The cassette contains two copies of Exmon on one side, both of which loaded first time.

The manual is printed on wafer thin, off-white paper and like the print it's small. The whole affair is held together by two staples and lasted for a few days before it fell apart. This is a pity because the content is quite good, with each of the commands clearly discussed together with any variations.

### In use

Setting up Exmon is simple enough. No setting of HIMEM is necessary as the

program does all this for you.

Once the program auto-runs you are greeted with the Kenema logo and the command prompt ' '. The top line is reserved as a status line and displays the capitals and printer status. Both can be toggled by using controls T and P respectively.

Using the commands was no problem and I didn't discover any bugs. The memory dump and disassembly were quite fast and so was the relocate. I do have two major grumbles about the package.

First, for the price (£15), I would have expected a two-pass disassembler, not a single pass as this package offers. These are not the easiest of things to implement and they still do not distinguish between data and commands completely, but they are very useful. Also a little intelligent error-checking would not go amiss; it is possible to accidentally overwrite the monitor or your own code using the relocate or memory move commands.

Secondly, the user interface could be cleaned up a bit. For example, when you execute a hex listing, an address followed by 8 bytes follows together with the ASCII representation is displayed. This looks nice and neat, but if you specify an end address which is equally divisible by eight then the dump will finish somewhere on the last line immediately followed by the ASCII dump. In other words it can look messy. Also, when you specify a hex dump or disassembly which will take up more than one screen you can't stop it by using the escape key.

All the commands for Exmon are entered as a single letter followed by parameters (if applicable). Generally the syntax checking for entering commands was quite good, but there were occasions when entering a command followed by too many spaces would normally result in the wrong address being disassembled.

### Verdict

On the whole, Exmon was reasonable. It has a large number of commands that will no doubt make the machine code programmer's life a lot easier. The way the program is organised is simple yet effective, with single letter commands a blessing. But for the price it could offer more, and if it were a fiver cheaper it would offer *real* value for money.

**Name** Exmon System 48K Oric-1 **Price** £15  
**Publisher** Kenema Associates Ltd. **Format**  
Cassette **Language** Machine code **Outlets** Mail  
order, dealers.

### RATING

**Features**  
**Documentation**  
**Performance**  
**Usability**  
**Reliability**  
**Overall value**





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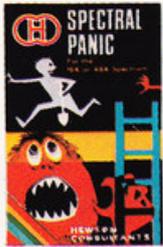
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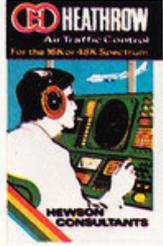
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Two health and diet packages get a thorough check-up from Mike Gerrard and a nurse.

# Good health!

**W**e've been accustomed to thinking of home software in terms of games and adventures, with a smattering of programs of a more or less educational nature thrown in for good measure, but there is a range of totally different material now becoming available for the more popular home micros, as indicated by the recent batch of health and diet programs for the 48K Spectrum that came PCN's way. Now an ability to get a high score at Manic Miner is all very well for a games reviewer, but it wouldn't get him very far with this type of software, so I also consulted a friend, an experienced nurse. Her comments are in italics throughout.

Cycle Planner / Growth Tracker comes as those two separate programs, the first helping a woman keep track of her periods and the second a guide to the health and growth of a baby.

Growth Tracker has a database of information for a week-by-week guide to a typical 40-week pregnancy and a monthly guide to development over the first two years of life, each entry comprising just two or three sentences. Each entry can be displayed separately, or you can see a range of entries or the whole database.

There are both virtues and vices in simplifying things in this manner, and while the publishers do point out that their information is only based on averages, it seems to me that the vices outweigh the virtues. It could be worrying for a parent to read, for instance, that at 12 months the child 'can walk



unaided', and at 20 months it 'can use 10-12 words'. Such are the variations in child growth that these assessments might not be true of a perfectly normal child, and parents would surely be better advised to consult a

more comprehensive book than rely on such brief unexpanded information.

*I would question some of the information the program gives on childhood illnesses. In the symptoms for measles it says that tiny white spots called Koplik Spots are seen in the mouth. That is a very rare occurrence, and someone reading that might see there were no spots in the child's mouth and not realise it was developing measles. I can't really see this program as being much more than a novelty. Why buy it when you could get comprehensive books at half the price?*

I assumed from the title that Dieta would be one of those handy guides helping weight-



watchers to calculate their daily calorie intake, but in fact it is much more complicated than that. It works out the calorie and fibre content of cooked meals from the ingredients that you input, and will suggest possible modifications to the recipe to reduce the calories. It didn't get off to a good start as the pages of information in the program were full of punctuation mistakes.

The menu offers eight options, so I selected 'Entering Ingredients' to see how it worked. I got my favourite rice pudding recipe to see how it might be made less fattening. After entering the name of the recipe and the number of people it serves, you enter the number of ingredients. Any eggs? it asks. No. Any cooking fat? I hope not. There was a worrying note at the top of the screen: 'Remember to use calories per oz units if your weight is in oz and calories per grams if your weight is in grams.' This was getting complicated.

'Enter name of next ingredients,' I was told, which puzzled me as I hadn't entered any

yet. I tried the first ingredient, milk, which seemed to satisfy the program. 'Enter weight of ingredient.' Obviously pints and tablespoons were not going to be accepted, and I wondered why the program didn't include a weights and measures guide. My cookbook said that one pint was 20 fluid ounces, so I entered that, only to be asked: 'Enter calorie per unit weight for ingredient.' But I've no idea. Aren't you meant to be telling me information like that, dear program?

In other words, you need a calorie counting book in order to make Dieta work, though to be fair to the program it does do what it claims to do and works out the calories per person for a recipe and suggests possible alterations. Some of them seem rather obvious, though, such as using smaller size eggs or sugar substitutes instead of sugar.

*The calories you'll save are hardly worth the effort. Most people know what to eat and what not to eat if they want to lose weight, and you can work out your daily intake on the back of an envelope with the help of a calorie book without going through all this performance.*

A more substantial program is Diet Master, one of a planned series to include Exercise Master and Heart Master, and comes with a 32-page booklet. This one 'is designed to help you and members of your family learn how to manage your diet, so that you receive a balanced intake of nutrients



according to your needs.'

The program begins by asking your sex, age, and type of occupation. It then prints out for you your RDA (Recommended Daily Allowances) of various nutrients: vitamins, calcium, iron etc. You then have three options, the first being to locate your weight range, provided you're 18 or over. You

could also elect to plan your day's food intake, or simply start the program afresh.

The first option draws a graph showing whether your weight is in the desired range. When I 'accidentally' told it I weighed 1500 lb it informed me that I would have to refer to the booklet. Nothing further appeared on the screen, so there was nothing for it but to reload.

The second option allows you to input food and drink from a three-page list in the booklet, the computer calculating the nutrients contained in the amounts you state. Bar graphs are then drawn to show how this measures up to your RDA. As with Dieta, this seemed to me to be a needlessly complicated way of doing things.

*I wasn't sure if the program was meant to be about losing weight, or about nutrition. If it's about nutrition why does it specifically exclude the most important categories: pregnant women, lactating mothers, babies and growing children? Why does it say it's designed 'to help you and your family' when it points out a few paragraphs later that babies and children under nine are excluded, and calculating the weight range is not for anyone under 18?*

The range of foods the booklet covers is also very limited. You'd be much better off buying a calorie counting book that tells you how many calories in a tin of Heinz baked beans compared to other brands etc. — something really comprehensive

Dieters would be better advised to get calorie counting books or free leaflets from Health Clinics or get free expert advice from dieticians and health visitors.

This batch of software doesn't come up to scratch, then, from either a programming or health point of view. Can you do it better with pen and paper? If you throw in a visit to a bookshop, Health Clinic or your GP, the answer is definitely Yes, you can, and at a fraction of the cost.

**Cycle Planner/Growth Tracker** (£7.25), Medidata, PO Box 26, London NW9 9BW  
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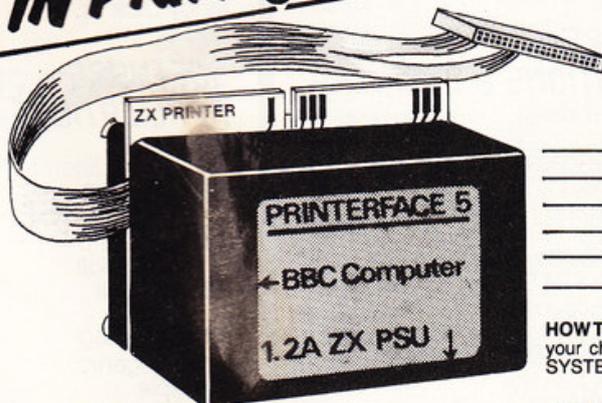
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## THE BEST FOR LESS

Brendan Lewis plugs into an Apple-compatible development and control system.

# Core of a new Apple

**T**he U-COM 2 is aimed fairly and squarely at the Apple II enthusiast (and the technically proficient enthusiast to boot). It's a development/control system which enables you to incorporate many of the add-on and expansion-card products destined for the Apple II micro.

The U-COM II can also be used as a network controller with BBC micros and Apples using a single disk drive. What you see in the picture is what you get — no keyboard, screen or any storage devices, but the system will hook up with almost any ASCII keyboard and any standard monochrome monitor.

## Presentation

The review system came in two small boxes containing the motherboard and the U-COM 2/40 optional 40-column video display card. Inside the boxes were padded with foam preventing the boards from moving about. After sifting through the foam I found a free piece of aluminium foil covering the bottom of the boards.

The two boards were packed inside one bigger cardboard box with more pieces of foam to prevent the boxes moving. Overall it would be safe to send through the post.

## Documentation

Don't for a second think that this system is designed for the beginner; without previous experience the user is going to have a hard time. The manual is produced for the engineer, which really is what you would expect of a system such as this as its main uses would be for development of hardware and software (normally for control systems) for either the Apple II or the U-COM II in a control environment.

The manual contains two pages of introduction and general information, and then takes off with in-depth descriptions of how the hardware functions. Then comes a set of various data sheets, timing diagrams, a memory map and finally a full set of excellent circuit diagrams. It should be said that, if you do want to use this system than a full set of Apple II manuals is essential, especially the Apple II Reference Manual.

## Construction

The construction of the motherboard and the 40-column boards themselves is very good, but the construction of a full system based around the U-COM II is almost infinitely flexible. Basically it depends on what box you want to put the boards in.

A monitor plugs onto the end of a phono connector lead sticking out of the video board. The display is 40-columns black and white when using the U-COM II/40 video card. The card itself uses a 54 way connector (as opposed to the standard 50-way connector used by the expansion slots) on the front right hand side of the

board. The socket on the board has a stopper about halfway along it to prevent any of the normal expansion boards being placed there.

The information on the screen is clear with only a very slight wobble. As with the Apple II the display is upper case only. This may cause trouble for some users, but on the whole is perfectly all right. The video modes are also the same as the Apple with reverse video and flashing modes.

As for storage facilities, neither disk nor cassette interfaces are provided with the system, which shows up one of the differences between the Apple II and the U-COM II. Though rarely used the Apple II does have a cassette interface built on board, whereas U-COM have omitted this feature because of the small amount of use it gets. Disk facilities are exactly the same as on the Apple; using the Apple II disk controller card, two disk drives can be plugged in per controller.

## Expansion

This is obviously one of the main areas where we find out just how compatible the U-COM and the Apple really are.

As you probably know, the Apple II has a set of eight expansion slots at the back of its board into which various expansion boards can be plugged. These include serial and parallel printer interfaces, language cards, memory expansion boards, colour video boards, analog to digital and digital to analog converter cards, 80-column cards, Z80 cards and of course the disk controller card. You will be happy to know that the U-COM II will accept these boards and others, including a few of their own.

As with the Apple there are some restrictions on what board can go in which slot. For example with the Apple II the colour card must go into slot 7 for hardware reasons. This is not the case with the U-COM, but their U-TERM/80 80-column video board must be plugged into slot 3 for software compatibility. With both systems the language card must be plugged into slot 0 and the first disk interface would be plugged into slot 6. As with the Apple the U-COM has eight expansion slots.

The only connections to the board other than the expansion slots are for keyboard, speaker, power supply unit, 40-column card and the games adaptor. The Apple offers video out and cassette connectors which, as mentioned, are not required on the U-COM. The big advantage of having a full hardware manual makes it very simple for design and development of your own add-on pieces of hardware.

## Operation

The system, because it is Apple compati-

ble, almost predictably uses the Apple DOS 3.3 as its operating system. This is automatically booted from the disk on power up in much the same way as Apple's autostart ROM does. Because Basic is not present in ROM you have to load a copy of Applesoft Basic into a specific area of RAM. The manual describes how this is to be loaded at D000 in the memory map. Although Basic is not required it is useful for simplifying software development.

After opening up the boxes and looking at the boards, the next thing to do is to work out how to set it up. I was using an Apple power supply and keyboard, so after putting the board on a piece of foam (to protect it from shorts) I set about the task of connecting the bits together. After connecting up the keyboard and speaker I was all set to connect up the power supply.

Beware if you are using an Apple power supply, you're going to find it pretty difficult to connect it up to the U-COM. Although the PSU connector is of the same type and the pins are arranged in the same way, the U-COM connector is too big for the Apple PSU to fit. This leads to one of two options: you obtain a U-COM power supply, or failing this, you build yourself a set of interface cables (stick some wire into the Apple connector holes, solder a few pins onto the other end and you've got interface cables). The only problem with this is that you have to be very careful how you connect these cables, especially if you only have one colour cable.

I finally managed to connect up the board to the PSU and switched on. Beep went the speaker and up came the U-COM banner and a hash monitor prompt. After reading through the Apple manual for a few minutes I was confident of trying a little machine code using the monitor. Within a few minutes I found that it was exactly the same as using the Apple and very easy to use.

### Display contents of memory:

```
#100
$0100:FF
#.110
$0101:F7 E0 FB E8 9B 3F 98
$0108:8C CC E8 D8 EC BD EC EC
$0110:EF
```

### Change contents of memory:

```
#100:00
#100
$0100:00
```

An interesting feature of the monitor is its ability to display contents of memory in assembler form:

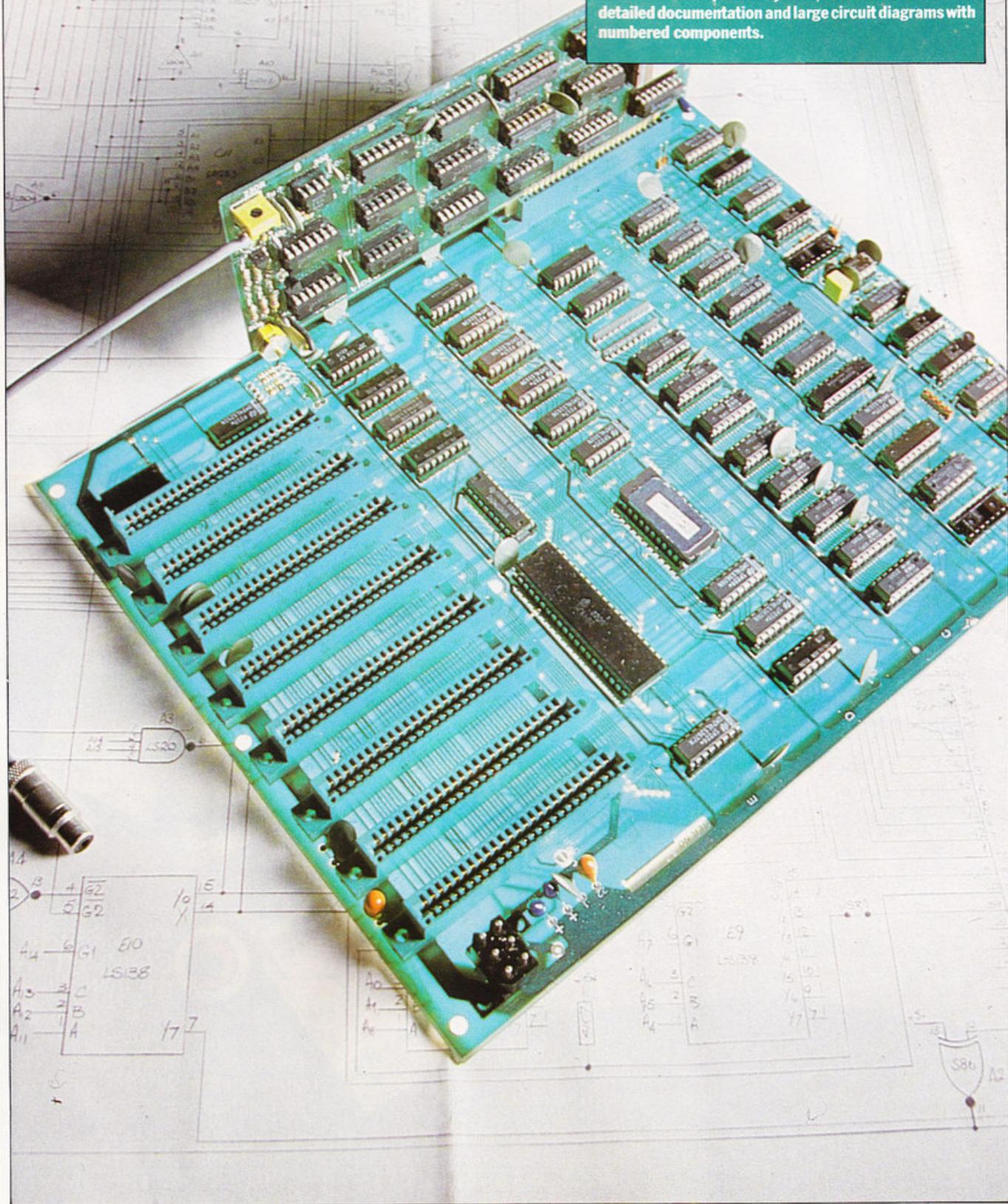
```
#0100L
```

This instruction prints out the contents of memory from 0100 to 0124 in the form:  
\$0124:E0 B3 CPX #B3

The one thing missing from the monitor,

## PCN PRO-TEST PERIPHERALS

The U-COM comes with a 40-column video display card, lots of expansion slots and Apple compatibility. As befits a development system, it also comes with detailed documentation and large circuit diagrams with numbered components.



which would be very useful for machine code programming, is a mini-assembler which is present on early Apple IIs and missing from the U-COM monitor.

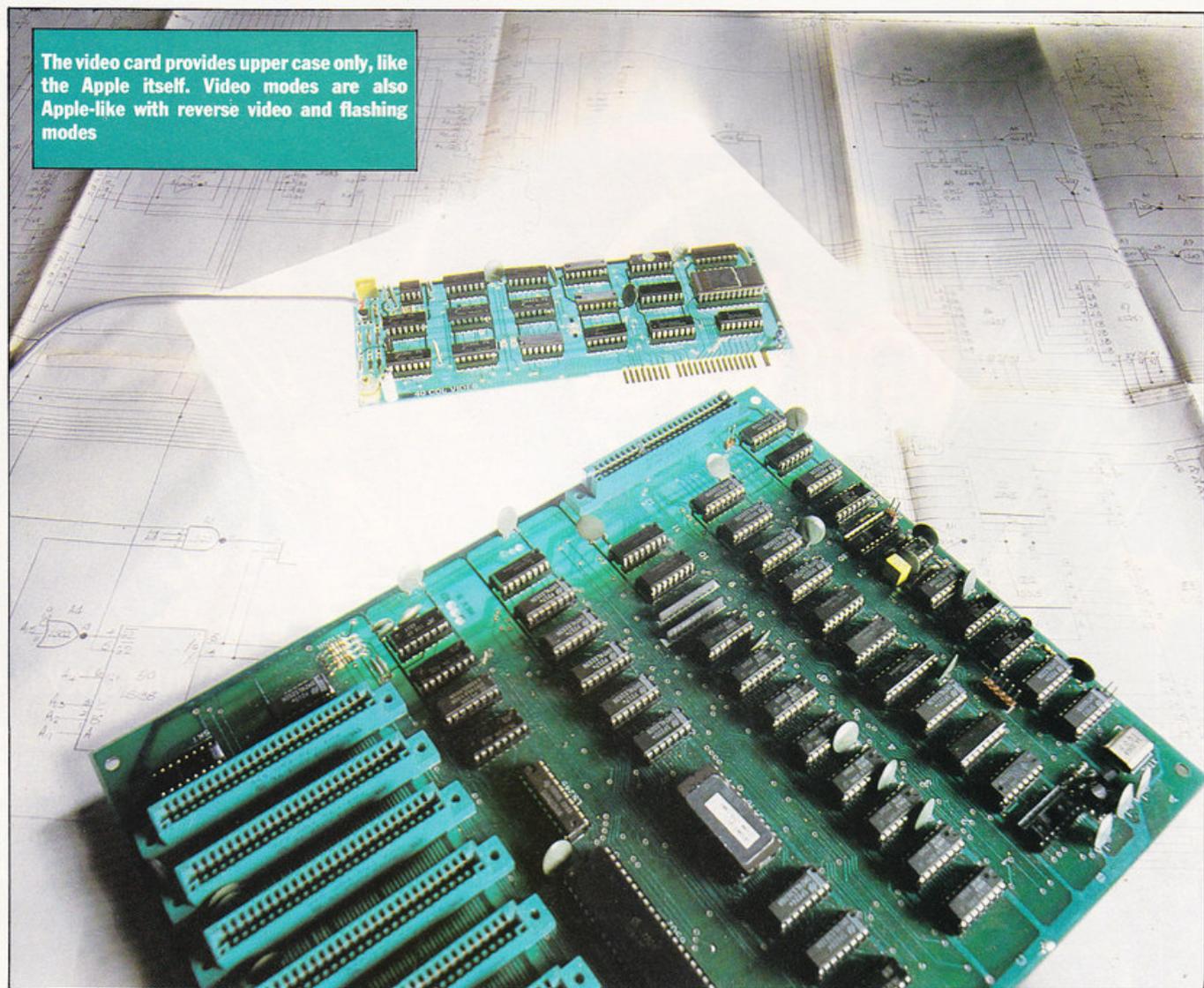
The next thing on the agenda is using the disk. The U-COM manual says that a disk must be made up that loads a copy of Applesoft at location D000 in memory, but

the problem with this is that you really need Basic to load the program from disk to memory. Apparently, there's a disk which loads Basic and gives a number of utilities such as copying files and disks. It wasn't available for review, but it's apparently similar to any systems disk and with any system.

