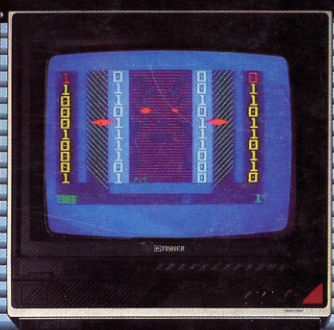


P E R S O N A L

COMPUTER

EVERY THURSDAY

50p October 13-19 1983 Vol 1 No 32 NEWS THE COMPLETE COMPUTER WEEKLY



THIS WEEK

APPLE EPROMS

Customise your computer with DIY ROMs

SPRITLY BBC

Speed up your graphics with DACC's sprites

PROGRAM COURSE

Flowcharts, arrays and sketch code in Micropaedia

ZX SPECULATIONS

Pools predictions on your Spectrum

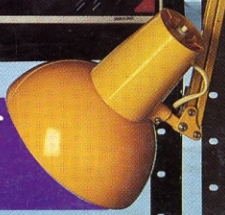
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REGULARS

- Monitor** 2
Apple rides out a storm, page 2; Oric prepares to be taken over, page 3; bigger Lynxes on the way, page 4; Digital Research's Gary Kildall speaks to PCN, page 5; Shugart goes optical, page 6; From France with chic, page 9.
- PCN Charts** 10
Who's the top this week.
- Random Access** 12
Your letters — and money in store for the best.
- Routine Inquiries** 15
Where we solve your problems . . .
- Microwaves** 16
. . . and you solve your own.
- Readout** 17
Adventures, Basic and machine code in the new books.
- Back issues** 52
Complete your collection here.
- Clubnet** 57
The BBC specialists at the Computer Users' Club.
- Program Cards** 64
An attack of the killer bees on the BBC and the last notes of Oric Composer.
- Billboard** 74
The place for computer bargains.
- Databasics** 75
The best of the software this week.
- Quit/Dateline** 88

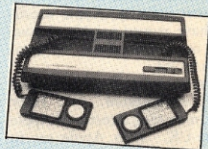
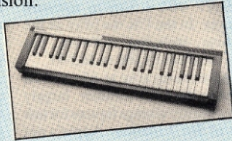
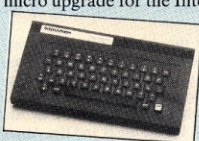
Cover picture by Chris Stevens
TVs courtesy of Fisher Sales UK; shelving, blind and spotlights courtesy of Practical Styling.

PCN PRO-TEST: HARDWARE

Mattel gets serious

18

They call it the intelligent television but just how smart is it? Richard King on the micro upgrade for the Intellivision.



PCN SPECIALS

Inside the Genie

24

Keith Hook helps you get the most from your Colour Genie by opening up the operating system.

PCN PRO-TEST: SOFTWARE

Animated Acorn

27

Sprite graphics are much vaunted features on some new machines. Simon Williams tests a new software package that puts these lively beasts in your BBC Micro.

Apple types

31

Richard King touches up his typing with more than a little help from his Apple and a new tutor program.



High speed Spectrum

32

If you want the ease of Basic programming and the speed of machine code, a compiler could be the answer. Ted Ball looks at MCoder.

PCN PRO-TEST: PERIPHERALS

Burned chips

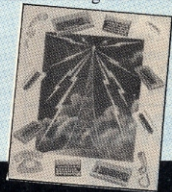
36

Dynamic duo Richard King and his trusty Apple again — this time burning EPROMs.

Putting it on the line

41

If you have the urge to communicate, micro-wise, Ian Scales has some of the answers in this overview of telecommunication.



GAMEPLAY

Frogs in space? With your Dragon anything is possible.

48

All things Atari. A round-up of the latest recreations.

50

Spectrum millionaires — will your pools numbers come up?

53

CHARACTER SET

EDITORIAL: Editor Cyndy Miles **Deputy editor** Geof Wheelwright **Managing editor** Peter Worlock **Sub editors** Harriet Arnold, Leah Batham **News editor** David Guest **News writers** Ralph Bancroft, Sandra Grandison **Hardware editor** Ian Scales **Features editor** John Lettice **Programs editor** Ken Garroch **Listings Editor** Wendie Pearson **Art director** Jim Dansie **Art Editor** David Robinson **Assistant art editor** Floyd Sayers **Publishing manager** Mark Eisen **Assistant publishing manager** Sue Clements **ADVERTISING:** **Advertisement director** John Cade **Group advertisement manager** Duncan Brown **Advertisement manager** Nic Jones **Assistant advertisement manager** Jenny Dunne **Sales executives** Christian McCarthy, Marie-Therese Bolger, Jan Martin, Julia Dale, Dik Veenman **Production manager** Eva Wroblewska **Advertisement assistant** Mark Satchell **Subscription enquiries** Gill Stevens **Subscription address** 53 Frith Street London W1A 2HG 01-439 4242 **Editorial address** 62 Oxford Street London W1A 2HG 01-636 6890 **Advertising address** 62 Oxford Street London W1A 2HG 01-323 3211 **Published by** VNU Business Publications, Evelyn House, 62 Oxford Street London W1A 2HG © VNU 1983. No material may be reproduced in whole or in part without written consent from the copyright holders. Photoset by Quickset, 184-186 Old Street, London EC1. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Seymour Press, 334 Brixton Road, London SW9, 01-733 4444. Registered at the PO as a newspaper

Apple bruised by IBM

By PCN writers in London and the US

As rumours that Apple was heading for a financial crisis swept the UK computer industry, Apple executives have moved quickly to pour scorn on doubts about the company's future.

'Rumours of my death have been greatly exaggerated,' said Peter Cobb, managing director of Apple in the UK. 'With Apple set to announce world-wide profits of \$75-80 million and carry forward substantial cash reserves it doesn't sound like a company about to go down the drain.'

Suggestions that Apple could soon be fighting for its life emanated from the US. And despite the reassuring noises now being made, doubts remain.

Apple Computer expects its 4th quarter profit to be sharply lower than during the same period last year. Sales of the Apple IIe are slowing down and, while Apple leads in education, on the business front IBM is making cider.

Sales of Lisa have not been spectacular, but the recent price cut will bring a Lisa down to less than an IBM XT with a VisiOn software package. In the UK the price of the machine, including software, has been cut from £8,000 to £6,500.

Apple shares rose to 63 on Wall Street in the early summer, largely on excellent earnings figures for last year of \$61.3 million. Apple's net income for the year is anticipated at 25 per cent or so above last year, but with increased advertising needs plus flattening sales of business machines, profitably has decreased.

Two weeks ago Apple closed its Lisa assembly line at its Cupertino plant in California and shifted all Lisa manufacturing to the high volume plants in Dallas, and Cork in Ireland. At the same time Apple stopped making its own disk drives for the Lisa.

Last week the company laid off 40 per cent of the Dallas workforce (although it was pointed out that

they were temporary workers employed to meet the backlog of orders that built up when the IIe was launched at the beginning of the year).

But the Apple software advantage continues. While IBM has almost caught up in business applications programs, reaching 975 titles this week compared to Apple's 1,187 for the II and IIe, Apple is years ahead in educational programs — 1,805 to 48. In total applications packages it has 4,361 to 1,900, and there are games too.

Apple is publicly confident, and its founder, Steve Jobs, is telling anyone who wants to listen that Apple will be No 2 computer manufacturer behind IBM.

Meanwhile its stock stays in the doldrums — it was down at 20.38 this week.

Wall Street was already jittery about how well Apple will be able to compete with IBM's Peanut, due to be launched any day now. The Peanut is expected to cost around

\$500-\$600 and will undercut the price of the Apple IIe.

Clearly Apple is going to have its work cut out in meeting the challenge. Its first response is to launch an enhanced version of the Apple III at Comdex at the end of this month. It will feature the new operating system, PRO-DOS, which is designed to work with hard disks and add IIe compatibility.

To back up the launch, Apple will be running a major advertising and promotional campaign for the III. It will be followed up by the end of the year with new software packages, including an Apple version of the top-selling 1-2-3 program and possibly a Lisa-like operating environment with icons and windows.

Plans for the III are something of a holding operation, as the main response to the Peanut is bound to be the long-awaited Macintosh, a cut down version of the Lisa. Apple has now said that it will be launched on the Lisa's first birthday in January.

Microsoft releases OS 'standard'

Microsoft has made its bid to standardise 8-bit micros by releasing the MSX-DOS operating system.

Microsoft claims the backing of 14 Japanese and one US computer manufacturer for the MSX standard. MSX-DOS is CPM-80 2.2 compatible and runs all Microsoft's 8-bit software including the programming languages MBasic, Cobol-80 and Fortran-80.

The first batch of MSX-DOS systems will be ready in January 1984, selling for under £100.

● *More on the MSX-DOS operating system in next week's PCN.*

Clean Orics by Christmas?

The long-awaited bug-free Oric ROM could be on the scene before Christmas.

Oric itself is tight-lipped about its infamous chip, but the word at the PCW Show was that the waiting could almost be over.

The evidence is circumstantial: Softek has an Oric Basic compiler for pre-Christmas launch.

Softek cannot pre-empt an Oric announcement and Oric is making no comment, but the speculation raises important questions for current Oric users: will Oric exchange new ROMs for old, and will Softek's compiler run with the old ROMs? The answers could be available within the next few weeks.

Cut-price dawn for the age of Aquarius

By Geoff Wheelwright

In the face of massive losses in the US and price-slashing by its competitors in the UK, Mattel Electronics has cut the prices of the Aquarius micro and the Intellivision computer games unit.

Mattel has reacted to its \$200 million loss in the second quarter of this financial year by cutting the price of its Aquarius 4K colour micro to £59.95 — from £79.95 — and the price of the mini-expander (which includes two games paddles and allows for games cartridges and memory expansion modules) to £39.95 — from £49.95.

The price of software has also been cut. Aquarius software was £19.95 for games and £49.95 for business programs, but has been reduced to £12.95 and £29.95 respectively. The 16K memory expansion module is still priced at £29.95.

It is the third price cut for the machine since it was announced (and reviewed by PCN) in April 1983. The Aquarius began as a £109 micro, dropped to £99 even before it was launched, moved to £79 last month, and became the cheapest colour computer in the country as it plunged to the £59 price.

And a Mattel spokesman said he expects some dealers will discount that price even further before Christmas to sell the Aquarius for £49.95. He said the price cut was caused partially by the announce-

ment of the 16K Oric's price cut to £79.95. The other factor in the decision, however, had to do with Mattel's poor sales figures.

'Our plan (for marketing the Aquarius) has been somewhat shaken by the losses of the parent company,' said the Mattel spokesman. 'We have obviously been forced to reduce prices.'

Meanwhile, the Intellivision games unit (whose computer adaptor unit and keyboard unit is pro-tested in PCN this week) is also

being packaged to beat the price cuts. The £59.95 Intellivision speech synthesis unit is being given away on a rebate basis with the £99.95 Intellivision games console — effectively bringing the price of the games unit to £50.

Heading up the new crew of cut price Mattel machines is former financial director Ian Wilson, who takes over from departing managing director Michael Lunch (who left Texas Instruments only six months ago to work for Mattel).



Michael Lunch: age of Aquarius must dawn without him.

Oric feels the strain

By Ralph Bancroft

Oric Products has become the latest UK micro manufacturer to be hit by growing pains and is to be acquired by property company Edenspring Investments.

The share transactions of a complex deal are subject to approval by Edenspring's shareholders at a meeting to be arranged for next month.

John Tullis, Oric's chairman, said that he had been looking for a deal along these lines for six months. It would, he claimed, help Oric in two ways. Firstly, it would increase Oric's capital base. 'The company was growing so fast that it needed to increase its working capital. We couldn't rely on retained profit,' he said.

Second, it could allow the company to be listed on the Stock Exchange.

It looks as though he may have

been defeated in this second objective, at least for the time being. Although Edenspring is quoted on the stock market, it will lose the listing as a result of the share transaction.

What the complex financial manoeuvres hide is the true extent of Oric's financial problems. Peter Jones, joint managing director of Edenspring, commented: 'Oric's cash requirements are, well, quite pressing.'

Under the terms of the agreement with Oric, Edenspring will pay off £1 million of loans to Oric by issuing shares to the lenders. In addition a further £750,000 is to be raised in cash by a further share issue (although Mr Tullis denies that this cash will go directly to Oric).

Like Dragon, but unlike Grundy, Oric's difficulties stem from growing too big, too fast.

Research and development also swallows up large sums of money that is not recouped until the new products are available in the shop. Both Grundy and Dragon were involved in the launch of disk systems when financial crisis struck. Oric appears to be no exception to this rule.

'We anticipate that the disk system will be in the shops by December,' said Mr Tullis, 'but we don't have all the components in our hands yet, all we have is promised delivery dates. I am not prepared to give a confirmation on

availability until those components have been delivered.'

Mr Tullis refused to give any information on when the modem, promised since last year, would be available.

Edenspring was formed in April this year out of an attempt to restructure a diversified firm called Pennine Commercial Holdings.

Mr Tullis is confident that if the deal with Edenspring goes through it will secure Oric's future. 'The argument provides a capital base for the expansion of the company over the next 12 months,' he said.

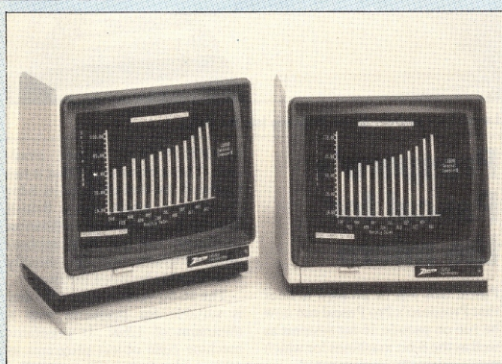
Spectrum keyboard solution

Since Sinclair changed its ULA in the Issue 3 and some Issue 2 Spectrums, you may have had problems reading the keyboard using the IN command. IN 57342 produces 255 in Spectrum before issue 3 and 191 in Issue 3 machines.

The solution to this problem in Basic, writes Mr W Smith of



Sedgely, West Midlands, is to use OUT 57342,255 directly before using the IN command. This method of reading the keyboard yields the same IN numbers for the whole Spectrum series. Try: 10 OUT 57342,255: PRINT IN 57342:GOTO 10



ZENITH TWINS — If you've just bought a micro and you're now looking for a monitor, Zenith Data Systems (0452 29451) has two new models available. For £109 you can buy the ZVM-123 which has a green phosphor display, or the ZVM-122 at £115 that gives an amber display. The 12in monochrome monitors display up to 25 lines of 80 characters, and a 15MHz bandwidth which enables them to show more than 800 lines horizontally. In addition to these standard features the monitors have optional tilt bases. Both are compatible with Apple II, IBM PC, Commodore 64, Vic 20, T199/4A, Atari 800 and 1200 and Zenith's own desktop computer.

Olivetti goes portable

Olivetti has followed Tandy and NEC with a version of Microsoft's A4-size portable. The Olivetti job, dubbed the M10, will be launched towards the end of the year and prices have yet to be fixed.

The M10's individual quirks include a 'pop up' 40x8 display — presumably to avoid having to prop the machine on a book. Tandy-style. It has only two function keys — Tandy has eight and NEC five. Olivetti has its eye on some useful add-ons — a four colour printer/

plotter and an acoustic coupler. Both will be battery operated.

Other features follow Microsoft's hazy standard — a full size keyboard, 32K ROM and 32K RAM. Interfaces are RS232 comms, parallel printer, cassette and bar code reader. Built in software is Basic, a text editor, terminal program, diary and address book.

It seems as though these popular and useful machines are going to become a standard part of the business world. Hopefully, the specification will soon be extended to include an efficient storage media — microfloppy disks or even bubble memory.

Tandy aiming to put a mouse in your house

Tandy has jumped on the mouse bandwagon with its own Colour Mouse to be used with its colour computers.

At \$49, Tandy claims that this is the first time a mouse has been sold exclusively for home and educational use, unlike the mouse sys-

tems being sold for the IBM PC and Apple Lisa at much higher prices.

Tandy users here will have to wait for some time before they get a glimpse of this new mouse, as Tandy UK is uncertain whether it will be selling it over here. It runs on the Colour Computer and MC-10.

16/32-bit CBM

By Sandra Grandison

Rumours floating around Silicon Valley indicate that Commodore has a 16/32-bit micro up its sleeve.

If Commodore is in the process of building such a machine it could reach the UK sometime next year. At the moment details of the business computer are sketchy, but sources say that the machine will sell for under \$1,000, running CP/M 86 and compatible with some IBM PC software.

Elsewhere in the Commodore empire some existing machines still seem to be under a cloud. The Commodore 700 has hardly been heard of since its launch earlier this year. Some dealers are still not sure of the machine's capabilities.

A spokesman from Sumlock Bondain said: 'As far as we are concerned we're not going to stock

the 700. We aren't too sure of its reliability.'

Adda Computers told a different story — it has sold six of the 128K versions at £1,144.25 and six of the 256K versions at £1,374.25. Another dealer, Direct Data Marketing, claimed it had several of the machines in stock but had not sold any.

Commodore says it is filling a backlog of orders for the 700, but it says it's too early to tell how the system is selling.

If you've been saving up for a Commodore 500, you could be in for a long wait. Production of the machine in the US is said to be steady with a limited supply of the micros being shipped. But it's still unclear when 500s will reach the UK in any numbers, or even whether they will arrive at all.

VIEW FROM AMERICA



From Chris Rowley

Micro mania hits TV and stocks

It often seems that unless it's on TV, nothing in America is actual, real or believable — one reason perhaps for the hysteria already mounting about ABC's planned screening of an anti-nuke film on November 20 called 'The Day After'.

This week CBS put the official imprimatur on micros with an hour-long prime-time show called 'Whizz Kids' which fits the War Games formula on to the small screen. Everything centres on a suburban computer freak of 13, who inexplicably keeps \$1/2m worth of computers, monitors, modems, robot arms etc in his room.

Can this sort of thing fly? New shows are a dime a dozen at this season and few pan out for more than a couple of weeks. But if it does fly it could become an ideal forum for reaching the microcomputer audience. And microcomputer advertisers need new places to go.

Already TV ads for micros have proliferated on NFL football broadcasts to the point of absurdity. And last week Alan Alda, from MASH, could be seen in the first of 11 new commercials for Atari. Alda is something of a computer nut himself and seems genuinely convincing in assuring us that we'll be able to 'do more with an Atari'.

On the micro scene itself, however, the atmosphere remains that of a casino crap shoot. Players come and go, all the while nervously gazing over their shoulders at Mount IBM — enormous, inscrutable Big Blue.

Rumours a bound, including the increasingly common whisper of WHAT IF THERE REALLY ISN'T A PEANUT? Does it make sense for IBM to decimate sales of PCs with a cheaper home computer that is PC compat?

Does IBM really want hundreds of thousands of families as end customers with repair and services demands? An announcement from IBM is expected on October 18 by the market savants.

Not that IBM has said anything about a date, but because it's a Tuesday and the PC was released on a Tuesday this is thought to be IBM's favourite day for this sort of thing.

Coleco's Adam remains the hot play of the moment. In fact the market on Coleco stock options at the Philadelphia Stock Exchange remains the No 1 contract in the country. Since February 975,000 options of Coleco stock have been sold. At the moment there are 78,000 pessimists with Puts and 108,000 optimists with Calls.

Last week the FCC finally gave the nod to the Adam and Coleco's factory is now storming quota day and night.

Some of the gamblers will also have noticed the three law suits brought against Coleco by stockholders charging insider trading by Arnold Greenberg, Coleco president, who is said to have sold \$8m of stock in June when Coleco was at 60. Currently it hovers around 31.

New players continue to take their places. Acorn Computers announced that it already had \$21m of orders for the BBC computer it is tutoring for the educational market.

Analysts tend to dismiss the Acorn move, noting that 40% of computers now in US schools are Apples and that the BBC machine is listed at \$995, without monitor or disk drive. Acorn however, does have unique classroom training software and the BBC has received nothing but good reviews here.

Ex-players still make news too. Former Atari president Ray Kassar agreed last week with the SEC and gave up \$80,000, which sum represented the loss he avoided last December by selling his Warner stock 23 minutes before Warner announced trouble at Atari.

Those troubles were illuminated last week by scenes in Alamogordo, New Mexico where Atari dumped 14 truck loads of unwanted video games cartridges and computer debris in a land fill. While on-lookers whooped, workers then spread tons of concrete over the deposit creating an archeological marvel for future generations.

New business micros were unveiled by Wang and Lanier. The \$2,995 Lanier Business Computer is a dual Z80 and 8088 machine. Wang went a step further with its Professional Image Computer which can store images of texted pages.

Expanded Lynx

By Wendie Pearson

Dixons will stock the 96K Lynx from this week, according to Computers.

The machine will be circulated to Dixon's 50 main stores around the country and this will be followed by the arrival of the 128K with CP/M and disk drives in five weeks' time.

CP/M will only be available on the 128K, but meanwhile, the Lynx shouldn't be short of software. The 128K model will cost £455 when it appears later this year. A disk drive will add £344 to this. Abbersoft in Dyfed is writing games, and Bus-tech of Portsmouth is producing a

range of six games and an educational program designed to help you with mathematics.

Romik in Slough has three new games out for the Lynx, and Rad Systems in north London have written home economics software including Accounts and Bank Account, all available now. Acme Software in Liverpool, run by two ex-Bug Byte programmers, is also writing software for the Lynx.

The micro itself is doing well abroad. As well as selling in Scandinavia, it has done particularly well in France, Computers says.



Larger Lynx systems are on their way into the shops.

Prospero's Pascal for the micro

Pascal fans will be pleased to hear that Prospero's Pro Pascal can now be run on pseudo 16-bit systems as well as the 8-bit machines for which it was originally implemented.

Prospero (01-785 6848) has already released a version of its compiler for use under CP/M86 and later this month it should have an

MSDOS/PCDOS variant available. The company says that it has followed the definition of its 8-bit Pro Pascal, which has a British Standards Institution validation certificate, and that most applications programs will be directly transferrable between the two.

The 16-bit version costs £368 and is suitable for machines with a minimum of 128K. It generates machine code object programs in relocatable form. The compiler comes with a link-editor, a library of run-time routines, a library manager, and a Pascal cross-reference generator.

Attention all TI owners

Owners of the TI 99/4A home computer now have a new national club offering advice, software, and the strength of numbers. On receipt of £5 annual membership, the TI Home Computer Users Club will send you the first issue of the club's quarterly magazine and details on club facilities.

Members will be kept up to date with details of new TI accessory and software releases and will have access to the THome Software Library which will provide software at low prices. The club is independent of TI. Program writing could

earn you some cash if your software is printed in the quarterly mailing, and the full time staff at the club's headquarters are on hand to answer queries and give advice. The club is located at PO Box 190, Maidenhead, Berks SL6 1YX and is run by a quarterly magazine which handles various clubs in different fields.

The club is currently seeking regional organisers. Once this is done, regular meetings should be arranged to give people without a local group the chance to swap tips and ideas. At present, user groups are located in Brighton and Leeds.

On the Eve of Adam

Word processing is the latest stumbling block in the path of Coleco's Adam as it totters towards full production.

Reports from the US indicate that the word processing software to be supplied with the \$700 Adam is far from being the professional program that was promised. Coleco is said to have undertaken to improve the software with a \$30 or

\$40 utility package early next year, but this would contradict what it was saying earlier in the year: that the word processing would need no additions to function as a professional quality system.

Shipments of the Adam are due to begin this month; they were originally planned for the end of August but problems with the system's tape drive set it back.

Coleco is largely a victim of its own publicity — the Adam was launched with such a fanfare and it promised so much that it was bound to attract close interest. Perhaps it was naive to believe that for \$600 (now \$700) a system could offer the kind of features it does — full keyboard, high speed tape, daisy-wheel printer and more — without corners having been cut in its

design. This is a harsh, and unforgetting business.

And demonstrating that it never rains but it pours, a Coleco shareholder has sued the company for misleading the public about the Adam.

It seeks damages for people who bought Coleco stock between the May launch of the Adam and the end of September.

That's the micro of Woolies

Woolies has plunged into the computer scene with the other big micro-selling chain stores.

Initially it will be stocking the new Atari 600XL, Vic 20, Commodore 64 and Spectrum machines at 160 Woolworth and Woolco stores. The computers will be supported by a range of games and educational software, which will include not only the manufacturers' own software but also programs

from Parker, Imagic and Activision.

A spokeswoman for Woolworth said: 'In our stores there will be a computer section for the range of machines, and, of course our staff will be trained. In the new year we shall be having discussions to decide whether or not we are going to supply a larger range of computers'.

Woolworth is following Tesco and the Co-op in its micro move.

Smiths cuts micro mag coverage

The range of micro magazines that you can buy at WH Smith is about to be slashed as the company cuts back on the titles it will stock.

Smiths has given its branch managers a list of 20 magazines that it regards as its best sellers. The branch managers are being asked to monitor their sales and to make sure that any magazine not earning its keep won't take up valuable shelf space.

A spokesman stressed that the list (which includes PCN) will not be a hard and fast rule; branch managers will still be able to decide

what they stock. The variety of titles will be cut, but you'll still be able to order a magazine if it isn't on the shelves.

Although the list hasn't been made public it is thought to include four Sinclair-related titles and three that concentrate on Acorn. It could be that Smiths is trying to use the magazine racks to support its own sales of micros. Of its 423 shops 250 have computer Know-How departments and there are now six 'Computer Shops', where Sinclair and Acorn systems share the space with Apple IIe and Commodore 64 machines.

The list is expected to change as new titles are launched or as existing ones become more or less popular. And the branch managers will still have the final word on what is displayed.

Piracy probe

Another voice has joined the chorus clamouring for sensible copyright laws — but there's no reason yet for the pirates to abandon ship.

A top Cabinet Office advisory team last week criticised current Government proposals on computer software protection.

Making a Business of Information, a report prepared for Mrs Thatcher by the Information Technology Advisory Panel (ITEP), states that the 1981 Green Paper on the reform of copyright law 'did not seem to us to cover all the needs of software suppliers and users,' and it calls for legislation that will not be outdated by rapid technological developments.

But an adequate copyright law on

software seems as far away as ever. The 1981 Green Paper is to form the basis of a new copyright law to replace the Copyright Act of 1956, which is now badly outdated, but the fact that new legislation is in preparation will tend to work against attempts to amend the 1956 law in the meantime.

The British Computer Society's copyright committee, for example, is currently pushing for a Private Member's Bill in the next session of Parliament to amend the 1956 Act (PCN, issue 29), but Lord Lloyd of Kilgarren, who is shepherding the proposals through Parliament, is not optimistic about their chances.

The problem is that governments tend to be against what they see as the haphazard amendment of existing legislation. 'They are dead against it,' says Lord Kilgarren.



Gary Kildall: 'The way to move ahead is to have a computer system which controls functions in the home.'

DR homes in

By Cyndy Miles

Gary Kildall, the man who invented CP/M, is planning revolutionary changes in the way computers are used in the home.

Using technology already developed by the company he founded, Digital Research, he predicts that within two years home computers could provide a network of electronic links that will bring greater efficiency and greater security to life at home. And unless home computing develops in this functional way it'll run the risk of being little more than a game-playing fad for most of its users, said Mr Kildall in an exclusive interview with PCN.

He was on a fact-finding trip taking in Europe and Japan when he stopped in London and outlined Digital Research's plans for the home.

'Home computer use is really based on games and standard utilities at the moment. But the way to move ahead is to have a computer system which controls functions in the home,' he said.

He has no intention of publishing specific plans and prefers to keep the competition guessing. But Digital Research has in recent weeks launched products and outlined plans that hint at an increasing concentration on the consumer software market. It made its name with a business operating system,

but having changed one industry by developing a standard there seems no reason to suppose that it can't transform home electronics as well.

Forming the foundations of Mr Kildall's plans are the real-time operating system Concurrent CP/M, and the multi-functional, easy to use interface VIP (Visual Information Processor). VIP is Digital Research's answer to Apple's Lisa technique, enabling newcomers to microcomputing to use systems with ease.