I then went back to connecting the system up and, to my horror, when I switched on all I got was a high pitched squeal from the PSU. No beep from the speaker and no display. I promptly switched off and started work on repairing the board. The manual is of little use for the first time user, but when it comes to repair



The video card provides upper case only, like the Apple itself. Video modes are also Apple-like with reverse video and flashing modes



◀41 it's a dream. Large circuit diagrams with numbered components make it very easy to work on the boards.

Without the video board installed the speaker beeped and all seemed OK. This narrowed the problem down to the video board, which I traced to one particular chip. After replacing this component the system worked perfectly once more. Relieved, I tried to use the disks, but to no avail.

Perhaps it needs a small machine code program to first load Basic.

An interesting feature for use when video is not required, which is the case in a lot of control applications, is the limited input/output using the games adaptor socket. This allows for control of:

- 2 variable resistors (potentiometers)
- 4 light emitting diodes (LEDs)
- 3 on/off switches

The potentiometers can be used for fine tuning of analog variables while the LEDs can be used to monitor the system in a working/not working way. The switches could be used for choosing program options to control the flow of operations.

### Software

Again, because the system is Apple compatible, the range of software available is extensive and (as mentioned in the

introduction) U-COM have a system controlling a network of BBC micros and Apple micros sharing the same disk. This type of system fits perfectly into this part of the market, where a full micro system with keyboard and video would be wasted.

If, on the other hand, a full system was required it would take little time and money to obtain it, and all the advantages of being Apple compatible would be clear. Both Fortran and UCSD Pascal have been tested on the system, both require a 16K RAM card in slot 0. The CP/M operating system is also available with the addition of a Z80 card (U-COM produce the U-Z80 card) in any slot and also a 16K RAM card in slot 0 if a full 56K system is required. Both the languages and CP/M will boot from standard disks.

### Verdict

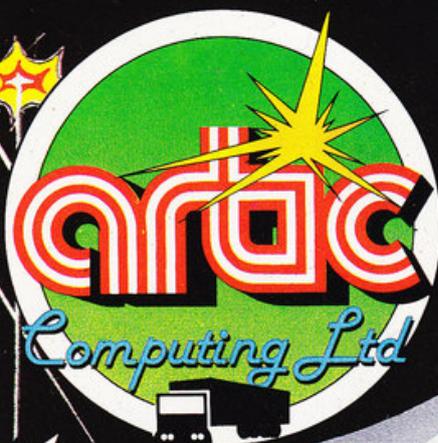
At £249 for the motherboard, £39 for the 40 column card and £71 for the PSU the U-COM 2 is a good compromise when a full Apple system is not required. It is ideal for development work, especially hardware development, as the manual is very thorough when it comes to the hardware side. Because of this it would be ideal for the electronics and computing sections of an educational establishment.

Maybe something should have been mentioned in the manual about the utilities disk which would normally be provided with the system. Also, if more information were given about the software and usage of the machine it could make a viable product for users who are not technically minded.

### SPECIFICATION

<b>Price</b>	Motherboard £249, 40-column board £39, PSU £71
<b>Processor</b>	6502
<b>RAM</b>	64K
<b>ROM</b>	2K monitor ROM
<b>Text screen</b>	40 × 24
<b>Graphics screen</b>	Low-resolution — 40 × 48, high-resolution — 280 × 192
<b>OS/Language</b>	Apple DOS 3.3/Applesoft Basic
<b>Other languages</b>	UCSD Pascal + Fortran available on disk
<b>Distributor</b>	U-Microcomputers Ltd, Winstanley Industrial Estate, Long Lane, Warrington, Cheshire WA2 8PR, 0925-54117/8

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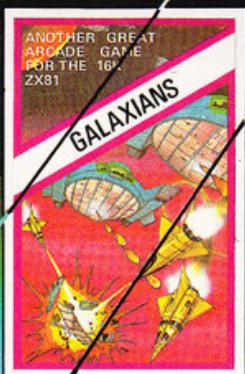
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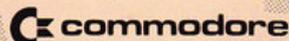
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## FIRING LINE

### VIC 20

# Saving energy

**Name** Creepers **System** Vic 20 **Price** £5.95 **Publisher** Virgin Games, 61/63 Portobello Rd., London, W11  
**Format** Cassette **Language** Basic  
**Other versions** None **Outlets** Retailers

Creepers is the first game from the Virgin stable I've played but it's yet another variation on the 'shoot them down' principle.

### Objectives

The objective is simple: protect your own interests *ie* stay alive. The aliens are dropping down to pinch your energy blocks, and you have to zap them if you can, before your energy runs out, and before they zap you.

### In play

To play the game is really just a question of finding the right spot to rest your fighter, and to keep pressing the fire button. The game features both joystick and keyboard controls, so you can choose. The choice of the particular keys is strange, and not one that I've seen before: up—U, down—Spacebar, left—H, right—K, and fire—RUN/STOP. A little bit awkward, and for a change I preferred the joystick.

You appear on the left-hand side of the screen, in your fighter, and can point left or right and up or down. A cluster of inverted 'A's is hanging from the top of the screen to your

right (A for Alien I suppose). Also on your right, but at the bottom are your energy blocks. These are what the 'A's drop off and pick up every so often.

If you keep firing, you seem to get most of them, but as there's little variety on this pattern of events there doesn't seem a great deal of incentive to keep on playing.

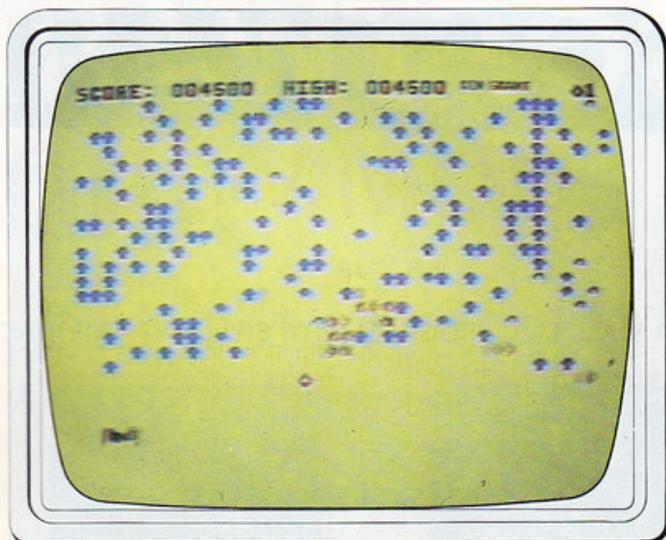
What variety there is, is restricted to 'watchers' which appear every so often and bob up and down. This is described as taunting on the cover, but in fact can be avoided by staying put and firing away. There are also some movements going on behind you, which is why you can face backwards too. This movement doesn't seem especially harmful, though.

The programmer writes, on the leaflet that comes with the program, that he would like to have a go at programming adventure games, and maybe this would give him a better opportunity than Creepers has to display his talents.

### Verdict

I'm not very impressed with this at all. The game seems to lack any motivation, and the absence of variety will probably send you to other pastures fairly quickly. The game is also spoilt by the way you can do nothing but fire away, moving about very occasionally and still seeming to get quite respectable scores. It's not that it's too easy, it's just far too dull. **Piers Letcher**

<b>Lasting appeal</b>	☆☆☆☆
<b>Playability</b>	☆☆☆☆
<b>Use of machine</b>	☆☆☆☆
<b>Overall value</b>	☆☆☆☆



### COMMODORE 64

# Spray and pray

**Name** Exterminator **System** Commodore 64 **Price** £5.99  
**Publisher** Bubble Bus, 87 High Street, Tonbridge, Kent TN9 1RX  
**Format** Cassette **Language** Machine code **Other versions** None **Outlet** Mail order

It doesn't matter whether it's summer or winter, those centipedes continue to infest our computers, wriggling their way down countless TV screens. Bubble Bus has brought out a new version: Exterminator is one of the best I've seen, and includes the most realistic spider ever to make you leap for the nearest dustpan.

### Objectives

The aim is simple — if it moves, shoot it; if it doesn't, shoot it anyway, for in this game the laws of nature and logic are suspended.

A new species, a worm with legs, steadily threads its way down through mushroom-like blue cacti. Armed with a spraygun, you puff away at the cacti and worm, scoring points for every hit. When a segment of worm is struck, it turns into a cactus, the rest of it continuing, unperturbed, on its own sweet way.

From time to time, you must defend yourself against a low-swooping eagle, a mosquito diving straight down the screen, and a scorpion. All can be exterminated. A hairy, life-like tarantula crawls across the bottom of the screen — all you can do is keep out of its way and

hope that it will go away.

### In play

The black worm and blue cacti appear on a cheerful yellow background. Your spray gun, which is a repeating fire model, is represented by a nozzle confined to the lower portion of the screen. As the worm is hit, it breaks up and before long umpteen little segments are trampling all over the place. To the sound of a harsh honking, a purple eagle appears hovering just about you and swooping. If it makes contact, you lose one of your three nozzles.

A loud hum warns of the imminent descent of a plummeting green mosquito — dodge it or shoot it. Similarly, a white scorpion scampers across high up — bonus points for potting it.

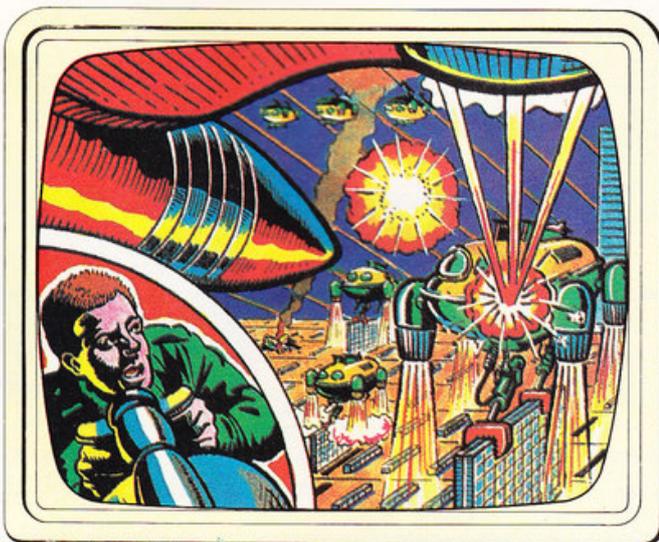
Extra lives are awarded for high scores and the game gets faster as you progress, with the screen changing colour at each new stage. Scores and statistics are printed at the top of the screen, being updated like those electronic train-departure boards. The sound effects are nicely done but if you prefer a quieter game, they can be turned off, and the action can be frozen with the F7 key.

### Verdict

Exterminator has superb animated graphics (the spider and worm are great), is full of action and uses sound effectively. For quality in all departments, this takes the prize. **Bob Chappell**

### RATING

<b>Lasting appeal</b>	☆☆☆☆
<b>Playability</b>	☆☆☆☆
<b>Use of machine</b>	☆☆☆☆
<b>Overall value</b>	☆☆☆☆



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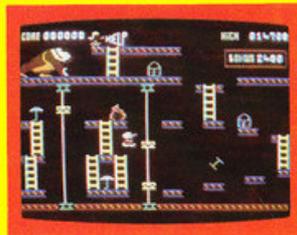
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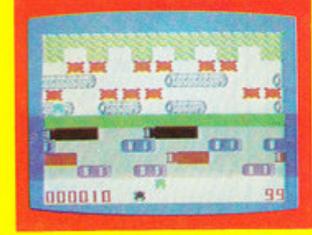


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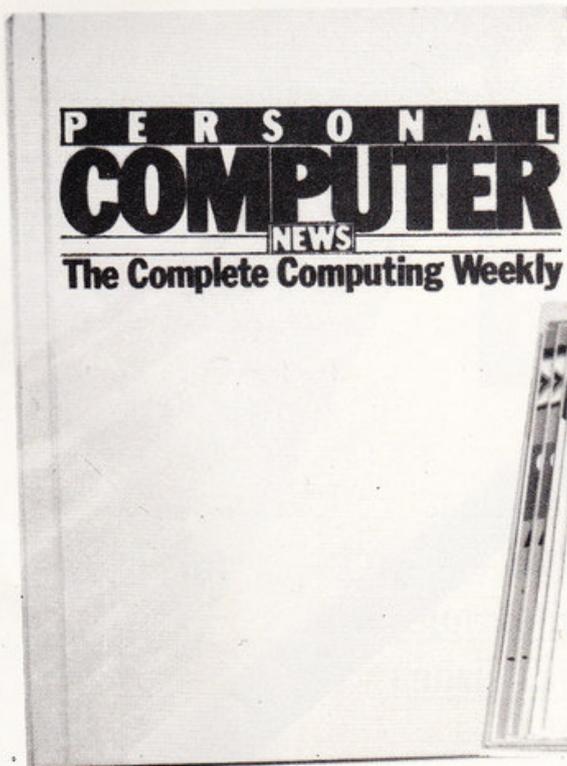
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John Lettice takes his Spectrum from the Spanish Main to the familiar monster mazes.

# Spectrum special

The Spectrum has now passed its first anniversary, and the current batch of games being released shows that age cannot wither it nor custom stale its infinite variety—in some cases at least.

## PLUNDER

First off the slipway is an everyday story of seafaring folk.

In *Plunder*, your objective is to stop the Spanish Armada sailing by pillaging the convoys of gold Spain is shipping to finance it.

You sail your ship—a nice little user-defined graphic—around a very impressive high-resolution map of the Atlantic Ocean, seeking out galleons (can be nasty), troopships (you can deal with these, but boarding might not be such a smart idea), merchant vessels (sitting ducks) and finally the warships (run for your life).

While you're doing this, the sea takes its toll of crew and hull, and naturally the odd cannonball can make mischief. So you use some of your winnings—they're probably tainted with the curse of Montezuma anyway—to hire new crew, make repairs, and perhaps do a little trading and/or drug running.

Yes, that's right, you can buy one of Central America's less savoury products in Haiti and sell it at a profit at Marseilles. I didn't run into Gene Hackman, but he and other cops might still prefer it if you stuck to grain and diamonds.

One nice point about *Plunder* is that it's actually fairly realistic. Broadly speaking, you can take on the ships a thieving buccaneer/national hero of the time would be able to, with approximately the logical consequences (although merchant seamen seem to be a lot less ready to run up the white flag than I'd expect). And I won't swear to it, but the warships really do seem to follow you around, hunt the *Graf Spee* style.

All in all, it's a particularly neat and inventive execution of what is becoming a fairly common idea.

## BARON



*Baron* is another offering in the honourable tradition of Candyfloss. Here your goal is to manage a small fiefdom, fighting off the villains and beating up the villeins.

You can play it solo, but the game is really geared to several—up to four—players. All players start off with the same amount of land, peasants and cash, and your goal is to manage these resources. You can play the game the peaceful way, tending your crops and amassing land legitimately by purchase, or you can hire mercenaries and pillage your neighbours.

It's certainly refreshing to see a computer game that'll take more than one player, but there are problems with this one. The instructions are a little ropery—for example, you can increase your supply of peasants by feeding more than you've got, but you aren't told this. There was one annoying bug on the review copy. At one point the program asked if you wanted to hire mercenaries. You answer 'y' or 'n'... and then it asks you if you want to hire mercenaries, up to a dozen times.

It defies belief that a manufacturer could send out a game with a louse-up like this in it, but there it is. If it wasn't for this boredom-inducing bug, the game would be relatively entertaining for several players. The one-player version is a fairly pointless exercise.

## ESCAPE



I could forgive this one a lot. It's a new twist on maze games, where you're stuck in a Hampton Court style environment, being pursued by various prehistoric monsters. Your aim is to find an axe, then use it to break down a door and get out of the maze.

But the real killer is the way the dinosaur comes after you, using the Spectrum's excessively quiet speaker to produce a 'pad pad pad' noise as it runs. I



never did get out of the maze, but I plead that I was too busy laughing at the dinosaur. If you can control yourself, it has potential to be a fast and entertaining maze game.

## THE DETECTIVE



More humour here. Load up the *Detective* and you're presented with a natty title page, across which you see a row of bullet holes creep.

Start on the game and you see a small figure in the centre of the screen; cursor left or right and the figure saunters, slowly but purposefully, in the relevant direction.

If you press the fire button the figure stops, whips out two guns and blazes away at the sky, the reason for this being that there are things falling out of the sky at you.

Yes, you've guessed it, someone's thought of yet another twist on *Space Invaders*. According to the instructions, you've got to get through *Dagger Alley* (all 25 screens of it), then crack a safe. The mob's 'out to get ya' (according to this 'broad' you met), and they're trying it in all sorts of weird ways.

The first screen seems to have them dropping giant-sized ring-pulls on you, while in the second they seem to be lamp-

shades. In addition to this, rows of car tyres form up above your head and then fall on you, and if the dog comes by you lose all your points.

It's not particularly fast to start with, but it's tricky, and highly entertaining.

## HOME RUNNER



Put together an Olympic runner, a set of monsters and some scaffolding, and *Home Runner* is what you come up with.

You hop, skip and jump your way up a number of levels, avoiding monsters and the holes that appear in the floor every now and then, until you get to home, at the top level.

I didn't find the monsters made my pulse race.

- Plunder** (£6), Cases Computer Simulations, 14 Langton Way, London SE3 7TL
- Baron** (£5.95), Temptation Software, 58-59 Poland St, London W1
- Escape** (£4.95), New Generation Software, Freeport, (BS 3433), Oldland Common, Bristol
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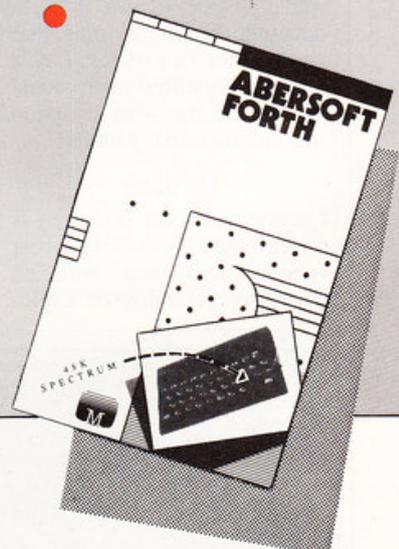
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# CRYPTIC CLUES

## DRAGON 32

# Arcade vs. adventure

**Name** Death Mines of Sirius **System** Dragon 32, 1 joystick **Price** £9.99  
**Publisher** Phoenix Software, Spangles House, 116 Marsh Road, Pinner, Middlesex **Format** Cassette  
**Language** Machine code **Other** Versions None **Outlets** Mail order/retail.

Trying to combine arcade and adventure games is nothing new, though what Phoenix have done is provide two tapes labelled The Action and The Adventure, with success at the first bringing you a code that enables you to play the second.

### Objectives

The arcade section is a version of that aged favourite, Lunar Lander, in which you are rescuing men from the planet surface, while the adventure requires you to save your damaged ship from a fungus growth that is slowly moving towards it.

### First impressions

The tapes come in a colourful wallet and are well-documented, mentioning that you will need a joystick. I have to admit to a stifled yawn when I discovered the arcade action was merely Lunar Lander.

### In play

I yawned too soon, however, as this proved to be one of the best versions I've seen, with an impressive opening of explo-

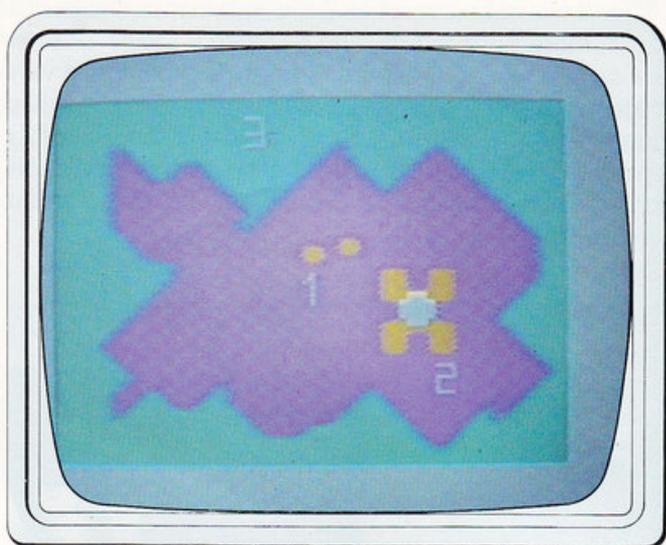
sive graphics, the theme from 2001, and the story outlined by a robotic voice via the TV loudspeaker. There are optional instructions and then you're on the first of the 12 skill levels, with four ships and 9999 units of fuel to rescue as many trapped men as possible and uncover clues to that adventure code.

There are 41 men split between the four landing pads, though you needn't return to the mother ship between each landing. You can hop from pad to pad and deposit them all at the end if you wish, and if you can manage it. The fire button activates your retro rockets in the direction of your joystick, and, as you might expect, all the controls have a slight delay mechanism built-in.

If this sounds fairly straightforward, there is a complication in the shape of asteroids floating across the screen which transform the game from the merely tricky to the downright difficult. The rocket responded well to the controls, though the asteroids failed to respond to yells of 'Get out of the way...'

Across the top of the screen are four pieces of information: the number of men saved so far, the number you're carrying at the moment, the fuel remaining and the lives left. The only easy part of the game is docking with the mother ship, where you merely float across underneath and the men are transferred automatically.

Success at each screen brings you some Morse-like bleeps and a message such as 'Don't count your Drunics.' Collect the cryptic comments and you should be able to piece together a running code for the adven-



ture, which could take some considerable time as the screens naturally get harder as you go.

What a pity, then, that when you get there the adventure is something of a disappointment. It is divided into two parts, one on each side of the tape, and yet another running code must be discovered from part one to enable you to play part two. This could go on forever.

The first drawback is that you have to load the adventure completely before being asked to input what you think the running code is, and if you get it wrong or hit the wrong key the program crashes and you must reload.

I assume this is designed to prevent guessing, but it seems rather harsh when it would have been easy to have just the first few program lines load and then refuse to proceed till the right code was received. Guessing is impossible anyway, as you don't know if the code is a word, a phrase, a sequence of numbers or letters or what.

But when all this rigmarole is sorted and the adventure is running, you'll find your damaged ship is down on the surface of Sirius. You're told how long it will take to repair, which is about four times as long as it will take the deadly fungus growth to reach you and kill you off. There are four courses of action open to you, and you're given their respective chances of success: go out and find an antidote and you stand a reasonable chance of success, hope the fungus dies which is not very likely, attempt to control the fungus which is virtually impossible, or sit back and do nothing *ie* commit suicide.

The first is the option to take as the others merely result in quick deaths. The main prob-

lem with the adventure, which is mostly text with a few graphics, is that wherever you're given a choice of actions the wrong option will simply kill you off and return you to the start.

So you retrace your steps, make the other choice, are confronted by yet another choice, and if you get that wrong you're back to the start to retrace your steps yet again, and so on. In other words it's not so much an adventure as a series of guesses... till you get to the point where you have to deduce another code.

The whole thing is more like a classroom examination than a genuine adventure. Once you do know all the right answers there is no point in ever playing the game again.

The poor impression the adventure gives is not helped by a succession of spelling mistakes which should never find their way into a supposedly professional program: there chance instead of their chance, opennings for openings, unconscious for unconscious, and so on.

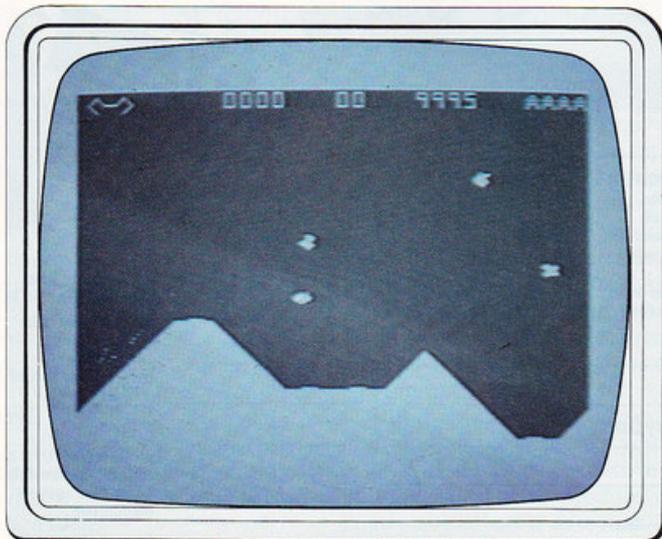
### Verdict

If the action game were sold on its own at half the price The Mines of Sirius would get a good recommendation, but it's hard to see who the two games together would satisfy. Anyone interested in a good adventure will be disappointed, while arcade fans will only be keen on the action tape anyway.

Mike Gerrard

### RATING

**Lasting appeal:**   
**Playability:**   
**Use of machine:**   
**Overall value:** 



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# PCN Program Cards

Two games for program cards this week. One for the BBC model B and one for the Spectrum 16K. The games differ a great deal, the Spectrum one is a puzzle that needs a bit of thought to solve, the BBC one is a zoom around the screen and shoot it up game.

Pyramid comes from Mr. S A Wring of Clevedon in Bristol. You pit your wits against the computer, trying to solve the puzzle it sets you. The puzzle involves a pyramid of random numbers. The computer chooses a route down the pyramid, which it keeps to itself (of course). The idea of the game is to find a route from the top of the pyramid to the bottom, while obtaining the same total as the computer.

The only clues you are given to find the route, or it's equivalent, are the sum of the numbers passed through, and highlighted squares on the computer's route. The number of highlighted squares depends on the difficulty selected. Lastly, note that

line 9000 is included to allow the screen colours to be set to normal if *break* is used to get out of the program. To use type 'GO TO 9000'.

The BBC program from A D Poole of Maidenhead, Berkshire, is a game called Falklands Raid. The program consists of a two dimensional section across the Falklands Islands, which is split up into five screen size sections; you are not bound to stay within these five sections, although your fuel is limited (500 units at the start and after each refuelling). When outside the specified five sections, there is a random chance of finding an aircraft carrier to refuel from.

The aim of the game is to fly over the islands firing on the enemy bases, ships, fuel dumps and radar antennas. Note that it is safer to fly low, otherwise you will come under enemy anti-aircraft fire. If you are hit, or you fly into something, besides the land, you damage the aircraft. Any more

hits and you'll not make it home. You are allowed to fire up to five air to ground (or sea) missiles at any one time.

All of the ships, planes, and installations are user defined characters and are defined using the loader program. Also in the loader program are various system variables which, if changed, will allow you to alter the characteristics of the game. Try making J% larger and see what happens to your maximum velocity!

If you have any programs, games or utilities sitting on the shelf at home, or that you have just written, why not send them in to ProgramCards? The more interesting, clever, well programmed and original, the more we pay for the program. Send your program on either a cassette or disk, preferably with a listing, instructions and comments, to:

Programs Editor, Personal Computer News, Evelyn House, 62 Oxford Street, London W1A 2HG.

## PCN Program Cards

### Falklands Raid Card 1 of 2 (Loader)

8336FR1/2

>L.

```
OMODE1:W%=0:V%=1:@%=0:K%=0:J%=22:L%=
```

0

```
10*K.OMD.7!MVDU14!ML.!M
```

```
20VDU23,240,16,16,16,56,40,254,248,56  
,23,243,0,0,0,32,32,44,40,56,23,244,3,11  
,15,47,127,63,31,31,23,245,208,224,240,2  
44,254,252,248,248,23,252,24,40,72,146,2  
54,42,85,255,23,253,82,255,255,255,2  
55,255,255,23,241,0,74,16,92,58,8,82,0
```

```
30VDU23,238,128,0,0,0,0,0,0,0,23,239,  
0,0,24,36,231,24,0,0
```

```
40VDU23,250,92,92,92,82,255,255,255,2  
55,23,249,8,8,8,28,8,127,62,28,23,246,54  
,62,124,255,123,62,31,15,23,247,0,0,0,25  
5,187,238,255,255,23,248,0,0,1,247,178,2  
36,248,240,23,242,32,32,96,36,36,36,46,1  
00
```

```
50*K.10DIMA 500!MCALL!-4!M
```

- 0 Select screen mode and initialise variables, note that some of these variables are carried over into the main program
- 10 Set key 0 for editing
- 20 Use the VDU 23 command to define characters for the ships etc. Character 243 is the top of a battleship. Character 244 is the left half of a battleship, with char 245 being the right half. The radar is defined by character number 252. The ground and fuel dumps are defined by character 253. The exploding missiles are done with character 241.

## BBC B BBC Basic

Application: Game  
Author: A D Poole



# SNOWBALL

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Snowball is our new fourth adventure. Here's what the reviewers have just said about the first three:

"The Level 9 Adventures are superbly designed and programmed, the contents first rate. The implementation of Colossal Cave is nothing short of brilliant; rush out and buy it. While you're at it, buy their others too. Simply smashing!"

- SOFT, September 83

"Of the programs reviewed here, the only one that is wholly admirable is Level 9's Colossal Adventure."

- Your Computer, September 83

"I found Dungeon exceedingly well planned and written, with a fast response. There are well over 200 locations and the descriptions are both lengthy and interesting."

- Computer & Video Games, September 83

"This has to be the bargain of the year... If adventures are your game, then this is your adventure"

- Home Computing Weekly, 30th August 83

"There are three excellent adventures on offer from Level 9... the descriptions are so good that few players could fail to be ensnared by the realism of the mythical worlds where they are the hero or heroine... great fun to play."

- Which Micro?, August 83

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## PCNProgramCards

### Falklands Raid Card 2 of 2 (Loader)

8336FR2/2

```
60COLOUR2:ONERRORRUN
70PRINTTAB(8,0)"Falklands Bombing Rai
d"
75COLOUR1
80PRINTTAB(0,3)" You are an R.A.F Ha
rrier pilot flying from H.M.S Hermes (sh
own by a '1' on your flying map). Althoug
h this is your base ship there are also t
wo other carriers that are in your rang
e, allowing you to refuel. (shown by 2)"
90PRINT" Your orders are to fly over
east ";
91PRINT" and west Falkland whilst fi
ring missiles ";
92PRINT"at the enemy ships, radars
and bases, ";
93PRINT" situated on and around the
islands. You can fly as far east and we
st as you wish, but you do have limit
ed fuel."
```

```
99COLOUR3
100PRINTTAB(0,15)"KEY'S TO USE
ENEMY"TAB(0,17)"A'.....For up
";CHR$(252);" radar"TAB(0,18)"Z'.....
For down"TAB(0,19)"'/.....For right
";CHR$(249);" small ship"
110PRINTTAB(0,20)"'.....For left"TAB
(0,21)"TAB'...To fire ";CHR$(244
);CHR$(245);" Large ship"TAB(0,22)"D'..
.To detenate"TAB(24,23);CHR$(253);" stor
es dump"
120PRINTTAB(0,21)"TAB'...To fire
";CHR$(244);CHR$(245);" Large ship"TA
B(20,25);CHR$(246);CHR$(247);CHR$(248);"
AIRCRAFT CARRIER"TAB(20,24);CHR$(242)
130VDU28,5,30,30,27,31,3,2
135A=GET
140COLOUR 2:CHAIN"FALKL"
```

30 238 is the character for a missile, note that this may be too small to see on a television and may need redefining. Character 239 is the harrier. Cruisers are defined with 249 and the aircraft carriers are defined with characters 246 to 242.

40 Define Key 10 to beep on reset.

50

60 Set printing colour and define error trapping routine.

70 Title.

75-120 Print in red, the instructions.

130 Set up a loading window.

135 Press any key to continue.

140 Chain the main program. Note that the program name can be anything you like, as long as the main program is saved under this name.

## PCNProgramCards

### Falklands Raid Card 1 of 5 (Main)

8336FM1/5

```
10MODE1:COLOUR131:CLS
20C=0:T=1:H$="Woolleysoft":HI%=10:DIM
CZ(10),CCX(10),XSX(5),YSX(5),MSX(5),MSY
Z(5),IX(5),LX(5),MLZ(5),MEZ(10),MRZ(10)
30FOR @%=1 TO 5:LZ(@%)=0:MLZ(@%)=0:NE
XT
40@%=0:TZ%=0:WT%=1:A=1:B=0:DD%=0:DZ%=0
50COLOUR0:VDU4:PRINTTAB(1,1)"Hi ghest
score=";HI%TAB(1,2)"by ";H$;" "TAB(1,4
)"FUEL=";TAB(15,4)"HITS=":VDU5:PROCBACK
60VDU24,10;40;1270;700;
70X%=100:Y%=120:MX%=10:MY%=0:FUZ%=500:
H%=0:Z%=1:EX%=1:NZ%=RND(10)-5:PROCLAND
80PROCCC:GOTO80
90DEFPROC:FZ%=RND(3)+1ANDY%+8*MY%>2
00THEN100ELSE150
100T%=TZ%+1:WT%=WT%+1
```

### BBC B BBC Basic

Application: Game  
Author: A D Poole

```
110IFTX>5TX=0
120SOUND0,-12,60,1:MEZ(TX)=X%+8*MX%+RN
D(100)-50:MRZ(TX)=Y%+8*MY%+RND(100)-50:G
COL0,2:MOVEMEZ(TX),MRZ(TX)+20:VDU241
130IFWTX>5WTX=0
140MOVEMEZ(WTX),MRZ(WTX)+20:SCOLO,0:VD
U241
150ENDPROC
160DEFPROCCC
170PROCF
180*FX15,1
190IF POINT(X%,Y%-20)=3THENPROCLANDED
200IF FUZ%>0THENPROCLIV
210IF@%=5THEN@%=0
220@%=@%+1:IF LZ(@%)=0ANDMLZ(@%)=0THEN
250
```

10 Select mode and colour.

20-40 Set up variables and dimension arrays.

50 Print Hi-score and the top of the screen titles, then draw the background.

60 Define graphics window.

70 Set up some more variables then draw the ships. PROCCC is the game so keep repeating it.

80 This procedure checks to see if you are above a certain height and if so, puts flak into the air.

90-150

160 This is the main program procedure.

170 Do flak routine.

180 Clear buffer.

190 Check whether harrier has landed, and if so, do PROCLAND.

200 Check fuel and execute PROCLIV if fuel greater than zero.

210 Check @%.

220 Check for flames, if none then 250.

# CHOOSING A HOME MICRO



Choosing a home micro can be a daunting task to the newcomer, and with an ever increasing number of micros emerging on the market, even up-grading, say, from a ZX81 can be a risky and expensive exercise if the wrong decision is made. It is important to look at the real facts and specifications, and check exactly what you get for your money before choosing your micro-computer system.

## THE PITFALLS

### "DON'T LET THE ADD ONS ADD UP"

A number of large companies are offering packages that seem to be good value and low cost. These offers usually have a hidden sting inasmuch as the essential accessories such as connection leads, peripherals and software often carry very high cost premiums. e.g. software for low cost hardware usually costs between £29 and £49 for a ROM cartridge!!

### CHECK THE QUALITY OF THE PRODUCT.

Raw materials are now an area where corners can be cut, and shoddy workmanship during 'building' can effect the 'up-time' of your unit. Areas to watch out for are unreliable edge connectors, corrosion and poor quality P.C.B.s. Low quality components and bad design will seriously effect the reliability of the end product, and can lead to false economy.

### DON'T BUY A GAMES MACHINE

Unless you want just games and nothing else! With a games computer you are limited. Some computers, however, have the advantage of both games facility plus the whole world of computing to explore, as your interest and skills develop. A real computer system will allow you to expand your knowledge of the Hi-Technology world, and help earn its keep with its added uses in the field of education, communication and home business use.

### SOFTWARE

Make sure the system you choose has a growing library of support software, to enable you to realize the full potential of your machine.

### KEY POINTS TO LOOK FOR

● **High Resolution Colour**  
In general most home computers have a poor graphics resolution (or detail). Check on the vertical and horizontal resolution in graphic mode and multiply the two numbers together. If the result is less than 35,000, then the graphics can hardly be considered high resolution. Without high resolution graphics displays such as those used in games tend to be "Chunky" in appearance.

● **High Quality Sound**

Some computers claim to provide a sound channel when in reality all that can be found inside the computer is a small buzzer controlled by electronic pulses. At the very least a sound facility should provide more than one channel and a raise channel as well (for gun shot effects in games for example). The best systems also provide envelope control of the sound channels to produce very sophisticated effects: very important for generating music. Also look for the ability to connect to external amplifiers.

● **Keyboard**

For accurate entry of programs and data into a computer it is important that the keyboard has a good tactile feel in operation. Coupled with acoustic feedback the user is fully aware when the computer has accepted his/her actions. Also of importance in a keyboard is layout. A standard computer keyboard layout will familiarise the user with the vast majority of computers used in the world of business and professional applications: very important if the purpose of purchasing a computer is educational.

● **RAM**

One of the most important features of a computer is the amount of RAM, or memory, included. In general the more powerful and exciting a computer program is the more RAM it requires. But take care, all computers are advertised quoting the total RAM used in the system. Computers use up a great deal of their own RAM for storing essential data and particularly in supporting the graphics display and the CPU. If it is less than 32K think again, is it enough?

● **Computer Language**

It is too difficult to program a computer in its own binary language so high level languages are used, the most popular being BASIC. However, there are a number of BASICs, some being very different from the rest. A de facto standard in the computer industry is Microsoft BASIC. Learn this one and you will be able to program in the majority of computer BASICs; such an important point if a home computer is to be used to educate your children to face the technology of the future.

● **Expansion**

As your interest and knowledge of computing grows, you will need a



*Choosing the right system carefully will save you from throwing your money away. Check full specification, plus peripherals and software prices, before you buy. Preferably choose a Real computer system that can expand to meet your needs.*

computer system that will grow with you: able to accommodate Printers, Disk-drives, Joysticks, Communications Modem, and Colour Monitor, as well as produce HI-FI sound effects.

● **Software**

The computer you choose should have a growing selection of utility

software to make the most of its capability. Remember, computing is here to stay. You can't learn to compute on a toy, or a device which does not behave like a real computer. In short, look out for a computer which offers all the points above, and you will be sure of getting the best value for money.

## To find out which company offers you the right choice, with:-

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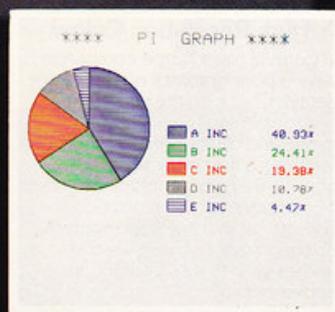


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This superb printer represents excellent value at just **£169.95 including VAT.**



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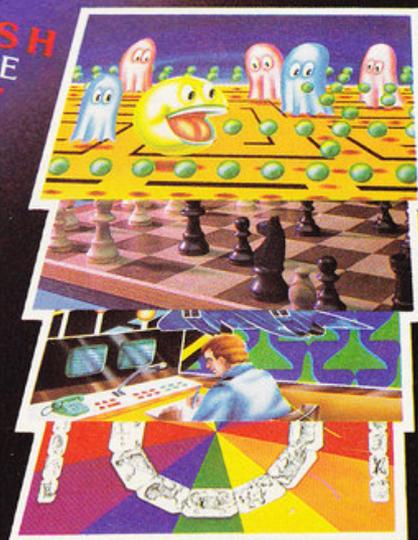
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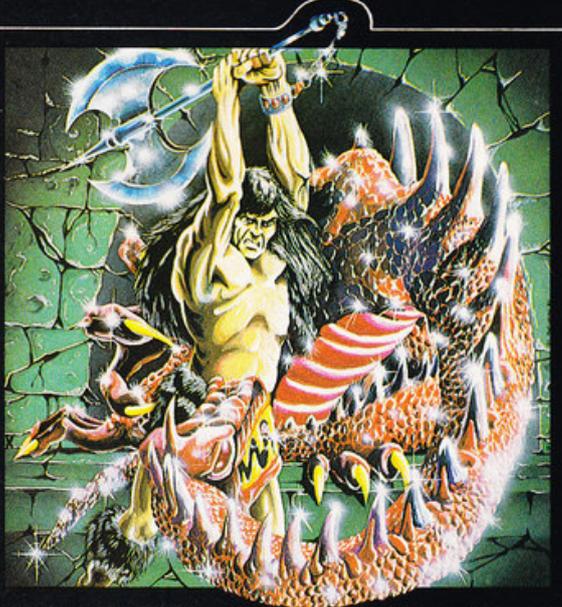
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Choosing which game to buy from the mountain available is a difficult job, especially when everyone claims to produce the best on the market. But how can you tell the best from the rest?. To help you decide, read on. . . .