Put these two together and you've the basis for a home control system, says Mr Kildall. The sort of system he has in mind would link home and office, include PBX telephone exchanges in the home and render obsolete switch and knob controls.

'The important thing is to make any computerised function better than the existing alternative. It should be better in terms of being simpler to use, more effective, cheaper and energy saving.'

This is what Digital Research will be studying in its electronic home showcase being built at its Californian headquarters.

Mr Kildall is confident Digital Research will lead the field. 'We have a clean slate; we have no baggage to carry. We don't have to worry about building hardware to test. We can get on with developing the software.'

Laser bonanza

Next spring could see the first appearance of a storage device that brings the price per megabyte down to \$7.

Shugart will unveil its optical disk drive, the Optimem 1000, at Comdex in Las Vegas in November. First shipments of the device, which is expected to sell for around \$7,000, should begin in the first quarter of 1984. UK users could see them shortly afterwards.

The Optimem 1000 uses non-erasable laser technology to store 1 gigabyte on one side of a removable 12in disk. Developed by a Shugart subsidiary, it can be connected to any micro that corresponds with the ANSI standard Small Computers System Interface (SCSI); this was previously known as the Shugart Associates System Interface but on becoming a standard it had to drop the developer's name.

Shugart sees the drive being used where large amounts of data are stored but not regularly accessed. The disk is removable but it is protected by a hard shell cartridge; double sided units will be available, and you'll be able to access the second billion characters by flipping the disk over.

An optical disk might be ex-

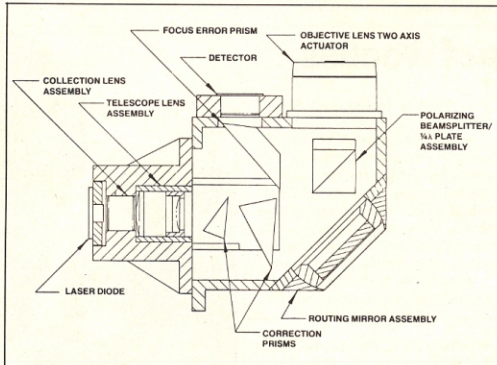
pected to operate at the speed of light but Schugart isn't yet confident enough to debunk all existing scientific theory: its device has an average access time of 100 milliseconds and a transfer rate of 5 megabits per second.

The drive occupies a space 7in by 19in by 24in. When it will occupy this sort of space on UK users' desks is not yet certain, nor is the price, but a spokesman for the company

said that shipments to the UK of Shugart products were not normally far adrift of shipments in the US.

Optical disk technology focuses a light beam through a protective plastic layer which serves as the disk substrate; the recording layer is deposited on the substrate and the light beam pierces the plastic to read the disk.

For more information contact Shugart on 04862-24527.



The collective lens assembly is the nerve centre of Shugart's optical disk.

Redwood puts Unix systems on the road

Software for Unix systems is beginning to appear at a pace that matches the hardware makers' announcements of 68000/Unix implementations.

St Albans-based Redwood (0727-38138) has launched integrated word processing and database software to run under Unix as the first elements of Unixplex. Peter Osborn of Redwood said: 'We are offering a suite of packages integrated at source code level as opposed to buying in several products and adding just a veneer of integration.'

Unixplex is intended to develop into a suite of software modules that will run on any Unix system regardless of hardware. The modules are written in C and can be customised.

The Unixplex word processor includes electronic mailing and a spelling checker. The Database is equipped with an applications generator and a report writer besides offering SQL, the relational query language used in IBM environments.

The next part of Unixplex due to emerge is a spreadsheet system.

Home runs and Sirius games

Business software for home micros and games software for business micros are among the crop of new software releases this week.

Micro Software (0473-462721) has brought out a database system for the Commodore 64 called Inventory 64. It is aimed at small businesses which want to keep track of stocks or parts. It can keep track of where the items are, who sold them, minimum re-order quantities and cost. Inventory 64 costs £29.95.

The company has also launched two educational packages for the Vic-20 called Sprinter and Tiny Tutor. The first teaches typing skills and the second maths skills for 2-7 year olds. Both packages cost £14.95.

For games players, Micro Software has Zeppelin Rescue for the Commodore 64 and Conqueror for the Vic-20.

The company encouraging business people to take up game playing is Merit Computers which has brought out a series of games to run on the Sirius.

The list is fairly predictable and among the titles are Cosmic Invaders, Speed Invaders, Mutant Birdmen, Speed Driver, Maze Craze, Climber, Galactic Invader and

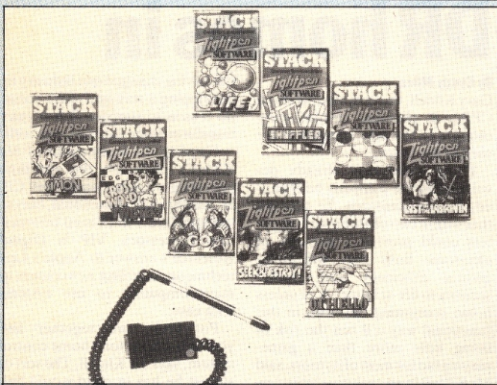
Super Othello. The games are available from Sirius dealers around the country.

For Spectrum owners interested in ball games, Abrasco (01-866 2518) has launched Pool and Golf. They cost £6.95 each and are available from dealers and high street chain stores.

Mikrogen has produced no less than 14 new titles for the Spectrum. They are Knockout, One Hundred and Eighty, Creepy Crawler, Star Trek, Mad Martha II, SAS Assault, Land of Sagan, Defender, Cruise Attack, Paratroopers, Laserarp, Pat the Postman, Naanas and Timequest. The games will be in the shops by the end of the month.

Imagine's new release is called Bewitched and is a continuous maze game to run on the Vic-20. You have to escape from a ghost-infested labyrinth of dungeons by escaping through a series of doors. Survive random attacks from the ghosts, or concussion from moving brick walls, and another maze scrolls up to delude you. The game comes on cassette for £5.95 and is available from usual stockists.

For £7.95 Brane of Penzance (073-62562) has a Spectrum program to attack your heating bills.



LIGHT PEN TOUCH — For those of you who prefer personal contact with your TV screen or monitor when playing games, Stack has produced a bundle of software packages for its range of light pens. Selling at £5.75 each, titles include Seek & Destroy, Crossword Twister, Simon, Shuffler, Life, List in Labyrinth, Othello, Draughts and Go. All packages run on the BBC, Vic 20, Atari and Commodore 64 and are available from Stack Computer Services, 051-933 5511.

Clubs merge to help out handicapped

Two Clitheroe computer groups have agreed to pool their resources and expertise to help the handicapped.

Ribble Valley Computer Club, formed about a year ago, has 70 members but has difficulties in

finding a regular meeting place.

In contrast, the Trinity Youth and Community Centre Computer Club has premises and organisers, but lacked expertise.

Now the two clubs have linked up and will work on programs that will aid the mentally handicapped.

Geoff Jackson, the area youth organiser based at the centre, said: 'The mentally handicapped have a communications problem and the two clubs will work together to find ways and means of helping them'.

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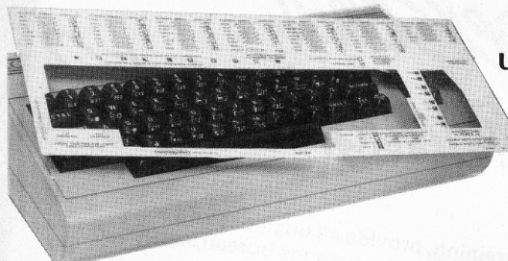
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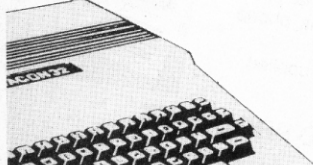
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Planet of Death	16/48	AR	6.95
Ship of Doom	16/48	AR	6.95
Invasors	16/48	AR	4.95
Micro Chess	16/48	AR	6.95
Cosmic Debris	48	AR	4.95
Chess Tutor	16/48	AR	9.45
Astroblaster	16/48	OU	7.95
Time Gate	48	OU	8.95
Space Intruder	16/48	OU	4.95
Mined-Out	48	OU	7.95
Meleor Storm	16	OU	4.95
3D Strategy	16/48	OU	6.95
Vainors Lair	48	OU	6.95
Smugglers Cove	48	OU	6.95
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20k's Kingdom	16	AN	5.95
Cavern Fighter	UNEX	AN	5.95
Astro Fighters	UNEX	SU	6.95
Wacky Waiters	ANY	IM	5.50
Catcha Snatcha	ANY	IM	5.50
Francic	ANY	IM	5.50
Arcadia	ANY	IM	5.50
Starquest	16	PI	7.95
Subspace Striker	16	PI	7.95
Harvester	16	PI	7.95
Cavern Raider	UNEX	SO	5.00
Asteroids	UNEX	SO	5.00
Gun Fight	UNEX	SO	5.00
Munch Man	UNEX	SO	5.00
Multitron	UNEX	SU	5.00
Gridder	ANY	TE	7.95
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Destroyer	UNEX	SU	7.95
Chopper	UNEX	SU	6.95
Starship Escape	16	SU	9.95
Puzzle Pack	UNEX	SU	6.95
Trader	16	PI	14.95

ZX 81

Game	Ram	Author	Price
Inca Curse	16	AR	5.95
Ship of Doom	16	AR	5.95
Koakil	16	AR	9.95
Galaxians	16	AR	5.95
IK Games Pack	16	AR	6.00
Asteroids	16	OU	3.95
Invasors	16	OU	3.95
Munchies	16	OU	3.95
Crosska Crawla	16	PS	3.95
Maze Death Race	16	PS	3.95
Allen	16	PS	3.95
Ghost Hunt	16	PS	3.95
Star Trek	16	PS	3.95
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SUPPLIERS KEY

SU — Sunlock; SO — Solar; PI — Pixel; IM — Imagine; AN — Anirog; UL — Ultimate; ME — Melbourne;
HE — Hewson Consultants; IP — Impact; AR — Artic; QU — Quicksilver; DK — DK Tronics; OC — Ocean; PS — Pss;
PE — Peaksoft; JK — J. K. Grege; NG — New Generation; CD — CDS; TE — Terminal; BB — Bug-Byte.

French for flexibility

The French micro builder SMT-Goupil intends to launch its Goupil 3 business micro in the UK next spring.

The company hopes to have a London office open by the end of this year, and export manager Patrice Roucayrol says that it is currently translating the software and documentation on its systems into English.

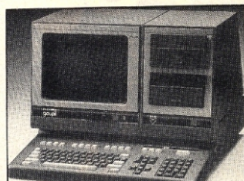
The Goupil 3 is a multiprocessor system with a 6809 and an 8088 on

board. It can also take a Z80 card to add CP/M. In its minimum configuration it costs £1,100, and the price rises to £5,700 for a full system with twin 8in drives.

Besides looking chic in a thickest way, the Goupil 3 is a versatile machine in the range of its processors, the types of disks it can use, and the variety of operating systems (Flex, UCSD p-system, CP/M, CP/M86, and MSDOS) it offers. Memory can be expanded to 1Mb.

The company has no intention of developing a portable version, but plans instead to pay more attention to the system's communications facilities.

Goupil (the word means 'fox' in medieval French) was formed in late 1979 and has venture capital backing from the French Government. It claims to be the number two supplier of business micros in this class in France, behind Apple which is estimated to have 17 per



Thickest chic — the Goupil 3.

cent of the small business market.

Soft swap

Salamander Software has moved into the Spectrum market and will convert some of its best-selling packages for the machine.

The packages will be marketed by Quicksilva and titles now avail-

able include Traxx and Gridrunner at £6.95.

As a warm-up to the Christmas rush, Salamander has also released new software for the BBC, Oric and Dragon. 737 Flight Simulator, French Tutor and a utilities package with four programs on one cassette all run on the BBC and cost £9.95.

About face

If you own an Apple or an IBM PC and are getting bored with the obvious dot matrix typeface from your printer, you might be interested in a new package called Type Faces.

Sold by Pete & Pam Computers (0706-227011), it is a software package that configures your printer to produce 15 different type styles. More than 100 symbols are included to supplement your printer's normal character set.

The program comes complete with a simple text editor which, Pete & Pam claims, can be mastered by a novice within minutes.

The package costs £114 and works with Epson MX-series and IDS printers. The Apple version also works with the Apple Silentype printer.

You will require a dual disk drive system to run the program which is compatible with Wordstar, Apple DOS and IBM DOS EDLIN files.

The software was written by Alpha Software Corp.

No expense spared

Merit Computers has produced a package to keep tabs on your budgets — and at £920 its first job could be to work out whether you can afford it.

Running on most CP/M-based business computers, the software aims to let marketing managers plan, monitor and control budgets.

Committed and actual expenditure is compared with annual budgets categorised by product area, type of service and supplier name.

Each marketing activity is allocated a job number and details are entered into the job file giving budget and supplier information. Costs within a job are listed and as invoices are received these are matched by job numbers and budgets.

Depending on your needs, the package is also capable of giving various reports.

Merit is on 0942 495821.



Transtec's Krypton system — the latest to be given Perfect software.

Perfect pack

Transtec has joined the list of micro manufacturers offering a bundle of Perfect software free with its machines.

Transtec (01-247 1327) makes the Krypton range of micros and from now on will give away Perfect Writer, Perfect Speller, Perfect Filer and Perfect Calc.

The total value of software is £1,500. But under the offer the Krypton remains at £1,695 for the basic 64K Z80 machine.

The Perfect packages are fully integrated using common commands and file structures. A virtual memory capability allows you to edit documents larger than your micro's memory. You can also work on seven files simultaneously with any two on display.

Tele-dragons

The Association of London Computer Clubs (ALCC) is turning adventure into a team game.

Through its arrangement with Essex University, 32 people at a time can dial into the university's system and play Multi-User Dungeons, from home computers of the calibre of the ZX81 upwards. Users are joining in from as far afield as the USA and Europe.

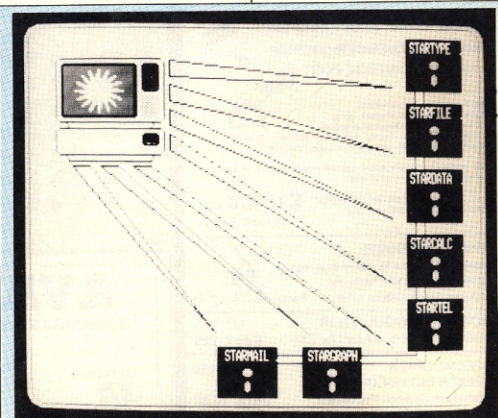
The club has a special interest in promoting communications using home micros like the BBC, Dragon and Spectrum and linking them to mainframes.

A modem plus software can turn an ordinary micro into a mainframe

terminal. For instance, if you use Computer Concepts' Termi software on the BBC, it becomes a standard network terminal, according to Len Stuart, secretary of the ALCC.

He went on to explain that any micro with a V24 serial interface, such as the BBC's RS232, can connect to a mainframe computer once it has been adapted for that particular purpose.

Anyone wanting to attend should go to the Community Computer Centre of North London Polytechnic, Holloway Road, any Monday during termtime between 6.30pm and 9pm.



STAR POTENTIAL — Rediffusion has added two new packages to the series of programs available with its Teleputer/3 business system. The newcomers are Stargraph, for business graphics, and Starmail, a mail merge utility. According to Rediffusion (0293-31211) Stargraph offers automatic scaling, multiple colours, a choice of charts, grid lines, and a complete set of default values. As with Starmail, the package can be integrated with the existing offerings on the Teleputer/3, which costs £3,595, hardware and software combined.

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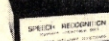
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PCN Charts

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 September 29 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 two-week period ending two weeks before publication date, so they tell the story in the high street between September 15 and September 29.

GAMES

Top Thirty

	GAME TITLE	PUBLISHER	MACHINE	PRICE
▲ 1 (6)	Flight	Psion	Spectrum	£5.95
▲ 2 (5)	3D Tanx	DK Tronics	Spectrum	£5.50
▲ 3 (4)	Jet Pac	Ultimate	Spectrum	£5.50
▲ 4 (7)	Arcadia	Imagine	Vic 20	£5.50
▲ 5 (11)	Heathrow ATC	Hewson	Spectrum	£5.50
▼ 6 (1)	Horace and the Spiders	Psion	Spectrum	£5.95
▼ 7 (3)	Manic Miner	Bug Byte	Spectrum	£6.00
▼ 8 (2)	Penetrator	Melbourne	Spectrum	£6.00
▶ 9 (9)	Gridrunner	Llamasoft	Vic 20	£8.50
▶ 10 (10)	Kong	Ocean	Spectrum	£5.95
▲ 11 (12)	Football Manager	Addictive	Spectrum	£5.95
▲ 12 (15)	Spawn of Evil	DK Tronics	Spectrum	£5.50
▲ 13 (23)	Pool	CDS	Spectrum	£5.50
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PCN Charts are compiled exclusively for us by MRIB (Computers), London, (01) 408 0250.

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AC Acorn Computers. ACT — ACT. AJ — Anderson Jacobson. AP — Apple Computer. AT — Atari International. CA — Computers. CGL — Computer Games Ltd. CO — Commodore. DEC — Digital. DR — Dragon Data. EP — Epson. GR — Grundy Business. IBM — IBM. JU — Jupiter Cantab. LO — Lowe Electronics. LL — Lucas Logic. MA — Mattel. MI — Midlectron. OL — Olivetti. OR — Oric. OS — Osborne Computers. PD — Portico Technology. RX — Rank Xerox. SH — Sharp. SI — Sinclair. SB — Sirtel. SO — Sord. TA — Tandy. TI — Texas Instruments.

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Shop assistants — beware!

I've read many letters recently in *PCN* on the subject of shop assistants giving incorrect information and in some cases not knowing the answers to basic questions.

Therefore, my friends and I who have all been subjected to this, set out to take revenge. When we had armed ourselves with sufficient information we set off down to our local computer shops and started posing simple questions.

The few assistants who answered these were subjected to even harder questions and only a handful managed our hardest questions.

The correct technique is for one person to start talking to the assistant asking them about a particular machine while your friends stand around, occasionally butting in to correct any mistakes they make and trying their best not to laugh.

Try it! It's really good fun.

Stephen Baker
St. George, Bristol.

I think I'm beginning to sympathise with shop assistants now...! Ed.

A very good question

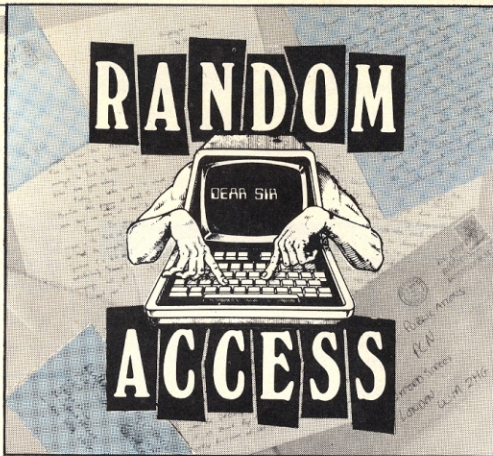
Anybody wanting to buy a home computer will take their time to look around for the best to suit particular needs. I did, and bought a Sinclair Spectrum 48K.

PCN £10 Star Letter



Having read the instructions and used the keys to get the feel of it, I fitted a pre-recorded cassette into a recorder and loaded the program — but the game wouldn't start. I tried about ten games programs in all, varying from *Hobbit* and *Inca Curse* to *Pitman 7* and *Missile*. They either wouldn't enter, start or store the game.

After testing the cassettes on a friend's 48K Spectrum and finding that they worked 100% I thought I had bought a malfunctioning console. Then I read an article in *PCN* which



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

told me that I might have purchased the new Issue 3 model, (the one with a different ULA chip). Having checked this, I established that I had, indeed, bought the most recent and up-to-date home computer — so up-to-date that most, if not all, software on the market does not work.

I telephoned some software manufacturers and although they knew of the possible 'problem' they were unable, at this stage, to say whether the new ULA chip would affect the loading and/or playing of their programs... it does.

Here I am, all keen to get on, but not able to have a break from the business side by playing software games.

To update a machine is all well and good but I wonder whether Sinclair warned the software manufacturers of its intention (the programs could have been written accordingly) so that I, and undoubtedly thousands of others, could use the hardware to its potential.

MJ Clements
Stockport

We were amazed too... but we might be able to help by publishing a solution to the problem in PCN. We'll get it into print as soon as possible. Ed.

Mike calls the tune in Gameplay

Could I inform Mike Gerrard (*PCN gameplay, issue 23*) that he nearly started a third world war in our house, by stating that the opening tune to Manic Miner was 'The Skater's Waltz'. I agreed with him, but

Mum insisted it was part of the Blue Danube. The argument got to such a point that we phoned Bug-Byte, to be informed that the tune is the Blue Danube. Apart from that, I would congratulate Mr Gerrard on his excellent and honest reviews.

By the way, my best score on Manic Miner is 19383, and I managed to get onto the 'Attack of the Mutant Telephones', which was pictured in the aforementioned review.

Darren Sargent
London E13

Whatever happened to the idea that music be the food of love? Ed.

Fading dream made clear

I read with some alarm your article entitled 'Job dream fades', (*PCN issue 23*). In it you make some statements which, to say the least, need clarification.

In the first paragraph you give the impression that youth training schemes have been promising young people that they will get full time employment at the end of their 12 months' training. This is not so. Youth training schemes have always made it clear that there is no such promise, but the high standard of training we give young people must go some way to helping them towards employment.

To take Patrick Raymond and Colin Stokes to task over their statements:— First, we give the trainees a detailed and intensive training in computer pro-

gramming, including keyboard skills, writing databases, using word processors and completing suites of programs. We also include such other skills as telecommunications and using PSN modems.

Regarding Mr Stokes' comment on training programmes, these are part of the pre-funding package required by the MSC from schemes, and cover the full twelve months' training period.

I am sure that the few comments which I have made will show that a number of youth training schemes are of a high quality, even though as I have already said, they are not a passport to full employment.

SJ Evans

Computer Project Supervisor
Merseyside Youth Training

Oddly enough your last sentence is exactly what we said in the first paragraph of our article — surely the point is that where full employment is concerned there is no substitute for job experience, and this is what Mr Raymond, Mr Stokes and others were saying. Ed.

What makes a Sinclair sick?

Your report on sick micros (*PCN issue 29*) said that Sinclair found more than 50 per cent of their systems returned not faulty.

My experience with buying a ZX81 leads me to think that most of Sinclair's faulty systems are in the ULA. I eventually found one working with my black and white TV. Those I returned to the shop worked with their colour TV. If Sinclair tested its returns on a right TV, they would not find the faults, and send them back to the shop again until someone with a compatible TV bought it. The public cannot be blamed for returning a black and white computer which will not work with a black and white TV.

K Chua
Birmingham

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Give your Vic some stick

Q Do you know how I can use my joystick in a program on my Vic 20? I've seen sub-routines which do this but can't get them to work.
Sheldon Kenton, Whytelgate, Surrey

A Reading a joystick on a Vic is no mean feat — you have to do it yourself rather than getting a ready-decoded result like you would on most systems. This short and simple subroutine is a crude and slow way to do it. But the idea is that it will help you understand how the joystick works. You can then have a go at some more sophisticated routines.

Where do you start? A Vic joystick is simply five switches, each of which can be on or off. Figure 1 shows these with some short names S0 (up), S1 (down), S2 (left), S3 (right) and FR (the fire button). Suppose you point the joystick to the northwest. This can be detected because both S0 and S2 will be on.

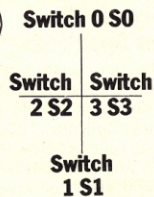


Figure 1

back a value from the ports. Finally, the result of the PEEK is a byte — a number between 0 and 255. Individual bits of the byte will be 0 or 1 depending on whether that particular switch is off or on.

Sounds awful doesn't it? It's easier if you try it. First of all, IOA is at location 37137 and its control register is at 37139. IOB is at 37152 with its control register at 37154. You've got to be careful with IOB because it's used for reading the keyboard. Forget to reset its control register to 0 and you'll cut the keyboard off!

You'll also need to know how the five switches are 'mapped' into the two ports: S0 is bit 2 of IOA S1 is bit 3 of IOA S2 is bit 4 of IOA S3 is bit 7 of IOB FR is bit 5 of IOA

S3 is a pain — if it was part of IOA, you would only need to read one port. Oh well! Try the subroutine and one-line demo in figure 2. This prints out the values of the five switches as you play about with the joystick. Let's look at how it works.

First of all, the contents of IOA are read by setting its control register to 0 and PEEKing it (line 50). Next, line 60 reads IOB by PEEKing 37152. Since we only want to know if

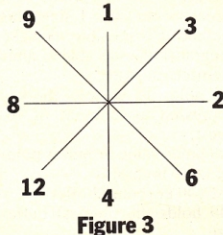


Figure 3

The switches are 'connected' to the Vic through two Input/Output ports on its 6522 VIAs. To read them, you have to tell the ports (which I'll call IOA and IOB) to read information (by POKing a register which controls them) and then PEEK

Bit 7 is 1 or 0, we can get the result simply by comparing with 128. Notice that the control register is set and immediately reset after use.

Finally, line 70 uses AND to extract the various individual bits out of IOA that relate to the

joystick. Obviously, the results may not be in the most ideal form for your own particular programs. You could add lines to convert the switches into a form that's more useful or, better still, re-write the routine entirely.

One example is to add a line $80 D = S0 + S3*2 + S1*4 + S32*8$.

Now you'll get a value of D back from the subroutine as shown in Figure 3. The Vic 20 Programmer's Reference Guide lists a clever routine that returns a pair of numbers that specify exactly the direction an object would move in response to the joystick.

So start with a simple routine like this. Understand and adapt it. You'll soon be able to write your own fast and efficient routines.

Seasonal Spectrum sizzle

Q I bought a 48K Spectrum a couple of days ago — it worked fine, but:

1 As soon as the Spectrum is switched on, there is a slight rustling or chirping sound from it. I think the effect of this sound can be seen on the TV, where the letters iridesce. Is it normal, or could it be shorting somewhere?

2 After some time I notice that the underside of the Spectrum in the top right hand quarter, gets hand warm, say 25-30°C. As there are no cooling slots in the box, I wonder if that is normal?
A M Wasung, Enfield

A As the nights draw in, you should already be getting the benefit of the second point you raise. Yes, it's perfectly normal for the Spectrum to get hot, and you'll find it a great comfort for your chilblains over the winter. This is caused by the Spectrum's heat-sink, which is a large metal plate which dissipates the power that the machine doesn't need in the form of heat.

As for the rustling and chirping, it's quite usual for the Spectrum to make a noise rather like shorting — or like an electricity substation — when it's on. If your micro is making a sound like feet tramping through dead leaves, or starlings at sunset, see your dealer. If it's just an electrical hiss, you're OK!

Better to BBC or await Elan?

Q I am new to computers and need to ask some advice about which micro to buy. After reading many magazines, I decided on the BBC Model B, which I think has a lot of potential. But then I saw the Elan Enterprise 64, with 64K memory, a graphics resolution of up to 672 x 512 and 256 colours. The Elan also has a built in word processor and joystick, and seems to be better value than the BBC.

PLEASE COULD YOU PUT ME OUT OF MY MISERY — SHOULD I BUY THE TRIED AND TESTED BBC FOR £399 OR THE 'TOO GOOD TO BE TRUE' ELAN FOR £200?

Paul Edwards, Camberwell, London

A You've got it in one — the Elan Enterprise is too good to be true, because it isn't true — yet. Its specifications are certainly attractive, but so have the pre-release specifications of many another micro.

So you've really got to ask yourself what you're contemplating — the BBC B has been our for some time now, and is a tried and tested machine with plenty of hardware and software support.

The Elan Enterprise, on the other hand, isn't going to be out until next year, and although it will support twin Sony microdrives through 'The Stack', there's no guarantee that it will be adequately supported by software and peripherals until some considerable time after its launch.

And note also that The Stack is — or is intended to be — an expansion peripheral, and that's there's no guarantee that it will be available at the same time as the Enterprise is.

Now don't misunderstand me — the Elan may well turn out to be the greatest thing since sliced bread, but it won't turn out to be so for quite some time yet, and if it's to secure the support it will need to survive, it will have to be very good indeed.

Things move so fast in the micro market that there is simply no point in waiting around for something better, because there will *always* be something better 'just around the corner.'

```
10 REM DEMO
20 GOSUB 50 PRINT S0;S1;S2;S3;FR:GOTO 20
30 REM READ JOYSTICK
40 REM RETURNS S0;S1
41 REM S2;S3 AND FR
42 REM
50 POK=37139:R=PEEK(37137)
60 POK=37154:R2=PEEK(37152)+128:POKE 37154,R2
70 S0=(R AND 4)=0:S1=(R AND 8)=0:S2=(R AND 16)=0:FR=(R AND 32)=0
80 RETURN
```

Figure 2



Scaled a new PEEK in microcomputing? If printed your tip will earn you a fiver.

If you've got something to crow about . . . a bit of magic that'll make the world a better place for micro users, then send it to *PCN* Microwaves—our regular readers' hints and tips page. We'll pay you £5 if we print it. We'll pay you even more if your little gem gets our vote as microwave of the month. Think on . . . and write to Microwaves, *PCN*, 62 Oxford Street, London W1A 2HG.

Friendly bugs in the Spectrum

I have found three possibly useful bugs in the Spectrum. They are:

```
1 10 PLOT 90,90
20 DRAW 66,32,599
```

This produces an excellent graphical effect which can be altered by changing the values in line 20.

```
2 Enter:
10 PRINT " "
20 GO TO 10
then type in
GOTO 10: REM PCN IS AN
EXCELLENT MAGAZINE
```

When 'Scroll' comes up, press caps shift and symbol shift together for the first effect and then press enter for the second. To improve the first effect, write the 'GO TO 10:REM' in the keyboard control colour, the same as the paper colour, and the PCN etc in black flashing characters leaving the last E of magazine.

```
3 Type in:
REM (30 spaces) PCN IS
GREAT
Then type in
PRINT USR 9010
Then look at line 13.
W Mitchel, Welton, Lincoln.
```

Putting off the printer

I have found a way of protecting BBC listings from being listed on either the screen or the printer. First enter, as a direct command:

```
*KEY 0 FOR A=PAGE TO
TOP: IF !A=&21262A29
THEN !A=&15030C07:N.
ELSE N.:M Then somewhere
at the beginning of the listings
enter the line: REM)*&!
and when you have finished
writing the program, press FO
Now whenever anyone tries
```

to list the program, the computer will make a small beep, turn off the printer, and then the screen will go blank so that control can be regained only by pressing BREAK.

If at any time in the future you want to relist the program then enter:

```
FOR A=PAGE TO TOP:
IF !A=&15030C07
THEN !A=&21262A29:N.
ELSE N.:M
```

It is best if REM)*&! is entered at the end of a long multistatement line, or else the line may be deleted.

David Clifton
Beckingham, South Yorkshire

CBM 64 magic writing

All Commodore machines employ a special technique for the entry of data through the keyboard. A knowledge of how this works allows a flexible system of data entry to be implemented.

Every 1/60th of a second the machine stops what it is doing to look at the keyboard, to see if a key has been pressed since the last check. It stores any key found on the top of the keyboard stack and whenever the machine is in direct mode, the computer will empty the stack to the system. This results in 'magic writing' seen if you type in something while the computer is listing a program. What happens is quite simple—while the program is being listed and you press a key, the corresponding character is pushed onto the stack. This stack or buffer is ordered in a first in first out system (FIFO). The same effect is also noticeable when a program halts in a get loop, waiting for a key to be pressed. The user may have accidentally pressed a key, which goes onto the stack and

the program ploughs on taking this key as the input.

The buffer has a capacity of ten characters and the key to this problem is to empty it before requesting data input by getting ten pieces of dummy data eg

```
1000 REM EMPTY BUFFER
1010 FOR A=1 TO 10:GET
A$:NEXT A
1020 REM NOW REQUEST
INPUT
```

A simpler and more elegant way of doing this is to tell the machine that there is no data in the buffer by POKEing the pointer with a zero. eg POKE 198,0

If you are simply interested in whether a key is being pressed at the moment then use PEEK(197), which returns a unique value for each key pressed.

The buffer itself starts at 631 and goes on to 640. It is possible to put characters into the buffer and tell the pointer how many are there. If the program is then stopped these keys will be interpreted in direct mode. Printing lines on the screen such as:

```
GOTO 100
and then putting the current
cursor position at the beginning
of the line, and then put a
character 13 (carriage return)
into the buffer then STOP the
program. This will cause the
GOTO to be interpreted as a
direct command. Using this
method it is possible to make
programs that are able to alter
themselves. Note:
197 holds the value of the key
depressed at moment of re-
quest.
```

198 holds value or buffer pointer (zero is empty)
631-640 keyboard buffer
649 holds the physical buffer size.

Paul Roper, Gosport, Hants.

Commodore merger bid

A simple merger routine for both the Vic and the CBM 64 can be devised with the knowledge that if the pointer for the start of Basic is set to the end of Basic and another program is loaded, then the new program will be stored just after the old. By restoring the pointer to the start of Basic, the memory will now hold a whole merged program. To do this, type in: POKE 43,PEEK(45)-2: POKE 44,PEEK(46)

Now load the new program and finally type: POKE 43,1:POKE 44,16 Locations 43 and 44, on the Vic-20, hold the start of Basic whereas locations 45 and 46 hold the start of variables which follow the end of Basic. The end of Basic is two bytes behind the variable pointer, so we subtract 2 from location 45 accordingly.

Numbers 1 and 16 are the start of Basic for the unexpanded Vic.

To find the respective numbers for a 64/expanded Vic, type: PRINT PEEK(43),PEEK(44) and write down the two numbers. This should be done before changing the start of Basic. Steven Palmer, Gt Yarmouth, Norfolk

Arcade din for Spectrum

The unfortunate lack of creative sound on the ZX Spectrum makes arcade style programming difficult. The machine code routine below, when called with RANDOMISE USR 32400, gives a noise similar to a laser burst. The duration can be altered by:

```
POKE 32401,n
where n is a number which
should be more or less around
20. The machine code will run
on a 16K Spectrum although
48K users might like to locate it
further up the memory.
10 REM LASER BURST
ROUTINE.
20 CLEAR 32399
30 FOR a=32400 TO 32425
40 READ b: POKE a,b
50 NEXT a
60 DATA 6, 5, 197, 33, 0, 3, 17,
1, 0, 229, 205, 181, 3, 225, 17,
16, 0, 167, 237, 82, 32, 240,
193, 16, 233, 201
```

O Hart,
Southmoor, Oxon

*FX/OSBYTE for the BBC

Here is an undocumented *FX/OSBYTE call for the BBC micro computer with 1.2 OS.

```
*FX 117 Returns in the X register, a flag with:
BIT SET UNSET
0 VDU 2 used VDU 3 used
2 Page mode on Page mode off
3 Software scrolling Hardware scrolling
7 VDU disabled VDU enabled
```

To use this call do the following:

```
A%=117
X%=0
PRINT~(USR(&FFF4) AND &FF00)&100
```

This prints the contents of the X register.

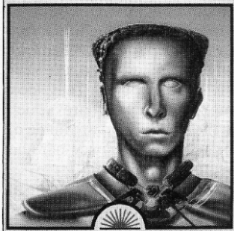
P K Hopkins, Withington, Manchester

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

commodore 64 adventures

A guide to playing and writing adventures

mike grace



'Commodore 64 Adventures' by Mike Grace, published by Sunshine Books at £5.95 (paperback, 215 pages).

Subtitled 'a guide to playing and writing adventures' this is actually a book about the writing of one adventure which is listed and described at great length.

Although this is the obvious approach, it is debatable whether or not it is the best. There is always the danger of overkill. True, you have a complete adventure at the end of it, but would you want to play something which you will undoubtedly know inside out? That reservation aside, Mr Grace has covered his subject with admirable thoroughness and anyone taking the trouble to digest what he has to say will be well placed to write their own adventures afterwards.

Everything is here, from writing the plot to flowcharting, mapping and — last and probably least — writing the code. The program itself is the least of your problems in writing an adventure in Basic. If you've written one, you've almost written them all since the core of your adventures will largely be transportable routines.

The question of portability raises another doubt: the publishers have probably done themselves a disservice by specifying the Commodore 64 in the title. With very few amendments, Mr Grace's comments and code could be converted for virtually any of the popular machines (unless, heaven forbid, we are in for a dozen books — Atari Adventures, Spectrum Adventures etc, all saying precisely the same thing).

The only drawbacks here to converting to other machines are the use of sound and sprites

but it must be said that these are little more than fripperies and their omission would matter very little. The actual 'playing' part of the books is very minimal and has the feel of padding. It has probably all been said before in magazines (and will no doubt be said again sometime).

If you are interested in writing adventures — perhaps you have a friend with the same machine with whom you could swap your efforts — Commodore 64 Adventures will go a long way to teaching you how to do it.

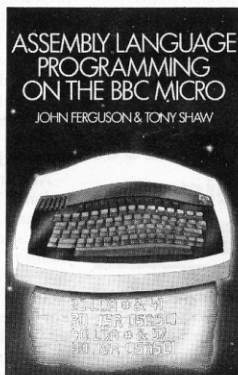
But if someone could persuade Scott Adams to reveal all.

PW

'Assembly language programming on the BBC micro' by John Ferguson and Tony Shaw, published by Addison-Wesley at £7.95 (paperback, 200 pages).

There are two good reasons usually cited for using assembly language. One is that the speed of execution of the instructions is much faster than the corresponding Basic code. The other is the generally accepted idea that using assembly language allows you to understand the fundamental operation of your micro.

However, learning assembly language is not exactly as easy as pie. It requires a lot to do a little, albeit at breakneck speed. Assembly language on the BBC micro is treated here in



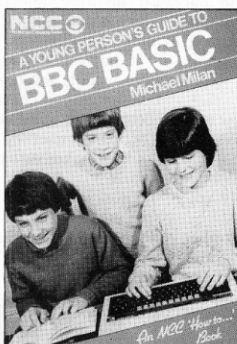
an easy and informative style. The book kicks off with an explanation of bits and bytes, ASCII codes and the mundane but mandatory operation of examining and changing memory locations.

As you'd expect, there are

many listings and examples to facilitate the learning process. There are also useful diagrams of memory maps, tables, FX commands, stack commands and so on.

Arithmetic using assembly code is not handled till chapter eight which is quite a departure for books of this kind. Overall the book is well structured giving the necessary information without being overwhelming.

TJ



'A Young Person's Guide To BBC Basic' by Michael Milan, published by NCC at £4.50 (paperback, 166 pages).

Appearances can be deceptive. This unassuming cover belies an eminently readable guide for young owners of an Acorn machine, wanting to become 'computer people'.

The programs all work on a BBC Model B, and most work on the Electron, or the Atom with BBC Basic ROM.

Naturally, you're told how to 'make a start', and then separate chapters cover such subjects as writing longer complicated programs, good programming, the different modes, colour, sound, arrays and high-resolution graphics.

Everything is easy to follow, from the moment you are talked gently through your first programming attempt. Helpful hints are scattered plentifully throughout, as is constant encouragement to experiment with programming.

The book's only appendix is a checklist for debugging your own programs.

The illustrations are refreshingly to the point, if simple, while the diagrams are clear and instantly comprehensible.

Mr Milan doesn't bamboozle

with binary or excavations of the guts of a micro. Nevertheless, he does try to suggest how a micro operates. His children, who helped with the researching of this book, seem to have provided some excellent advice.

Obviously, good things come in plain packages.

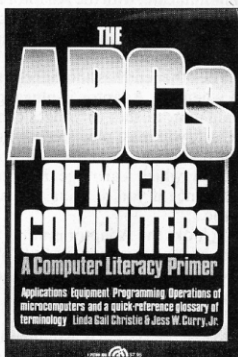
HA

'The ABCs of Microcomputers' by Linda Gail Christie and Jess W. Curry, Jr., published by Prentice-Hall, at £6.75 (paperback, 218 pages).

The ABCs of microcomputers could be described as a computer literacy primer intended for the person with no previous knowledge. The text is written in a lucid style with simple and adequate explanations.

The introductory chapter explains what a microcomputer is and the basics of how it operates. The next section deals with different applications of computers ranging from business applications to the use of micros in the classroom.

The different types of printers, terminals, and other hardware available are discussed, and the pros and cons of various



memory and storage facilities are explained.

The extensive section on software gives some useful hints on how to evaluate programs and their documentation. Programming is dealt with very briefly without giving any genuine instructions. This makes the subsequent discussion on which language to use somewhat superfluous. The last chapter ties together all the previous ideas and critically considers whether a computer is needed at all for a particular problem.

TJ

With the Mattel Computer Adaptor the Intellivision plays it your way. Richard King in command . . .

It's not often pointed out, but almost all the home video game type of machines have quite respectable computers inside them. Not only that, but the need for sophisticated colour graphics means that some of them have screen displays which compare favourably with the dedicated arcade machines.

Unfortunately, all these clever chips are completely inaccessible except when used under the control of a ROM cartridge, and the information about how to write these isn't available.

The Mattel Computer Adaptor is a unit which, when plugged into the Intellivision games computer, will unlock much of that power, turning the dedicated games computer into a small, but quite interesting, Basic microcomputer.

Presentation

We were presented with a pre-release unit which came in brown cardboard boxes, so the packaging isn't yet ready, but if the Intellivision unit gives any indication, it will be adequately robust, brightly coloured and very appealing to the eye.

The Computer Adaptor is a rather uninteresting ultra-dark grey block with grooves along the top, a hatch on the front edge, some extrusions and holes on the sides, and little else in the way of distinguishing marks.

On the left-hand side is a thick square tongue which plugs into the main console's cartridge slot. This is how the two communicate, with the Adaptor acting as a very big, smart cartridge, leaving the console free to handle the screen, sound, joypads and so on.

The other end has another cartridge slot, so when the Adaptor is plugged into the main unit, further cartridges can be used. In fact, you must plug something into this slot before the Adaptor will work at all, though which cartridge it is makes no difference if you're using the machine in Basic.

In looks the Adaptor is more 'modern', with hard square corners, Star Wars-style, and completely different from the console, which is styled along the lines of a '60s Buick.

When the system is assembled it's huge, with a footprint that feels like a football pitch. Put alongside an Apricot it would look distinctly freakish, and if the relative speeds and sizes of memory etc were considered, dinosaurs might well spring to mind.

The Adaptor itself is an extra bit, but apart from that the only essential is the TV lead. Eight feet or more of it seems a little generous, but better than that too short.

To use the system properly you'll need a cassette recorder, and as usual most makes will suffice, though Mattel is understandably anxious to offer its own product. This is the unit sold for the Aquarius, and the printer from the same range can also be used with this system.

Adding these last two items would result in a most odd-looking arrangement with

three distinct colour-schemes and stylings, and though this wouldn't affect performance, the visual mish-mash wouldn't inspire confidence in its users.

Documentation

Documentation is one of the most important aspects of low-end machines, and one which is often badly handled. Mattel has made strenuous efforts to get this right in previous products, and the manuals provided with the Aquarius are quite exemplary.

The manual which comes with the Computer Adaptor is fairly good, but it isn't up to the same standard by a long way, which is surprising, since the two machines aren't that different.

It has all the necessary sections — introduction, setting up, detailed explanations and so on — but no index. The various sections are quite competent, especially Chapter 1, on setting up, which takes great pains to make sure each detail is covered clearly.

There are also various support sections, such as a glossary, and a dictionary of Basic terms, and this is where the book is a little

This is one of the major drawbacks of the system, since four-foot squares of empty space aren't easy to find.

The keyboard is a flatish rectangular slab with more-or-less typewriter-spaced keys. This is connected by a long lead to the Adaptor. Two sub-miniature D-type plugs are moulded together and plug into a pair of holes under the hatch on the Adaptor.

Unlike many in this keyboard, the keys aren't horrible rubber things. They look much the same, being little squares which poke through the surface, but are made of hard plastic. There's a real space-bar and two shift-keys, too.

Unfortunately, Mattel didn't make it that close to a 'proper' keyboard, so the arrangement of keys is distinctly odd. The letters are in the usual qwerty format, with the numbers on the top row, but the specials and punctuation are all over the shop, as are the various control-keys.

Return has sunk to bottom-right, on the outside of one shift-key, the cursor-pad is on the left, and has shifted values which produce ?/%. Escape is at top-right, which is much too close to the place normally occupied by Return, and the shifted values

The Mattel wor

less than inspiring. It wasn't that it was bad, just that it was rather dull and sometimes a bit skimpy.

The glossary, for example, is barely two pages long . . . I may be wrong, but I'm sure there are more terms that might have been usefully included. The explanations were pretty terse, though, with far too much use of other, also skimpily-defined terms.

Don't think that I'm saying that the docs are poorly done . . . they aren't. In fact they are among the best I've seen, but that's not much of a compliment. Mattel

'The Adaptor acts as a very big smart cartridge'

excelled itself with the Aquarius, and I'd like to know why this isn't so here. It feels almost as though the two products were developed by two autonomous teams, who share little in common but paycheques from the same head office.

Construction

As I've mentioned, the whole system consists of bits . . . the console, the Adaptor, keyboard, power-supply, a cheapo tape-recorder, possibly a printer, and the family telly, and when they're all up and running, a fairly large area is occupied.

of the numbers are anything but standard [= "£\$-+/*()]. The oddest thing is the presence of two slashes, one on shift-cursor-right, and another as shift-7. Why?

Considering the market at which this system is aimed, this isn't a serious failing, but it's a completely unnecessary one. Any mapping would have been just as simple to produce, so why didn't they stick reasonably close to the de facto standard, despite its well-known failings?

To have done so would have made the keyboard easier to learn, particularly for parents and others who might be proficient typists, as well as making it easier for owners to transfer to 'grown-up' keyboards.

All home video game units plug into an ordinary TV, and the Intellivision system is the same, but also like others of its genre, there is no provision for driving any kind of monitor.

The system, like most equipment which connects to a TV, puts out a signal on Ch36. For some reason I found that it wasn't all that stable, and if the machine is tuned in, then turned off and then on again, it needed retuning again. Apart from this small irritation, the quality was quite high, with good saturated colours and reasonable edge-definition.

One of the strong points of the Intellivision unit is the screen display — or rather, the very creative use that has been made of it by Mattel's programmers.

In fact, though it's about half the resolution of the displays of the TI99/4A or **22▶**

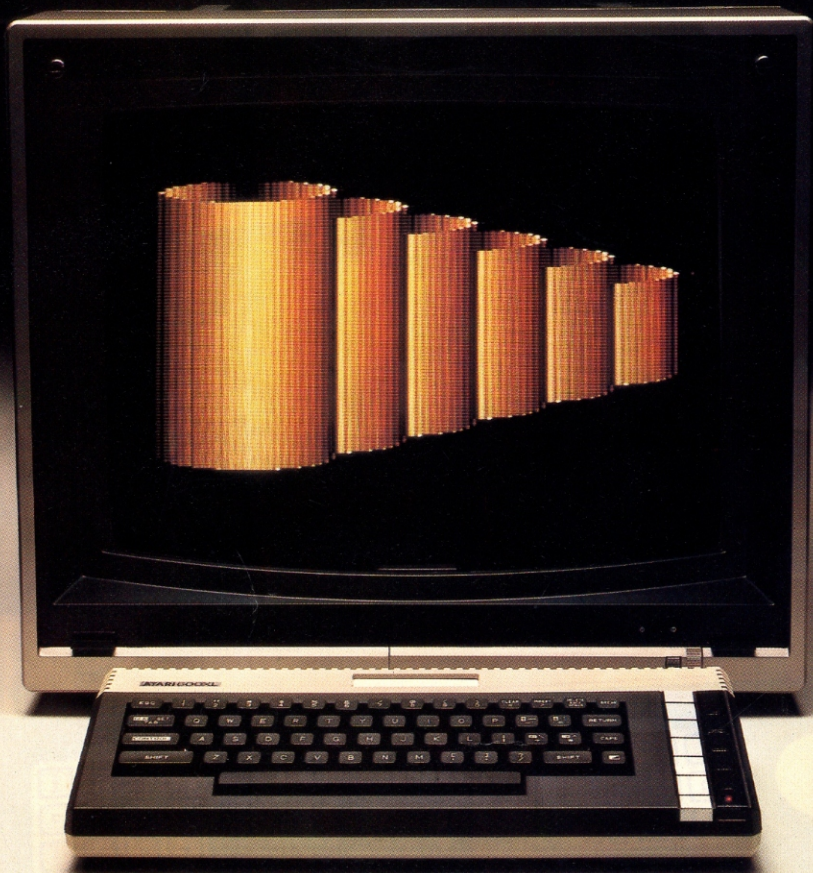
Mattel's plug-in-and-play system. From TV game (bottom) to computer (middle) to synthesiser (top).



ker



As your expectations so can your



600XL Home Computer.

Whatever you want your home computer to do, the ATARI 600XL™ can do it.

ATARI 600XL product specifications.

Colour capabilities: 16 colours and 16 intensities. 256 shades.

Memory: 16K RAM expandable to 64K with memory expansion module. 24K ROM operating system including ATARI BASIC programming language.

Sound: 4 independent sound synthesisers. Each with a 3½ octave range.

Display: 11 graphic modes. 5 text modes. Up to 320 x 192 resolution. Maximum text display 24 lines by 40 columns.

Special ATARI integrated circuits: GTIA for graphics display. POKEY for sound and controller ports. ANTIC for screen control and I/O.

CPU: 6502C microprocessor. 0.56 micro-second cycle. 1.8 Mhz.

Extended graphics functions: High resolution graphics. Multi-coloured character set. Software screen switching. Multiple redefined character sets. Player missile (sprite) graphics. Fine screen scrolling. Changeable colour registers. Smooth character movement. Simple colour animation facilities.

Programming features: Built in ATARI

BASIC programming language plus 8 other languages. HELP key will provide additional information and menu screens. Syntax checking on entry.

Input/Output: External processor bus for expansion with memory and peripherals. 2 controller ports. Serial I/O connector. Monitor output.

Software: Over 1000 items of software available including self teaching programs with unique voice over. Education. Home management. Programming aids. Atari user written programs (APX). And Atari's famous entertainment software.

Experience grows Atari 600XL.



1. Program Recorder.



2. 64K Memory Module.



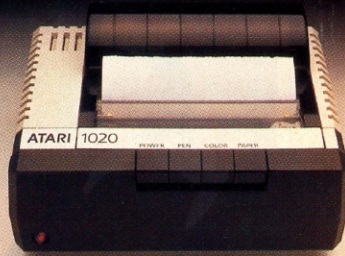
3. Touch Tablet.



4. Trak Ball™ Controller.



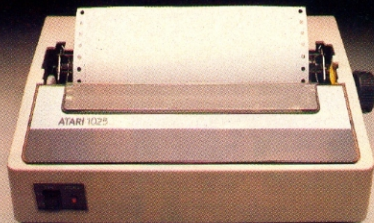
5. Super Joysticks.



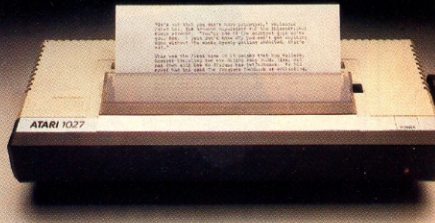
6. Colour Printer.



7. Disk Drive.



8. 80 Column Dot Matrix Printer.



9. Letter Quality Printer.

These peripherals will be available soon:
 1. **ATARI 1010™ Program Recorder** for low cost storage and retrieval capability. Data transmission 600 baud. Storage capability 100K bytes on a 60 minute cassette. Track configuration 4 track, 2 channels (digital and audio). Auto record/playback/pause control.

2. **ATARI 64K Memory Module** gives the 600XL a massive 64K RAM.

3. **ATARI Touch Tablet** enables you to paint pictures and draw diagrams, with the touch of a stylus.

4. **ATARI Trak Ball™ Controller** enables

cursor movement in any direction; adds to the pleasure of Atari games.

5. **ATARI Super Joysticks**. Gives you a greater competitive edge over your games.

6. **ATARI 1020™ Colour Printer** plotter. Four colour graphic print capability. 40 column. 10 characters per second. 5, 10 and 20 characters per inch.

7. **ATARI 1050™ Dual Density Disk Drive**. 5¼ inch disks holding 127K randomly accessible bytes provides both expansion and flexibility for your 600XL system with DOS III.

8. **ATARI 1025™ 80 Column Dot Matrix Printer** prints 5, 10 or 16.5 characters per inch. 40 characters per second. Ideal for program listings, financial reports, etc.

9. **ATARI 1027™ Letter Quality Printer** for word processing letters in professional type.

If you'd like to know more about the ATARI 600XL, write to Atari International (UK) Inc., P.O. Box 407, Blackhorse Road, London SE8 5JH and we'll send you all the details.

The new Atari XL home computer system.

ATARI®

©ATARI and design. Reg. U.S. Pat and TM Off. TM: Trademark of Atari Inc. The ATARI 600XL is compatible with ATARI 400 and 800 programs.

◀18 the Commodore 64, with 16 colours, 20 characters on 12 lines or 167 × 104 pixels, and 7 'Objects' which are much like sprites, it often appears as good or better, due as much as anything to the way it's used.

The Atlantis or Tank Battle cartridges are particularly good examples, with shadings for the lit and unlit sides of objects, producing a much more 'believable' display.

Granted, the actual resolution is lower, and it looks like there are fewer sprites, but any single object can have up to 16 animated steps to it, and can also be flipped vertically or horizontally. To do the same thing with TI-type sprites, you'd need 28 sets of definition tables and a smart management routine.

A feature which TI-sprites don't have is a



way to set a speed of movement which can continue automatically. The Intellivision 'object' can have a vertical or horizontal velocity as well as an animation speed.

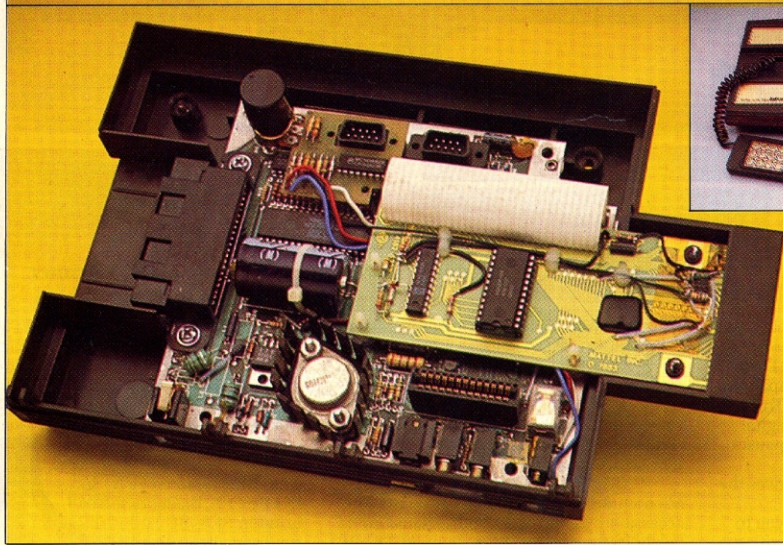
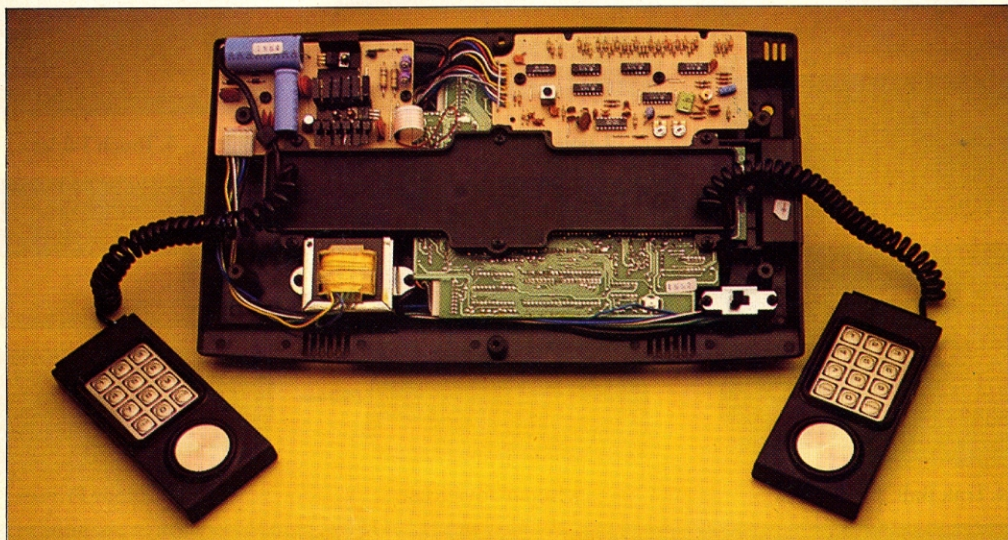
Storage

Program storage is, as expected, on cassette, and with that goes volumes of comments, none of which I'll repeat here. In use it's average, and due to the very small memory, the programs are so short that they can't be anything but quick to load... even at 300 cps, 2K is less than ten seconds.