## THE DUNGEON MASTER

Let your Spectrum be your guide in a totally new dimension in adventures in the true spirit of traditional role playing games where YOU design the scenario.

"I have been a Dungeons and Dragons fan for several years...The package provides excellent entertainment for all fans of the cults and should prove a good introduction to the game".

...Sinclair User.

"Highly recommended for its versatility, originality and quality. Definitely well worth obtaining".

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ZX Spectrum 48K

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Written by Graham Stafford.

What the real critics say. . . .

Very rarely have software titles produced such universal acclaim as 'Halls of the Things' and 'The Dungeon Master'. Now, with three brand new programs, Crystal continues to set the standard of software excellence. The difference is obvious - the choice is yours:

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## HALLS OF THE THINGS

A stunning multi-level maze 'arcade - adventure'. "Excellent and dangerously addictive - could change the Spectrum games scene overnight".

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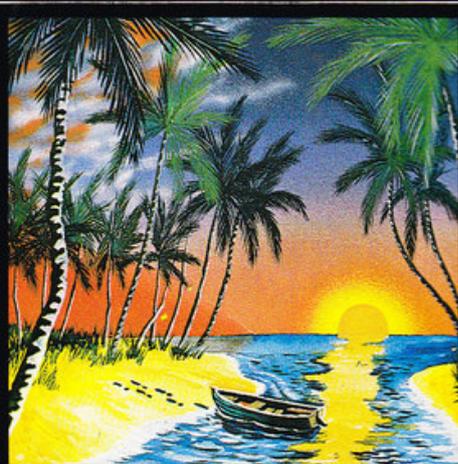
"Spectacular - One of the best games I've seen, finely balanced between simplicity and addictiveness - superb graphics and colour - I CAN'T RECOMMEND IT HIGHLY ENOUGH".

...Popular Computing Weekly.

ZX Spectrum 48K

£7.50

Written by Neil Mottershead, Simon Brattel and Martin Horsley.



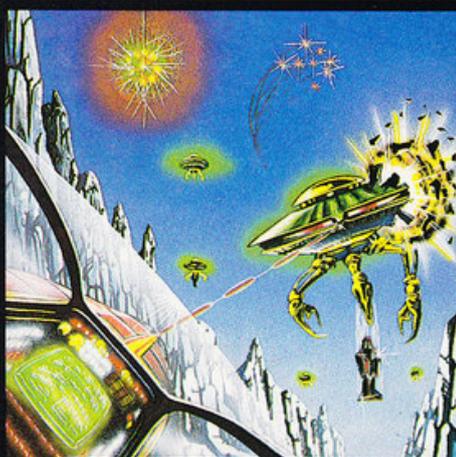
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The ultimate test of logic and deduction! Can you solve the hidden mysteries of the South Pacific Island on which you have been stranded - and escape alive! A brilliant classic style adventure game to fascinate and frustrate you for months!

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```

10 GO SUB 0000
20 BORDER 0: INK 0: PAPER 0: 0
30 REM HORIZONTAL PYRAMID LINE
40 LET D=10
50 PLOT 0,0
60 FOR A=1 TO 10 STEP 0
70 PLOT 0,0
80 DRAW 0,0
90 LET D=D-1
100 NEXT D
110 REM VERTICAL PYRAMID LINES-
120 LET D=10
130 PLOT 0,0
140 FOR A=1 TO 10 STEP 0
150 PLOT 0,0
160 DRAW 0,0
170 LET D=D-1
180 NEXT D

```

ZX Spectrum  
Spectrum BasicAuthor: S A Wring  
Application: Game

```

300 REM NUMBER SETTING AND PRINTING
310 RANDOMIZE 0: REM rnd set
320 LET D=14
330 LET N=2
340 DEN X(10,0)
350 FOR A=1 TO 10
360 FOR B=1 TO N
370 LET X(A,B)=INT (RAND*9)+.5)
380 PRINT OVER 1: PAPER 7: INK 1: AT A+B, D+B: X(A,B)
390 NEXT B
400 NEXT A
410 REM SETTING THE COMPUTER'S NUMBER ROUTE & TOTAL
420 LET B=1: IF AND(1,0) THEN LET B=2
430 LET I=B
440 DEN H(10): DIM U(10)
450 LET TOTAL=X(1,B)
460 LET U(1)=0: LET H(1)=B+14
470 FOR A=2 TO 10: LET U(A)=A+B
480 LET Z=INT (RAND*9)+.5)
490 IF Z<=0 THEN LET Z=-1: GO TO 500

```

10 Gosub and print title pages.  
20 Set border and paper for game.  
100-170 Draw horizontal pyramid lines.  
200-290 Draw vertical pyramid lines.

310 Set up random number seed.  
315-395 Put random numbers into the pyramid.  
400-530 Select computer's route and total.

```

480 IF Z<=0 THEN LET Z=0: GO TO 500
490 LET Z=1
500 LET B=B+Z+1
510 LET TOTAL=TOTAL+X(A,B)
520 LET H(A)=15-A+B
530 NEXT A
540 REM GO sub for players diff
550 GO SUB 1000
560 REM PLAYER'S GUESS & ROUTE
570 PRINT
580 LET B=1
590 DIM D(10): DIM E(10)
600 GO SUB 0000
610 LET GUESS=X(1,B)
620 LET E(1)=0: LET D(1)=B+14
630 PRINT OVER 1: PAPER 0: AT E(1), D(1): " "
640 FOR A=2 TO 10
650 BEEP .5, 40
660 PRINT PAPER 0: INK 0: AT 10, 0: GUESS
670 LET E(A)=A+B
680 REM MOVING CURSOR ROUTINE--
690 IF INKEY$="" THEN GO TO 680
700 IF INKEY$=CHR# 50 THEN LET Z=-1: GO TO 750
710 IF INKEY$=CHR# 54 THEN LET Z=0: GO TO 750

```