As a result, multiple attempts (when setting the volume) won't take forever. Happily, named files are supported though not absolutely essential. Correct storage can be verified with the CVRF command, which will respond with the word 'VERF' in various colours, depending on the result.

Expansion

As might be expected, there isn't much



Above — Inside the infamous console. Intellivision TV game graphics are still hard to match with most micros. Left — Inside the long-awaited computer adapter. There's only 2K RAM and an idiosyncratic Basic.

future in asking if this machine will ever have disks or other add-ons, mostly because the whole thing is an add-on anyway. Any more probably wouldn't be practical, so apart from the printer and tape-connections and the TV socket there is no other access to the system.

Alternative keyboards are another thing entirely. The keyboard plugs into the system via two small D-type sockets, so clearly it isn't unreasonable to plug a different keyboard in there instead.

To exploit this, Mattel has produced an almost-real musical keyboard! In fact, to the computer, it's a perfectly normal letters-and-numbers device, but when the Music Synthesiser cartridge is plugged into the Adaptor or the Music option is selected from the main menu, the values sent by either will be reproduced as sounds.

The musical keyboard is impressive to look at, but not much more. It's labelled on the bottom with a warning that it isn't a toy, and shouldn't be used without adult supervision.

I beg to differ. If it isn't a toy, then why does it feel like one? The action is horrible, with a nasty unbalanced feel to the keys, which are too stiff at the top and too soft at the bottom, and wouldn't improve anyone's technique.

Operation

The Computer Adaptor is intended to implement Basic on the machine, but it's a pretty peculiar version. MicroSoft it ain't, nor any other recognisable dialect.

In fact, calling it Basic at all is almost poetic licence . . . it would be more accurate to call it a Basic-like control language which has faculties which take advantage of the Intellivision unit.

The principal difference is in the keywords, which are restricted to four letters each. Not four significant letters, with abbreviations permitted, but *four*. So PRINT becomes PRIN, and GOSUB, GSUB. There are some shorter words, like RD and IT (RND and INT, respectively) and a few, such as GET and GOTO, pass through unscathed.

There are some remarkable restrictions inherent in the language. Three strings and three arrays, which have predefined names (A\$, B\$ and C\$, and AA, AB and AC), and 26 simple variables (one letter for each). It doesn't seem to point it out specifically, but it would appear that several of these latter are reserved, and are used for passing values to the control routines.

For example, C = 0: V = 15: P = 200: CALL TONE will make a loud (V of 15) high-pitched (P of 200) sound on channel 0. If this works as it appears, then the variables C, D, E, H, L, M, N, O, U, V, W, X, Y and Z all have special uses.

There's a real funny in the use of IF, which doesn't have an associated THEN word. This usage is seen in other languages, notably C and BCPL, but never in Basic to my knowledge, and its absence tends to make the division between the condition and the subclause hard to see. In C or BCPL this is no problem, since the two

can be put on separate lines. No so here, though.

It seems that an unfortunate number of errors crept into the manual, which is accompanied by several pages of extra documentation. One of these is called a Troubleshooting Guide to Lucky Basic. This is presumably because Lucky Basic is so flippin' peculiar that you'd get into trouble for shooting somebody if they hadn't remembered to include it.

'There are two superb ideas which could be copied'

It's not what it says it is . . . in fact, it's a monumental erratum. It's when you look carefully at these that the real idiosyncrasies of this machine become most apparent.

For example, you can't do INPU A, B, C, D if it's after IF, nor can you respond to any input with a negative exponent. You mustn't put an operator in a string constant after an IF, either, and you're only allowed six operators per calculation. Line numbers which are multiples of 128 aren't permitted! A string variable and a string constant can't be compared. And so on.

There's plenty more, but the overall result is that previous experience will prove little help on this machine; there are just too many differences to be comfortable.

In compensation, and justifying my comment that it's a Basic-like control language, are a whole load of special functions and routines concerned with making pictures and sounds, jobs at which the Intellivision excels.

Examples are YM(n) and XM(n) which flip the Object n vertically or horizontally, VS(n) which makes Object n visible or invisible, and so on. These extensions allow sequences to be animated at variable speeds, starting at selectable points in the sequence, as well as controlling the sound-generators and reading the hand-controllers.

Used as a control language, rather than as a funny-Basic, it's much more impressive, but hardly easy. In fact, in order to arrange suitable correspondences between the various features you'll have to write some pretty hairy code, which certainly won't be 'ground-level programming'.

Since it is intended for use by first-time users, there are a couple of quite superb ideas, which could well be copied by other

programs. One is to colour-code the various parts of a program, depending what they are.

This is used as a method of pointing out incorrect syntax and other errors. If a line is incomplete, and so can't be executed, the bit that was acceptable is displayed in grey. When a line can't be added because there's no room (inevitable with only 2K), then the whole thing is turned grey.

Another very neat idea is the keyword MENU. This may have an argument between 0 and 3, each of which will produce a list of keywords. Most times the sight of the word in the context of similar words will be enough to trigger a memory of how to use it.

Overall, this language has several good points, some idiosyncrasies, and provided one doesn't think too much in terms of 'real' Basic, is quite useful and exploits the machine well.

Support

'Ninety days!' roared the Judge. Seriously, though such periods aren't uncommon, a bare three months' guarantee still seems pretty mean . . . almost as though that's the shortest period that can be suggested with a clear conscience.

If it breaks down afterwards, or you need some other help, the back of the manual contains sections on what to do.

Verdict

In essence the question is whether the price of this system would be better spent on a 'proper' computer, say a TI 99/4A or Mattel's own Aquarius, or whether owners of the Intellivision would prefer to expand the machine they're used to.

I can't really recommend it as an introductory machine, simply because despite the flashy colours and stuff, 2K is too cramping, and the Basic is so unusual. If you want to get some understanding of computers, I think you could spend money better. Certainly it isn't worth buying an Intellivision to run the Adaptor.

If you already have an Intellivision, like messing about with sophisticated graphics machines and can handle the oddities, I'm sure it would be quite fun, especially if you've used one of the larger programmable calculators at some point, which the organisation of the machine resembles quite closely.

PRICES

Console	£99.95
Computer adaptor & keyboard	£89.95
Music keyboard	£69.95
Music cartridge	£19.95

SPECIFICATIONS

Processor type and speed

Keyboard

Display

Storage

ROM memory

RAM memory

Interfaces

Price

Distributor

Unknown

42 keys + spacebar and 2 shifts

16 colours, 20 x 12 text, 167 x 104 graphics

Cassette with named files

Unknown

2K

Mattel printer, Tape, TV, Cartridge slot, Keyboard

£89.95

Mattel UK

Keith Hook shows you how to accelerate your Colour Genie by using the machine to the full.

Many first-time microcomputer buyers spend weeks typing in published program listings only to find that most aren't worth the effort.

The trouble with Basic is that it's just that—basic. And most computer manuals are less than basic. Like most versions of Basic the Colour Genie's Microsoft Basic is designed for ease of use, but because of this many exciting ideas have to be shelved while the user gains more knowledge.

The first step towards learning this is by PEEKing and POKEing. These routines can speed up an inoffensive, tediously slow game and provide reasonable results while you learn machine code.

First, a word about Listing 1. Hexadecimal is not everyone's cup of tea—so this program converts decimal to hexadecimal and vice-versa. It will also display the Most Significant Byte (MSB) and Least Significant Byte (LSB) . . . more about these later.

MSB and LSB

Each memory location in the Genie is given a number (an address) from 0 to 65535. Any value you store into these locations is given an 8-bit binary number (one byte), which can be equalled to a hexadecimal number, which is easier to work with. One byte of memory can hold a value from 0 to 255 (0—FF Hex). So, two bytes (16 bits) will hold any integer number from 256 to 65535 (100—FFFF Hex).

Trouble is, in the Genie, as in any other Z80-based machine, the numbers are stored back-to-front after 255 (FF Hex),

The speedy Genie

and this lends to the confusion when first starting on the path of PEEKs and POKEs. If you look in your manual under the USR command, you will see that you have to POKE the start address of your machine language program sub-routine into locations 16526 and 16527. So must POKE the LSB into 16526 and the MSB into 16527.

If you have a sub-routine that starts at location 31867 (decimal), what do you POKE and into where? Start by using the program from Listing 1. The LSB is 123 and the MSB is 124, therefore we POKE location 16526 with 123 and location 16527 with 124. When you have done this, every time you use the command USR(0), the computer knows where, in memory, your sub-routine starts and shoots off to do it, then returns to your Basic program.

POKEing a memory location is just like saying: Let X equal 16526 and let the address specified by X be filled with 124.

Try this:

- 1 CLS
- 2 X = 18367 (last address on screen)
- 3 POKE X,209 (a graphic character)

If you add 4 Goto 4, you will see that your screen does not scroll. If you had tried: 3 Print@ 959,CHR\$(209), the screen would have scrolled.

PEEKing is just the opposite of POKEing. You are taking out of memory,

without disturbing memory, and assigning the value to a variable. For example: X = PEEK(16526). *Let X equal the value that is in memory location 16526.*

Before you start PEEKing and POKEing you need to know where things are in memory and then you know what you're looking at, (or where you're putting things by POKEing (see *Memory Map*).

How do you go about using this information? Well, take a look at location 17180. This holds the current CHAR value. Try this:

- 1 CLS
- 2 FOR I = 128 TO 255
- 3 PRINT I; : NEXT
- 4 FOR J = 1 TO 200 : NEXT
- 5 POKE 17180,0 :FOR I = 1 TO 200 :NEXT
- 6 POKE 17180,8 :FOR I = 1 TO 200 :NEXT
- 7 POKE 17180,16 :GOTO 4

You will notice that some of the characters go blank, some of them stay and some change. You can look up the reason for this in your manual under the CHAR n command.

Under Basic you have a choice of eight colours. But now you know where the colour RAM is located you can experiment.

- 1 CLS : X = 17408 *First screen location*
- 2 FOR I = 0 TO 16
- 3 POKE X+I,202
- 4 C = X+I+&HAC00
- 5 POKE C,I
- 6 NEXT

Line 1 clears the screen and assigns the value of the first screen location to X.

Line 2 is the loop counter 0 to 16.

Line 3 increments the screen and POKES a graphic character at that location.

Line 4 gives C the value of SCREEN LOCATION + I . . . and what's this? It also adds a hexadecimal value to C. Now you've got a good tip. Adding AC00Hex to the screen location gives the equivalent location in colour memory.

Line 5 pokes the colour RAM with value of I.

Line 6 If I is not 16, go and do it again, else stop.

This little program shows the versatility of the Colour Genie. You can mix decimal and hexadecimal numbers together, or even octal if you wish.

How time-saving this is might be best explained by asking you to change &HAC00 in line 4 to its equivalent number (use the program from listing one), which is 44032. Now line 4 should read: C = X+I+44032. Run the program again. What do you get? A syntax error. To calculate an address to poke to over 32767 you have to subtract 65536 from it, so &HAC00 becomes -21504 and &HFFFF becomes -1.

On the Genie 1 this was the way all

```

10 PR=17462: X=4096
20 CLS: PRINT@, TAB(10): "MENU"
30 FOR L=17426 TO 17430: POKE L+&HAC00, 11: NEXT
40 POKE 16419, 7: PRINT@, "TYPE 1 FOR DECIMAL TO HEX"
50 PRINT@ 127, "TYPE 2 FOR HEX TO DECIMAL"
60 PRINT: PRINT: INPUT R
70 IF R=1 THEN 100
80 IF R<2 THEN 40
90 GOTO 10
100 COLOUR 1: CLS: PRINT@, "Input Decimal Number ": INPUT DEC: IF NOT(DEC>0) OR NOT(DEC<65536) THEN PRINT@, CHR$(30): GOTO 100
110 DC1=DEC: DEC=DEC/2: GOSUB 160
120 CNU=H1: GOSUB 170: CNU=H2: GOSUB 170: CNU=H3: GOSUB 170: CNU=H4: GOSUB 170
130 PRINT@ 288, " AGAIN ? (TYPE 'Y' TO continue else 'N')": INPUT R#
140 IF R#="Y" THEN GOTO 100 ELSE GOTO 20
150 .
160 H1=INT(DEC): DEC=H1*X+A=DC1-DEC: B=A:H2=INT(A/256): H4=B-(H2*256): H3=INT(H4/16)
:H4=H4-(H3*16): RETURN
170 CNU=CNU+48: IF CNU>57 CNU=CNU+7
180 IF CNU < 48 THEN CNU=48
190 COLOUR 4: PRINT@ 340, "Hexidecimal = ": POKE PR, CNU: CP=PR+&HAC00: POKE CP, 08: PR=PR+1
200 FOR L=17050: NEXT: RETURN
210 CLS: COLOUR 2:
220 PRINT@, "ENTER Hexidecimal Number": INPUT H#
230 IF LEN(H#)>4: PRINT@, CHR$(30): GOTO 220
240 F1=ASC(LEFT$(H#,1)): F2=ASC(RIGHT$(H#,3)): F3=ASC(RIGHT$(H#,2)): F4=ASC(RIGHT$(H#,1))
250 IF F1>57 THEN F1=F1-7 ELSE IF F1<0 THEN F1=0
260 IF F2>57 THEN F2=F2-7 ELSE IF F2<0 THEN F2=0
270 IF F3>57 THEN F3=F3-7 ELSE IF F3<0 THEN F3=0
280 IF F4>57 THEN F4=F4-7 ELSE IF F4<0 THEN F4=0
290 F1=F1-48: IF F1<0 THEN F1=0
300 F2=F2-48: IF F2<0 THEN F2=0
310 F3=F3-48: IF F3<0 THEN F3=0
320 F4=F4-48: IF F4<0 THEN F4=0
330 F1=F1*4096: F2=F2*256: F3=F3*16
340 H=F1+F2+F3+F4
350 COLOUR 7: PRINT@ 340, "Decimal number = ": H#
360 MSB=INT(H#/256)
370 LSB=H#-(MSB*256)
380 COLOUR 3: PRINT@ 335, "MSB = ": MSB
390 COLOUR 2: PRINT@ 375, "LSB = ": LSB
400 PRINT: PRINT
410 COLOUR 4: PRINT "ANOTHER ? ('Y' for another so else 'N')
420 X#=INKEY$: IF X#="" THEN 420
430 IF X#="" THEN 20
440 GOTO 10
450 END

```

Listing 1 — this converts decimal to hexadecimal and vice-versa.

INSIDE THE GENIE

```

1 INITIALISE VARIABLES AND DIM MOST COMMON VARIABLES
2
10 CLS:DEFINITE Z=2:DIM V,X,P,I:IN=40:SC=0:F=0:RANDOM
18 INITIALISE SCREEN DISPLAY.
19
20 COLOUR2:PRINT@00,"SCORE":
30 COLOUR3:PRINT@120,"FALUTS":
40 COLOUR6:PRINT@800,"*****"
L I U E
W I R E
";
50 COLOUR6:FOR I=1 TO 309:PRINT@I,CHR$(210)::NEXT:FOR I=1834 TO
18367:POKE I,209:POKE I+8HAC00,09:NEXT
60 FOR I=53 TO 8935:STEP 40:PRINT@I,CHR$(202)::NEXT
70 FOR I=57 TO 8937:STEP 40:PRINT@I,CHR$(202)::NEXT
80 FOR I=61 TO 9015:STEP 40:PRINT@I,CHR$(202)::NEXT
90 FOR I=65 TO 9055:STEP 40:PRINT@I,CHR$(202)::NEXT
100 FOR I=69 TO 9095:STEP 40:PRINT@I,CHR$(202)::NEXT
110 FOR I=73 TO 9135:STEP 40:PRINT@I,CHR$(202)::NEXT
120 FOR I=79 TO 9195:STEP 40:PRINT@I,CHR$(202)::NEXT
128 *NEXT LINES MAKE A SPACE IN WIRES AT RANDOM INTERVALS.
129
130 V=17465
140 FOR I=1 TO 5:X=RND(18)+2
150 X=X*40
160 POKE V+X,32
170 V=V+4:NEXT
178 *NEXT LINES POKE CHARACTER IN A RANDOM POSITION AND
INITIALISES COLOR RAM TO SAME POSITION.
179
180 V=17806
190 X=RND(6):POKE V+X*(40),221
200 V=17463
210 V=V+(RND(20)+2)*40:X=V+8HAC00
220 POKE V,243:POKE X,1
229 *KEYBOARD SCAN FOLLOWS.
230 G=PEEK(-1984)
240 IF G AND 32 THEN V=V+X*(X):V=V-1:X=X-1:GOTO 270
250 IF G AND 64 THEN V=V+X*(X):V=V+1:X=X+1:GOTO 270
260 V=V+V+IN:X=X*(X):X=X+IN
270 P=PEEK(V)
280 IF P=32 THEN POKE V,32:POKE X,03:POKE V,243:POKE X,1:GOTO 340
290 IF P<202 THEN IN=320 ELSE F=1:PRINT@127,F:POKE X,14:GOSUB 420:V=V+X*(X)
300 IF SGN(IN)=1 THEN IN=-40:GOTO 230
310 IN=40:GOTO 230
320 IF P=221 GOTO 350
330 IF P=209 OR P=210 THEN V=V+X*(X):GOSUB 420:GOTO 300
340 IF G=32 OR G=64 THEN SC=SC+10:COLOUR 4:PRINT@87,SC:GOTO 230 ELSE SEG0 TO 230
350 F=F+34:FOR I=0 TO F
360 POKE I+419,04:PRINT@87,SC-1:
370 GOSUB 430
380 FOR I=1 TO 60:NEXT:NEXT
389 *THIS NEXT LINE HALTS PROGRAM AT END::CHANGE TO GO TO START WHEN YOU
MODIFY PROGRAM.
390 GOTO 390
400 SOUND 7,62
410 SOUND 8,16: SOUND 12,14: RETURN
420 GOSUB 400: SOUND 1,6: SOUND 0,120: SOUND 13,0: RETURN
430 GOSUB 400: SOUND 0,75: SOUND 1,0: SOUND 13,0: RETURN
    
```

The most common variables used in listing 2 (above) are:

- X = Colour RAM POKE position
- Y = Screen RAM POKE position
- XX & YY hold temporary values of X&Y.
- F = Fault count SC = Score value
- P = PEEK position on screen.

addresses over 65536 had to be calculated, and to find out why this happens refer to any good computer book under the machine's treatment of integers. But on the Colour Genie this doesn't matter as the machine takes all the hard work out of the calculations. Just use &Hnnnn. Without using SCREEN LOCATION + &HAC00 there is no easy way of changing the colour of a POKEd character under Basic.

Experimentation is the spice of computing, and this is how you find what the computer is capable of. Try typing: FOR I = &H4400 to &H4425:POKE I,202:NEXT. Press RETURN. You should get a syntax error.

Re-type the line exactly like this: FOR I=&H4400 TO &H4425:POKE I,202:NEXT. Press RETURN. Now it works.

Refer to the Keyboard Layout table for the layout of the keyboard matrix at locations 63488 to 64511. Try the program from Listing 2. This is a game to show how some of these POKES can be put to use in Basic.

Your aim is to guide the graphic character through a series of electric fences with the aid of the Left Arrow and Right Arrow keys. You help it to the safety of the yellow block at the end of the wire fences.

Every time you touch the fence your character is given an electric shock and momentarily changes colour and the Fault count is increased by one. Each time you use the arrows and your character does not touch the fence, your score is increased by 10. At the end of the game, the fault count is multiplied by two and deducted from your score.

You will notice the statement: G=PEEK(-1984): IF G AND 64 THEN... It is the reason for the VALUE in the Keyboard Layout table. This is the value that G will take on if that key is pressed under that particular address PEEK(-nnnn) etc.

MEMORY MAP

LOCATION	CONTENTS OF MEMORY
0000-16383	16K Read Only Memory (Basic ROM)
16384-17407	Communications area used by computer
17407-18431	Text Screen Memory (locations after 18367 not displayed on screen)
18432-22527	High Resolution Memory Area
22528-32767	Start of Basic programs to top of 16K memory. 32K ends at 49151
49152-61439	Reserved for cartridge programs
61440-62463	Colour RAM
62464-63487	Programmable Character RAM
63488-64511	Keyboard Matrix
64512-TOP OF MEM	Reserved for Disk Basic and I/O

USEFUL LOCATIONS

LOCATION	COMMENTS
16419	Holds current colour data. POKeing into this location with 0-16 changes colour used by PRINT
17180	Holds CHAR current mode. Change mode by POKeing 0;4;8 or 16, equivalent to using Char(n) under Basic
16416 } 16417 } 16435 }	2byte address Current cursor position in video memory
16422	You can use this location and the next to jump to a machine language routine, eg if you place (by POKeing) a 0 in 16405, which is in the Keyboard Data Control Block, every time the keyboard is scanned it will jump to this address
16424	Line Printer Driver Address
16425	Number of lines per page
16548	Current line number being printed
	Holds start of Basic program location.

KEYBOARD LAYOUT

BIT NO	7	6	5	4	3	2	1	0
VALUE	128	64	32	16	08	04	02	01
ADDRESS								
F801(-2047)	G	F	E	D	C	B	A	@
F802(-2046)	O	N	M	L	K	J	I	H
F804(-2044)	W	V	U	T	S	R	Q	P
F808(-2040)	F4	F3	F2	F1		Z	Y	X
F810(-2032)	.	&	%	\$	#	"	!	/
F820(-2016)	7	6	5	4	3	2	1	0
F820(-2016)	?	>	=	<	+	*)	(
F840(-1984)	/	.	-	.	.	:	9	8
F840(-1984)	Space	→	←	↓	↑	BRK	CLR	ENTER
F880(-1920)						CTRL	RPT	Mod Sel SHIFT

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Simon Williams springs into arcade action with a sprite generating package for the BBC.

Tales of teenage superstar programmers grossing large sums for yet more intricate arcade-style games can be a bit hard on us ordinary mortals. We may have elaborate ideas, but we have to rely on the sluggishness of Basic to interpret them. Sprite-Gen promises to rectify this by providing sprite graphics similar to those available on Atari or CBM machines.

Documentation

The well-presented manual is well printed and sets a fine standard for the producers of other programs. Each aspect of Sprite-Gen is covered in detail without adopting the patronising style often found in manuals intended for the novice user. Listings of the two games on the tape are included and may serve to further illustrate techniques of sprite usage, but a listing of the Sprite Generator itself is not supplied.

Features

The package consists of a cassette containing the machine code routines for handling the sprites, a Basic sprite generator program and two demonstration, sprite-ridden games.

Up to 32 sprites can be defined at once, although only eight independent shapes are allowed. Three 'clones', or copies, of each of these eight form the remaining 24. But each of the eight shapes may have two alternative forms, which allows animation of the sprites, as they may be displayed sequentially from within a Basic program.

All 16 colours, including the flashing ones, may be incorporated in each sprite, which means that any program using the code must be written for Mode 2. The code used for the sprites, once they are defined, may be saved and loaded with the parent game program and remains

Sprightly sprites

completely transparent in use. The code takes about 1K of user RAM, leaving about 8K for a parent program.

DACC will allow purchasers of Sprite-Gen to sell programs incorporating sprites, provided they inform the company in writing first.

In use

The first thing that has to be done is to reserve space for the resident machine code. To do this Page must be reset to &1200 before loading any sprite program or the sprite generator itself. The generator is then chained in and a Mode 2 screen comes up, displaying an 8x8 grid and asking for a sprite number.

Sprites are numbered from 0 to 31, with sprites 0 to 7 representing the primary shapes and 8 to 31 the clones. On entering the number of the primary sprite and clearing any existing figure assigned to that number, a flashing cross cursor appears in the grid and may be moved around using the cursor keys.

What is annoying is that to place a colour in any of the squares on the grid, a complicated sequence of actions must be performed.

Return must be pressed to obtain a prompt for the required logical colour, the appropriate number must be entered and Return pressed again.

At the same time as the grid is being filled with colours, two lifsize sprites are built up alongside and represent the 'left' and 'right' images of the same primary form. These two images may be made different and used to animate the sprite.

To alter one of the images, eight is added to the number of the primary

sprite when using the generator, and the left image can then be edited or completely redefined. Having defined all the sprites required, the generator is exited and may then be wiped from memory, leaving only the machine code, including the sprites, in RAM.

To position a sprite on the screen, the x and y coordinates are assigned to two of the resident integer variables, the number of the required sprite to Z% and the machine code routines are called via CALL Y%.

Each primary sprite and its clones use a different pair of variables, running from A% and B% to O% and P%. Although it is easy to see why the author has chosen to implement the sprites this way, making use of the resident integers which are not cleared on Break, it may prove restrictive in that they will always have to be addressed explicitly.

It is not possible to move a series of sprites within a loop, addressing each indirectly, as would have been the case if, for instance, the x,y coordinates had been controlled within a two dimensional array. As it is, control of sprites could eat up a lot of the small amount of memory left for user programs.

The two demonstration programs supplied with Sprite-Gen are certainly very effective in demonstrating what it is possible to achieve with the package. Chopper Chase offers control of a small helicopter, complete with rotating rotor blade, in an attempt to bomb tanks, which travel across the screen in lines of four, while avoiding a hostile plane which tries to drop its own bombs on the helicopter. The second game, Space Pilot Test, is the more satisfying and involves shooting up various aliens with a small plane à la Defender. Both games demonstrate fast moving, smooth action graphics.

Verdict

Sprite-Gen is an extremely useful utility which opens the door to high speed graphics for Basic programmers. While sprites may not be as fast as tailor made, machine code graphics, they should be quite fast enough to produce effective, arcade-style games.