```

710 IF INKEY$=CHR# 56 THEN LET Z=1: GO TO 750
720 IF INKEY$=CHR# 62 OR INKEY$=CHR# 114 THEN GO SUB 1000: GO TO 1000
730 IF INKEY$=CHR# 63 OR INKEY$=CHR# 115 THEN GO TO 900
740 GO TO 680
750 LET B=B+Z+1
760 LET GUESS=GUESS+X(A,B)
770 LET D(A)=15-A+B
780 PRINT OVER 1: PAPER 0: AT E(A), D(A): " "
790 NEXT A
800 REM to clear INKEY$ buffer
810 PAUSE 1
820 REM displaying programs you
830 FOR A=1 TO 10
840 PRINT OVER 1: PAPER 4: AT U(A), H(A): " "
850 NEXT A
860 REM clearing screen bottom
870 FOR B=10 TO 20
880 FOR A=1 TO 20
890 PRINT PAPER 2: AT B,A: " "
900 NEXT A: NEXT B

```

560 Gosub and plot player's help route.  
600-615 Set up for player's guessing.  
620 Gosub and print totals.

650-740 Check player's keys and take appropriate action.  
1000-1030 Display the computer's route.  
1040-1070 Clear the bottom of the screen.

Which book would your micro want you to buy? PCN's review page helps you choose.

**'Using the 64'** by Peter Gerrard, published by Duckworth at £9.95 (paperback, 328 pages)

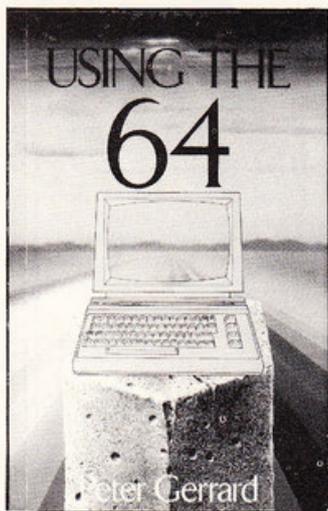
Owners of the Commodore 64 are now on the receiving end of a veritable landslide of books, software and peripherals — for which I'm sure they are truly grateful. This does, however, bring with it the problem of sorting out the gems from the dross.

In this case, we are dealing with a gem of a book. It deserves a place on the bookshelves of every 64 user whether beginner or expert.

There is an excellent introduction to 6502/6510 machine code, plus superb sections on sound and sprites, as well as a rundown on the full graphics facilities on the 64. These sections are far superior to Commodore's own in terms of readability, although the latter does give more information.

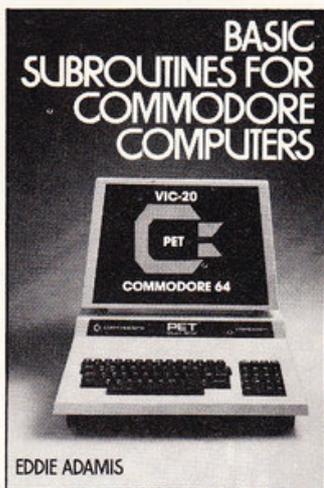
The second part of the book contains a wealth of technical information on the many dedicated chips in the 64 and while this will undoubtedly be beyond the grasp of most users, it is nice to have the information available in one source.

At £9.95 it is more costly than the usual run of 64 titles but at 328 pages (including an indispensable index) it provides good value for the money. Highly recommended. **PW**



**'Basic Subroutines for Commodore Computers'** by Eddie Adamis, published by John Wiley & Sons at £10.50 (paperback, 312 pages).

The main question pertinent to this book is why it has been published. There have been a number of subroutine compendiums in the past and this one seems to offer little that's new.



The fact that all the programs are written in Commodore Basic is of little merit since the earlier titles are all in standard (Microsoft) Basics and this one uses no commands or control codes peculiar to the Commodore machines.

More critically, the routines on offer are spectacularly dull. They may be of interest to users of business Pets, but will probably be of little interest to the average 64 or Vic owner. Most are of scientific or mathematical bias covering such subjects as area, capacity, energy and temperature conversions, statistics and word and number sorts.

The physical size of the book is misleading too. Almost a third of the pages are taken up by screen dumps of the programs in action and while a little of this is useful, too much looks like a waste of space.

There are about 300 routines here, each accompanied by a clear explanation of the code, and for programmers who really need a wide variety of routines of this nature the book will no doubt be useful.

But for the average micro user there's not much of interest. **PW**

**'Data Base Management for the Apple'** by N Wadsworth, published by Hayden Book Company Inc, distributed by J Wiley at £12.95 (paperback, 122 pages).

In the literature relating to micros, where so many books provide dozens of more or less useful programs, a book that concentrates on only one program would appear to be a rip-off. But not in the case of 'Data Base Management'.

The author starts with an introduction to the concept of

controlling information, and then proceeds to describe how the database is structured. The author explains very well a difficult subject in layman's terms.

The Data Base Manager program listing covers a mere five pages, which is important because the database resides in the RAM when in use.

Using the program is made very easy by the presence of a primary and secondary menu. The primary menu enables the major functions of defining the file format, reading a file from or writing to disk, cataloguing disks and erasing files.

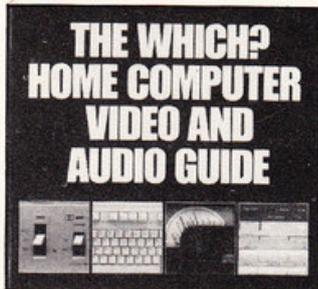
The secondary menu allows record changes such as additions, subtractions and corrections as well as containing the search facilities.

The section on applications is aimed predominantly at home use with a few more business oriented examples. Not so usual is the extent to which the adaptation of the program to these applications has been described.

For the more advanced students of microcomputing, a detailed explanation of the program's structure is given.

The suggestions altering various routines, contained in the last chapter, are useful but only go so far. When it comes to transferring routines into machine code the author draws the line and suggests further reading.

Considering the price of similar software in disk form, the book is reasonably good value. Particularly because of the versatility and adaptability of the 'Data Base Manager' program. It is not, however, intended for databases that are larger than a few thousand records, without machine code amendments. **LB**



**'The Which? Home Computer, Video and Audio Guide'**, edited by Quentin Deane, published by Consumers' Association and Hodder and Stoughton at £6.95

The run-up to Christmas is the traditional time for publishers to produce guides to the consumer jungle. But in all jungles, there are times when you ask for a machete and someone hands you a teaspoon. Unfortunately, this book is in nothing like the great tradition of the Consumers' Association.

What it does give you is a very basic — and at some points misleading — guide to what computers are all about, and what you might want one for. It's sorted into chapters with sub-headings, at the end of which you get a few lines headed 'Buying Guide'.

These 'guides' lack the pithiness of the standard *Which?* summaries. For example: 'If you intend to run mainly bought software then the limitations of the built-in Basic do not matter too much; if you want to write your own programs, the more commands there are for handling words and numbers, the better.' Is this really a recommendation to budding programmers to buy a machine without built-in Basic?

This particular *Which?* guide covers — as you may have deduced from the title — video and audio as well. The press release accompanying the review copy was deeply unconvincing on why this should be, but it would seem that the book is aimed at the consumer goods junkie who has little or no knowledge of the various fields covered.

In the first place I don't think this is a particularly fruitful line of enquiry, and in the second I don't think nearly enough hard consumer information has been included.

Far better to be 'baffled by the terminology or swept along on a tide of uncritical journalism.' That way, you'll eventually pick up some facts. **JL**

# sinclair special

5



*Inside...  
New Interface 2  
and ROM cartridges!  
New Software!*

## TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software. Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX<sup>®</sup> assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

### Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

### New ROM software too!

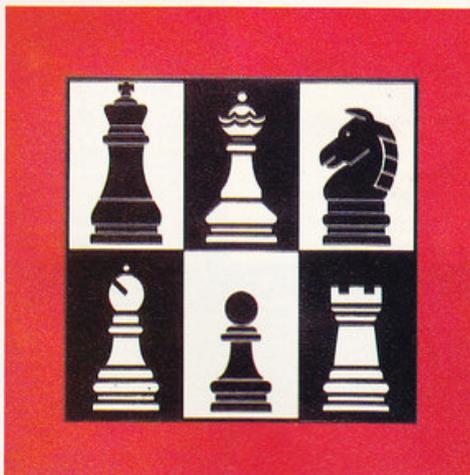
You may well have heard news of ZX Interface 2<sup>®</sup> and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

*Alison Maguire*

Alison Maguire  
Applications Software Manager

# SOFTWARE UPDATE

## The latest cassette software for ZX<sup>®</sup> Computers



### Chess Tutor 1

For 48K RAM Spectrum. **£9.95.**

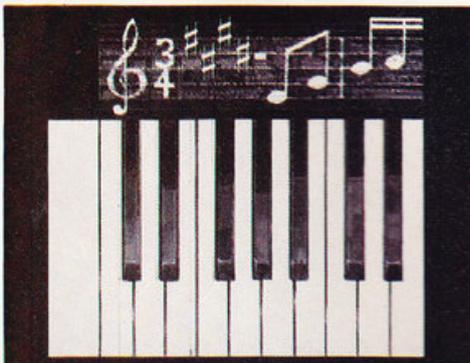
Chess Tutor is a new way of learning all about chess - using your ZX Spectrum.<sup>®</sup>

It starts from the beginning by teaching you about the chess pieces and the way they move - including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

Then it teaches you the basic tactics - pins, forks, double attacks and skewers.

There are over 120 exercises and over 200 questions for you to answer - with demonstrations and hints from your ZX Spectrum when you want them.

You can choose which parts of the course you want - and even experienced players may be surprised at what they can learn from Chess Tutor.



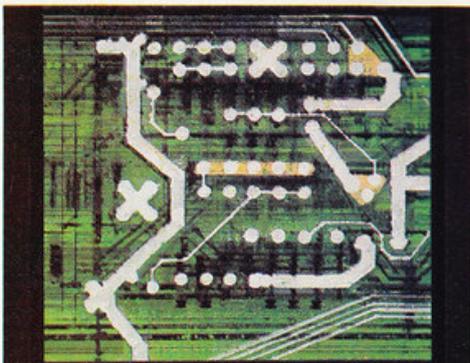
### Musicmaster

For 48K RAM Spectrum. **£9.95.**

Musicmaster turns your ZX Spectrum into a musical instrument which will not only play tunes, but will also demonstrate key signatures, durations of notes, and scales.

You can write your own tunes - in any key - play them over and over again, save them on tape, modify them.

You can either write your music on a staff, or place a simple overlay on your Spectrum for a 17-note keyboard.



### Make-a-Chip

For 48K RAM Spectrum. **£9.95.**

Make-a-Chip teaches you the basic elements of circuit design, shows you how they fit together, and then lets you design and test your own circuits.

When you have designed a circuit, you can give it inputs and outputs and your ZX Spectrum will check it for you. Then it will run it, or tell you what's wrong so that you can modify it.

Make-a-Chip is a fascinating way of finding out how computer logic works.

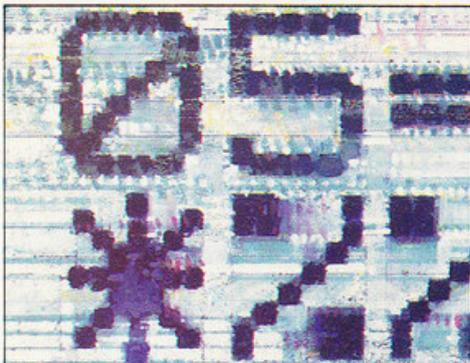


### Print Utilities

For 16K and 48K RAM Spectrum. **£9.95.**

Increase the printing and display facilities of your ZX Spectrum with the Print Utilities program.

Print Utilities enables you to enhance your programs by generating characters of eight different sizes which you can place anywhere on your screen.



### Beyond BASIC

For 48K RAM Spectrum. **£9.95.**

Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

A major feature of Beyond BASIC is that it enables you to write your own Z80 assembler programs - then you can actually see on your screen how they affect the ZX Spectrum memory and registers.

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## The New ROM Cartridge/Joystick Interface

**Loads programs instantly!  
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Just plug-in and play!**

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum® system. It enables you to use new ZX® ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

To use new ZX ROM cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. The program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum-compatible programs!



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SEE BACK PAGE FOR  
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## ...AND BRAND NEW ROM CARTRIDGE SOFTWARE!

There's already plenty of choice of ZX ROM cartridge programs for your Spectrum. Some are old favourites, in an exciting new form. Others are new.

And now, thanks to ROM cartridge technology, you can run them *all* on a 16K RAM Spectrum, even if they were originally written only for 48K machines!

Every ROM cartridge program loads fast and faultlessly. No wires, no waiting, no worries about loading errors! All of them are affordably priced too, at £14.95.

### New! PSSST



Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help

him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

One and two player option, with a host of features including sound effects.

### Chess



This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chess-board and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

Full-colour high-resolution graphics.

### New! Tranz Am



Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

### Horace and the Spiders



Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

Kill all the spiders, and a new web appears... with even more spiders to catch.

Full-colour high-resolution graphics.

### Backgammon



Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice

and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

### Space Raiders



Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base

to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

### Planetoids



Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves

fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

### Hungry Horace



Horace is forever being chased around the park by guards.

He steals their lunch, eats pathway flowers and creates chaos in the park by ringing the alarm!

You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

### New! Cookie



You're Charlie the Chef, who keeps his ingredients locked in the larder. But if the ingredients escape, they

bring the inedible Nasties with them!

You must daze the escaping ingredients with flour bombs, and knock them into the mixing bowl. Stop them getting into the dustbin, at all costs! And beware of Nasties that get into the mixing bowl!

Cookie is fast-moving panic in the pantry, with a cast of real characters. A program to make you smile – and sweat!

### New! Jet Pac



As Chief Test Pilot of the Acme Interstellar Transport Company, your task is to deliver and assemble spaceship

kits. On your way round the galaxy, you're free to collect precious stones and gold.

The catch? Rocket fuel is precious and scarce. And the aliens don't take kindly to the theft of their valuables. You'll need your wits and your lasers!

With a host of features, including multi-directional movement, explosions, sound effects and one and two player option.

# ZX MICRODRIVE



## NOW ON RELEASE

The ZX Microdrive® System – as you'd expect from Sinclair – is unique to the world of computing. It's a compact, expandable add-on system which provides high-speed access to massive data storage. With just one Microdrive alone (and Interface 1), you'll have at least 85K bytes of storage, the ability to LOAD and SAVE in mere seconds, the beginnings of a local area network of up to 64 Spectrums, and a built-in RS232 interface! The cost? Less than £50 for each Microdrive.

**How to get ZX Microdrive**  
Spectrum owners who bought direct from us, by mail order, have been

sent full details. Order forms are being mailed in strict rotation, so if you haven't yet received your order form please bear with us. We're making good progress in meeting the huge demand.

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# BACK ISSUES

**Issue 1, March 11-18.**  
**Pro-Tests:** Apple's Lisa, Text TX8000; Spectrum speech synthesiser, Apple printer, Commodore network; 3D on Spectrum, graphs package for Apple and IBM, BBC graphics system.  
**Features:** computer chess, Occam parallel processing language, Victor/Sirius function keys.  
**ProgramCards:** Towers of Bramah (Pascal), Biorhythm (Apple II), Roman Year (Apple II), Shape Utility (Apple II).  
**Gameplay:** Darts, Soccer (Atari); Castle of Riddles (BBC Model B); Pimania (Spectrum); Flight Simulator (IBM PC).  
**Databasics:** micros and peripherals.



**Issue 2, March 18-25.**  
**Pro-Tests:** Toshiba T100, Casio PB100, ZX81/Basicare, Vic speech synthesiser, Spectrum spreadsheet, IBM graphics, BBC word processing.  
**Features:** Colecovision, micro backgammon, nursery computing.  
**Gameplay:** Ultima II (Apple), Trader (ZX81), Starquest (Vic 20), Hungry Horace (Spectrum).  
**ProgramCards:** String editor (Spectrum), Analogue Clock (BBC Model B), Chart generator (Spectrum), String extractor/replace.  
**Databasics:** full software listings.

**Issue 3, March 25-April 1.**  
**Pro-Tests:** TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Petspeed compiler, Sirius toolkit, Dragoncalc.  
**Features:** Atom upgrade, Lynx programming, Apple music.  
**Gameplay:** Mangrove (Vic 20), Mutant Herd (Vic 20), Compedium (Dragon), Patience (Spectrum), Nights and Crosses (Dragon), Great Britain Ltd (Spectrum), Ulysses (IBM PC).  
**ProgramCards:** Magnify (Spectrum), Spider (Vic 20), Firing Range (BBC).  
**Databasics:** micros.  
**Micropaedia:** Anatomy of the BBC, part 3.

**Issue 4, April 1-8.**  
**Pro-Tests:** Pied Piper Communicator, Olympia ESW3000 printer, Namal Supertalker, Commodore Calresult, Spectrum Pascal, Cashbook (BBC).  
**Gameplay:** Dark Crystal (Apple II), St George (Dragon), Wizard War (Dragon).  
**ProgramCards:** Fruit Machine (C64), Tunessmith (Oric), Array Editor.  
**Databasics:** peripherals.  
**Clubnet:** Clubs and user groups.  
**Micropaedia:** Go Forth, part 1.

**Issue 5, April 8-15.**  
**Pro-Tests:** Commodore 700, Ikon Hobbit, 1-2-3 (IBM), ZX81 machine code.  
**Features:** speech packs, monitors.  
**Gameplay:** Grand Prix (Dragon), Derby Day (Spectrum), Deadline (Apple).  
**ProgramCards:** Wacky Racers (Oric), Fruit Machine (C64), Parse Integer.  
**Databasics:** Software.  
**Clubnet:** full list of user groups.  
**Micropaedia:** Go Forth, part 2.

**Issue 6, April 15-22.**  
**Pro-Tests:** Tycam Microframe, IBM PC, Scorpio Disks, Dragon sound module, ZX81 graphics, Bottom Line Strategist (CP/M), PaperClip word processor.  
**Features:** IBM PC DOS, BBC word processing, PC-1251.  
**Gameplay:** Mined Out (Spectrum), Transylvanian Tower (Spectrum), Lunar Leeper (Apple II), Evolution (Apple II).  
**ProgramCards:** Wacky Racers (Oric), Mortgage Comparison

(Sharp MZ80K), Computer Set Up (BBC), Day of Week.  