RATING

Features

Documentation

Performance

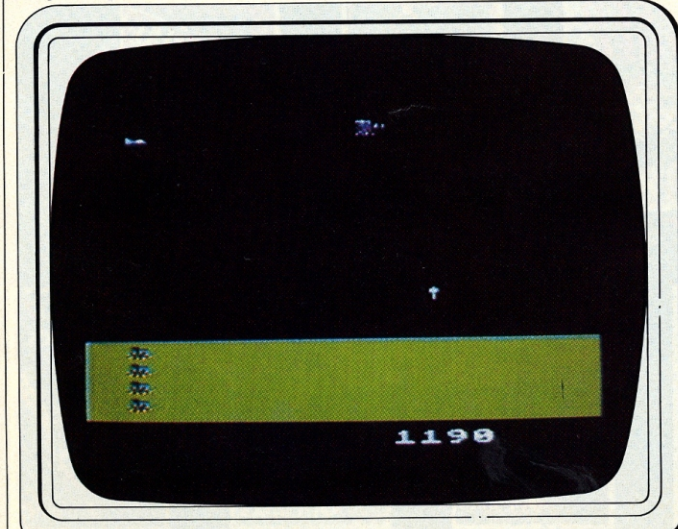
Useability

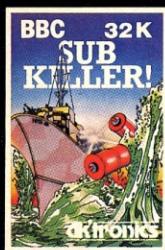
Reliability

Overall value

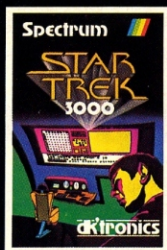


Name Sprite-Gen System BBC B Price £17.95
Publisher DACC, 23 Waverley Road, Hindley,
Wigan, Lancs. Format Cassette Outlets Mail
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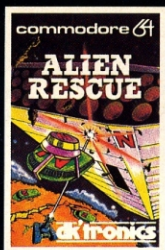
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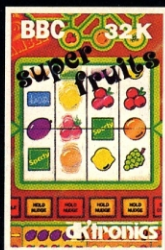
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3000



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WOODWORM
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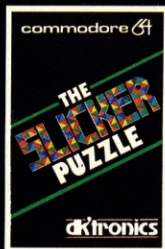
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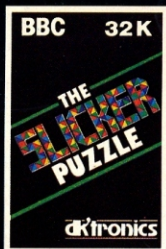
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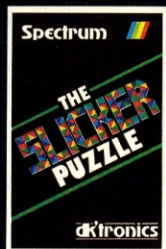
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PUZZLE



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PUZZLE



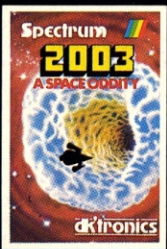
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THE SLICKER
PUZZLE



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PUZZLE



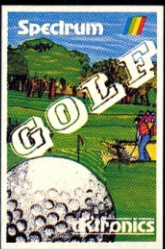
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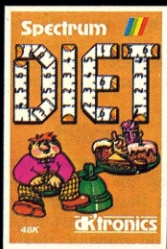
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WINS



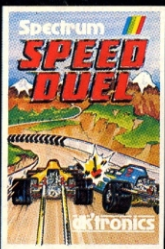
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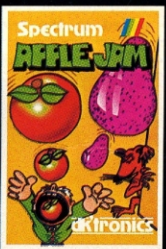
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NEW Spectrum
DIET



NEW Spectrum
SPEED DUEL



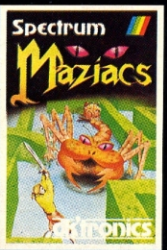
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APPLE JAM



NEW Spectrum
PERSONAL
FINANCE



Spectrum
SOUND FX



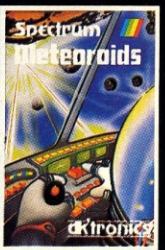
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Spectrum
ASTRON



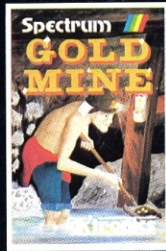
Spectrum
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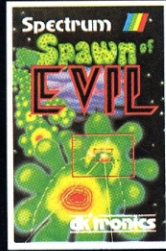
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MILLIE-BUG



ZX81
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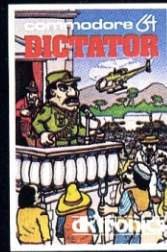
Spectrum
GOLD MINE



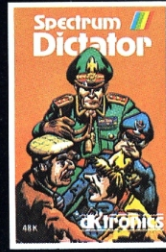
Spectrum
SPAWN OF EVIL



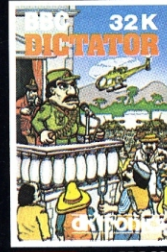
Spectrum
ROAD TOAD



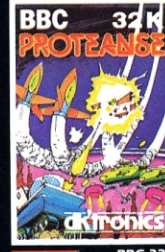
NEW Commodore
64
DICTATOR



Spectrum
DICTATOR



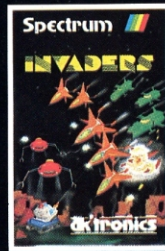
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DICTATOR



NEW BBC 32K
PROTEANSE



Spectrum
JAWZ



Spectrum
INVADERS



ZX81
METEOR STORM



Spectrum
CENTI-BUG



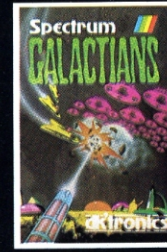
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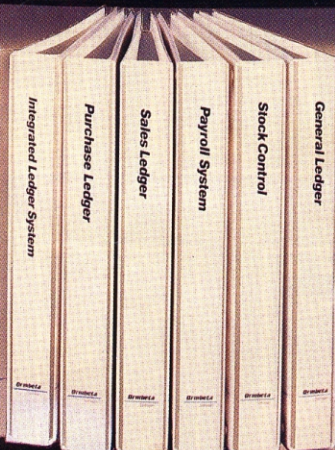
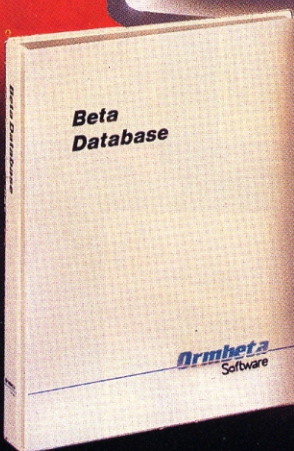
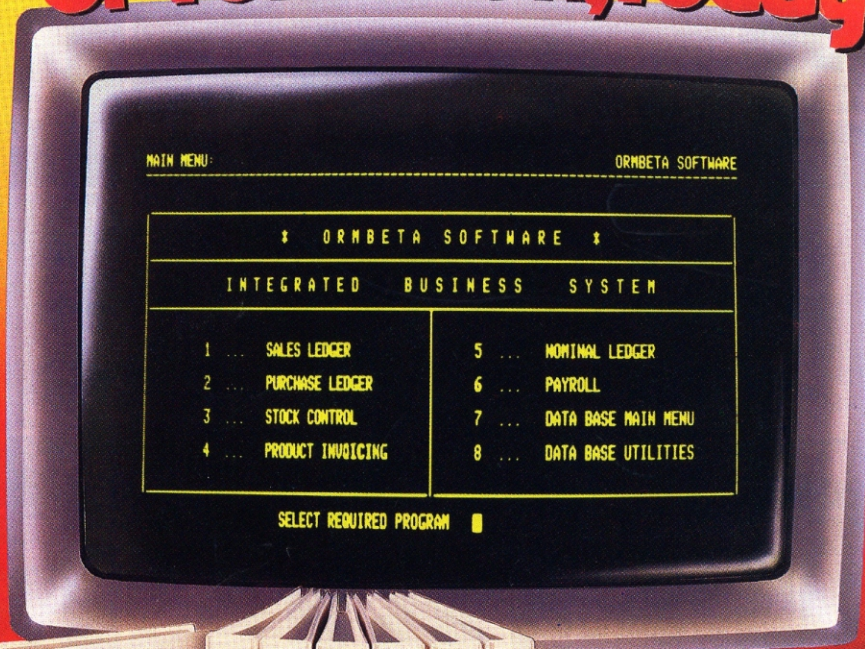


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Richard King learns to type with an educational package from Behavioural Engineering.

Hands on skill

Many uses have been suggested for microcomputers since they became cheap and plentiful, and one of the most interesting that has been put forward is as an 'educational' machine.

This term has several meanings, depending mostly on who's talking. To some it means a kind of referee for multiple-choice tests, to others a way of relieving the teacher by presenting 'boring' material in an 'interesting' fashion, and yet others feel that it is best for simulations.

The notable feature of most of these 'traditional' approaches is that they appear more to reflect the programmer's philosophy of education than to provide a more effective method of learning.

How many times have you found a so-called education game in which it is considerably more fun to get the answer wrong, thus producing a satisfying explosion or some such effect, than it is to get it right and be rewarded with an uninspiring 'Correct'?

The problem here is that the reinforcement is upside-down. It should be more rewarding to get the answer right.

A new series of programs running on the Apple II or IIe has been produced by Behavioural Engineering, and these are designed to reverse this unfortunate trend. The first two are designed to teach keyboard skills — not the musical variety, but typewriter or computer keyboards, though the system would be just as effective in teaching you to play an instrument.

Typing Strategy is designed to take a complete novice, engender some good habits, and thus produce a competent touch-typist in a period which may be as short as a few days.

Getting started

The theory behind these programs is psycho-linguistics, which deals with the methods people use to solve problems. For example, the difference between a good typist and a bad one, (me, for example), isn't so much a difference in speed, but more that the competent one doesn't need to look at the keyboard.

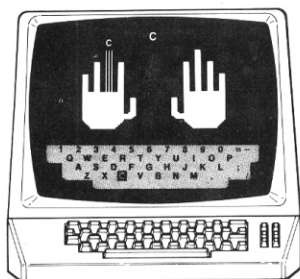
This is because the better typist has developed a 'strategy' which involves envisaging a keyboard in the mind, and then simply sticking one's fingers in the holes. Typing Strategy is designed to teach you how to do this, and though it sounds very difficult, it works.

In use

Provided you have an Applesoft machine, all you do is boot the disk. A fancy display draws itself on the screen, and you're away. This is pretty the first time, but gets to be a nuisance after two

repetitions, the more so when you find that the only way to make it go any faster is to press any key with the REPT key held down. I would like to have found some kind of 'skip to menu' here, for example when the ESC key is hit.

An uninteresting and rather uninformative main menu appears next, offering to run the training-program, demon-



Typing Strategy teaches finger usage

strate the program, let you design some exercises or exit. Selecting option 1 (Typing Strategy) produces some more questions. The manual isn't a lot of help in answering, because it refers to 'choice points' which are called menus in the program.

In fact the computer is asking you if you know anything about typing, and if so, whether you know how good you are. As an alternative, it's offering to test you, and to choose an appropriate level to start teaching you.

If you admit to being a total incompetent, or the machine delivers its judgment and decides that you are, you'll next go on to do some elementary fingering exercises. These teach you where the 'home' keys (ASDF and JKL;) are, makes sure you have your fingers on them, and then runs through the letters associated with each finger.

As the photo shows, the display consists of three parts — the letter to be typed at the top of the screen, a pair of hands in the central area showing in colour which finger should be used, and at the bottom a symbolic keyboard, which will have the required key highlighted.

When the machine wants you to press a particular key it will modify this display to show you how, and if (horrors!) you should mis-hit, it will beep, mark the incorrect key on the keyboard-picture, and wait for the correct one.

Each exercise consists of about a dozen keypresses, after which the Apple impassively reports your performance. This is where the surprises start arriving hard and fast.

I recorded the figures for my second session:

Using the left index finger:

	Accuracy	Speed	Adjusted WPM
1	84%	7	0
2	91%	11	6
3	100%	15	15
4	100%	12	12

Then I changed and started using the right index finger:

Of course, this all depends on your being totally honest, and rigidly refusing to look at your fingers or the keyboard.

The more advanced level of instruction requires you to type complete sentences, which may be set at the 'Author level' (Main menu Option 3). It's assumed that you'd need the 'magic hands' at this stage, so only the keyboard-picture is shown, with the exercise above.

The results are shown in much the same way, giving the error-rate as a percentage, speed in wpm and the 'adjusted speed', which takes both the former and integrates them. After doing these exercises for a while, I would be confident that most people would be quite competent typists, with better than 95% accuracy at 50 wpm.

The yes/no questions didn't always respond as expected, dumping me into an unwanted section of the program, from which there is often no escape apart from the end of the exercise.

However, the program appears to be robustly error-trapped, but the handling is far from gentle, with an admonition to 'call Behavioural Engineering immediately' in every case. Expensive way to find out that Control-C (Break) is trapped as an error!

Verdict

Despite the shortcomings of the actual program, I can't recommend this product highly enough. It's inexpensive and adequately reliable, and not only fulfils a very important need but does so in an amusing and highly effective manner which is as applicable to small children as to adults. Definitely worth the price.

RATING

Features



Documentation



Performance



Usability



Reliability



Overall value



Name Typing Strategy Application Keyboard Trainer System Apple Price £29.50 Publisher Behavioural Engineering Format Disk Language Applesoft Outlets Mail Order Graham Dawes, 15 Milton House, Elmington Estate, London SE5 7HZ 01-701 3340.

Ted Ball reviews a tool to speed up your Spectrum by converting Basic into machine code.

Spectrum MCoder

Spectrum Basic is rather slow, and is particularly unsuitable for writing games that need fast-moving graphics. Machine code and Forth are much faster, but using one of these means learning a whole new programming language.

MCoder is an easier method of producing faster programs on the 48K Spectrum — it is a compiler that takes programs written in a cut-down version of Spectrum Basic and turns them into machine code that will run 20 to 50 times as fast.

Features

MCoder will not accept everything that will run under the Spectrum Basic interpreter, and before you can compile a program you have to write it — or rewrite it — so that it works using only the parts of Spectrum Basic that MCoder can handle.

Although you can use most of Spectrum Basic with MCoder — enough to allow you to write useful programs fairly easily — it is mainly the more powerful features of Spectrum Basic that are missing from MCoder.

The most important difference is that MCoder allows you to use integers only between -32768 and +32767. An obvious consequence of this is that you can't use the trigonometric and other functions that work essentially on floating-point numbers, and another is that the RND function in MCoder gives an integer between 0 and 32767 instead of a fraction between 0 and 1.

The integer division in MCoder normally gives an integer result, any fractional part of the answer being ignored. However, in the BEEP and DRAW commands fractional parameters are evaluated exactly, but they must be written as fractions and not as decimals. For example, you have to write 3/2 instead of 1.5.

Other important differences are that MCoder does not allow numeric arrays of more than one dimension and it does not allow string arrays at all.

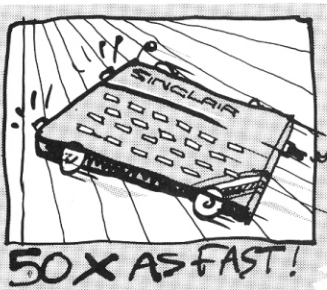
A number of other small differences are less important, as they don't restrict what you can do but do mean that things have to be done differently from interpreted Spectrum Basic. For example, you can't have STEP in a FOR...NEXT loop, so if you need a step other than 1 you have to rewrite the loop using IF...THEN...

Presentation

The cassette is clearly labelled on both sides, and has two copies of the program on each side.

The documentation is a small printed leaflet that gives information about using MCoder and a list of the Basic commands and functions you can use with some notes on the differences between MCoder and the Spectrum Basic interpreter.

DOLORIS FAIRMAN



Getting started

Anyone who is familiar with Spectrum Basic will be able to use MCoder without much trouble. The documentation gives some help on writing and converting programs to work with MCoder, but it does not help with using integer arithmetic, and this is the main area where you will find problems.

In use

It's easy to use MCoder as a compiler: first load the MCoder tape, then type in or load your Basic program from tape; to convert Basic to machine code all you have to do is type in "RANDOMISE USR 60000" and MCoder does the rest. After Basic has been compiled you can run the machine code with "RANDOMISE USR 40000".

The compiled machine code will run without the original Basic source code, but you do need the MCoder program in the Spectrum to run the machine code.

With the mixture of Basic statements you will have in a reasonable-sized program the average improvement will be between 20 and 50 times faster than what you will get from the interpreter.

What really impressed me about MCoder was that I was able to use it to compile two programs I already had on tape.

The first one calculated and printed on the screen the prime numbers up to 25000. The only changes I had to make were a few lines of the form "IF V THEN..." which had to be altered to "IF V>0 THEN...".

The program took 18 minutes 50 seconds under the Basic interpreter, but only 30 seconds after being compiled by MCoder — almost 38 times as fast.

The second program played the strategy game Four in a row. It needed more changes than the prime number program, but it didn't take long to alter even though it contained more than 200 lines, most of them having more than one statement. Running under the interpreter it took several seconds to effect a move, but after compilation it responded instantaneously.

Reliability

You need to debug your program under the Basic interpreter before you compile it with MCoder, but MCoder does provide extra facilities to help you debug compiled programs. If you try to compile something MCoder cannot handle the compilation will stop and print a question mark after the problematic statement.

With run-time errors such as 'Division by Zero' or 'Integer out of Range' you get the usual Spectrum error message, but because the compiled machine code is called by an immediate-mode USR statement the error message refers to line '0/1'. However, MCoder provides a trace option which allows you to compile your program so that the line numbers are printed on the screen as the program is executed.

The main points where MCoder does not provide adequate error-checking are in bounds and string-lengths. Before you can use an array in MCoder you have to include a dimension statement, just as in the interpreted Spectrum Basic, but MCoder will not check that an array reference is within the limit specified in the dimension statement, so an error can give unpredictable results in the program.

Apart from array and string-size checking, and a few other points that the documentation warns you about, the only error I found was with the OR function. According to the documentation MCoder allows the Boolean functions AND and OR in IF...THEN... statements. However, although MCoder will compile statements like 'IF (A>B) AND (B>C) THEN...' it will not compile similar statements with OR instead of AND.

Verdict

Although MCoder will not compile everything the Spectrum Basic interpreter will run, you can still do a great deal with it. The limitation to integer arithmetic means that you cannot compile scientific programs or programs involving complicated graphics that need trigonometrical or other essentially floating-point functions; and the absence of string arrays means that you cannot compile text handling programs.

However, you should be able to write almost any other kind of program in a form that MCoder will compile, without much more difficulty than writing the program to run under the Spectrum Basic interpreter.

RATING

Features
Documentation
Performance
Usability
Reliability
Overall value



Name MCoder 2 **Application** Basic compiler
System 48K ZX Spectrum **Price** £9.95 **Publisher**
Personal Software Systems, 452 Stoney
Stanton Road, Coventry CV6 5DG. **Format**
cassette **Language** Machine code.



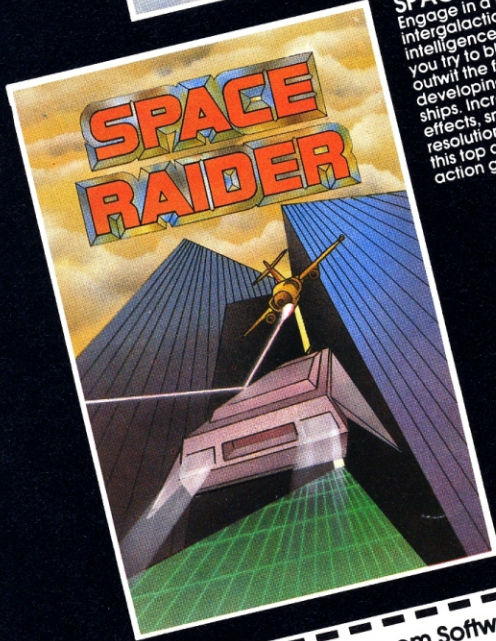
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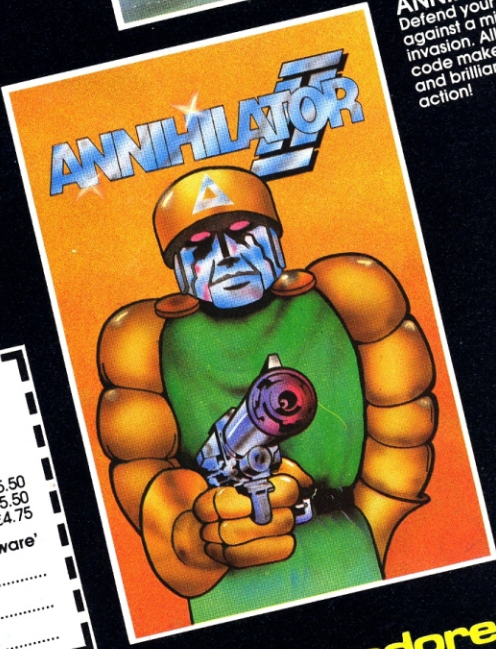
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Burning EPROMs isn't difficult, but first take your burner. Richard King tests one for the Apple.

Burning desire?

If you've ever wanted to make a semi-permanent alteration in the operation of your computer, say to put in a different character-set, add a special routine or even give it a new language, then you might well want to make a special ROM. Quite often (on machines without disks, for example), it's the only convenient way, and to do this an EPROM-burner is essential.

The Cirtech EPROM programmer is sold as a set of units which work on Apple-bus computers, though the programmer itself, being driven by a parallel interface (unspecified format) could be used with any suitably-programmed PIA.

However, the interface card also contains 2K of firmware which make the process much simpler, so an Apple is essential. This doesn't limit the uses of the device to burning ROMs for Apples, though, since any piece of data can be written, read, copied or verified. You could write a new language for the Spectrum with WordStar, assemble it with the MAC80 assembler and burn that.

It will program any EPROM in the 27XX series from the 2K 2716 to the 27265, holding 32K, but the documentation rather grudgingly notes that it won't currently handle the 25XX series.

Presentation

The accompanying notes are best described as thinly adequate. For some reason smaller companies seem very unwilling to spend anything on proper packing or printing.

Decent documentation is seldom written by engineers or programmers, largely because they're much too close to the product to explain it well, but it is absolutely essential if the product is to become popular.

The documentation assumes you have a good idea what's going on. It tells you about LEDs and EPROM types then tells you what the power-supply looks like and how to take the cover off the Apple!

What it doesn't tell you is how the PIA is arranged, and what signals go down which line, or much about memory-usage. In particular, it doesn't explain why there's an extra set of connector-pins on the interface card as well as an empty 20-pin socket. It may not be useful, but such unexplained features are profoundly unsettling.

Construction

The Cirtech EPROM programmer consists of two small green-lacquered PCBs. The track-design appears neat and tidy. The programmer itself is a small board about 3.5 by 2.25 inches, and because it is meant to be kept outside the machine, Cirtech have backed it with a half-inch foam cushion. This eliminates the risks of short-circuiting from the back.

It might be an idea to substitute Velcro so that some semi-permanent mounting-place can be arranged. The top of the board is unprotected. An errant paper-clip or staple could cause a short, and with +25v programming pulses hanging about, this wouldn't be wonderful.

This device is intended for several kinds of EPROM, almost every one of which uses a different programming-voltage, despite being in the same family, so some arrangement has to be made. Cirtech's solution is to have five different sockets made up of several sets of Single In Line (SIL) sockets, into which a Zero Insertion Force (ZIF) socket is plugged.

I don't like the idea. It may save space and perhaps make the card smaller, but it leaves the system wide open to some horribly expensive mistakes. Programming some common-or-garden 2716 chips and then forgetting to move the ZIF socket before burning a 27256 will put 25v into your large, hard-to-get chip which prefers a more gentle 12.5v! Be warned.

Moving the ZIF socket isn't all that smart, either. It tends to come loose with a jerk causing the pins on the bottom to bend. These things are precision engineered, nearly impossible to get, and aren't cheap when you do.

The interface card, which plugs into one of the Apple's expansion connectors is

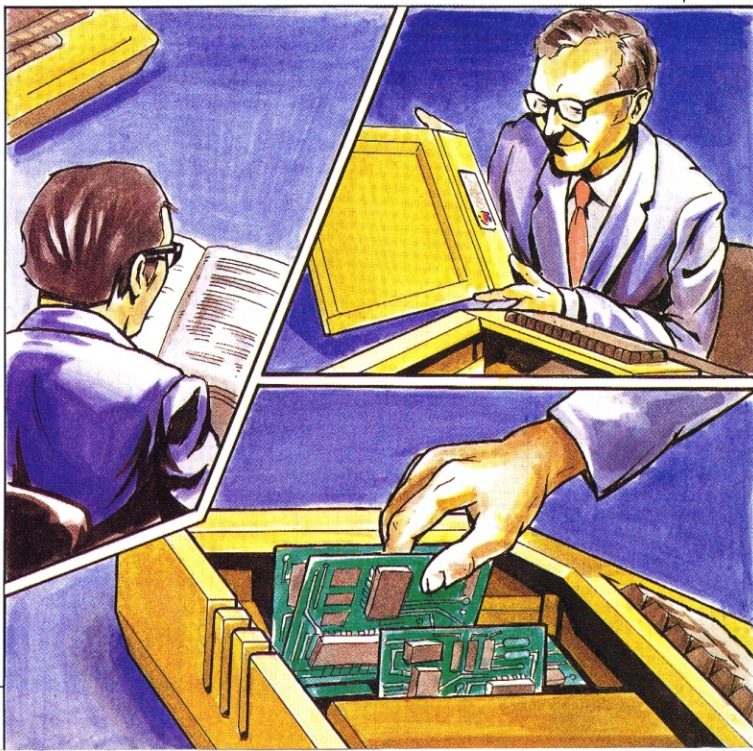
One of the most convenient methods of storing programs is in a chip, mostly because it can be immediately available for use, without the inconvenience of a loading-procedure.

The chips most often used for small jobs are Electrically Programmable Read Only Memories, (EPROMs). These work exactly like any other ROM, but due to a difference in the semi-conducting junctions which make up each bit, are able to store an electric charge which can be changed with special currents.

This is done by sending the value desired down the data-lines, then putting a much higher voltage than normal (12.5 to 25v) onto the programming pin for a set time. After several repetitions the cells become fixed with the value applied. When all the cells have been correctly set, the EPROM has been programmed.

about as small as it could be, and apart from an empty socket and an unused connector (of which more later), carries only five chips, a 2716 EPROM containing the driver-firmware, a 6821 PIA and three 74LS chips. As it's rectangular, with no obvious front or back, it could be plugged in the wrong way round, even though the documentation does take a certain amount of time to give a description of the

Ivan Allen



orientation. This is let down by being potentially ambiguous, it might have been better to make the card apple-shaped like most others.

The PIA is connected to a 20-way DIP connector, providing the datapath to the actual programmer by way of a 24 inch ribbon cable. This is a much better way of arranging things than on many EPROM-burners for the Apple. As the documentation points out, you won't have to dismantle the Apple to write a ROM, and no more dropping EPROMS into it, either.

The cable is actually (and unnecessarily) polarised, and if the wrong end is put on the interface card, the plug on the programmer-end interferes with the fitting of the ZIF-socket.

There's also an unfilled 20-pin DIL socket which is connected to the lower of the two 20-way DIP-connectors. Nothing is mentioned in the documentation about what this will do, but looking at it leads one to the assumption that this card is a dual-function device, and that putting something (buffer, latch, shift register) into it would add additional features.

It's simple to use, once you have prepared a suitable data-block and loaded it into the machine, or alternatively, have an EPROM you want to copy.

Writing an EPROM is a pretty hairy business, since you are aware that what you're doing is permanent. To erase an EPROM you need an ultra-violet lamp powerful enough to give you a very serious burn. It comes in a special unit with safety devices to prevent just this, but most people haven't got one.

When you are burning ROMs, you have

to be very careful, neat, conscientious and precise. However, assuming you can master this, using the programmer is delightfully simple.

Unlike many EPROM-blowers which require that a driver-program be loaded from disk before you can get to work, the Cirtech unit has all the necessary firmware on the interface card, so it's activated by a normal PR# <slot number>. This brings up a five-option menu, allowing you to select the kind of EPROM you propose to program. A single-key reply then takes you to the main operating menu, which gives you the option of programming an EPROM, reading one from the socket into RAM, or of copying a ROM. This latter is just a read/write pair.

'You have to be very careful, neat and precise'

The fourth option turns off the interface and drops you into the monitor. This is the most inelegant exit possible, with the suggested method of returning to Basic being RESET. Not even an attempt to return to the system active at the time, which in almost every case would be a perfectly ordinary JSR \$3D0 to warmstart DOS, or a JSR \$3D3, to coldstart it.

There's a rather neat trick used in the actual programming firmware which cuts down on the time needed to correctly burn the EPROM. It works by only giving a cell enough of a programming-pulse to set it.

This is often much less than the times listed on the data-sheet, which is a 'worst-case' value.

Even though this technique is supported by the manufacturers of the EPROMS, I can't really see much point in all this work. This isn't a device that would be used for bulk production, so the odd few minutes saved isn't going to be scrutinised by a cost/benefit analyst.

Admittedly, at the top end the savings in programming time are dramatic, with a 27256 taking about 2 minutes 30 seconds at best, as against 30 minutes. But since you can't even get them yet and nothing you can put in an Apple could use 32K of ROM anyway, it's all pretty academic. You can't do it on the 2716 or 2732, which are the chips most often used.