**Databasics:** micros.  
**Micropaedia:** Graphics, part 1.

**Issue 7, April 22-29.**  
**Pro-Tests:** Mattel Aquarius, Epson FX80, Olivetti JP101, Lisp on Spectrum, Vic 20 assembler, Supergrat on Victor/Sirius.  
**Features:** Dealer support, Atari graphics.  
**Gameplay:** Krakit (ZX81), Cruising On Broadway (Spectrum), Kaktus (Vic 20), Fantastic Voyage (ZX81).  
**ProgramCards:** CBM controls, Computer Set Up (BBC), Wacky Racers (Oric), Julian Dates.  
**Databasics:** Peripherals.  
**Micropaedia:** Graphics part 2.

**Issue 8, April 29-May 6.**  
**Pro-Tests:** Atari Home Files Manager, Kobra's Vic Stat for the Vic 20, Hestacrest's Accounts for the Spectrum, Epson RX80 printer, NCR's Decision Mate V, Future Computer's FX20.  
**Features:** Micronet, Compact programming on the TI99/4A.  
**Gameplay:** Harvester (Vic 20), Strategic Command (Dragon 32), A first Book of Micro Rhythms (BBC), Telling the Time/Money (Spectrum).  
**ProgramCards:** Program Indexer (BBC B), CBM Database cards 1-4, Sort/Extract.  
**Databasics:** software.

**Issue 9, May 6-13.**  
**Pro-Tests:** Structured Basic on the Apple, Pixel Power on the Vic 20, Star DP510 printer, Dams and Interpod interfaces for Commodore 64; Micro-Professor.  
**Features:** BBC function keys, Atari word-processing part 1.  
**Gameplay:** Dungeons of Intrigue (Oric), The Castle (Oric), Starship Command (BBC B), Dragon Trek, Nowotnik Puzzle (Spectrum).  
**ProgramCards:** Lower case (Dragon 32), CBM database cards 5-6, Monster (Spectrum), Wildcard Search (MBasic).  
**Databasics:** hardware.  
**Micropaedia:** Graphics, part 4.

**Issue 10, May 13-20.**  
**Pro-Tests:** Infomast on Commodore 64, Dragon Mace; MC202 and CMU800 music synthesisers (Apple), Prism directly coupled modem; Epson QX10.  
**Features:** ZX81 graphics part 1; Atari word-processing part 2.  
**Gameplay:** Rescue (Spectrum), Dictator (Spectrum), Roman Empire (Spectrum), Choplifter (Vic 20), Skyhawk (Vic 20).  
**ProgramCards:** Union Jack (Lynx), Escape (Spectrum), CBM Database cards 7-9, Evaluate (MBasic), Formula (BBC B).  
**Databasics:** peripherals.  
**Micropaedia:** Graphics, part 5.

**Issue 11, May 20-26.**  
**Pro-Tests:** BBC Vufile, PFS:File for IBM, Apple Pascal; printer comparison, Pickard Joystick Controller for ZX81 and Spectrum; C9E Computer Board.  
**Features:** ZX81 graphics part 2; Basic on the Sharp MZ80K.  
**Gameplay:** Motor Mania (Commodore 64), Oric Flight, BBC Music Synthesiser, Music Maker (Spectrum), Embassy Assault (Spectrum), Tobor (Spectrum).  
**ProgramCards:** Homeward Bound (ZX81), Connect Four (Dragon 32), CBM Database, cards 10 - end.  
**Micropaedia:** Keyboards.

**Issue 12, May 27-June 2.**  
**Pro-Tests:** Spectrum word processor, PFS:Report on IBM, File Handling for Colour Genie; CTI CP80 type 1 printer, TG Trackball; Sord M5.  
**Features:** Epson Basic, Oric sound part 1, Tandy Colour graphics.  
**Gameplay:** Mad Martha (Spectrum), Frenzy (Spectrum), Headbanger (Spectrum), Oric roundup.  
**ProgramCards:** Election Barchart (Commodore 64), Memory Utility (BBC B), Munch (Spectrum).  
**Databasics:** Hardware.  
**Clubnet:** clubs (Cambridge Microcomputer Club special).  
**Micropaedia:** Disk Drives, part 1.

**Issue 13, June 3-9.**  
**Pro-Tests:** Telewriter for Dragon 32, Abersoft Forth for Spectrum, GPS graphics processing system for Apple II+; joysticks, rulers; Ajile.  
**Features:** Dragon meets Tandy, Oric music part 2, transferring Basic for Colour Genie and Genie 1.  
**Gameplay:** Everest Ascent (Spectrum), Colour Genie roundup, Micro Maze (Jupiter Ace), Oix (Atari).  
**ProgramCards:** Cupid (Oric), Alien (Dragon 32), Time Bomb (Atari).  
**Databasics:** peripherals.

**Issue 14, June 10-June 15.**  
**Pro-Tests:** Apple Accelerator II board, Modula-2 (Apple II), Oric-Basic, Joystick Control Unit J6, Kempston Centronics Interface, BBC Speech Synthesiser.  
**Features:** Newbrain Basic part 1, Sirius designing.  
**Gameplay:** Ah Diddids (Spectrum), Monopole (Commodore 64), Automonopoli (Spectrum), Dragon dramatics.  
**ProgramCards:** Time Bomb (Atari, cont), Sheep Drive (BBC B).  
**Databasics:** Software.  
**Micropaedia:** Spectrum, Part 1

**Issue 15, June 16-June 22.**  
**Pro-Test:** Comx 35, Address Manager (Spectrum), Sysres (Commodore 64), MST Database (Epson HX-20), Voice Input Module (Apple II).  
**Features:** Newbrain Basic part 2, Genie scene.  
**Gameplay:** Cleared for Landing, Playing the Ace (Apple II), Vultures, Star Jammer (Dragon 32).  
**ProgramCards:** Mover (BBC B), Sprite Clock (Commodore 64), Pirate Island (Atari 3 of 9), Micro-mind (Colour Genie), Brickbat (Dragon 32).  
**Databasics:** Hardware.  
**Micropaedia:** Spectrum, part 2.

**Issue 16, June 23-June 29.**  
**Pro-Tests:** Atari v Acorn, word processing for the Commodore 64, Simplifile (CP/M), MPF-II printer, Z80 Pack for BBC.  
**Features:** ZX81 Maths, US mail order, Atari graphics.  
**Gameplay:** Computer Scrabble (Spectrum), Education (BBC), Horace and Spiders (Spectrum), Catcha Snatcha (Vic 20).  
**ProgramCards:** Video Titler (TI99/4A 3 of 6), Bowling (Spectrum), Pirate Island (Atari cont), Micropaedia: Spectrum, part 3.

**Issue 17, June 30-July 6.**  
**Pro-Tests:** Duet-16, The Organizer (CP/M), Trace and ZX Text (Spectrum), Juki 6100 daisywheel, Videx Ultra Term (Apple II).  
**Features:** Leasing part 1, Atari screen action.  
**Gameplay:** Oric chess, Grand Master (Commodore 64), Escape from Orion (BBC), Jet Pac (Spectrum), The Ring of Darkness (Dragon 32), Spectrum spectacle.  
**ProgramCards:** Video Titler (TI99/4A cont), Pirate Island (Atari cont) Word processor (BBC).

**Issue 18, July 7-July 13.**  
**Pro-Tests:** Tandy 100, RS232 interface (ZX81), ROM pager (Commodore), Interface printer buffer, IBM Personal Basic, Spectrum assembler, Newbrain WP.  
**Features:** Leasing Part 2, Lynx music.  
**Gameplay:** Spectrum Backgammon, BBC Snooker, Commodore 64 round-up, Serpentine (Vic 20), Pst (Spectrum), Spectrum Safari.  
**ProgramCards:** Word Processor (BBC), Fruit Machine (Spectrum).  
**Micropaedia:** Sound Part 2.

**Issue 19, July 14-July 20.**  
**Pro-Tests:** 16-bit chips, Stock control (Epson HX20), Mailplus (Torch), Smith-Corona daisywheel, ZX81 word processing.  
**Features:** Insurance, buying secondhand.  
**Gameplay:** Escape MCP (C64), Escape from Perilous (Atari), Apple round-up, Temple of Apsai (C64), Airline (Spectrum), Heathrow (Spectrum).  
**ProgramCards:** Colour Code (Atari), Wreck (Dragon).  
**Micropaedia:** Sound, part 3.

**Issue 20, July 21-July 27.**  
**Pro-Tests:** Rade bareboard, Vic digital tape drive, Seikosha colour printer, Toolkit (Spectrum), Bonus (Pet payroll), Newbrain monitor.  
**Features:** Computer art, Dragon scrolling.  
**Gameplay:** Rabbit Trail (TI99/4A), Aztec Challenge (Atari, Vic 20, TI99/4A), BBC round-up, Joust (Spectrum), Molar Maul (Spectrum), Print Shop (Spectrum), Time-Lords (BBC).  
**ProgramCards:** Tumbler (Oric), Wreck (Dragon), Atari Errors, Speed Race (Vic 20).  
**Micropaedia:** Sound, part 4.

**Issue 21, July 28-August 3.**  
**Pro-Tests:** BBC graphics, Newbrain assembler, BBC turtle, Oric printer, Triumph printer.  
**Gameplay:** Franklin's Tomb (Dragon), Hummer House of Horror (Spectrum), Jumpman (64), Jumping Jack (Spectrum), Fourth Encounter (Vic), Cyclons (64).  
**ProgramCards:** Collection (Vic), Bomber (64), Definer (BBC).  
**Micropaedia:** Sound, part 5.

**Issue 22, August 4-August 10.**  
**Pro-Tests:** Spectrum Forth, BBC graphics, Music synthesisers, IBM plotter, Brother daisywheel, Maltron keyboard, Mupid.  
**Features:** Genie assembler, Dragon machine code.  
**Gameplay:** River Rescue, Orc Attack (Atari), Zork (64), Knot in 3D, 3D Combat Zone (Spectrum), Moria (Oric), Velnor's Lair (Spectrum).  
**Micropaedia:** CP/M part 1.

**Issue 23, August 11-August 17.**  
**Pro-Tests:** Sord Basic-G, Tasword, BBC microfloppies, Microdrive, Tandy Model 4.  
**Features:** Dragon machine code, Atari controllers.  
**Gameplay:** Bridge Master, Styx, Manic Miner (Spectrum), Atari roundup, Candy Floss/Hangman (Oric), Everest (Dragon).  
**Micropaedia:** CP/M, part 2.

**Issue 24, August 18-August 24.**  
**Pro-Tests:** T-Maker III, Spectrum Fifth, daisywheels surveyed, Spectrum digital tracer, Laser.  
**Features:** Videotex, Dragon machine code.  
**Gameplay:** Oric roundup, Cookie, Egg Farm, Xadom (Spectrum), Sea Lord (BBC), Lusitanic (Dragon), The Island (64).  
**Micropaedia:** Commodore 64, part 1.

**Issue 25, August 25-August 31.**  
**Pro-Tests:** Electron, Simons Basic, Oric monitors, Microdrive.  
**Features:** Newbrain map, Acorn Atom, Dragon machine code.  
**Gameplay:** Suspended (64), Terror Daktils, Tranz AM (Spectrum), Dragon roundup, Jogger (Oric), Frogger (IBM).  
**Micropaedia:** Commodore 64.

**Issue 26, September 1-September 7.**  
**Pro-Tests:** Microtan 65, BCPL, BBC tracer, 80 column Pet, Oric interfaces.  
**Gameplay:** Magic Mountain, Smugglers Cove (Spectrum), Spectrum roundup, Matrix (64), Ninja Warrior (Dragon), Dallas, (Oric), Call to Arms (IBM).  
**Micropaedia:** Commodore 64.

**Issue 27, September 8-September 14.**  
**Pro-Tests:** Sharp MZ700, BBC Lisp, Apple editor, IBM micc, ZX81 surgery.  
**Gameplay:** Zip-Zap, Zzoom (Spectrum), Spectrum roundup, Hover Bover, Benji-Space Rescue (64).  
**Micropaedia:** Dragon, part 1.

**Issue 28, September 15-September 21.**  
**Pro-Tests:** Zenith Z100, Snail Logo, Atari Supergraphics, Newbrain CP/M, IBM micc.  
**Gameplay:** The Witness, Super Scramble, Stix (64), Harrier Attack (Oric), Morocco Grand Prix (Dragon), Pharaoh's Tomb (Spectrum).  
**Micropaedia:** Dragon, part 2.

**Issue 29, September 22-September 28.**  
**Pro-Tests:** Portico Miracle, Dragon editor, BBC toolkit, Dragon drives, Apple light pen.  
**Features:** HX20 disassembles, TI transformations.  
**Gameplay:** Griddler, Gloopert, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Splat, General Election (Spectrum).  
**Micropaedia:** Dragon, part 3.

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We confined coverage to five main types of applications: business, education, games, home and utility. All details published are the latest available.

Companies wanting to add their best-selling packages to Databasics, or wanting to update information already here, should send details to: Databasics, Personal

Computer News, VNU, 62 Oxford Street, London W1A 2HG.

**APPLICATION** Each software package is listed alphabetically by its application. **PRICE** includes VAT.

**MACHINE/OPERATING SYSTEM** on which the best selling packages runs.

**OTHER VERSIONS** indicates whether or not the package runs on a different machine or operating system.

**MEDIA SUPPLIED** indicates in what format the package comes — either cassette, disk, or cartridge.

**MAIL ORDER AVAILABLE** tells you whether or not the package is available by mail order.

**HARDWARE REQUIRED** shows the need for special hardware, such as disk drive, joystick or printer.

**PUBLISHER/DISTRIBUTOR** This code refers to the distributor code table at the end of the listings, which will give the name and telephone number of the publisher/distributor.

**COMMENTS** — any other points of interest.

## SOFTWARE

### BUSINESS

Accounting	Price inc vat	Machine/Operating System	Other versions	Title	Memory required	Media Supplied			Hardware Required			Distributor	Comments
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	£339.25	Apple II		General Ledger	48K	●			●			C1	Supports 1000 accounts and 100 analyses. Self-balancing, full audit trail.
	£552	Apple II		Informex Integrated Accounting System	48K	●			●			I1	Contains nominal, sales, purchase ledger + VAT. Can handle 800 accounts.
	£1,147.70	Apple II		Informex Integrated Business System	48K	●			●			I1	Contains accounting system modules plus invoicing + stock.
	£172.50	Apple II	●	Micro-General Ledger	48K	●			●			G1	Also on ITT 3030 and Basis 108. Goes through profit/loss + balance sheets.
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	£339.25	Apple II		Sales Ledger	48K	●			●			C1	Supports 700 + accounts. Direct posting, credit control & 100 analyses, self balancing
	£1,725	Commodore 8000	●	Auditman	32K	●			●			C4	Also on Commodore 4000. Complete accounts production system.
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	£2,070	Commodore 8000	●	Microfacts	32K	●			●			M1	Also on Commodore 700, Victor & Sirius. £345 per module. Integrated accounting.
	£454.25	Commodore 8000	●	Micro-simplex	32K	●			●			M2	Also on Commodore 64 (£172.50). Needs printer. For smaller retail business.
	£2,300	Commodore 4000	●	Pegasus Integrated Accounting Suite	32K	●			●			P3	Also on MS-DOS (128K). Contains six stand alone modules.
	£116.00	CP/M	●	CalcStar 1.4	160K	●			●			M10	Also on IBM PC, MS-DOS. Integrates with WordStar and InfoStar.
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	£569.25	CP/M	●	Nucleus	64K	●			●			C2	Also on MS-DOS. Disk drives of 280K needed. A program generating system.
	£1,431.75	CP/M	●	Padmede Business Control System	64K	●			●			P2	Five modules (£286.35 per module). Nominal, sales, purchase, invoicing, stock.
	£1,380	CP/M	●	Motor Dealers Part Distribution	64K	●			●			S2	Also on CP/M 86 & MS-DOS. Combines stock control, order processing ledgers.
	£1,868.75	CP/M	●	Peachtree Basic Accounting Systems	48K	●			●			P1	Also on MP/M & MZ-DOS. Available on hard disk (£2,156.25). 5 stand alone modules.
	£287.50	CP/M	●	Sales Ledger	64K	●			●			S2	Also on CP/M 86 and MS-DOS. Flexible ledger system.

	Price	Machine/Operating System	Other versions	Title	Memory required	Media Supplied	Hardware Required	Distributor	Comments
	Inc vat					Cassette Disk Cartridge	Disk drive Joystick Other		
	£45.42	Sharp MZ80A	●	Easy VAT	48K	●	●	K1	Also on Sharp MZ80B & M200K. VAT record system.
	£2,460	MS-DOS	●	Hi-line Integrated Accounting Suite	64K	●	●	H6	Also available on PC-DOS, HAI-BAS, CPM.
Agriculture	£1,150	Apple II	●	Dairy Package	64K	●	●	F2	Available on floppy or hard disk. Files individual cow production, with herd summaries
	£1,150	Apple II	●	Management Program	64K	●	●	F2	Available on floppy or hard disk. Monitors individual field activities, budgets, etc.
	£35	Newbrain	●	Agricultural Field costings	32K	●	●	P8	Field data costings
Bill of Materials	£373.75	CP/M	●	Fastbill	60K	●	●	T2	Also on MS-DOS & TRS-DOS. Will give parts explosion at 10 levels, 99 items/level.
Bookkeeper	£56.35	Apple II	●	Apple Bookkeeper	48K	●	●	H1	Needs printer. Keeps petty cash, sales, other business books, sorts, analysis etc.
Building Specifications	£460	Commodore 8000	●	National Building Specifications	32K	●	●	C3	Also on Commodore 4000. Used with Wordcraft. Produces building specifications.
Business Graphics	£471.50	16-bit machines	●	Micro-Graphpower	128	●	●	I2	Needs plotter. Business graphics which plots business data.
	£120.75	Apple III	●	Business Graphics	48K	●	●	P6	Also on Apple II (£125.35). Supports range of plotters & pie-charts, etc.
	£149.50	IBM PC	●	Graph Magic	96K	●	●	F1	Also on Apple II, III. Displays files graphically. Reviewed 18.3.83.
Business Management	£569.25	Commodore 8000	●	The Administrator	96K	●	●	S11	Complete applications generator. No programming required.
	£4,140	CP/M	●	Peachtree Business Management System	48K	●	●	P1	Also on MP/M & Unix. Available on hard disk (£6,900). Six modules for single user.
	£684.25	IBM PC	●	Tomorrow's Office	128K	●	●	S11	Also on Sirius, Victor & MSDOS. Complete applications generator.
Cash Book	£224.25	Commodore 4000	●	Electronic Cash Book	32K	●	●	D1	Also on Commodore 8000 & 64. For small business or add-on products.
Cataloguing	£46.00	Apple II	●	Floppy Cat	48K	●	●	P4	Enables user to catalogue & store all information.
	£35.00	Newbrain	●	Dentists' NHS Schedule	32K	●	●	P8	Aid for checking statutory returns.
Estate Agents	£1,092.50	Apple II	●	Commercial Agency Systems	48K	●	●	C7	Matches in both directions with lists, labels and letters.
	£977.50	Apple II	●	Cyberpress Clients Recoverable Costs	48K	●	●	C7	Also on Rair Black Box. Designed to keep record of incurred expenditures.
	£1,121.00	Apple II	●	Cyberpress Residential System	48K	●	●	C7	Also on Rair Black Box. An applicant & property matching system.
	£419.75	CP/M	●	Estate Agents Match & Mail	56K	●	●	S4	Matches & prints out potential customers for every property.
Financial Accounting	£569.25	Commodore 8000	●	Finplan	32K	●	●	M3	Also on Commodore 3, 4, & 8000. Vic-20 and Commodore 64. £46.57 on floppy disk
	£287.50	Commodore 8096	●	The Financial Director	96K	●	●	D1	Designed to handle large & complex planning & financial applications.
Financial Planning	£44.85	Commodore Pet	●	Buiscalc	16K	●	●	S5	Also on Hytec & ICL PC. 96K version available. Helps decide on financial strategy.
	£188.60	Apple II	●	VisiCalc	48K	●	●	R1	Also on Apple III, Commodore & IBM PC, etc. The classic spreadsheet.
	£345.00	CP/M	●	Bottom-Line Strategist	48K	●	●	P4	A business/project forecasting program. Allows user to test business assumptions.
	£281.75	CP/M	●	Master Planner	64K	●	●	C5	Also on MS-DOS & CP/M 86. Needs 80 column printer. Upgrade of a spreadsheet.
	£396.75	CP/M	●	Micro Plan	64K	●	●	B1	Also on MP/M. Spreadsheet financial planner.
	£343.85	CP/M	●	Minimodel Financial Modelling	48K	●	●	G1	Needs 80 column screen. Model consolidation facility, colour option.
	£182.85	CP/M	●	Multi-Plan	48K	●	●	P4	Also on PC-DOS, Cromix, Fortune, Corvus & Sirius. Second generation spreadsheet
	£44.85	CP/M	●	Plannercalc	48K	●	●	C5	Needs 80 column screen. Entry level system for spreadsheet planning.
	£218.50	CP/M	●	SP2020	48K	●	●	G2	Forecast effects of proposed actions. Aid to management decision-making.
	£172.50	CP/M	●	Supercalc	128K	●	●	A1	Electronic worksheet, representing a large flexible accounting work pad.
	£212.75	CP/M	●	Super Calculator	48K	●	●	E1	Spreadsheet calculator.
	£178.25	CP/M	●	T-Maker	48K	●	●	L1	Utility for analysis & presentation of numerical data & test material.
	£224.25	MS-DOS	●	Pulsar Business System	128K	●	●	A1	Consists of eight integrated packages & provides commercial accounting functions.
	£339.25	Osborne	●	PADAC	64K	●	●	P2	Also on CP/M. Two systems. Incomplete records accounting, time/cost recording.
	£632.50	UCSD-P System	●	Microfinesse	128K	●	●	P5	Financial modelling program for businessmen.
	£741.75	UCSD-P System	●	Micro-Modeller	48K	●	●	I2	Also on CP/M & MS-DOS. Designed for large corporations.
Industrial Costing	£747.50	Apple II	●	Stock & Production Costing	48K	●	●	A2	Also on Apple IIE & III & Sirius. Available on hard disk. Needs Pascal system.
Insurance Accounting	£1,380	Commodore 4000	●	Insurance Man	32K	●	●	C4	Also on Commodore 8000, provides insurance broker with sales ledger.
Insurance Broking	£5,462.50	ICL DRS20	●	HS-100	64K	●	●	H2	Requires 16 or 27 Mb hard disk to run off. Maintains client & policy records.
Integrated Software	£569.25	IBM PC	●	Context MBA	256K	●	●	B1	Also on Sirius & Victor. Comprises word processor database management system.
	£908.50	Commodore 8000	●	Silicon Office	256K	●	●	F1	Integrated spreadsheet modelling, graphics, WP, database & communications.
Invoicing	£6	Sharp MZ-80A	●	Invoice Control	48K	●	●	D6	Also MZ80K. Invoice details, payments, reminders.
Linear Programming	£373.75	CP/M	●	Optimiser	48K	●	●	C6	Also on Apple. Management tool for optimizing the deployment of scarce resources
Local Authority	£862.50	Commodore 8000	●	P.U.S.W.A.	96K	●	●	M3	Also on Hytec. Monitors road holes under Public Utilities Street Work Act (1950).
Mailing	£86.25	CP/M	●	Mailing List	56K	●	●	S4	Works with Super file. Prints labels, files, names & addresses. Mail merge facility.
	£149.00	CP/M	●	Mail Merge	56K	●	●	M10	Also on IBM PC. MS-DOS. Integrates with WordStar.



Business Game	Price	Machine/Operating System	Other versions	Title	Memory required	Media Supplied			Hardware Required		Publisher/Distributor	Comments
						Cassette	Disk	Cartridge	Disk drive	Joystick		
Business Game	£9.95	BBC Model A	●	Business Game	16K	●	●	●			W1	Also on Model B. Two games for economics, business & general studies, teaching.
	£5.95	BBC Model B	●	Inkosi	32K	●	●	●			C9	Also on Vic-20. Rule for ten years, overcoming obstacles, e.g. famines.
Chemistry	£14.38	Research Machine 380Z	●	Symbols To Moles	31K	●	●	●			H4	Also on Apple II. Practise using chemical symbols, writing & mole concept.
Children	£37.89	Apple II	●	Bumble Plot	48K	●	●	●			P4	A set of five programs for developing graphics and maths skills. For children 8 to 13.
	£29.84	Apple II	●	Bumble Plot	48K	●	●	●			P4	Also on IBM PC. Designed for children to learn computer keyboard by building up face.
	£37.89	Apple II	●	Gertrude's Secret	48K	●	●	●			P4	An educational game to teach logical thinking & planning. For children aged 6-9.
	£9.80	Atari 400	●	Jigsaw Puzzles	16K	●	●	●			T4	Also on Atari 800. Has 16 puzzles and optional difficulty.
	£9.95	BBC Model B	●	Letters	32K	●	●	●			C9	Designed for children aged 4-6 & for dyslexic & remedial children.