More time is saved by skipping the cell if the value to be put there is \$FF, the same as an empty cell, but unless you're proposing to waste most of the space it's not going to make much difference.

These are nice touches, but it might have been better utilised, perhaps to provide relocation and thus permitting offset burning, or some other utilities. For example, they could have made it possible to copy from the lower four pages of RAM.

The soft switches are up the other end of RAM in the \$C000 — \$CFFF region, and anyway, what on earth is the program doing if it's liable to alter anything in any source-area? Granted, the \$00 — \$3FF region contains a lot of very important stuff on any 6502 machine, but no read operation, even there, should fail to save and restore all scratch locations. Even better would be an attempt to use locations which are not in the areas involved.

Of course, copying into the bottom end of RAM will destroy page zero and the stack, which will immediately crash the machine, but much worse, there really is an area on the Apple which you mustn't read or write as a block, and that's the aforementioned \$C000 — \$CFFF. The reason is that this is exactly where the interface card sits in memory, so messing with this area will quite definitely cause problems. In the worst case this could actually destroy the EPROM in the programmer.

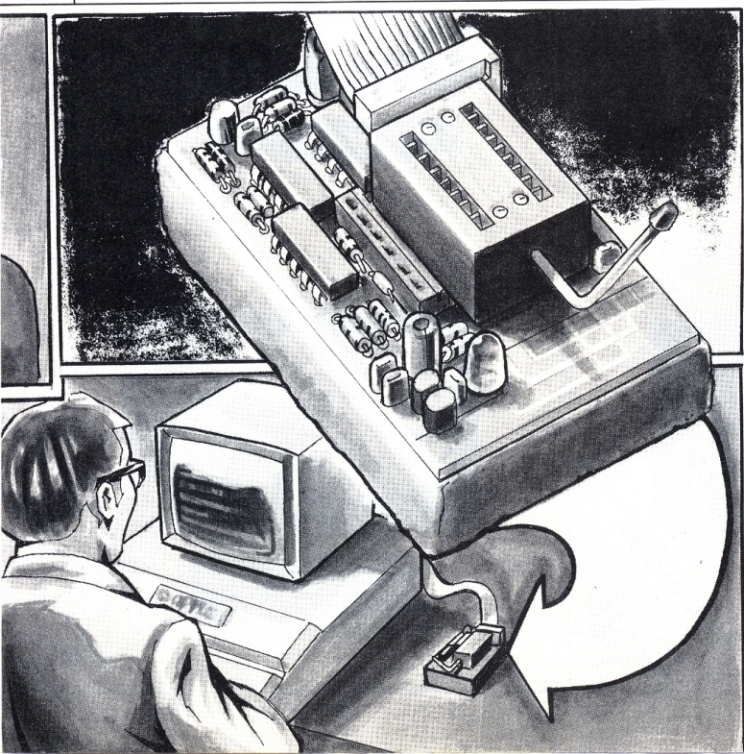
Verdict

Despite the criticisms I have made, the unit is quite attractive, you just have to be very careful when you're using it. It seems to work well, but that isn't unexpected since EPROM programmers aren't the most complicated devices in the world.

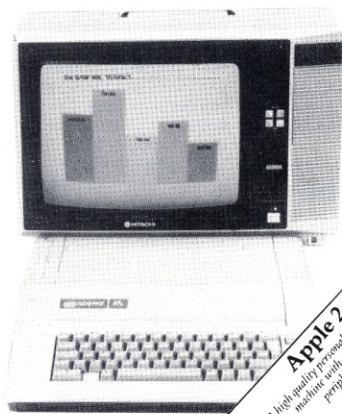
The documentation needs a lot of work, I feel, and the overall presentation could be improved. As it stands, it's too unassuming to make much of a splash.

As value for money, it's about average and it scores well in ease of use, due to the two-unit design.

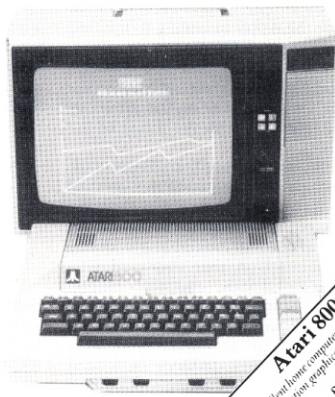
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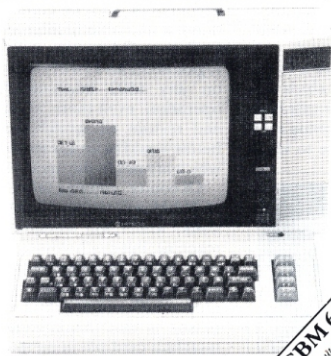
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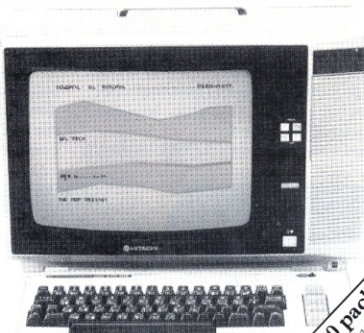
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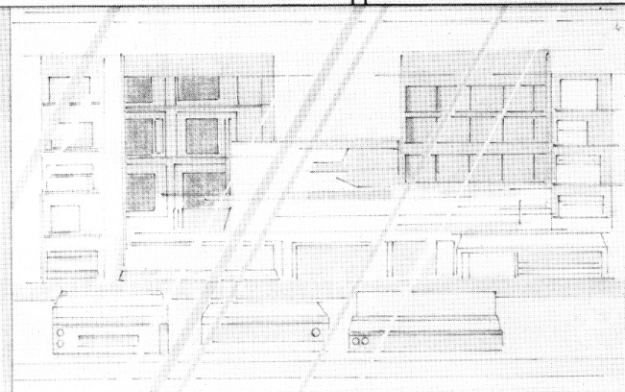
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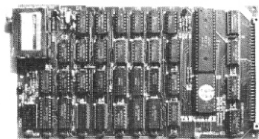
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Catch your breath while Ian Scales analyses the state of the art of data transfer on micros.

Telesoft options

The past few months have witnessed the triumphant arrival of a variety of separate communications devices for low-cost microcomputers. Now seems to be a good time to take an overview of what's actually going on and which, if any, technology is worthy of your considerable investment. Among those devices to consider are the recently released BBC telesoftware service and Acorn's teletext adaptor for the BBC micro.

At the moment the term 'communications' covers three broad concepts. First there is simple computer-to-computer communication, sometimes called networking. The notable recent release in this field is the Interface 1 for the Sinclair Spectrum.

The interface 1 also features a standard RS232 serial interface, which brings us to the next level of communication, the use of the telephone system. Once you have a serial interface (one that sends the data out one bit at a time) it's a short step to configure a modem to convert these digital signals into analogue pulses and send them down the telephone system to another modem which converts them back to computer-speak again. This technology is the basis of Micronet, Britain's public access database and information service. The arrival of Micronet has spurred activity in the modem market. It is now possible to buy a complete RS232 and directly connected modem for the Spectrum for £100 (*PCN Peripherals issue 30*).

Here enters the first complication. Spectrum owners now have two routes. You can buy the Interface 1 and configure your own modem or you can get the all-in-one package from Prism. Prism also sells an RS232-driven, directly coupled modem for £90, so if your computer has an RS232 interface and you have some communications software you're in business.

The advantage of the telephone-based approach includes having a virtually unlimited amount of information theoretically accessible. Using a modem on the telephone system allows you to interact with the computer dispensing the information on the other end of the line. In other words you have access to as much information as the computer can hold and you can tell it what to send you.

The same cannot be said for the third way of sending electronic information. This involves broadcasting days over the air. This is the way Ceefax and Oracle work. Until recently the hardware needed to access these systems was a special teletext adaptor which you hooked up to your TV set. In this guise the systems were essentially non-enthusiast consumer or business items of only passing interest to the micro hobbyist. But the BBC and



Acorn (*PCN Monitor, issues 29 and 30*) have teamed up to enhance the BBC Computer Literacy Project by introducing a telesoftware service on Ceefax. With the purchase of Acorn's long-awaited teletext adaptor for the BBC Micro the user has free access to any software beamed over the airwaves by the BBC and access to all the Ceefax information — the usual news, weather, travel services and so on. The Teletext adaptor, when it eventually arrives in volume, will cost £225 (inc VAT).

The essential difference is that this system is non-interactive. The computer that dishes the stuff out is receiving no indications from your computer as to what you want. Because it's possible to safely send data on a spare TV channel much faster than over a telephone line, there is a way of coping with this non-interactive problem.

You send the entire database over the airwaves in a sort of loop. After about 30 seconds the whole lot has been broadcast and you're back at the beginning again. The computer simply selects the data required by the user as it comes flooding

into the system, and displays it on the screen. Obviously there is a limit to the amount of data that can be sent out without long waiting periods at the keyboard.

Under the Ceefax system you have the ability to chain the pages together. The system saves a consecutive series of pages so you can read them at your leisure. This facility is also vital for downloading medium to long programs.

At the moment BBC owners are faced with two competing technologies and it probably won't be long before other micro owners are being lured in similar directions.

The BBC owner can select Ceefax, where there is a much more limited quantity of information — though, the BBC claims, there will be a concerted effort on quality. The Ceefax route also has the advantage of being a free service, though the initial outlay of £225 for the adaptor is pretty steep.

On the other hand there is the modem investment to take advantage of the telephone-based information services and databases. Here you get a lower entry cost, but ongoing charges for the service.

The new boy from Acorn already has a gang of playmates.

The Acorn Electron, Britain's most exciting new home micro, already has a range of software programs specially designed for it by Acornsoft, makers of software for the BBC Micro.

There are six mind-boggling games, two programming languages, two exciting graphics cassettes, a home educational program and a personal money management program.

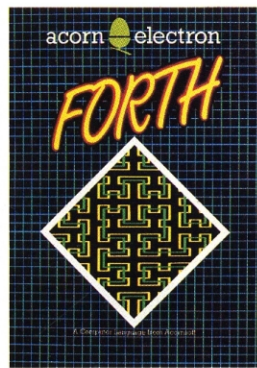
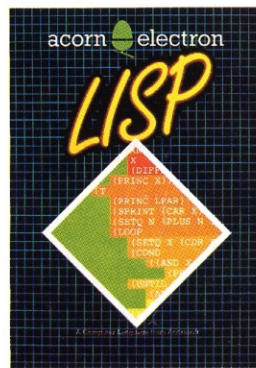
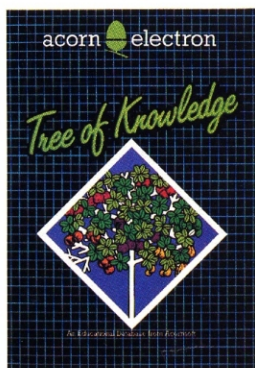
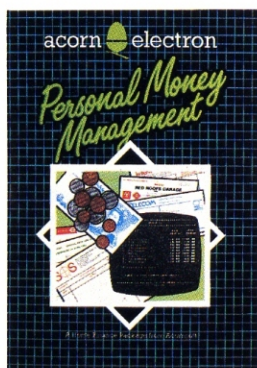
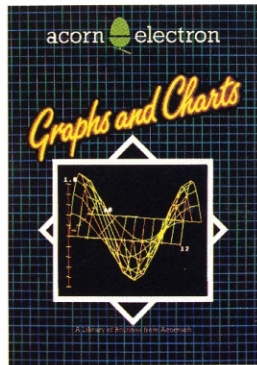
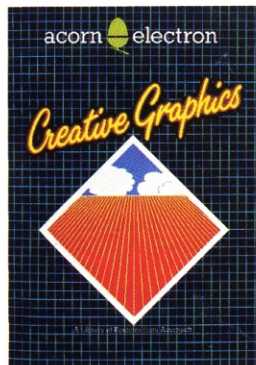
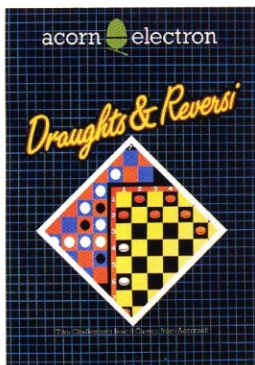
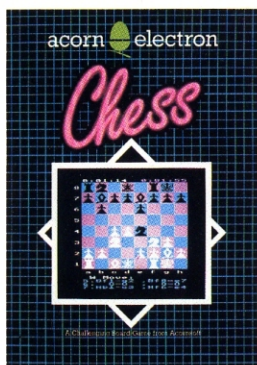
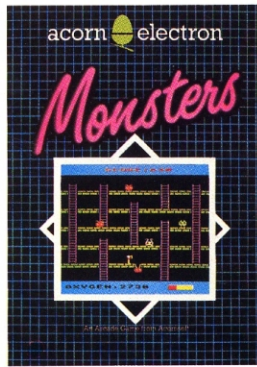
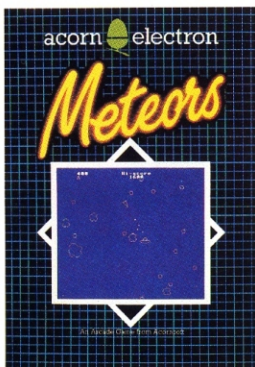
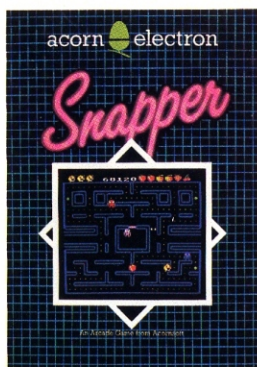
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The Electron. The new boy from Acorn.



range of programs for the BBC Micro, available at selected W.H. Smith branches and at your local Acorn stockist. (To find out where they are call 01-200 0200.)

Alternatively, you can send off for the Acornsoft Electron or BBC Micro catalogue, by writing to:
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THE AMAZING ADVENTURES OF THE **LAUGHING SHARK**

PART ONE

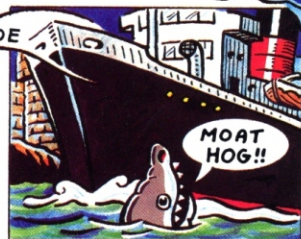
GSTH
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THE LAUGHING SHARK TORPEDOED TO THE SURFACE ONLY TO FIND HE WASN'T IN THE SUNNY PACIFIC - BUT IN THE DARK MURKY MOAT OF THE.....



CASTLE ADVENTURE
WITH A THOUSAND DASTARDLY DEATHS - ACCOMPANIED BY THE MAD ORGANIST - PULLING OUT ALL THE STOPS.....



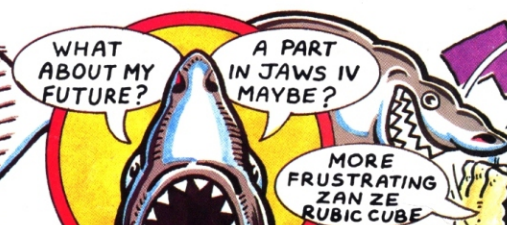
ESCAPING THE DEADLY SOUND OF MUSIC, THE LAUGHING SHARK NARROWLY AVOIDED A CRUISE LINER - IN A MOAT?!!



PASSING A PORTHOLE HE ESPIED NASTY DR. SINISTER PLANTING A BOMB. STOP HIM SOMEONE - OR THIS COULD TURN INTO A.....
DEATH CRUISE!!



NOT WISHING TO SUFFER THE SAME FATE AS HIS COUSIN JAWS, OUR HERO DECIDED TO CONSULT THE ORACLE OF **I CHING**....



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DIZZY FROM HAVING TO USE HIS LITTLE FISHY BRAIN OUR INTREPID 'CHUCKLES' GOT LOST AND FOUND HIMSELF IN THE DANK DEPTHS OF **KILLER CAVERNS**.



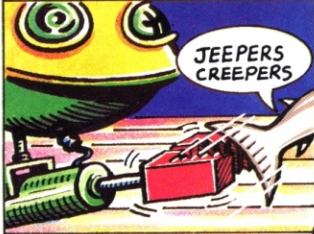
WITH ITS HORDES OF TREASURE AND DEADLY GUARDIANS... TOO MUCH, EVEN FOR A SUPER FISH, SO HE HOPPED ON A BUS.

AND WENT OFF TO SPEND A DAY AT THE RACES, HAVE A FLUTTER OR TWO, EVEN INVEST HIS WINNINGS IN BECOMING A RACING MANAGER



ALL THAT LOVELY HORSE-FLESH

FLUSH WITH HIS SUCCESS ON THE 'GEE GEE'S', SMILEY WAS ALMOST NIPPED IN THE TAIL BY ONE OF THE MOST FEARED CREATURES IN THE UNIVERSE....



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OUCH!

A CREEPER IN ITS CRAZED QUEST FOR POWER CELLS.... STOP IT OR END CLICHES AS WE KNOW THEM.



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HEADING BACK TO SEA, THE LAUGHING SHARK HAD TO AVOID THE ALIEN 'MUNCHIES' NIBBLING AWAY AT A GIANT DAM. HELP! IF THE DAM BURSTS, IT WOULD FLOOD ENVAHI



BACK TO THE SUNNY PACIFIC

— TO BE CONTINUED

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DRAGON GAMES

DRAGON 32 Dragons might fly

Name Space Shuttle System Dragon 32, plus one joystick **Price** £8 **Publisher** Microdeal, 41 Truro Road, St Austell, Cornwall (0726-3456) **Format** Cassette **Language** Machine code **Other versions** Some in preparation **Outlets** Mail order, most dealers.

To describe this as a flight simulation is rather an understatement. Instead of a quick trip round an airfield you're expected to take a space shuttle up into orbit, rescue a damaged satellite, and then bring it back down to earth. The simulation ought to be authentic, as the program is apparently written by an ex-NASA pilot.

First impressions

The packaging is disappointing. Although the tape comes with an informative 16-page manual to guide you, it is all contained in a styrofoam box with a flimsy wrap-around cover which gets bent and creased as soon as the cellophane is removed.

In play

A careful reading of the manual is essential, although in contrast to other simulation programs this is one where you can't help but get off the ground. You're given points according to how well you perform each part of the operation rather than being dumped unceremoniously back to earth for failing to take up your undercarriage at the right moment.

The first stage is the launch. You have to look at the landing site weather. To guide you there's a display of the shuttle's progress in the bottom left corner, while the view from the windscreen occupies a quarter of the screen, with the instrument read-outs scattered around. A joystick is essential.

The rescue mission comes after the launch into orbit. This is the only easy part as you retract the satellite into the shuttle with the remotely controlled arms. The final re-entry and landing is the only place where disaster can strike. It's also the only part where you see the shuttle itself instead of the view through the windscreen. The graphics are impressive as the craft sweeps down the runway to land . . . or not.

This program makes use of the high-speed poke, though this can be deleted at the start if yours is one of the Dragons that can't cope. Even at the slower speed the response to the joystick and the occasional keyboard input is instantaneous. While there's hardly any sound that doesn't really matter as it would only slow up the speed of operation anyway.

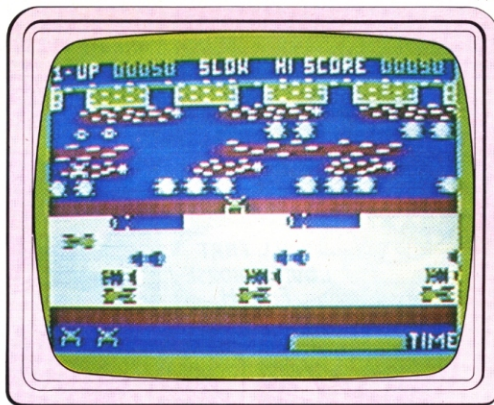
Verdict

This is the first decent flight simulator I've seen for the Dragon, and if you're thinking of getting one you needn't consider the others. This is

Mike Gerrard

RATING

Lasting appeal 
Playability 
Use of machine 
Overall value 



DRAGON 32 Dogged frog

Name Frogger System Dragon 32 **Price** £8 **Publisher** Microdeal, 41 Truro Road, St Austell, Cornwall (0726-3456) **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Mail order, most dealers.

Frogger maniacs who bought a Dragon have so far had to make do with some poor substitutes, like Dragon Data's Rail Runner, but at last Microdeal have brought over the official Sega arcade version from America.

Objectives

For the one or two PCN readers who maybe don't know, the idea is to manoeuvre your frog across a busy five-lane highway to the river bank, then across the river to one of the five caves representing home. Then you do it again, and again, for as long as you can make your four lives last.

First impressions

The cassette sleeve includes a screen-shot suggesting that this could indeed be very close to the arcade original in both graphics and colour. On loading it does prove to be the case, the only thing missing being the slot for your money.

In play

Choose between the fast version with snakes or the slow version without. Finally you indicate whether it's a one or two player game. The top of the screen keeps a note of everything going on, including the

high-score record, while at the bottom there's a timer to warn you when you're about to become an ex-frog.

The five streams of traffic move at various speeds and in alternating directions, and the river contains the usual mix of floating logs and turtles who may turn at any time, along with the occasional lady frog who can be pounced on for extra points. The caves may contain tasty flies for even more bonus points, or alternatively snapping heads in which case you become the meal should you be foolish enough to hop in. Later stages of the game see alligators and snakes in the river, with snakes also patrolling the bank, and naturally everything's at a faster pace with more traffic on the road. When you do eventually lose a life a skull and crossbones is displayed.

The sound shows what the Dragon can do given a bit of encouragement, and control of the little creature is quick and accurate whether by keyboard or joystick. You can also freeze the frame should you feel the need to hop to the bathroom, or stop the game altogether if you want a fresh start.

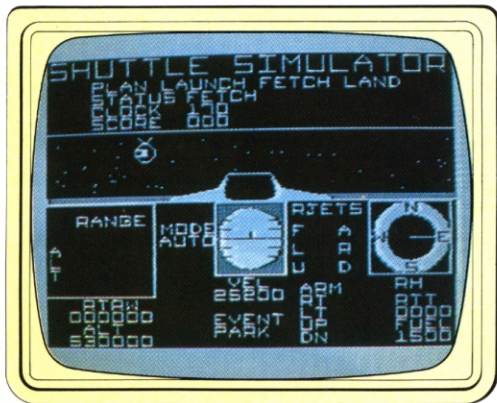
Verdict

I've always found Frogger rather a boring game, but for those who do like it this is a first class implementation and is as close to the original as Microdeal's The King is to Donkey Kong.

Mike Gerrard

RATING

Lasting Appeal 
Playability 
Use of machine 
Overall value 



The ADVENTURES of MONTY The Mountaineer

Be Apibus Semper Dubitandum Est.

"AVALANCHE!"
 MONTAGUE MONTAGUE III, DUKE OF BOLTON, HAS ORGANIZED AN EXPEDITION TO CLIMB MOUNT EVEREST, BUT MONTY AND THE TWO OTHER BRITISH CLIMBERS, IAN AND TOM, DID NOT RETURN TO CAMP THE PREVIOUS NIGHT. THE AMERICAN, HANK, TAKES CHARGE OF THE SEARCH PARTY...



"LEE, YOU GO WITH FRED BACK TO BASE CAMP AND GET MORE SUPPLIES. CARL AND I WILL SEARCH FOR THE OTHERS."

"SURE THING, HANK! WE'LL SEE Y'ALL BACK HERE LATER."

"GUT, DIS MAY VELL BE MY CHANCE TO DISPOSE OF ZIE SCHWEINHUND AMERIKANER!"

NOT FAR AWAY, MONTY, TOM AND IAN ARE TRAPPED AT THE BOTTOM OF A CREVASS.



"DASHED LUCKY REALLY, THAT THIS FISSURE HAS SHELTERED US FROM THE WEATHER. YOU SHARE THE LAST GINGER NUT, CHAPS. I AM SURE THAT AID IS IMMINENT."

"HAVE THE GINGER TOM, I'LL TAKE THE NUT"

MEANWHILE, AT THE TOP...



"LOOKY HERE WHAT I'VE FOUND, CARL. MONTY'S HAT. THEY MUST BE TRAPPED BELOW."

"AND IN A MINUTE SCHWEIN, YOU WILL JOIN ZEM IN OBLIVION."

SUDDENLY, THE TWO CLIMBERS HEAR A NOISE ABOVE THEM!

RUMBLE

"GOTT IM HIMMEL!"

"WATCH OUT, AVALANCHE!"

WILL HANK AND CARL SURVIVE THE AVALANCHE? WILL MONTY BE RESCUED? WILL CARL'S EVIL PLANS COME TO FRUITION? WILL THE AARDVARKS REACH THE SUMMIT OF MOUNT PALOMAR BEFORE PETERKINS THE FERRET-STRANGLER? DON'T MISS NEXT WEEK'S EXCITING EPISODE!

CAN YOU ORGANISE AN EXPEDITION BETTER THAN MONTAGUE MONTAGUE III? **EVEREST** (FOR THE DRAGON 32) BRINGS YOU ALL THE EXCITEMENT OF HIMALAYAN MOUNTAINEERING. YOU CAN CHOOSE ANY ONE OF THREE PEAKS IN SPRING OR AUTUMN, BUT ONLY THE BEST AND THE BRAVEST WILL LOOK DOWN ON THE ROOF OF THE WORLD.

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"THEY'RE REALLY JOLLY SPIFFING CHAPS!"

Salamander SOFTWARE

QUALITY SOFTWARE FOR THE DRAGON 32, ORIC-1 AND BBC MODEL B MICROCOMPUTERS.

A vertiginous Bob Chappell survives the best that Centresoft can throw at him.

Atari stunners

This selection of games, with not a dud among the bunch, explains why the Atari is such a popular games machine. When its graphics and sound potential are exploited to the full, the resulting games rank with the finest.

NECROMANCER

 Heading the lineup is Necromancer, one of the strangest and most imaginative games to come my way. You control a wizard who has a magical wand that hurls out a ball of energy. Having sown a handful of tree seeds by means of the wand, the wizard's task is to defend the sprouting trees against the ravages of marauding trolls, not to mention infestation by spiders. It is vital to preserve as many trees as possible since they are needed in the next stage of the game.

The club-carrying trolls lope back and forth across the screen at irregular intervals and speeds, and can be driven back only by a blast from the magic wand.

Occasionally, an odd rubber-necked creature with a single blinking eye wanders in; touching it with a flash from the wand produces bonus seeds. Malevolent spiders attack both trees and wizard, inflicting damage on contact.

The longer the wizard lasts, the faster run the trolls and spiders until, with a great eruption of sound and movement, his strength gives out and it's on to the next stage.

The wizard is at the top of a parapet, at the other end of which is one of the trees. Hurling a magical bolt at it brings forth a delightful animated tree creature. Disembodied clutching arms descend from on high without warning to drag the hapless victim wriggling into the heavens. Below are several walled compartments, each containing a shapeless blob that looks as if it's going to hatch out into something unpleasant before long.

A tree creature has to be guided over a compartment

then transformed back into a tree, whereupon its roots will gradually crack the floor beneath and down it will fall, with a mighty crash, on to the blob below.

Further tree creatures summoned forth leap over the newly created pits. If the wizard lands in a pit, he can fly upwards to escape. Passing over a question mark, seductively placed on the parapet by one of the arms, causes ladders to materialise which may be used to reach other levels.

The game has stunning graphics, a completely original and fascinating concept and excellent sound effects. In a word, magnificent.

DONKEY KONG

 Atari's own Donkey Kong is undoubtedly the best version for this machine; in fact, it is considerably better than any other micro's Kong. Everything is there — superb animation, colour and sound, with all the challenges of the original arcade game. There are barrels, firefoxes, hammers, rivets, elevators, sand piles, prizes, conveyor belts and mad bouncing springs.

There are four screens to conquer and five selectable levels of difficulty.

While Kong demonstrates his strength by thumping his chest and leaping up and down, Mario shows that he, too, is capable of mighty feats — he can jump two or three barrels at a time, providing he gets a long enough run-up. This is one all Atari owners should have in their collection.

CAVERNS OF MARS

 Caverns of Mars has been out for a while but remains one of the better versions of Scramble. In this, you travel down through the caves as opposed to the usual horizontal route. There are transmitters, pyxias rockets, fuel tanks, creon rockets, space mines and laser gates to be tackled (though not all at


once.

The twisting, claustrophobic caverns keep you on your toes. The final challenge is to reach and arm a fusion bomber deep within enemy territory — if you manage this, you've still got to escape back to the surface before it explodes.

There are four difficulty levels, each with extra caverns.

The graphics are crisp, smooth-scrolling and colourful. The game is never less than totally challenging.

JUMBO JET PILOT

 This one gives you the chance to fly your very own jumbo jet without the worry of picking up the bill when you crash it.


A detailed instrument panel covers the lower half of the screen, its readings covering altitude, airspeed, elevator setting, heading, brake and stall lights, etc. To the right of the panel is a map showing your current position relative to two airports. A window on the panel supplies a picture of the artificial horizon. Above is the view through the cockpit's window.

You are given some useful tips in getting your jumbo into the air and flying it but you can't expect a 14-page booklet to turn you into an airline pilot overnight.

I soon managed to get the craft airborne but, unfortunately, heading in the wrong direction. Despite flying with one wing pointing at the ground for most of the trip then nosediving to Mother Earth at several hundred miles an hour, I thoroughly enjoyed the ride.

Easy it is not, but if you want an even tougher challenge there's always the night-flight option.

MOON SHUTTLE


 No, you don't have to fly the US shuttle to the moon — this is another variation of the traditional shoot-em-up genre. But this one has a little extra to offer.

The action alternates be-

tween manoeuvring your shuttle through a thick asteroid belt and doing battle with a variety of aliens. First come the Bomb Launchers, large double-wheeled craft which zoom overhead, executing occasional cartwheels. Next, the Expandos, pneumatic drill clones which puff up just before they let fly with a bomb. Joining the parade are the bulbous Man-O-Wars, rather like the jellyfish of the same name. Finally, the Blob Men, large sunbursts which mutate into two smaller, meaner Blob Men on being hit.

You start round again with everything a shade more vicious. Chunky graphics and effective sound put this a cut above the usual run of alien showdowns.

DEFENDER

 The classic arcade game and probably the most difficult — a player needs two pairs of eyes and three hands.

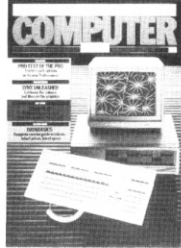
There they all are, — the pods, baiters, landers, swarmer, mutants and bombers. On your side, you have the good ship Defender, fully equipped with forward and reverse thrust, lasers, smart bombs and hyperspace panic button.

The humanoids are in trouble again and you must defend them, with the help of your scanner. Joystick response is excellent and sound and graphics spectacular.

For Defender lovers (and, like the landers, there are a lot of them about), this is a must. If you don't like Defender, have a look anyway — it's a feast of movement, colour and sound.

All the above run in 16K and are available from CentreSoft stockists. Centresoft are at CentreSoft House, Unit 16, Tipton Trading Estate, Bloomfield Road, Tipton, West Midlands DY4 9AH, tel: 021-520 7591. **Necromancer** (disk £29.95) — Synapse **Donkey Kong, Caverns of Mars** and **Defender** (cartridge £29.95) — Atari **Jumbo Jet Pilot** (cartridge £29.95) — Thorn EMI **Moon Shuttle** (disk & cassette £27.50) — Datasoft.

Issue 1, March 11-18.
Pro-Tests: Apple's Lisa, Text TX8000; Spectrum speech synthesiser; Apple printer, Commodore network; 3D on Spectrum; graphics package for Apple and IBM; BBC graphics system.
Features: computer chess, Occam parallel processing language, Victor/Sirius function keys.
Program Cards: Towers of Braham (Pascal), Bowdoin (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).
Databases: 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 hack/gammon, murray computing.
Gameplay: Ultima II (Apple), Trader (ZX81), Starquest (Vic 20), Hungry Horror (Spectrum).
Program Cards: String editor (Spectrum), Analogue Clock (BBC Model B), Chart generator (Spectrum), String extract/replace.
Databases: full software listings.

Issue 3, March 25-April 1.
Pro-Tests: TI Professional, Apple speech synthesiser, Facit 410 printer, IBM keyboards, Petsped compiler, Sirius toolkit, Dragoneal.
Features: Atom upgrade, Lynx programming, AppliPlus.
Gameplay: Mangrove (Vic 20), Mutant Herd (Vic 20), Compendium (Dragon), Patience (Spectrum), Noughts and Crosses (Dragon), Great Britain Ltd (Spectrum), Ulysses (IBM PC).
Program Cards: Magnify (Spectrum), Spider (Vic 20), Firing Range (BBC).
Databases: micros.
Micromedia: Anatomy of the BBC, part 3.

Issue 4, April 1-8.
Pro-Tests: Pied Piper Communication, Olympia E8100 printer, Namal Superlatter, Commodore Calcsult, Spectrum Pascal, Cashbook (BBC), Dark Crystal (Dragon II), St George (Dragon), Wizard War (Dragon).
Program Cards: Fruit Machine (C), Timesmith (Oric), Arnie Editor.
Databases: peripherals.
Clubnet: Clubs and user groups.
Micromedia: Go Forth, part 1.

Issue 5, April 8-15.
Pro-Tests: Commodore 700, Ixon Habitat, 1-2-3 (IBM), ZX81 machine code.
Features: speech packs, monitors.
Gameplay: Grand Prix (Dragon), Derby Day (Spectrum), Deadline (Apple).
Program Cards: Wacky Racers (Oric), Fruit Machine (C64), Parse Interpreter.
Databases: Software.
Clubnet: full list of user groups.
Micromedia: Go Forth, part 2.

Issue 6, April 15-22.
Pro-Tests: Tycom Microframe, IBM PC, Scorpio Discs, Dragon sound module, ZX81 graphics, Bottom Line Strategist (CPM), 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).
Program Cards: Wacky Racers (Oric), Mortgage Comparison

(Sharp MZ80K), Computer Set Up (BBC), Day of Weck.
Databases: micros.
Micromedia: Graphics, part 1.

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

Issue 8, April 29-May 6.
Pro-Tests: Atari Home Files Manager, Kohra's Vic Mat for the Vic 20, Hester's Accounts for the Commodore, Epson RX80 printer, NCR's Decision Mate V, Future Computer's FX20.
Features: Miconet, Compact programming on the T199-4A.
Gameplay: Harvester (Vic 20), Strategy Command (Dragon 32), A First Book of Hero Rhymes (BBC), Telling the Time/Money (Spectrum).
Program Cards: Program Indexer (BBC B), CBM Database cards 1-4, Sort/Extract.
Databases: software.

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

Issue 10, May 13-20.
Pro-Tests: Infomast on Commodore 64, Dragon Mac, MC202 and CMU800 music synthesisers (Apple), Prism directly coupled modem; Epson OX10.
Features: ZX81 graphics part 1; Atari word processing part 2.
Gameplay: Rescue (Spectrum), Dictator (Spectrum), Roman Empire (Spectrum), Choplifter (Vic 20), Skyhawk (Vic 20).
Program Cards: Union Jack (Lynx), Escape (Spectrum), CBM Database cards 7-9, Evaluate (MBasic), Formula (BBC B).
Databases: peripherals.
Micromedia: Graphics, part 5.

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

Issue 12, May 27-June 2.
Pro-Tests: Spectrum word processor, PFS-Report on IBM, File Handling for Colour/Gem, CFI CP80 type I printer, TG Trackball; Sord MS.
Features: Epson Basic, Oric sound part 1, Tandem Colour graphics.
Gameplay: Mad Martha (Spectrum), Frenzy (Spectrum), Headbanger (Spectrum), Oric roundup.
Program Cards: Election Bazaar (Commodore 64), Memory Utility (BBC B), Munch (Spectrum).
Databases: Hardware.
Clubnet: clubs (Cambridge Micro-computer Club special).
Micromedia: 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+; joystick, rulers; Ajile.
Features: Dragon meets Tandy, Oric music part 2, transferring Base for Colour/Gem and Gemie 1.
Gameplay: Everest Ascent (Spectrum), Colour/Gem roundup, Micro Maze (Jupiter Ace), Qix (Atari).
Program Cards: Cupid (Oric), Atari (Dragon 32), Time Bomb (Atari).
Databases: peripherals.

Issue 14, June 10-June 15.
Pro-Tests: Apple Accelerator II board, Modula-2 (Apple II), Oric-Basic, Joystick Control Unit Jo Kempston Centronics Interface, BBC Speech Synthesiser.
Features: Newbrain Basic part 1, Sirus (Spectrum).
Gameplay: Ab Diddums (Spectrum), Monopoly (Commodore 64), Automopolis (Spectrum), Dragon dramas.
Program Cards: Time Bomb (Atari, cont), Sheep Drive (BBC B).

Databases: Software.
Micromedia: Spectrum, part 1.
Issue 15, June 16-June 21.
Pro-Test: Com 35, Address Manager (Spectrum), Sysres (Commodore 64), MST Database (Epson HX 20), Voice Input Module (Apple II).
Features: Newbrain Basic part 2, Gemie scene.
Gameplay: Cleared for Landing, Playing the Ace (Apple II), Vultures, Star Jammer (Dragon 32).
Program Cards: Mover (BBC B), Sprite Clock (Commodore 64), Pirate Island (Atari, 3 of 9), Micro-mind (Colour/Gem), Brickbat (Dragon 32).
Databases: Hardware.
Micromedia: Spectrum, part 2.

Issue 16, June 23-June 29.
Pro-Tests: Atari V Acorn, word processing for the Commodore 64, Simplifile (CPM), MPF-II printer, Z80 Pack for BBC.
Features: ZX81 Maths, US mail order, Atari graphics.
Gameplay: Computer Scrabble (Spectrum), Education (BBC), Orich and Spiders (Spectrum), Catcha Snatcha (Vic 20).
Program Cards: Video Titrer (T199-4A 3 of 6), Bowling (Spectrum), Pirate Island (Atari, cont).
Micromedia: Spectrum, part 3.

Issue 17, June 30-July 6.
Pro-Tests: Duet-16, The Organizer (CPM), 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), Pac (Spectrum), The Ring of Darkness (Dragon 32), Spectrum spectacle.
Program Cards: Video Titrer (T199-4A cont), Pirate Island (Atari cont), Word processor (BBC).

Micromedia: Sound, part 1.

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), Post (Spectrum), Spectrum Safari, IBM Personal Basic (Spectrum), (BBC), Fruit Machine (Spectrum).
Micromedia: Sound Part 2.

Issue 19, July 14-July 20.
Pro-Tests: 16-bit chips, Stock control (Epson HX20), Mailplus (Torch), Smith-Corona 40 daisywheel, ZX81 word processing.
Features: Insurance, buying second-hand.
Gameplay: Escape MCP (C64), Escape from Perilous (Atari), Apple round-up, Temple of Asphalt (C64), Airline (Spectrum), Health.
Program Cards: Colour Code (Atari), Wreck (Dragon 32).
Micromedia: 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 (T199-4A), Arzie's Challenge (Atari, Vic 20, T199-4A), BBC round-up, Joust (Spectrum), Molar Mail (Spectrum), Print Shop (Spectrum), Time-Lords (BBC).
Program Cards: Tumbler (Oric), Wreck (Dragon), Atari Errors, Speed Race (Vic 20).
Micromedia: 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), Hammer House of Horror (Spectrum), Jumpman (64), Jumping Jack (Spectrum), Fourth Encounter (Vic), Cyclons (64).
Program Cards: Collection (Vic), Bomb (64), Definer (BBC).
Micromedia: Sound, part 5.

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

Issue 23, August 11-August 17.
Pro-Tests: Sord Basic-6, Tassword, 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).
Micromedia: 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 Battle, BBC Lusitania (Dragon), The Island (64).
Micromedia: Commodore 64, part 1.

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

Issue 27, September 8-September 14.
Pro-Tests: Sharp MZ700, BBC Lasp, Apple editor, IBM mice, ZX81 surgery.
Gameplay: Zap-Zap, Zoom (Spectrum), Spectrum roundup, Hoover Bower, Benji-Space Rescue (64).
Micromedia: Dragon, part 1.

Issue 28, September 15-September 21.
Pro-Tests: Zenith Z100, Snail Logo, Atari Supergraphics, Newbrain CP/M, IBM mice.
Gameplay: The Witness, Super Scramble, Six (64), Harter Attack (Oric), Morocco Grand Prix (Dragon), Pharaoh's Ship (Spectrum).
Micromedia: 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: Cracker, Gloopert, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Split, General Election (Spectrum).
Micromedia: Dragon, part 3.

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POOLS PROGRAMS

48K Spectrum

Soccer sage

Name Spectradraw 2 **Application** Pools prediction program **System** Spectrum **48K Price** £12.95
Publisher Spectradraw, 1 Cowleaze, Chinnor, Oxford OX9 4TD **Format** Cassette **Language** Basic

Name Football Pools Program **Application** Pools prediction program **System** Spectrum **48K Price** £5.95 **Publisher** Hartland Software, 8 Penzance Place, London W11 4PA **Format** Cassette **Language** Basic

In a few months time, as you sit by the villa pool sipping your sundowner, wondering what you're not going to bother doing tomorrow, you'll thank me. You'll realise that you owe the house, the sun, fast women and loose cars to PCN and its review of two football pools forecasting programs — or will you?

On the other hand, as you crouch in the corner of the padded cell, numbers swimming in front of your eyes, jabbering 'home draw, away win, upper quartile, lower quartile,' you might think something different. If you can still think.

Objectives

Spectradraw 2, from B S McAlley, and Football Pools Program, from Hartland Software, are two programs with the aim of forecasting the performance in the top four English divisions and the top three Scottish. They

should theoretically help you to see when like is meeting like, and therefore should increase your chance of predicting draws.

In the case of Spectradraw 2, we are told 'the wins are likely to be fairly small — a scientific approach has no chance of producing a really big win — but should leave you in pocket at the end of the season.' We can probably take it as read this goes for all such programs.

In the case of both programs, the scientific approach involves keeping a database of sorts up to date, and this is your first nightmare.

Features

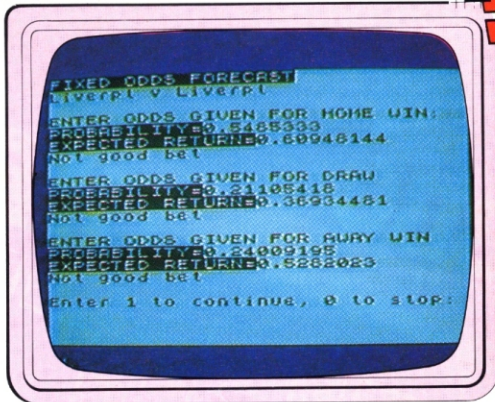
Both programs are broadly similar in results, if not in use. Spectradraw 2 will predict likely draws from the matches that are taking place that week, provided you've told it which matches are taking place. It will also print out a list of the 30 most likely draws based on its current database.

Football Pools Program gives you a little more information. It lists draws in order of preference, but will also pick out games with over-generous odds on fixed-odds coupons.

In use

In both cases you are provided with a database. Spectradraw 2's database was up to date for the start of the current season, while the review copy of Football Pools Program's database didn't include results for the latter part of last season.

I took on board Spectradraw's point that it takes about a month for form to settle down at the beginning of the season,



and began inputting feverishly.

This speedily became tiresome in both cases. Football Pools Program is not particularly stylish or user-friendly in appearance, but in the end I found it marginally easier to use. Its main drawback seemed to be that you have to type in the team's names one letter at a time when you update the league tables.

When you type in the week's fixtures it takes a considerable amount of time comparing form and making its prediction, with no sign on-screen that this is what it is doing.

Spectradraw 2, on the other hand, seems particularly user-friendly at first. Arranging your fixture list involves seeing a list of the teams in each division on screen, inputting the team numbers for each match, then moving on division by division. The teams already typed in are blacked out, so it's relatively easy to see where you are.

You're advised to deal with the match list towards the beginning of the week, and update your records when the results come in on Saturday. It's a staggering amount of typing, as indeed are all such prediction programs, and you'd need to be quite a football fiend to raise the energy to do this every week.

Of course, between arranging the fixtures and putting in the results, you'll want a prediction, won't you? This is where I ran into problems with Spectradraw. The first time I used it, it threw an error message, but I was unable to reproduce it, so couldn't nail it down.

After reloading, I managed to get a fair slice of results typed in, then tried a prediction. It threw up a different error message, and I spent quite some time puzzling before I

worked out that it just doesn't work unless you've typed in results for *all* the teams covered.

In general, both programs tend to be difficult to use if you've been approaching them half-heartedly, and have failed to keep your database up to date.

Verdict

Both Spectradraw and Football Pools Program are effective in assessing form, but considerably less so when it comes to predicting draws.

Spectradraw assesses its own effectiveness as about 20-30 per cent more successful than sticking a pin in the coupon, and this would seem about right to me in the cases of both programs. If you know your football, you could probably equal their success with your own guesstimates, but if you used them in an advisory capacity, rather than filling in their prediction religiously, it could well improve your chances.

The major drawback with both programs is the amount of typing you have to do.

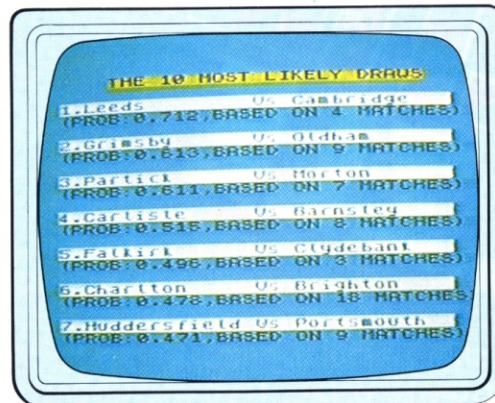
John Lettice

Spectradraw 2

RATING	☆☆☆☆
Features	☆☆☆☆
Documentation	☆☆☆☆
Performance	☆☆☆☆
User interface	☆☆☆☆
Reliability	☆☆☆☆
Overall value	☆☆☆☆

Football Pools Program

RATING	☆☆☆☆
Features	☆☆☆☆
Documentation	☆☆☆☆
Performance	☆☆☆☆
User interface	☆☆☆☆
Reliability	☆☆☆☆
Overall value	☆☆☆☆



The SLICKER Challenge

BBC

THE

SLICKER

PUZZLE

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To the few that succeed through skill or luck and out slicker slicker by solving Level 8, the ultimate prize, free membership of the Slicker Champions Club.

We challenge you to beat SLICKER the new totally original puzzle game that has been designed to test your micro games ability to the full.

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Simply write the code number on the inside of the card cassette cover and send it to us with your name and address and we will send you by return a **FREE GAMES CASSETTE** and your Slicker Champions Club Membership (Applications must be received by Jan. 31st 1984).

To order Slicker see order form on page 72

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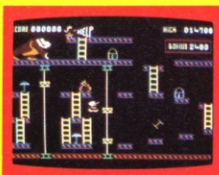
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A 31 K ALL M/C PROGRAM WITH BRILLIANT ANIMATED GRAPHICS



1. CHASING FIREBALLS AND BARRELS CAN BE SMASHED BY THE MALLET IF YOU CAN JUMP UP AND GET IT

2. JUMP OVER THE PIES AS YOU RUN ALONG THE CONVEYOR BELT MAKE SURE YOU DONT END UP INSIDE THE COOKER

3. THE ONLY WAY UP IS BY THE LIFT WHICH IS UNDER A CONSTANT BARRAGE OF GIRDERS.

4. KNOCK OUT ALL THE SUPPORTS BY RUNNING OVER THEM AND WITNESS THE SPECTACULAR COLLAPSE OF KONGS LAIR.

SKRAMBLE J.S.

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PILOT YOUR SPACE CRAFT THROUGH THE SIX DEFENCE SECTORS AND DESTROY THE COMMAND MODULE OF THE COBRON EMPIRE. A 32 K ALL M/C BLOCKBUSTER.



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2. FIGHT COBRON QUASER ION SHIPS.

3. DODGE THE FIREBALLS, BECAUSE YOU CANT SHOOT THEM DOWN.

4. CITY WITH HIGH RISE BUILDINGS.



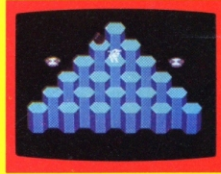
5. GUIDE YOUR SHIP WITH DEXTERITY THROUGH THE MAZE

6. DESTROY THE BASE BEFORE YOU RUN OUT OF FUEL.

HEXPERT J.S.

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THE EVIL WITCH ZOGANAAR HAS FORCED BERT TO PLAY ON HER 3D HEXAGONAL PYRAMID AS HE JUMPS FROM STEP TO STEP OF THE PYRAMID MASSIVE RUBBER BALLS BOUNCE DOWN THE PYRAMID TO CRUSH HIM. HER PET SNAKE, COILY, MOVES UP AND DOWN THE PYRAMID CHASING BERT. YOU HAVE TWO SPINNING DISCS TO JUMP ON TO AND LURE COILY TO HIS DEATH. CAN YOU MAKE BERT THE HEXPERT?
 A SUPERB ALL M/C GAME WITH EXCELLENT 3D GRAPHICS

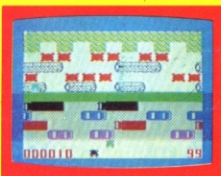


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J.S. £7.95

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Clubnet keeps you in touch with enthusiasts throughout the country. It is divided into clubs and user groups and a list of each is published on alternate weeks.

This week it is the turn of clubs, which are listed alphabetically by county and town.

Trans-globe users

At the back of a micro shop in Welling, Kent, the Computer Users Club is thriving.

With an international membership of 600, most of whom are academics, sub-groups operate from countries including Singapore, USA, Belgium, Italy, Africa and Australia. 'We send programs all over the world, and assist people in writing them,' said organiser Tony Latham, who stocks micros, peripherals and software in his shop.

'The club was started by a group of engineers designing equipment in garages and attics,' said Mr Latham.

Members work primarily on the BBC Micro and the club acts as a referral centre for this machine. 'It's done by word of mouth — we'd be swamped if we advertised,' he said.

Members write software for the BBC and Mr Latham is assisting in marketing private products for it. Some products are sold direct through the club.

Set up in 1981, the club also features a 10 megabyte Torch, Commodore PET and Video Genie, among other machines.

Mr Latham feels that micros have a part to play in world peace. 'We think nations will come together as a result of sharing computer language, and feel this is very important.'

The club has had two actual meetings which were well received, but they couldn't find local premises that were stable and so

If your association has something special on the agenda or if you've just started a new one, contact us at *Clubnet*, Personal Computer News, VNU, 62 Oxford Street, London W1A 2HG.

Our Clubnet report this week focuses on the Computer User's Club.



Club member Mike Sein at work on a BBC program gets advice and encouragement from Tony Latham.

the open house arrangement will continue at the shop until they can build an extension in which to have meetings.

One of the club's claims to fame is journalist member Penny Junor, who is writing Margaret Thatcher's life story. The club has supplied her with a daisywheel printer, plus BBC and disk drives and word processing equipment to help her complete the task.

Wendie Pearson

Name Computer Users Club **Venue** 69 Hadlow Road, Welling, Kent **Meetings** Facilities open 9am-5pm Monday to Saturday **Contact** Tony Latham, 01-304 3910

CLUBS

AVON

Bristol Berkeley Nuclear Laboratories Club. Contact Neil Walker, 53 Wolfbridge Ride, Alveston, Bristol, 0454 414262.
Bristol Micro Computer Club. Meets at the Pavilion, Southend Road, Filton, Bristol, every other Tuesday. Darryl Collins, 60 Mackie Rd, Filton, Bristol BS12 7NA. 0272 792982.

Bristol Format 40/80 Disc Club, for BBC disk users. Contact Peter Hughes. Format 40/80 Disc Club, c/o The Lending Library, Five Marshall Street, Bristol BS1 4AA.
Multi-User Club Valerie Boyde-Shaw, Nailsea 851337.
Worce Computer Club. Meets at Woodsprings Inn Functions Rooms on alternate Mondays at 7-10.30pm. H Bennett, 0934 514902 or F Feeney, 0934 833122.

BEDFORDSHIRE

Bedford Amateur Computer Club. Meets at Star Rowing Club, Bedford, on the first and third Tuesday of month 8pm. Rowan Bird, 74 High Street, Great Barford, MK44 3LB, 0234 870763.

Chiltern Computer Club. Meets at Five Bells, Eaton Bray, Near Dunstable, Leighton Buzzard on second and fourth Monday of each month. Contact Steve Betts, 42 Wallace Road, Eaton Bray, 016 2DF, 0525 220922.

Luton College Computer Club. John Rodger, 0582 3411.
Luton Computer Club. J P Fletcher, 1 Trowbridge Gardens, Luton, LU2 7JY, 0582 450887.

BERKSHIRE

Easthampstead Computer Club. Meets at Easthampstead Park School, Bracknell, on the first Wednesday in month at 8pm. Brian Poulton, 0344 84423.

BIRMINGHAM

Birmingham Amateur Computer Club. Meets at Free Church Hall, Land Lane, Marston Green, Birmingham on first and third Thursday of each month at 7.30pm. Contact Les Moore, Secretary, Wolverhampton 725340.

BUCKINGHAMSHIRE

Aylesbury Computer Club. Meets at Quarrendon Youth Club every Friday at 7.30pm and at Mandeville County Secondary School the first Thursday of

each month at 7pm. Ken Knight, 22 Mount Street, Aylesbury, 0296 5181.

Chiltern Microcomputer Club. Meets at the Garden Centre, School Lane, Chalfont St Giles, on the first Wednesday of each month. Mrs W Tibbitts, Ellwood, Deanway, Chalfont St Giles: 024 07 4906.
Iver Computer Club. P A Seal, 1 Ormonde Flats, Church Road, Iver Heath, 0753 652792.

Iver Computer Society meets at Huntsmoor house, Iver Village Hall on the second and fourth Thursday every month at 7.30. John Haigh, 141 Leas Drive, Iver, SLO 9RP.

CAMBRIDGESHIRE

Cambridge Microcomputer Club, meets on the third Wednesday of month. Derek

Tripp, 3 Spurgeons Avenue, Waterbeach. 0223 315662.

Peterborough Personal Computer Club meets at Crosfield Electronics Social Club, fortnightly on Mondays. Andrew Pike, 0733 44342 after 5pm.

CHESHIRE

Altrincham Computer Club. Meets at N. Cestrian Grammar School, Durham Road, Altrincham, fortnightly. Martin Hicking, 39 Barrington Road, Altrincham, WA14 1H2, 061 941 4547.
Bruntal Computer Club. Meets at St Werburgh Community Centre on alternate Wednesdays at 7 to 10pm. Mr R Simpson, 4 The Coats, Stockwood.

Chester Computer Club. Contact W Collins, 37 Garden Lane, Chester, Cheshire.

Crew Computer Users Club meets at Buffaloes Club, Earl Street, Crewe, on the third Thursday of each month at 8pm. Bram Knight, 0270 623375.

Holmes Chapel Micro Club meets at Leisure Centre, Holmes Chapel at 7.30 to 9.30pm on the first and third Tuesday of month. Margaret Baker, 1 Helton Close, Crewe. 0477 34238.

Kinder Peak Computer Club meets at Bew Mills School every Monday. John Eary, New Mills 43870.

Kettleshulme National Computer Buyer's Club. Send SAE to Barry Edwards, Lanside House, Paddock Lane, Kettleshulme, nr Stockport, Cheshire.

New Mills & District PCC meets at New Mills School, fortnightly on Fridays at 7 to 9.30pm. Mr G M Fianagan, 11 Sundown Close, New Mills, Stockport, SK12 3DH, 0663 44051.

Northwest Computer Club meets fortnightly. John Lightfoot, 13 Aston Drive,

Once a month

Your eyes will not be deceiving you next week when you open PCN to find no Databasics. But before you write this off as gross carelessness on our part, let us assure you that it is deliberate. Databasics is merely deferred.