	£9.95	BBC Model B	●	Metrics	32K	●	●	●			C9	Also on Vic-20+ Spectrum. Structure of metric system, for children aged 10-15.
	£5.95	BBC Model B	●	Pascal	32K	●	●	●			C9	Also on Vic-20. Shows construction of Pascal Triangle and tests on it.
	£5.95	BBC Model B	●	Sequences	32K	●	●	●			C9	Also on Vic-20. Demonstrates number patterns.
	£6.50	BBC Model B	●	The Early Stages	32K	●	●	●			H3	Reading aid. Plays nursery rhymes. Available on disk.
	£4.50	BBC Model B	●	Super Hangman	32K	●	●	●			I4	Version of famous game. High resolution graphics. 800 words or enter own choice.
	£9.95	BBC Model B	●	Tree of Knowledge	32K	●	●	●			A9	Interactive program teaching categorisation. Simplified information retrieval.
	£4.95	Sharp MZ80A	●	Giant Maths	32K	●	●	●			S8	Also on MZ80K. Big screen figures & humorous error messages. 5 to 11 years.
	£4.95	Sharp MZ80A	●	Rocket	3K	●	●	●			S8	Also on MZ80A. Four difficulty levels. For five to 11 year olds.
	£9.20	Sharp MZ80A	●	Teach Tables	48K	●	●	●			K3	Also on MZ80K. Plays like game but motivates children to improve their ability.
	£4.95	Sharp MZ80K	●	Master Builder	48K	●	●	●			S8	Also on MZ80A. Repair a wall using random blocks. Teaches spacing.
	£5.25	Spectrum	●	Alphabet	48K	●	●	●			W2	'Picture for each letter of the alphabet. Option for lower case.' Aimed at ages 2-6.
	£5.25	Spectrum	●	Adding and Subtracting	16K	●	●	●			W2	For children aged 3-7. Three animated programs with full graphics.
Classroom Monitor	£322.00	UCSD-P	●	Classroom Monitor	64K	●	●	●			K4	Also on Apple II. Provides demonstration facilities & monitors student's progress.
Economics	£28.75	Sharp MZ80K	●	Broadwater Economics Simulation	16K	●	●	●			W1	Also on Commodore Pet & BBC. Simulates micro & macro economics.
French	£14.38	Research Machine 380Z	●	Repondez	31K	●	●	●			H4	Also on Apple II. Practising French verb formation (present tense).
	£9.20	Sharp MZ80A	●	French Conjugate	48K	●	●	●			K1	Also on MZ80K. Automatically conjugates regular verbs into tenses.
	£9.20	Sharp MZ80A	●	French Verbs	48K	●	●	●			K1	Also on MZ80K. Allows user to impart up to 20 verbs & eight tenses at a time.
Graphics	£8.00	BBC Model B	●	Painter	32K	●	●	●			A5	Also on Spectrum (£5.75). Atom (£6.90) & on disk.
	£9.95	BBC Model B	●	Creative Graphics	16K	●	●	●			A9	Book available (£7.50). Designed to illustrate BBC graphics.
History	£20.13	Sharp MZ80A	●	Kings & Queens	48K	●	●	●			K1	Also on MZ80K. Facts & figures on English monarchs since 1066.
Languages	£7.95	Sharp MZ80A	●	Multilingualist	3K	●	●	●			S8	Also on MZ80K. A language tutor to suit all European languages.
Mathematics	£8.95	BBC Model B	●	Angle	32K	●	●	●			C9	Also on Spectrum. Includes four programs designed to teach simple geometry.
	£9.95	BBC Model A	●	Algebraic Manipulations	16K	●	●	●			W1	Also on Model B. Includes four programs designed for use in maths teaching.
	£82.80	IBM PC	●	Fact Track	64K	●	●	●			I3	Learning basic arithmetic. Presents simple two-line sums in random order.
	£9.20	Sharp MZ80A	●	Directed Numbers	48K	●	●	●			K3	Also on MZ80K. Teaches difficult mathematical functions.
	£9.20	Sharp MZ80A	●	Divisor Advisor	48K	●	●	●			K3	Also on MZ80K. Teaches division at a variety of skill levels.
	£27.60	Sharp MZ80A	●	Numerical Integration	48K	●	●	●			K3	Also on MZ80K & B. Teaches Simpson's Rule.
	£5.25	Spectrum	●	Counting	16K	●	●	●			W2	Graded programs. 'Good as a first introduction to numbers.' Aimed at ages 3-6.
Meteorology	£23.00	Research Machines 380Z	●	Weather	31K	●	●	●			H4	Also on Apple II. Gives synoptic charts. Teaches elementary meteorology.
Morse Code	£9.20	Sharp MZ80A	●	Morse Tutor	48K	●	●	●			K3	Also on MZ80K. Used to teach morse code by sight and sound. At seven levels.
Physics	£14.38	Research Machines 380Z	●	Lenses	31K	●	●	●			H4	Also on Apple II. Illustrates formation of images by lenses using ray diagrams.
	£9.20	Sharp MZ80A	●	Casino Chips	48K	●	●	●			K3	Also on MZ80K. Uses radioactive chips to teach half-life concept.
	£3.00	Sharp MZ80A	●	Physics 1 and 2	20K	●	●	●			D6	Also MZ80K. O' level electricity and motion.
Typing	£28.75	CPM	●	Touch'n'Go	48K	●	●	●			C6	Also on MS-DOS. Typing tutor for mastering numeric pad & Qwerty keyboard.
	£31.05	IBM PC	●	Typing Tutor	64K	●	●	●			I3	Presents exercises for learning touch typing or for improving existing skills.
<b>GAMES</b>												
Adventure	£17.95	Atari	●	Arrow of Death	16K	●	●	●			C8	Also runs on TRS-80, BBC, Vic-20. A 'classic text adventure'.
	£7.99	BBC Model B	●	Adventure	16K	●	●	●			M7	Also runs on Atom. 'Many rooms to explore and many hazards to overcome'.
	£9.95	BBC Model B	●	Philosopher's Quest	16K	●	●	●			W1	'Progress through a world of fiendish puzzles.'
	£9.95	BBC Model B	●	Sphinx	16K	●	●	●			W1	'A classic adventure, moving through caves avoiding hazards to collect treasure'.
	£13.80	Commodore Pet	●	Hitch-Hikers Guide to the Galaxy	32K	●	●	●			S5	Also runs on Commodore 64, Vic-20, 3000, 4000, 8000. 'Involved, textual game'.
	£18.40	Commodore Pet	●	Pythonesque	32K	●	●	●			S5	'Increasingly difficult textual game based on Monty Python'. Disk available (£20.12)
	£24.99	Commodore Vic-20	●	River Rescue	8K	●	●	●			T4	Needs joystick. 'Captain boat through treacherous rivers to rescue explorers'.

	£8.00	Dragon 32	Flipper	32K					M12	'A game of intrigue and strategy. Requires an agile mind and a lot of fore-thought.'
	£8.00	Dragon 32	Mansion Adventure	32K					M12	'Wind your way through an old mansion picking up clues to find the diamond'.
	£7.95	Dragon 32	Wizard War	32K					S7	Needs joystick. 'Magical combat for two to nine players; interactive duel'.
	£35.00	IBM PC	Adventure in Serema	64K					I3	Needs colour graphics adaptor and direct drive colour monitor for use.
	£6.90	Oric	Zodiac	16K					A5	Also runs on Atom. 'A thinking persons adventure game'.
	£12.07	Sharp MZ80A	Adventure	48K					K1	Also runs on Sharp MZ80B and MZ80K. 'An interactive adventure game'.
	£12.07	Sharp MZ80A	Quest	48K					K1	Also runs on Sharp MZ80B and MZ80K. 'Dungeons & Dragons type game'.
	£7.95	Sharp MZ80K	Nightmare Park	48K					S8	Also runs on MZ90A. 'Cross Nightmare Park. Every few steps play game or task'.
	£7.95	Sharp MZ80K	Tombs of Karnak	48K					S8	Also runs on MZ80A. 'Bargain for items required before entering tombs'.
	£5.95	Spectrum	Faust Folly	16K					A6	'A 16K adventure with the same traps, magic, fiends, treasure as the 48K game'.
	£14.95	Spectrum	The Hobbit	48K					M8	'Object is to get treasure. For one player. Can instruct computer in ordinary English'.
	£5.00	Spectrum	Orb	16K					I5	Also runs on Dragon 32 and Commodore Vic-20. 'Explore labyrinth and destroy Orb'.
	£10.00	Spectrum	Pimania	48K					A7	Also runs on Sinclair ZX81, BBC 13, Dragon 32. Reviewed 18.3.83.
	£5.00	Spectrum	The Quest	48K					I5	Also runs on Dragon 32. 'Fighting adventure game'.
	£5.00	Spectrum	Star Trek	48K					I5	Also runs on Dragon 32 and Commodore Vic-20. 'Hunt down the Klingon in space'.
	£5.95	Spectrum	Slippery Sid	16K					S9	Needs joystick and keyboard to use. 'Snake type game'.
	£10.06	Tandy TRS-80 I	Mysterious Adventurer	16K					M6	Also runs on Tandy TRS-80 III, Genie I, II, Colour Genie and BBC B.
	£4.95	Texas Instruments 99/4A	Forbidden City	16K					A8	'You have to explore a deserted alien city with many hazards on the way'.
	£3.95	Texas Instruments 99/4A	Sorcerers' Castle	16K					A8	'You are trying to rescue the captured princess'.
	£7.50	BBC Model B	Allantis	32K					I4	'Guide submarine through caverns & destroy enemy'.
Arcade type	£9.99	Commodore Vic-20	Night Crawler	5K					R2	'A Centipede style game. Fast action, graphics and sound effects'.
	£5.50	Spectrum	Arcadia	16K					I6	Also on Commodore Vic-20. '12 levels of aliens attacking in different ways'.
	£5.95	Spectrum	Ground Attack	16K					S9	'Variable speeds allows this game to be played by everyone'.
	£3.95	Texas Instruments 99/4A	Bomber	16K					A8	'Must land plane & bomb skyscrapers'.
	£5.95	Spectrum	Cyber Rats	16K					S9	Needs joystick and keyboard to run.
Asteroids type	£4.95	Spectrum	Meteor Storm	16K					Q1	'Progressive difficulty, variety of controls'.
	£6.95	Spectrum	Time-Gate	48K					Q1	'Time travel, 3D graphics, colour, cockpit view and instrument display'.
	£4.95	ZX81	Asteroids	4K					S9	'Fast moving, suitable for all ages'.
Ballooning	£14.95	Atari 400	Up Up Away	16K					S13	Reviewed in PCW week ending April 29. Also on Atari 800. Available on disk.
Centipede type	£7.99	Dragon 32	Caterpillar	32K					M12	'A new generation munching game'.
Chess type	£7.99	BBC Model B	Chess	16K					M7	'Machine code, high resolution graphics with many play options'.
	£24.95	Dragon 32	Cyrus Chess	32K					D3	'Won European microcomputer chess championship 1981. Nine levels of difficulty'.
	£14.50	Sharp MZ80A	Chess	48K					K1	Also on Sharp MZ80B & MZ80K. '14 levels of difficulty'.
	£42.95	Texas Instruments 99/4A	Chess	16K					T5	'Different difficulty levels. Will solve problems. Can teach chess'.
	£3.00	Sharp MZ80A	Bean Feast	20K					D6	Also MZ80K. Logic board game.
Darts	£19.99	Atari 400	Darts	8K					T4	Also on 800. 'Aim & throw — the computer does the arithmetic'.
Defender type	£22.80	Atari 400/800	Submarine Commander	16K					T4	'One player. Nine levels of difficulty. Destroy shipping. Oxygen levels, fuel etc.'
	£9.95	BBC Model B	Planetoid	32K					A9	'A game of speed & skill'. Available on floppy disk (£11.50).
	£7.95	Commodore Vic-20	Alien Blitz	5K					A3	Needs joystick to run. 'Difficulty levels, colour & sound'.
	£9.99	Commodore Vic-20	Annihilator	3K					R2	'Based on Defender'.
	£6.95	Spectrum	Penetrator	48K					M8	'Two levels of difficulty difficulty'.
Flight Simulator	£21.95	TI 99/4A	Parsec	16K					T5	'Increasingly difficult. Alter four onslaughts pass through to next stage'.
	£22.80	Atari 400	Jumbo Jet Pilot	16K					T4	Also Atari 800. 'Ten difficulty levels. View through cockpit with flight instrumentation'.
	£7.95	Spectrum	Flight Simulation	48K					S10	Also on ZX81 (£5.95). 'Shows control panel & control view'.
	£17.20	Tandy TRS-80	Jumbo	16K					M6	Also on Genie I, II & BBC Model B. 'Simulation of piloting a Jumbo'.
Football	£29.99	Atari 400	Kick Back	8K					T4	Also available on Atari 800. Needs joystick to run. 'Beat the high score'.
	£19.55	Atari 400	Soccer	8K					T4	Also on Atari 800. 'Aerial view of field'. Reviewed 11.3.83.
Frogger type	£5.50	Commodore Vic-20	Wacky Waiters	3.5K					I6	'Waiter serving drinks in hotel. Has to hop from lift to lift'.
	£9.99	Commodore Vic-20	Hopper	3K					R2	'A version of Frogger'.
	£5.95	Spectrum	Horace Goes Ski-ing	16K					S10	'Sequel to Hungry Horace. He must cross busy road, fetch skis & ski down slope'.
Golf	£7.95	Dragon 32	Golf	32K					S7	'For one or two players. Full handicapping system'.
	£3.75	Spectrum	Golf	16K					R3	'For one or two players. Choice of nine or 13 holes'.
	£3.75	Sinclair ZX81	Golf	16K					R3	'Similar to other golf games, in black and white'.
Helicopter	£24.95	Commodore Vic-20	Chop Lifter	8K					A3	Also on Commodore 64. Needs joystick to run. 'Vic version of USA's best-seller'.
Jigsaw	£14.99	Atari 400	British Heritage Jigsaw Puzzle	8K					T4	Also on Atari 800. 'Educational game with selective difficulty'.
Kong type	£7.95	Commodore Vic-20	Bonzo	8K					A3	'Workman dodges robots on split-level. Sound & full graphics'.

Price	Machine/Operating System	Other versions	Title	Memory required	Media Supplied			Hardware Required		Publisher/Distributor	Comments
					Cassette	Disk	Cartridge	Mail order avail.	Disk drive		
£8.00	Dragon 32		Donkey King	32K	●			●		M12	'Popular arcade game.'
£9.95	BBC Model B		Monsters	32K		●		●		W1	'The player has to run up & down ladders & along walls, pursued by monsters.'
£24.95	Dragon 32		Ghost Attack	N/A		●		●		D3	'The aim is to avoid & eliminate ghosts which roam a maze.'
£8.00	Dragon 32		Jerusalem Adventure	32K	●					M12	'Aim is to get treasure & avoid being eaten.'
£5.95	Spectrum		Hungry Horace	16K	●			●		S10	'Animated maze game with sound & full graphics.'
£4.95	Spectrum	●	Mined-Out	48K	●			●		Q1	Reviewed in PCN week ending April 22. Also on Dragon 32.
£5.95	Spectrum		Muncher	16K	●			●		S9	'A monster munching marathon.'
£8.00	Spectrum		Spectres	16K	●			●		B3	'An increasingly difficult maze game. The object is to fit light bulbs & destroy ghosts.'
£10.00	Sinclair ZX81		Mazogs	16K	●			●		B3	'Three levels. Find & collect treasure in a maze & escape.'
£9.95	BBC Model B		Snapper	16K	●			●		W1	'Based on Pacman.'
£9.50	Colour Genie		Chomper	16K	●			●		K2	'Based on Pacman.'
£8.00	Dragon 32		Scarfman	32K	●			●		M12	'Based on Pacman.'
£4.95	Spectrum		Gnasher	16K	●			●		R3	Joystick optional. 'Based on Pacman using Beano characters.'
£8.50	BBC Model B		Billiards	32K	●			●		H3	Available on disk. 'A game for all ages.'
£7.95	Dragon 32		Grand Prix	32K	●			●		S7	'For one or two players, features eight Grand Prix tracks & 10 levels of difficulty.'
£21.95	TI 99/4A		Car Wars	16K	●			●		T5	'Race through maze whilst avoiding computer controlled car.'
£19.95	Apple II		Lunar Lopper	16K	●			●		S12	Reviewed in PCN week ending April 22.
£29.95	Atari 400	●	Claim Jumper	16K	●			●		C8	Also on Atari 800. 'A two player shoot-out over gold nuggets & cash.'
£29.95	Atari 400		Shamus	16K	●			●		C8	'Player has to move through lair avoiding hazards.'
£5.95	BBC Model B	●	Invisible Man	32K	●			●		C9	Also on Commodore Vic-20. 'Aim is to shoot man who keeps disappearing.'
£9.99	Commodore Vic-20	●	Quacker	3K	●			●		R2	'Aim is to shoot down ducks & rabbits on shooting gallery.'
£19.95	Commodore Vic-20	●	Spiders of Mars	N/A	●			●		A3	'Popular game for the Vic-20'. Also on Commodore 64.
£5.95	Spectrum		High Noon	16K	●			●		A6	'Clean up chaos & disorder in town.'
£9.95	Dragon 32		Dragon Trek	32K	●			●		S7	'A version of Star Trek with ten levels of difficulty.'
£5.95	Spectrum		Android Run	16K	●			●		A6	'Control android to shoot walls, kill mutants & reach central complex.'
£5.95	Spectrum		Cosmos	16K	●			●		A6	'Defend space convoy from aliens & asteroids.'
£5.50	Spectrum		Shizoids	16K	●			●		I6	'Space bull-dozer nudges shapes into black hole.'
£5.95	Spectrum		Starship Enterprise	48K	●			●		S9	'Based on the classic Star Trek. Includes arcade action.'
£4.95	Spectrum	●	Star Trek	48K	●			●		R3	Also on ZX81 (£3.95). 'One player, sound & full colour graphics strategy game.'
£7.99	BBC Model B		Swoop	32K	●			●		M7	'Written in machine code with full colour & high resolution graphics.'
£7.50	BBC Model B		Model B Invaders	32K	●			●		I4	'A Space Invaders game with high resolution & colour graphics.'
£9.99	Commodore Vic-20		Orbis	3K	●			●		R2	'Based on Missile Command. Fast & colour.'
£19.95	Dragon 32		Cosmic Invaders	N/A		●		●		D3	Joystick optional. '15 levels of difficulty.'
£6.50	Spectrum		Destroyer	16K	●			●		I5	'Destroy the varying alien invaders.'
£4.95	Spectrum		Intruders	16K	●			●		Q1	'Includes mutants, random saucers, bonus base & 14 different aliens. Sound & colour.'
£5.00	Spectrum		Spectral Invaders	16K	●			●		B3	'For one or two players. Increasingly difficult, high resolution colour graphics.'
£21.95	TI 99/4A		Invaders	16K	●			●		T5	'Based on Space Invaders. Alter every two screens a new character appears.'
£3.95	Sinclair ZX81		Invaders	4K	●			●		S9	'Based on Space Invaders.'
£33.35	IBM PC		Decathlon	64K	●			●		I3	Needs colour graphics adaptor & direct drive colour monitor. 'For up to six players.'
£7.95	Dragon 32		Wizard War	32K	●			●		S7	Reviewed in PCN week ending April 8.
£5.95	Commodore Vic-20		Innovation Cassette	48K	●			●		M8	'One tape containing seven games.'
£5.95	Spectrum		Over the Spectrum	16K	●			●		M8	'One tape with 10 games. Defender to geometry, beginners to advanced.'
£29.95	Atari 400	●	Picnic Paranoia	16K	●			●		C8	Also on Atari 800. Needs joystick to run. 'A graphics game based on picnic site.'
£4.95	Colour Genie		Breakout	16K	●			●		M9	'Different levels of skill.'
£6.95	Commodore Vic-20		Amok	5K	●			●		A3	'Chased by robots in enclosed room. Different levels of difficulty.'
£9.95	Commodore Vic-20		Black Squid	3K	●			●		C8	'Get men to shore in shortest time.'
£24.95	Commodore Vic-20		Mutant Herd	8K	●			●		T4	'Protect a powerhouse from mutants. Enter their burrows & destroy eggs.'
£6.90	Dragon 32		Dead Wood	32K	●			●		A5	'A game for all the family.'
£3.95	Texas Instruments 99/4A		Chalice of Kalmar	16K	●			●		A8	'The aim is to retrieve a chalice from a temple.'
£78.00	Sharp MZ80A		Clubman	48K	●			●		S8	Golf handicapping and competition results system complying with 1983 regulations

	£575.00	Apple II	Tabs Golf Package	48K	●	●	●	●	●	T3	Alison on MS-DOS (64K). Maintains members handicaps including 1983 regulations. Also on Newbrain and Sharp. A punters aid to betting.
	£28.18	Epson HX20	Horse Race Forecast	48K	●	●	●	●	●	K1	Also on MZ80K. Simulations of navigating a yacht on the English Channel.
	£28.69	Sharp MZ80A	Navex	48K	●	●	●	●	●	K1	Also on BBC Model B. Consists of address book & diary planner (plus instructions).
Diary	£9.95	BBC Model A	Desk Diary	16K	●	●	●	●	●	W1	Also on Atari 800. Needs Atari Basic cartridge. Aids money management.
Home budget	£19.99	Atari 400	Home Financial Management	8K	●	●	●	●	●	T4	Also on Sharp, MZ80 & Osborne. Keeps records of home finances with graphics.
	£19.95	Epson HX20	Home Budget	16K	●	●	●	●	●	K1	Designed for balancing home debits & credits.
	£14.95	Sharp MZ80A	Sam Analysis	3K	●	●	●	●	●	S8	Aids to aspiring composer. Also for entertainment and education.
Music composition	£24.99	Commodore Vic-20	Vic Music Composer	8K	●	●	●	●	●	T4	Teaches musical notation, aids composition.
	£5.75	Spectrum	Music Maker	48K	●	●	●	●	●	B5	Stock control program useful in home, e.g. record collection, etc.
Stock control	£10.00	Spectrum	Spec File	48K	●	●	●	●	●	A5	900-page colour teletext simulation with 24-hour clock etc.
Various	£4.95	Spectrum	ZX Text	16K	●	●	●	●	●	S14	Comprises VicPro (word processor) & VicData (A database program).
	£12.95	Commodore Vic-20	Home Office	5K	●	●	●	●	●	A3	

## UTILITIES

Basic	£201.25	CP/M	Basic 80	48K	●	●	●	●	●	L1	Industry standard Basic.
	£235.70	CP/M	Basic Compiler	48K	●	●	●	●	●	L1	Companion to Basic 80. Allows programs to run faster.
	£80.50	CP/M	BDS C Compiler	48K	●	●	●	●	●	L1	A subset of 'C' that enables its implementation. Includes symbolic debuggers.
	£121.90	CP/M	C Basic	64K	●	●	●	●	●	X1	Commercial Basic. Also on CP/M86 (£265.65).
	£213	Any Z80	X-Basic	48K	●	●	●	●	●	X1	Built-in matrix functions. Supports MP/M record locking. Graphics option.
Basic Upgrader	74.75	Commodore 64	VicTree	64K	●	●	●	●	●	S5	Also Commodore Vic-20. Also on floppy (£92.00). Adds 50 commands to Basic.
Card Index System	£215.05	Apple II	VisiDex	48K	●	●	●	●	●	R1	Also on IBM PC. Needs printer. One record/screen designed for cross-referencing.
	£178.25	CP/M	Cardbox	48K	●	●	●	●	●	C6	Also on MS-DOS. Needs 24 x 80 VDU & 100K disk storage.
Communications	£102.35	Apple II	ASCII Express — The Professional	48K	●	●	●	●	●	P4	Needs RS232. Asynchronous serial communications package.
	£448.50	Apple II	Editel	48K	●	●	●	●	●	O1	Needs modem. A Viewdata frame word processor designed to aid data editing.
	£626.75	Apple II	Owlsync 3780	48K	●	●	●	●	●	O1	A full IBM 3780 emulator package allowing communication up to 2400 Baud.
	£454.25	Apple II	Owitel	48K	●	●	●	●	●	O1	Needs modem. Allows access to Prestel & private viewdata systems.
	£149.50	Apple II	Terminal Utilities	48K	●	●	●	●	●	C1	Also on Apple IIE. Converts Apple II to intelligent terminal. Speeds up to 9600 BPS.
	£57.50	CP/M	Xcopy 1.0	64K	●	●	●	●	●	X1	Disk copy utility for Cromemco machines. Copies 8" or 5 1/4" single/double sided.
	£454.25	CP/M	Micro-Linkline	64K	●	●	●	●	●	I2	Also on UCSD-P. Teletype comms for transferring datafiles.
	£575	CP/M	Bisync AC-3780	64K	●	●	●	●	●	E1	Also on MP/M & CP/M86. Micro to mainframe comms through IBM terminal emulation.
	£41.40	IBM PC	Asynchronous Communications	64K	●	●	●	●	●	I3	Needs asynchronous comms adaptor. Makes PC act as asyncs comms terminal.
	£117.30	IBM PC	IBM 3101 Emulation Program	64K	●	●	●	●	●	I3	Makes PC act as 3101 terminal provides 3270 emulations when connected to host.
	£638.25	IBM PC	PC SNA 3270 Emulation	128K	●	●	●	●	●	I3	Needs SDLL adaptor card makes PC act as IBM 3270 terminal.
	£22.43	Sharp MZ80A	Zen	48K	●	●	●	●	●	K1	Also MZ80K & B. Full Z80 editor/assembler.
	£115.00	IBM PC	Interlink	48K	●	●	●	●	●	T2	Also on Sirius, Apple II, Xerox, Osborne etc. Connects processors for downloading.
Database	£132.25	Apple II	DB Master	48K	●	●	●	●	●	M5	Available on hard disk. Allows 1K records over 100 fields. Report generation, etc.
	£224.25	Apple II	Informex Database System	48K	●	●	●	●	●	I1	Database system which can be used to & update info on any type of record.
	£402.50	Apple II	Mailist	48K	●	●	●	●	●	A4	Also for IBM PC & Corvus Concept. Requires hard disk. A networking product.
	£96.60	Apple III	PFS: File	48K	●	●	●	●	●	P6	Also for Apple II (£135.70). Used in tandem with PFS (£96.60).
	£217.35	Apple IIE	VisiTrend + VisiPlot	64K	●	●	●	●	●	R6	Also for CP/M. Graphic representation of data. Compatible with VisiCalc.
	£10.30	BBC Model B	Filler	16K	●	●	●	●	●	M7	Allows searching, sorting, saving & recovery of data.
	£201.25	CP/M	Dataflow II	56K	●	●	●	●	●	G1	Also on CP/M 86. Needs 160K disk space. Extract files to link with other systems.
	£295.00	CP/M	InfoStar	48K	●	●	●	●	●	M10	Also on IBM PC, MS-DOS. Integrates with WordStar and Calcstar.
	£201.25	CP/M	Datastaff	64K	●	●	●	●	●	X1	Data entry & retrieval system. Interfaces with WordStar.
	£499.74	CP/M	dBase II	48K	●	●	●	●	●	E1	Micro DBMS. Can be used for high level programming for a range of applications.
	£557.50	CP/M	Superfile	56K	●	●	●	●	●	S4	Multi-file database giving application package information.
	£166.75	CP/M	Supersort 116	64K	●	●	●	●	●	M10	A sort utility for handling various forms of data files. Mainframe-like additions.
	£1,840	CP/M	MDBS II	64K	●	●	●	●	●	T2	Also on CP/M-86, MS-DOS, Turbo DOS, Unix and Xenix. Mainframe-like facilities.
	£569.25	Commodore 8000	The Administrator	32K	●	●	●	●	●	S11	Applications generator. No programming involved.
	£68.42	Newbrain	Invoice & Credit Program	32K	●	●	●	●	●	E2	The invoice program allows you to put in your own information and design invoice.
	£29.32	Newbrain	Database 40 S	32K	●	●	●	●	●	E2	Information gatherer, stores large quantity of information & can be interrogated at will.
	£684.25	Sirius, IBM PC, MS DOS	Tomorrow's Office	128K	●	●	●	●	●	S11	Complete applications generator.
Debugger	£258.75	CP/M	Animator	64K	●	●	●	●	●	M11	Also on Unix & MS100S, interactive source level debugging tool for C-IS-Cobol.
File Transfer	£132.25	CP/M	BSTAM	16K	●	●	●	●	●	L1	Needs common interface ports or modem access. Utility for transferring CP/M files.
Graphics	£34.50	Apple II	Graphic Utilities	48K	●	●	●	●	●	C1	Also for Apple Iie. Parameter driven machine code programs' high res graphics.
	£24.95	Atari	Constructor	48K	●	●	●	●	●	C8	Less experienced & new programmers can design animated sequences.
	£9.95	BBC Model A	Creative Graphics	16K	●	●	●	●	●	W1	Also for BBC model B.30 programs on cassette produce range of pictures & patterns.

	£24.95	BBC Model B	EDG Graphics Package	32K	S7	Computer aided design package. Reviewed 11.3.83.
Language	£50.60	CP/M	CP/M Graphics	64K	D4	Range goes up to £421.70 & conforms to GKS Graphics Standard.
	£488.75	CP/M	CIS Cobol	64K	M11	Also on Unix. Compact, interactive ANSI 74 standard implementation of Cobol.
	£1,109.75	CP/M	Level II Cobol	96K	M11	Also on Unix & MS-DOS. High level ANSI 74. Compiler, mainframe-compatible code.
	£396.00	CP/M	Fortran 80	48K	T2	Useful for scientific applications, where Pascal is inefficient.
	£285.20	CP/M	Pascal — MT +	64K	X1	ANSI standard Pascal for Z80 processors. Also on CP/M 86 (£484.90).
	£210	CP/M	Supersoft C Compiler	48K	M4	Also on CP/M-86, MS/DOS, PC, DOS. Fast implementation of C.
	£114.43	Commodore 64	DTL-Basic Compiler	32K	D1	Also on Commodore 8000, 4000 & 3000. Also tape version on CBM 64 (£39.96).
	£16.85	BBC Model A	Lisp on the BBC	16K	W1	Also on BBC Model B. Book available £7.50. Lisp is artificial intelligence language.
	£253.00	CP/M	ProPascal	56K	E1	Also on CDOS. Needs two disk drives. Native code Pascal.
	£40.19	Sharp MZ80A	Forth	48K	K1	Also on MZ80K & Osborne. Allows implementation of Forth.
	£25	Spectrum	Hisoft Pascal	48K	H5	Reviewed in PCN week ending April 8. Pascal compiler and screen editor.
	£421.70	Any 8 or 16 bit machine	PL/1	48K	D4	A compact implementation based on ANSI standard general purpose. .oset of PL/1
	£350.75	IBM PC	Lattice-C	64K	L1	Also on MS/DOS, C Compiler for 16 bit machines — full implementation & execution
Linker	£172.50	UCSD p-System	UCSD Pascal	48K	D4	Portable Pascal for systems development or commercial applications.
	£224.25	CP/M	Plink 2	48K	L1	Up to 8 megabytes.
Operations	£59.80	CP/M	Operating Guide	48K	E1	Works by putting CP/M to sleep & replacing it with operating environment.
Operating system	£22.94	Apple II	Fasdos	48K	P4	Disk operating system for Apples which speeds up location of binary & Applesoft files
	£277	8086 micro	Concurrent CP/M-86	48K	T2	Enables four separate tasks to run in a single user station.
	£431.25	Many processors	UCSD p-System	48K	D4	Portable user-friendly operating system including one compiler.
	£126.50	8080 and Z80 micros	CP/M 2.2	64K	D4	O/S for 8-bit micros with over 1.5 million users.
	£379.50	8080 and Z80 micros	MP/M	64K	D4	Multiuser, multitasking. Features record & file locking, date & time stamping etc.
	£210.80	8086 and 8088 micros	CP/M-86	64K	D4	Manages up to one megabyte of RAM & allows up to 128 megabytes of on-line storage
	£548.20	8086 and 8088 micros	MP/M-86	64K	D4	Multi-user. Multi-tasking. Multi-user capability with multi-programming for each user
	£168.70	8080, Z80, 8086 and 8088 micros	CP/Net	64K	D4	A CP/M compatible O/S designed to access local & networked resources.
	£295.20	Motorola MC68000	CP/M 68K	64K	D4	Extends CP/M to Motorola MC68000 microprocessors. Single user, single tasking.
Program Generator	£228.85	Apple II	Quickcode	64K	P4	Also on IBM PC. Program generator for dBase II.
	£126.50	CP/M	Forms-2	64K	M11	Also for Unix & MS-DOS. Programming tool, for generating Cobol code.
	£379.50	CP/M	Last One	64K	S3	Also on MS-DOS and Apple DOS.
Programming Tool	£2,500	Apple II	Pascal Isam/Pascal Form	48K	A4	Also on IBM PC & Corvus Concept. Needs Corvus hard disk. Pascal prog tool.
	£287.50	CP/M	Fileshare	48K	M11	Also on MP/M. Bank-switched memory or CP/M network.
	£7.95	Dragon 32	Dragon Selection 2	32K	D3	Four utility programs which can be listed to see how the program works.
	£4.00	Sharp MZ80A	Tape Copier	48K	D6	Back-up copier for BASIC and machine code.
Telex	£2,113.70	Superbrain	Micro Telex	64K	E1	Also on Teletext 802. Enables automatic sending-receiving or telex by micro.
Testing Tool	£95.82	CP/M 80	Diagnosics II	32K	M4	Also on CP/M-86 and MS/DOS. Tests systems.
	£862.50	Commodore 8000	Minuteman	32K	C2	Also on Commodore 4000. Time recording system. Can produce range or reports.
Time Recording	£402.50	CP/M-86	Time Recording System	64K	D2	Also on CP/M 80. Control over man/hour expenditure by job or account number.
	£23.00	Apple II	Computech Utilities Disk II	48K	C1	Also on Apple IIe. Error checking, copying. Single disk copy. Label disk.
Utilities	£115.00	IBM PC	C-Food Smorgasbord	64K	L1	Decimal arithmetic, low level & terminal independent input & output.
	£79.35	CP/M	Visa 80	64K	M13	Constructs a menu-driven system to your design.

Computers, Nottingham 412777 **K5** Kobra Micro Marketing, Henley-on-Thames 2512 **K6** Kemp Ltd., 01-444 5499  
**L1** Lifeboat, 01-836 9028  
**M1** MMS, Bedford 4060 **M2** Microsimplex, Macclesfield 615000 **M3** McDowell Knaggs & Associates, Worcester 612261 **M4** Micro Technology, Tunbridge Wells 45433 **M5** Micromed, 01-843 9457 **M6** Molimer, Boxhill-on-Sea 223636 **M7** Micro Power, Leeds 683186 **M8** Melbourne House, 01-977 9160 **M9** Mercury Software, Darwen 776677 **M10** MicroPro, 01-499 5777 **M11** MicroFocus, Swindon 695891 **M12** Microdeal, St Austell 67676 **M13** Mediatech, 01-903 4372  
**O1** Owl Microcommunications, Bishops Cleeve 723848 **O2** Omicron, 01-636 6575  
**P1** Peachtree Software International, Maidenhead 52711 **P2** Padmade, Fleet 21892 **P3** Pegasus, Kettering 522822 **P4** Pele & Pam Computers, 01-769 1022 **P5** PE Consulting Group, Egham 34411 **P6** Personal Computers, 01-377 1200 **P7** PTRC, 01-836 2208  
**P8** Pritivity, 02407-4906  
**Q1** Quickalva, Southampton 20169  
**R1** Rapid Terminals, High Wycombe 26271 **R2** Rabbit Software, 01-863 0833 **R3** R & R Software, Gloucester 502819  
**S1** Systematics International Microsystems, Haverhill 61121 **S2** SGS Software Products, 01-486 7498 **S3** Silicon Valley Trade, 01-242 2807 **S4** Southdata, 01-994 6477 **S5** Supersoft, 01-861 1166 **S6** Seed, Brownhills 378151 **S7** Salamander, Brighton 771942 **S8** Solo Software, Worcester 424152 **S9** Silversoft, 01-748 4125 **S10** Sinclair Research, Cambridge 352004 **S11** Stage One Software, Poole 735656 **S12** SBD Software, 01-870 9275 **S13** Starcade, 01-236 6628 **S14** Iain Stewart, 0259-60840  
**T1** Tamsys, Windsor 56747 **T3** Tabs, Andover 5893 **T4** Thorn EMI, 01-836 2444 **T5** Texas Instruments, Bedford 63211  
**X1** John Wiley & Sons, Chichester 784531 **W2** Widdit Software, 01-444 5285  
**X1** Xitan Systems, Southampton 334711

**A1** ACT Pulsar, 021-454 8585 **A2** Advanced Quality Software, Norwich 21117 **A3** Audiogenic, Reading 595647 **A4** Atlantic Software, Nottingham 412777 **A5** A & F Software, 061-223 6206 **A6** Abbex Electronics, 01-203 1465 **A7** Automata UK, Portsmouth 735242 **A8** Apex Trading, Brighton 36894 **A9** Aconsoft, Cambridge 316039  
**B1** Bonsai, 01-580 0902 **B2** Bristol Software Factory, Bristol 23430 **B3** Bug-Byte, 051-227 2299 **B4** Bytesoft, 0480-215005 **B5** Bellflower software, 01-903 1816  
**C1** Computech Systems, 01-794 0202 **C2** Compact Accounting, Dorking 887373 **C3** Claremont Controls, Rothbury 21081 **C4** Computer Services Midlands, 021-382 4171 **C5** Comshare, 01-222 5665 **C6** Caxton Software, 01-379 6502 **C7** Cyberpress, Wallingford 37769 **C8** Channel 8 Software, Preston 53057 **C9** Chalksoft, Wellington 7117 **C10** Construction Computing Services, Byfleet 47541  
**D1** Dataview, Colchester 869414 **D2** DEC, Basingstoke 59200 **D3** Dragon Data, Kenilg Hill 744700 **D4** Digital Research, Newbury 35304 **D5** Dipar Software, 0329 46756 **D6** David Computer Software, 061-439 4841  
**E1** Encotel Systems, 01-686 9687 **E2** Elstree Computer Centre, 01-953 6921  
**F1** Ferrari, 01-751 5791 **F2** Farmlan Computer Systems, Ross-on-Wye 64321  
**G1** Great Northern, Leeds 589980 **G2** Graficom Systems, 01-727 5561  
**H1** Hilderbey, 01-485 1059 **H2** Hartford Software Norwich, 781156 **H3** H & H Software, Runcorn 65566 **H4** Heinemann, 01-637 3311 **H5** Hisoft, Swindon 26616 **H6** Holland Automation, 06286 63695  
**I1** Informex, 01-318 4213 **I2** Intelligence (UK), 01-543 3711 **I3** IBM UK Product Services, Basingstoke 56144 **I4** UK Software, Blackpool 21555 **I5** Impact Software, 031-441 4257 **I6** Imagine Software, 051-236 6849  
**J1** Jarman Systems, Tring 6841  
**K1** Kurma Computers, Maidenhead 71778 **K2** Kansas City Systems, Chesterfield 850357 **K3** Knights, Aberdeen 630526 **K4** Keen

**VIC-20 + C2N** expansion board VIC 1540, disk drive Vicfile Supercalc, Vicmon, Programmers aid, books, 16K cartridge, superscreen tape. Tel: Reading 0734 871421 offers?

**Wanted BBC Model A or B**, in good condition, up to £300 paid for computer only, no software please. Tel: Jim 0202 518828.

**Sorcerer** professional computer for sale, 48K Word-pro, quality keyboard 64 x 30 VDU, RS 232, etc. £350. Interested? Write: Stephen Howd, 27 Echo Barn Lane, Earningham, Surrey GU10 4NQ.

**Wanted high res colour monitor**, disk drive for BBC, reasonable price please. Ken Mallison 28 (A) Ashtree Road, Oadby, Leics. Tel: 0533 717372.

**TRS-80 LII 16K** with recorder, monitor, leads, manuals and one cassette, £215, for quick sale. Tel: Frilford Heath 0865 390422 after 6.15pm.

**Acorn Atom 12K + 12K**, Fully expanded, BBC Basic board, Acorn WP ROM, Forth, Invaders, Chess, Soft VDU etc. £130. B.W. Crofton Monitor, £30. Tel: Oxford 66984.

**TRS 80 Model 1 level 2 48K**, two disk drives, manuals, programs etc. £550. Tel: Wood, Bridlington 0262 77513.

**Lynx 48K** excellent condition, includes book, leads and game, £160, suitable for upgrading to 128K and CP/M. Tel: Ron Manson 0506-413491 or office 0506 31122.

**Atari Disk** software to swap, good selection, also three ROMs for sale, Miner, Soccer, Missile Command, any offers. Tel: Richy 051-220 8927.

**Atari 400 48K** Basic program recorder + over £1000's worth of software, including, Sam, ET, Dig-Dug, £225 or near offer. Tel: David Keech 0908 75094.

**16K Rampack** for ZX81, still under guarantee, £15. Three cassettes, GB Ltd, Inca Curse, Break-out + Scramble, £7.50 for all three, both £20. Tel: 0632 533169.

**VIC-20** plus tape deck, blank tapes, programmers reference manual, £80. Tel: Ron 01-451 0331.

**Atari VCS**, plus ten games, Space Invaders, Combat, Basketball, Shoot-out, etc, joysticks, £120 ono. 12 Weavers Terrace, Micklethwaite Road, Fulham, London, SW6 1QE. Tel: 01-381 3290.

**Kelan** engineering I/O port Spectrum, with project book, £16 ono or swap for Spectrum software. R MacKay, Brochrobbie Brora, Sutherland, Scotland KW9 6NE.

**Apple II 48K + 2** disk drives (DOS 3.3), Epson printer interface, colour, etc., Manuals, books, + over £300 software. £575 for quick sale. Chorleywood 2680 (260-2680 from London).

**BBC Model B 1.2** OS Torch disks Microvitec monitor etc. Cost £1,750. Perfect, little used, boxed, guaranteed. Will deliver London/Sheffield, £1,350. Tel: 01-948 5568.

**Acorn Atom**, 12K RAM, 12K ROM via printer interface user manual, PSV leads, three books and £25 worth of software, only £80. Tel: 0254 71151.

**Epson HX-20** portable computer. Manuals, carrycase, micro-cassette unit, tapes. £390 ono. Tel: Saffron Walden 0799-24244 eves.

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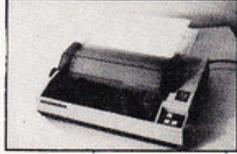
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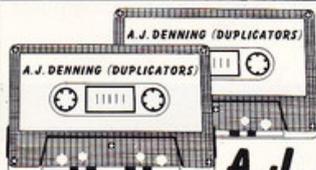
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# SANTAX ERRORS

## Kemp review caper

We made some errors in our review of the Kemp Stock Control System in issue 35. One of these was that the REORDER list gave costs, it in fact gives quantities. We implied that there is only one search facility when there are two and the program is meant to be used as a full system.

## Enterprising Elan

Our report from the Elan stand at the PCW Show (issue 31) hinted that it had a video recorder driving its graphics display. Well, it wasn't quite an Elan Enterprise 64 but it wasn't a video recorder either (see Random Access this week). Our apologies to Elan.

## Computer T-shirt craze

Here's an idea you can put your shirt on from a West German company called Kema — computerised T-shirts.

Kema's advertising promises 'an instant money-earner that can earn you \$8,000 to \$10,000 per month'. All you need is a TV camera, a Kema Computer

Portrait System, and a steady supply of T-shirts. Sounds expensive? You bet. \$35,000 for the deluxe colour version.

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## NEXT WEEK

### Apricot

### Take flight

### Painting by numbers

### Speech day

### Games

### Micropaedia

—PCN Pro-tests ACT's slimline micro.

—We survey flight simulations packages.

—A look at Paint, Atari's temptation to budding artists.

—Now you can talk to your Spectrum — but will it understand?

—Reviews of games for the Dragon, Commodore 64 and Vic 20, and Spectrum.

—PCN's pull-out programming guide moves into Part 8.

## Mystical micro keyboard

Perceptive readers will have noticed something curious about Fuller's recent ads for the legendary FDS keyboard for the Sinclair Spectrum.

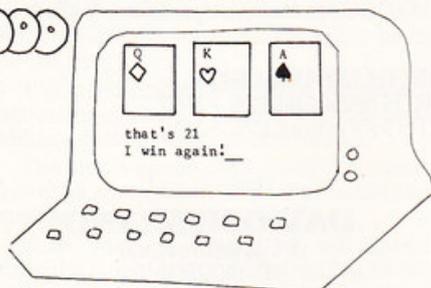
The alleged keyboard is shown in glorious technicolour, displaying to best advantage its amazing full-travel, typewriter-style keyboard.

Which is the curiosity. It's so typewriter-style it has ordinary typewriter keys — no tokenised single keystroke commands accessed by quadruple cross-draw shifts on alternate Tuesdays. We at PCN know a story when it falls on us, just so long as it falls hard enough.

Apparently Fuller has lots of cases, but is still waiting for the keys.

The FDS, with a nine-week waiting list two weeks ago (issue 34) is still a touch on the non-existent side, and — we can count too — now has an 11-week waiting list. Watch this space.

PAL2000  
by Mollusc



## PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in

PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

## UK EVENTS

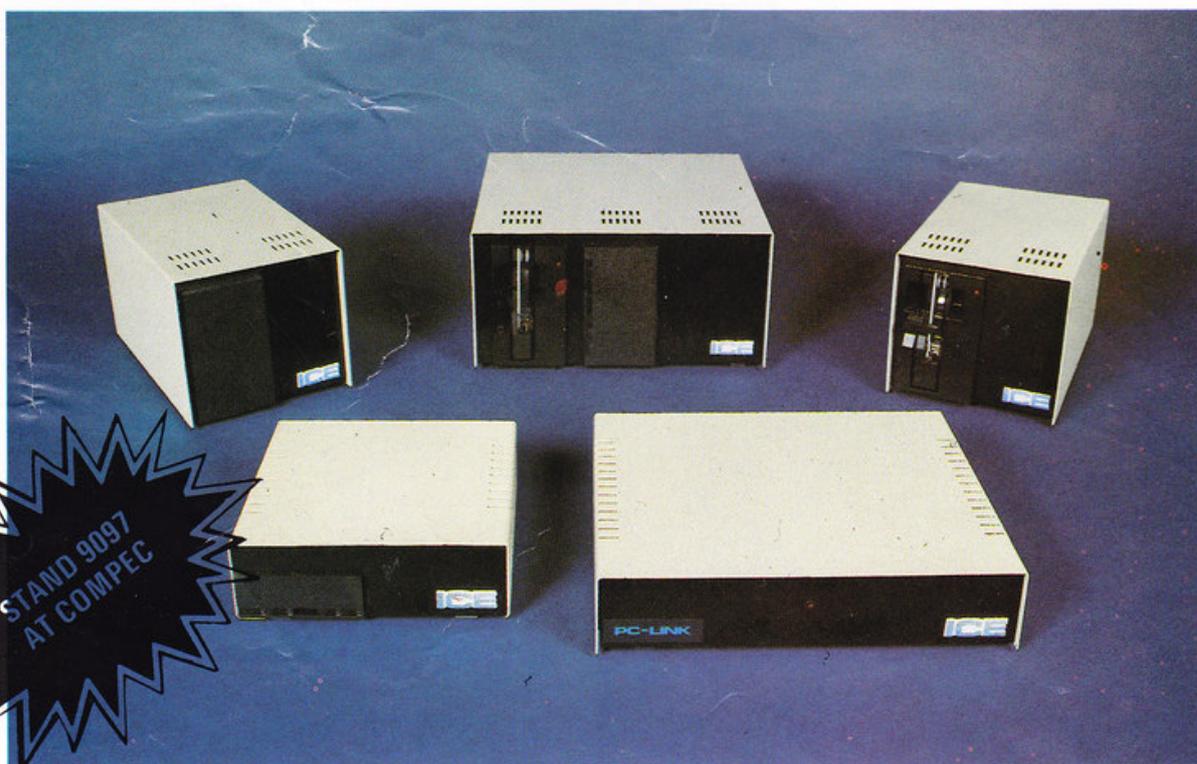
Event	Dates	Venue	Organisers
Computertown UK	October 31- November 18	Nailsea Library, Avon	Byte Micro Computing Centre, 0272 851337
Home Computer Exhibition Personal Computers & Leisure Technology Exhibition — HOMETECH	November 9-13 November 11-13	Dublin Bristol Exhibition Centre	SDL Exhibitions, Dublin 763871 Homotech Exhibitions, 0272-650465
Malvern Micro Fair	November 12	Malvern Winter Gardens, Worcestershire	Personal Computer Fairs, Worcester 22659
Manchester Apple Village COMPEC	November 13-16	Belle Vue, Manchester	Database Publications, 061-456 8383
Computer Aided Design for the Building Professional	November 15-18	London Olympia	Reed Exhibitions, 01-643 8040
Humberside Computer Fair	November 16	RIBA, 66 Portland Place, London W1	Helen Carpenter, 01-637 8991
Northern Computer Fair	November 20	Winter Gardens, Cleethorpes	Jenson Lee, 0472 42559
BBC Micro User Show	November 24-26	Belle Vue, Manchester	Reed Exhibitions, 01-643 8040
Your Computer Christmas Fair	December 9-11	Westminster Exhibition Centre	Database Publications, 061-456-8383
Which Computer? Show	December 15-18 January 17-20	Wembley Conference Centre NEC, Birmingham	Reed Exhibitions, 01-643 8040 Clapp & Poliak Europe Ltd., 01-747 3131

## OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Gulf Computer Exhibition	November 21-24	Dubai	Trade Centre Management, 01-930 3881
Computer Indonesia	Nov 22-25	Jakarta	Overseas Exhibition Services Ltd., 01-486 1951
Computer Dealers Exhibition	November 28-Dec 2	Las Vegas, USA	Interface Group Conference & Exposition Management, 160 Speen St., Framingham, MA 01701, USA

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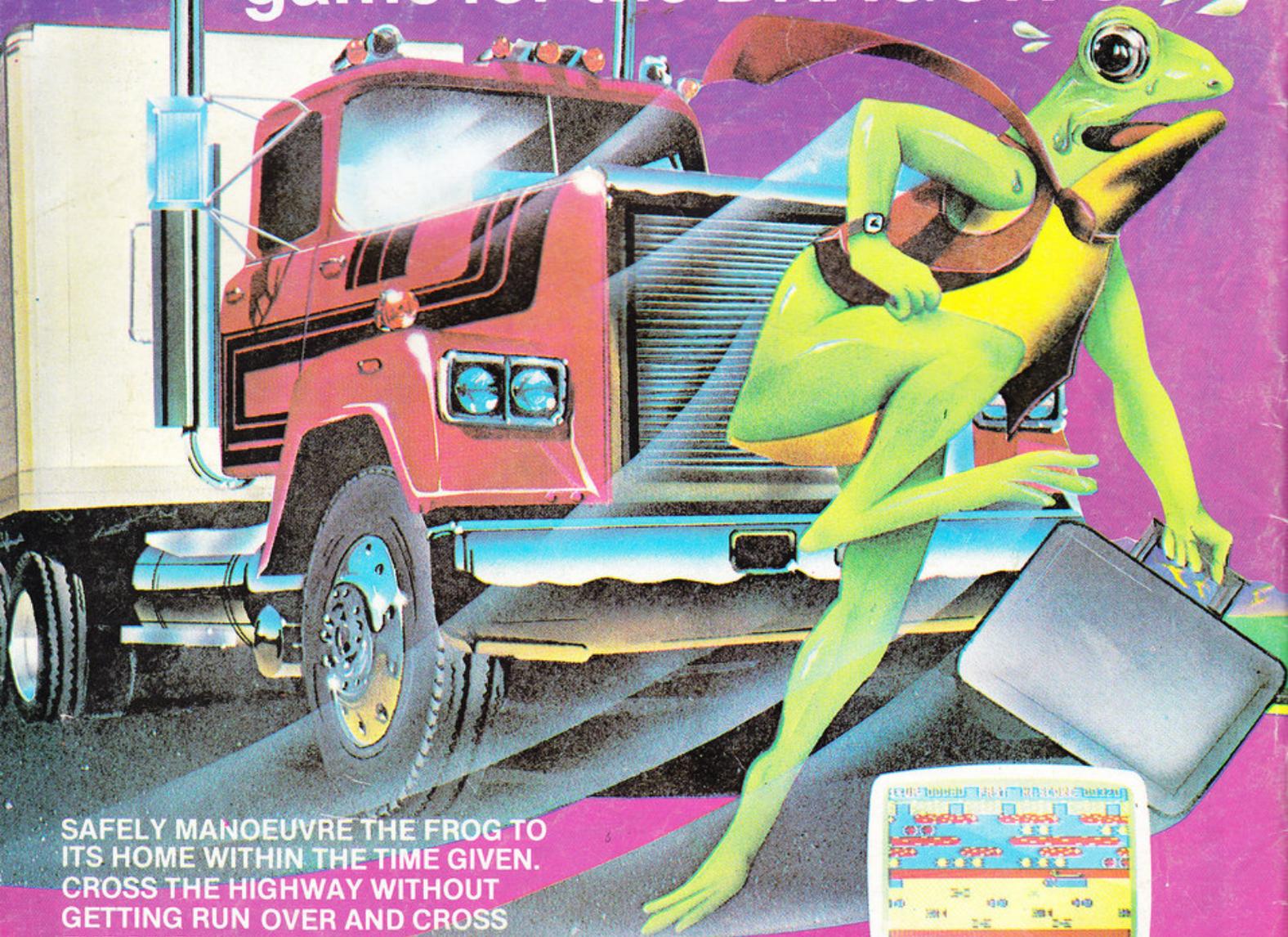
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