Every fourth week, starting with issue 33, you'll get a full list of clubs and user groups nationwide, as well as two reports.

In issue 34, there will be no clubs or user groups but Databasics will be back, starting with hardware. The next week will consist of peripherals and the week after that will feature software.

sinclair special

5



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

SOFTWARE UPDATE

The latest cassette software for ZX[®] Computers

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[®] 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[®] 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



Chess Tutor 1

For 48K RAM Spectrum. **£9.95.**

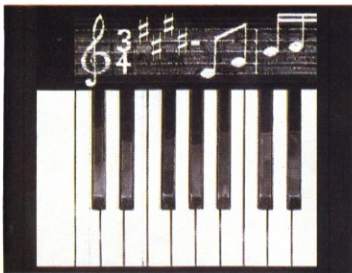
Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.[®]

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.



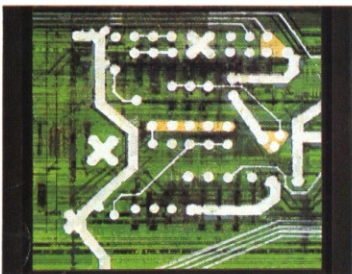
Musicmaster

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.



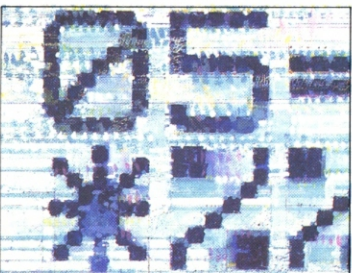
Print Utilities

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.

ZX INTERFACE 2[®]

The New ROM Cartridge/Joystick Interface

**Loads programs instantly!
Takes two joysticks!
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!



...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.

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.

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.

Hungry Horace



Horace is forever being chased around the park by guards.

He steals their lunch, eats path-way 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.

If you didn't buy your Spectrum by mail order, don't worry. Send us the form from the bottom of this page. We'll add your name to the mailing list, and send you details by return.

Each Microdrive costs £49.95. Interface 1 costs £49.95, but just £29.95 if purchased with a ZX Microdrive. Extra ZX Microdrive cartridges: £4.95.

How to order

Simply fill in the relevant sections on the order form below. Note that there is no postage or packing to pay on some purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option, of course. Please allow 28 days for delivery.

® ZX Spectrum, ZX Interface and ZX Microdrive are all registered trademarks of Sinclair Research Ltd.

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Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Telephone: (0276) 685311.

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR.

Section A: Hardware

Qty	Item	Code	Item Price £	Total £
	ZX Interface 2	8501	19.95	
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
			TOTAL £	

Section B: Software ROM CARTRIDGE PROGRAMS

G12/R	Planetoids	5302	14.95
G9/R	Space Raiders	5300	14.95
G13/R	Hungry Horace	5303	14.95
G24/R	Horace and the Spiders	5305	14.95
G28/R	PSSST	5307	14.95
G30/R	Cookie	5309	14.95
G29/R	Tranz Am	5308	14.95
G27/R	Jet Pac	5306	14.95
G22/R	Backgammon	5304	14.95
G10/R	Chess	5301	14.95

ORDER FORM

CASSETTE PROGRAMS for ZX Spectrum

E9/S	Chess Tutor 1	4308	9.95
E7/S	Musicmaster	4306	9.95
E8/S	Beyond BASIC	4307	9.95
E6/S	Make-a-Chip	4305	9.95
L5/S	Print Utilities	4404	9.95
			TOTAL £

* I enclose a cheque/postal order made payable to Sinclair Research Ltd for £.

* Please charge to my Access/Barclaycard/Trustcard account no:

* Delete/complete as applicable

Signature

Mr/Mrs/Miss

Address

PCN 910
(Please print)

ZX Microdrive information request

Please add my name to the Microdrive Mailing List, and send me a colour brochure with full specifications of ZX Microdrive/Interface 1 (tick here). You can use the above form to send us your name and address.

PCN Program Cards

Program cards aim to provide you with an easily referenced collection of programs. Although the programs are generally written for one particular machine, they are usually easily converted to run on any machine. To this end each program, on one or more cards, contains a listing of the program and set of notes to help you understand what is going on inside the computer, while you follow the action on the screen.

For program collectors this week, we have the conclusion of the composer program for the Oric-1, and the beginning of the *PCN Game*, as used in the PCW show.

For those of you who were unable to get to the show, or who missed the last two issues of *PCN*, or who, for any other reason, are wondering what the *PCN Game* is, here are the details.

We ran a competition to win an Acorn Electron at the show. To win all you had to do was go to the show, play the game, and

get the highest score. It is too late to win the competition, for obvious reasons, but now you can play the game. You take control of a bee, which you fly around the screen. The objective of the game is to eat and thus pollinate, as many of the flowers as possible, before they reach the top of the screen. These flowers move and multiply as they grow. When the bee eats them, the seeds instantly drop back to the bottom of the screen to begin growing again.

There are two types of flower, one of which, the ordinary four petal type, gives you ten points when eaten, and the other, the super purple nastie, nets you 100 points. Unfortunately these purple nasties bloom only at certain times of the game so keep your eyes peeled. Bees have a very limited life span (well, they do in this game) and when the flowers reach the top of the screen, the bees' life ends. Shame. But by pressing a few keys on the keyboard, you can make the bee live again, to pollinate more flowers.

To give you something to beat, the winning score of the competition was 3260 points by Jonathan Acott aged nine. For all of you who wanted to know, the game was written by the programs editor (yours truly) with the help and comments from the rest of the *Personal Computer News* editorial team.

Finally, 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. You, of course, retain the copyright on your program so just send them, with any instructions, comments, on either cassette or disk — with a 40-column listing, if possible — to:
Programs Editor,
Personal Computer News,
Evelyn House,
62 Oxford Street,
London.

PCN Program Cards

Bees Away

Card 1 of 7

8332BA1/7

```
10*FX 220,255
20MODE1
30VDU19,3,2,0,0,0
40*FX16,0
50PROCINBF
60DIMYPOS$(15),XPOS$(15),HS$(5),HS$(5)
),HT$(5)
70PROCSCORES
80PROCINST
90PROCSCREEN
100CPY%=890
110CPX%=500
120MV%=10
130S%=30
140NR%=50
150SC%=10
160TL%=0
170FLR$=FL$
```

BBC B BBC Basic

Application: Game
 Author: Kenn Garrock

```
180ENVELOPE2,129,-100,-100,-100,10,10,
10,127,-2,-2,-127,60,127
190NH%=1
200PROCINIT
210TIME=0
220MOVES00,0
230FORT%=0TONHX
240SOUND&10,-15,7,2
250SOUND&11,-5,(CPY%+RND(10))/30,15
260MOVEXPOS%(TX),YPOS%(TX)
280AZ%=RND(10)+MV%
290D%=RND(100)-50
300XPOS%(TX)=XPOS%(TX)+D%
310YPOS%(TX)=YPOS%(TX)+AZ%
320IFXPOS%(TX)<65XPOS%(TX)=XPOS%(TX)-D%
%
330IFXPOS%(TX)>1200XPOS%(TX)=XPOS%(TX)-AZ%
```

10	Define escape key as char 255, effectively disabling it.	100-110	Set up start position of bee.	220	Move to start position of stem.
20-30	Select screen mode, define logical colour 3 to be green.	120	Define amount that flowers move.	230	Start loop for moving heads.
40	Disable all ADC channels.	130	Define amount that bee moves.	240-250	Make growing sound and bee sound.
50	Set up user defined characters for bee and flowers.	140	Define nearest approach variable.	260	Move to current flower position.
60	Dimension arrays. YPOS% and XPOS% hold positions of flowers. HS\$, HS% HT% used for high scores.	150	Set score time.	280-1290	Get random vertical and horizontal movement.
70-90	Set up default scores, title page and instructions, draw playing screen.	170	Set flower to low scoring type.	300-310	Add movements to the current flower position.
		180	Define envelope 2.	320	Check for going off screen to left.
		190	Set number of flower heads to 1.	330	Check for flowers going off screen to right.
		200	Set up start positions of the flowers		
		210	Set system time to zero.		

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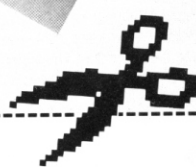
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PCNProgramCards

Bees Away

Card 2 of 7

8332BA2/7

```

340GCOL2,1:PRINT;BL$;
350GCOL0,1
360PLOT1,D$,A$
370GCOL0,2
380MOVEXPOS%(TX),YPOS%(TX):PRINT;FLR$;
390MOVECPX%,CPY%
400GCOL2,1:PRINT;BL$;
410IFCPX%<=65 CPX%=CPX%+S$
420IFCPX%>=1180 CPX%=CPX%-S$
430IFCPY%<=100 CPY%=CPY%+S$
440IFCPY%>=866 CPY%=CPY%-S$
450PROCKEY
460GCOL0,2
470MOVECPX%,CPY%:PRINT;BE$;
480IFYPOS%(TX)>890 PROCEND:PROCHISCORE
:TX=NH%:NEXT:GOTO 80
490IF(CPX%>XPOS%(TX)-NR%ANDCPX%<XPOS%(
TX)+NR%)AND(CPY%<YPOS%(TX)+NR%ANDCPY%>Y
POS%(TX)-NR%) PROCBITE
500NEXT
    
```

```

510PROCNHS
520GOTO230
530DEFFPROCNHEAD(TX)
540IFNH%=20 ENDPROC
550IFRND(50)=25 NH%=NH%+1:YPOS%(NH%)=Y
POS%(TX):XPOS%(NH%)=XPOS%(TX)
560ENDPROC
570DEFFPROCNHS
580FORTX%=0TGNH%
590PROCNHEAD(TX)
600NEXT
610ENDPROC
620DEFFPROCINIT
630FORTX%=0T010
640XPOS%(TX)=500
650YPOS%(TX)=80
660NEXT
670ENDPROC
680DEFFPROCKEY
690IFINKEY(-98)=-1CPX%=CPX%-S$
    
```

340	Rubout flower (all colours except red).	460	Set up the colour for bee.	540	If number of heads is greater than 20 then don't do any more. If the random numbers fall right then define new flower head, place it at current position. Procedure to get a set of new heads.
350	Define next colour to be red.	470	Put bee into position.	550	
360	Plot stem.	480	If current flower has gone off screen, at the top, then end game, check high score, restart.	570	
370	Define next colour to be yellow.		Check to see if bee has bitten flower.	570	
380	Move to new position and print flower.	490	Next flower.		
390	Move to bee's current position.		Get some new flower heads.	580-600	
400	Rubout all colours except red.	500	Continue game.	620-670	
410-440	Make sure that bee cannot get off screen.	510 520	Procedure to get a random new head.		
450	Get key from keyboard and update bee's position.	530			

PCNProgramCards

Bees Away

Card 3 of 7

8332BA3/7

```

700IFINKEY(-67)=-1CPX%=CPX%+S$
710IFINKEY(-73)=-1CPY%=CPY%+S$
720IFINKEY(-105)=-1CPY%=CPY%-S$
730ENDPROC
740DEFFPROCINBF
750VDU23,224,1,2,2,2,2,1,123,134
760VDU23,225,123,1,2,2,2,2,1,0
770VDU23,226,0,128,128,128,128,0,188,1
94
780VDU23,227,188,0,128,128,128,128,0,0
790FL$=CHR$224+CHR$226+CHR$10+CHR$8+CH
R$227+CHR$8+CHR$8+CHR$225
800VDU23,228,&0E,&1F,&1F,&1F,&0F,&07,&
07,&0B
810VDU23,229,&10,&10,&10,&0F,&0B,&10,&
20,&40
820VDU23,230,&00,&00,&80,&C0,&C0,&C0,&
F0,&3B
830VDU23,231,&3B,&0B,&10,&E0,&10,&0B,&
04,&04
840BE$=CHR$228+CHR$230+CHR$10+CHR$8+CH
R$231+CHR$8+CHR$8+CHR$229
850VDU23,232,&FF,&FF,&FF,&FF,&FF,&FF,&
FF,&FF
860BL$=CHR$232+CHR$232+CHR$10+CHR$8+CH
R$232+CHR$8+CHR$8+CHR$232
870VDU23,233,&03,&0F,&1E,&3A,&6B,&60,&
C0,&C1
880VDU23,234,&C0,&F0,&AC,&BB,&AE,&06,&
    
```

```

03,&83
890VDU23,235,&C1,&C0,&60,&6A,&3A,&1E,&
0F,&03
900VDU23,236,&83,&03,&02,&AE,&AC,&B8,&
F0,&C0
910BT$=CHR$233+CHR$234+CHR$10+CHR$8+CH
R$236+CHR$8+CHR$8+CHR$235
920ENDPROC
930DEFFPROCSCREEN
940CLG
950VDU5,20
960GCOL0,2
970MOVE0,0
980MOVE0,10
990PLOT85,1270,10
1000PLOT85,1270,0
1010MOVE1280,0
1020PLOT85,1270,1014
1030PLOT85,1280,1014
1040MOVE1280,1024
1050PLOT85,10,1014
1060PLOT85,10,1024
1070MOVE0,1024
1080PLOT85,10,10
1090PLOT85,0,10
1100MOVE10,900
1110PLOT5,1270,900
1120MOVE1270,904
1130MOVE1270,1014
    
```

680-730	Get controls from keyboard and move bee accordingly.	740-920	Set up user defined characters for bee, flowers and blank.	930-1130	Set up playing screen
---------	--	---------	--	----------	-----------------------



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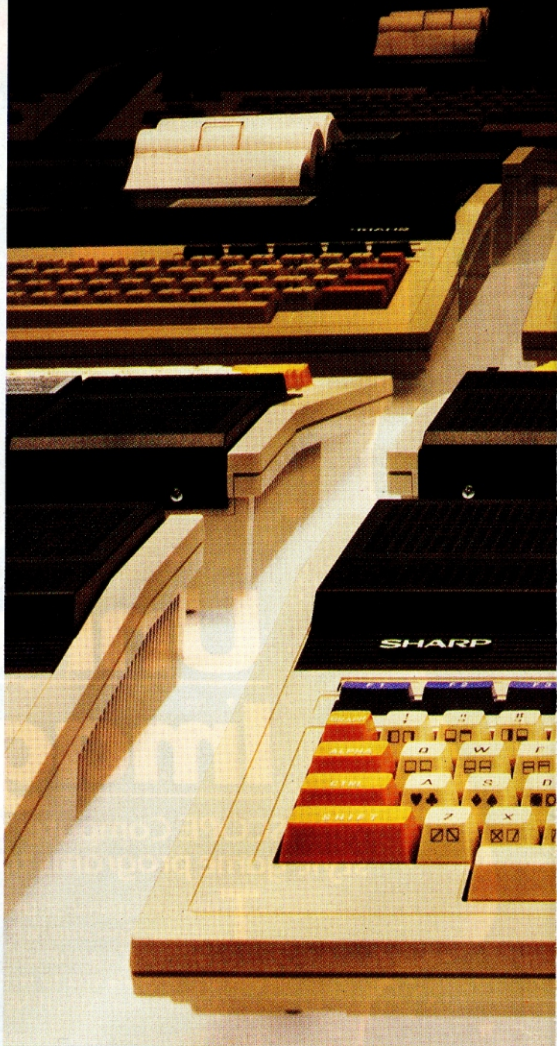
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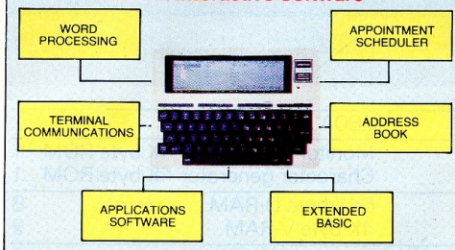
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Composer Card 8 of 11

Oric 1 (48K)/Oric Basic/R Bower/Cont

8332C08/11

```

6360 PRINT"                LIST OF COMMANDS                ":PRINT
6370 RESTORE
6371 FOR I=1 TO 07:READ DTA#,DTA
6372 PRINT DTA#;NEXT I
6380 PRINT"N.B. When typing in notes or commands":PRINT
6390 PRINT"do not type any spaces after it,or it":PRINT
6400 PRINT"will not be recognised.                ":PRINT
6410 PRINT"type 'H' for full description of        ":PRINT
6420 PRINT"commands,or any other key to continue":PRINT
6430 PRINT"the program                                ":PRINT
6440 GET A#;IF A#<>"H" AND A#<>"h" THEN 9000
6500 REM ** HELP SCREEN **
6510 DOKE 621,48160;POKE 623,23:CLS
6520 PRINT"                HELP SCREEN                ":
6530 PRINT"                =====                ":PRINT
6540 PRINT"CHANGE allows you to change octave        ":PRINT
6550 PRINT"within a tune.Procedure same as when      ":PRINT
6560 PRINT"octave first typed in.                    ":PRINT
6570 PRINT"DELETE deletes the last note typed in":PRINT
6580 PRINT"and reverts the octave back to what     ":PRINT
6590 PRINT"it was when the note before the one      ":PRINT
6600 PRINT"deleted was typed in.                    ":PRINT
6610 GOSUB 8900:REM TURN PAGE
6620 PRINT"PLAY plays the tune.You will be         ":PRINT
6630 PRINT"asked for five pieces of information,":PRINT
6640 PRINT"the first four concern the envelope        ":PRINT
6650 PRINT"See p.100 in the manual for              ":PRINT
6660 PRINT"descriptions,parameters etc.            ":PRINT
6670 PRINT"The fifth prompt is for 'basic note     ":PRINT
6680 PRINT"length',this is the time in ten m/      ":PRINT
6690 PRINT"seconds for ONE beat i.e. it controls":PRINT
6700 PRINT"the speed which the music is played. ":PRINT

```

Composer Card 9 of 11

8332C09/11

```

6710 GOSUB 8900
6715 GOSUB 6800
6720 PRINT"PRINT automatically prints out the  ":PRINT
6730 PRINT"tune in the form NOTElength:        ":PRINT
6740 PRINT"e.g. A1: or C#3:                      ":PRINT
6750 PRINT"HELP prints the HELP screen.         ":PRINT
6760 PRINT"INSTRUCTIONS prints the instructions.":PRINT
6780 PRINT"END finishes the program,and does   ":PRINT
6790 PRINT"a warm reset.                        ":PRINT
6795 GOSUB 8900:GOTO 9000
6800 REM MORE INSTRUCTIONS FROM LINE 6715
6810 PRINT"EDIT allows you to change the value":PRINT
6820 PRINT"of any note in memory.Procedure is  ":PRINT
6830 PRINT"same as when typing original note.   ":PRINT
6900 RETURN
8900 .PRINT" PRESS ANY KEY TO CONTINUE":GET A#;CLS:RETURN
9000 CLS:DOKE 621,48920;POKE 623,4:IFA1#=""THEN DOKE 621,48000;POKE 6
23,27
9999 RETURN
10000 REM ** CHARACTER DEFINITIONS **
10010 FOR I=35*8+47104 TO 53*8+47111
10020 READ A
10030 POKE I,A
10040 NEXT I
10100 DATA 0,0,0,63,0,0,0,63 "=
10120 DATA 7,5,55,31,48,0,0,63 'L1RIG
10130 DATA 0,0,1,62,29,20,28,63'L1MID
10135 DATA 0,0,0,63,0,0,7,61 'L1LEF
10140 DATA 55,16,48,63,0,0,0,63'L2RIG

```

6795

Gosub 'any key to continue' and
reset window subroutines.

9000-9999

Reset window.

10000-10730

Redefine characters.

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- PROTEANS BBC 32K. D. Hoskins** £6.95
In our humble opinion the fastest zappiest most addictive original colourful superb arcade game for the BBC.
- SUBKILLER BBC 32K. D. Regan** £6.95
1st class graphics and superbly bring the excitement of the submarine hunter killer drama to your screen. Best subroutine ever!
- GOLF Spectrum 16K. D. Johnson** £4.95
Sit back and enjoy a peaceful game of Golf without the trouble and expense. Guaranteed to give hours of enjoyment. All possible features including rate spectators.
- GALACTIANS Spectrum 16K. D. Turner** £5.95
No serious games player should be without this version of an old favourite. Excellent graphics and sound. 36 different permutations of game.
- ROAD TOAD Spectrum 16K** £4.95
Join Toady on his hectic journey to the Lily Pads. An excellent full feature version.
- STAR TREK 3000 Spectrum 48K. M. Florey** £4.95
Boldly go where everyone's been before. Then go further.
- INVADERS Spectrum 16K. D. Heelas** £4.95
An excellent version of the original and for many people still the best arcade game ever.
- JAWZ Spectrum 16K** £4.95
Get your teeth into the task of ridding the depths of hoards of marauding sharks and giant jellyfish.
- MILLIE-BUG Commodore 64. K. Moughtin** £5.95
A new and faithful version Commodore 64 owners have all been waiting for.
- HARD CHEESE 16K Spectrum. P. Johnson & E. Farrell** £4.95
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PCNProgramCards**Composer Card 10 of 11**

8332CO10/11

```

10150 DATA 1,1,29,55,28,0,0,63 ^L2MID
10160 DATA 0,0,0,63,7,5,59,31 ^L2MID
10170 DATA 0,0,0,63,0,0,1,62 ^L2LEF
10180 DATA 48,0,0,63,0,0,0,0 ^L3RIG
10190 DATA 29,20,28,63,0,0,0,0 ^L3MID
10200 DATA 0,0,7,61,7,0,0,0 ^L3LEF
10210 DATA 0,0,0,63,0,0,0,0 ^-
10220 REM * LETTER DATA *
10300 DATA 0,7,4,4,5,7,0,0 ^G
10310 DATA 0,9,21,21,29,21,0,0 ^A
10320 DATA 0,39,20,36,20,39,0,0^BC
10330 DATA 0,25,21,21,21,25,0,0^D
10340 DATA 0,55,4,38,4,52,0,0 ^EF
10350 DATA 0,28,17,17,21,29,0,0^G
10360 DATA 0,38,21,23,53,22,0,0^AB
10500 FOR I=35*8+46080 TO 35*8+46087
10510 READ A:POKE I,A
10520 NEXT I
10530 DATA 10,31,10,31,10,0,0,0^#
10600 FOR I=48*8+46080 TO 57*8+46087
10610 READ A:POKE I,A
10620 NEXT I
10630 RETURN
10640 DATA 0,12,18,18,18,12,0,0^0
10650 DATA 0,4,4,4,4,4,0,0 ^1
10660 DATA 0,12,18,4,8,30,0,0 ^2
10670 DATA 0,28,2,12,2,28,0,0 ^3
10680 DATA 0,16,16,20,30,4,0,0 ^4
10690 DATA 0,28,16,28,4,28,0,0 ^5

```

PCNProgramCards**Composer Card 11 of 11**

8332CO11/11

```

10700 DATA 0,24,16,28,20,28,0,0^6
10710 DATA 0,28,4,4,8,16,0,0 ^7
10720 DATA 0,28,20,28,20,28,0,0^8
10730 DATA 0,28,20,28,4,4,0,0 ^9
60000 PRINT"ARE YOU SURE (y/n) ?":GET A#
60010 IF A#="N" OR A#="n" THEN RETURN
60020 IF A#<>"y" AND A#<>"Y" THEN 60000
60030 PRINT" End of program ":WAIT 200
60040 CALL#22B:REM: simulate RESET button
60100 REM ** RUN OUT OF NOTES **
60110 DOKE 621,48160:POKE 623,23
60120 CLS
60130 PRINT:PRINT"YOU HAVE RUN OUT OF NOTES":PRINT
60140 PRINT"YOU CAN ...":PRINT
60150 PRINT" PRINT what you have done,":PRINT
60160 PRINT" PLAY it,or END ":PRINT
60170 INPUT"What will you do ";WD#
60180 IF WD#="N" THEN PRINT" THEN 3000
60190 IF WD#="PLAY" THEN GOSUB 2100:GOTO 60100
60200 IF WD#="END" THEN GOSUB 60000:GOTO 60100
60210 GOTO 60170
60300 OC#=STR$(OC(COUNT)):OC#=MID$(OC#,2,LEN(OC#)-1)
60310 OC#=STR$(OC(COUNT)):OC#=MID$(OC#,2,LEN(OC#)-1)
60320 OC#=" Octave-"+OC#+CHR$(151)
60330 PLOT 11,3,CHR$(144)+CHR$(130)+CHR$(136)
60340 PLOT OA,OD,OC#
60350 RETURN

```

60000

End program check.

60040

Perform softreset.

60300-60350

Change octave if delete has been used.

60100-60210

You have run out of notes subroutine.

Exchange car, Fiat 124, 1975, taxed, MoT, superb order, wanted BBC A or B disk drive, interface etc. Cash either way. What have you? Tel: Bracknell 0344 28540.

Seikosha GP100VC for sale, new and boxed, unwanted gift, new £230, will accept £185. Tel: (Hoddesdon) 0992 443627 evenings and weekends.

Acorn Atom 12K RAM, 12K ROM, PSU, manual leads, Magic Book and listings, still boxed. Also invader tape, £90. Tel: (0532) 563575.

TRS-80 Model III 48K plus CTR-80A recorder plus software catalogues games cassettes, full documentation, £550 on. Powerful home or business computer. Tel: Mansfield 758910.

Lynx 48K, excellent condition, plus book, two games and newsletter, still under guarantee, £185 on. Tel: 01-735 4861 Ext. 69 (day), 01-656 2897 (evenings).

Dragon 32 plus CGP 115 printer plus over £70 worth of software, mint condition. Cost £430, will sell for £355 on. Tel: 01-883 2381 after 6pm.

Apple II Z80 Card, £50, CP/M 2.2 with Microsoft Softcard Manual, £60. Copying Software Locksmith 4.1, nibbles away and back-it-up, £20. John 128A, High Street, Orpington, Kent. Tel: Orpington 23903 (day).

Vic-20 computer, 16K cartridge, C2N cassette, books, 3 cartridge games, 5 cassette games, excellent condition. Cost £396, £180 on. Tel: 01-808 0096.

Oric 48K, brand new replacement machine, boxed, complete with £19 software: Xenon, Invaders, Mushroom Mania. Moving house. Only £130 incl carriage. Tel: 0255 429984. Bargain.

ZX81 16K computer with 20 games plus 15 magazines, every item with the computer, 9 months old. £65 for quick sale. Will sell separately. Tel: 01-504 7203.

Apple II Europlus 48K, monitor, manuals, books and £200 worth of games on tape and disk, still under guarantee, £575. Tel: Chester 380082.

Tandy PC1 pocket computer, complete system with printer, cassette interface, software, batteries, mains adaptor, charger. Cost £150 now. Now at less than half price — £69. Tel: Bristol (0272) 635419.

Voyager 1 (1 tape only), 3-D Spacestation maze, graphic adventure, 4 levels, 120 rooms robots in pursuit, shuttle craft, nuclear generators etc. Colour and sound runs on Atari (32K), Apple II (32K), Pet CBM (32K), TRS 80MoDI+III (16K), £9.50. Tel: Mike Bolton 593313.

TI99/4A modules for sale. Tombstone City, the Attack and Hunt the Wampus. All immaculate, original packing, £8 each. Tel: Brian on 0501 70347.

Dragon 32 complete, manual, books, magazines, joysticks, cassette recorder, software worth over £200 included. Total value over £500. Asking £200 on. Contact Harry on 01-727 6956 for further details.

PCN Billboard

Wanted Sharp MZ80B secondhand software, especially any business. Offers. Tel: Richard on Camberly (0276) 61948 after 8pm.

Acorn Atom 12K + 8K + PSU, in very good condition, £100. Tel: John on Cambridge 841226 after 5pm.

Vic-20 + 16K, 3K, speech synth, Gorf cartridge with over 150 games, £250. Tel: Martin on New Milton 618216.

Spectrum 48K printer, programmable joystick plus interface, Sony recorder plus software worth £100. Cost £325 new. Accept £225 the lot. Tel: 041-637 0808.

Lynx 48K, excellent condition, includes rebus button, still boxed with all leads and cassettes, £195. Tel: Andrew on Newark (0636) 79786.

Centronics 761 teleprinter RS232 300 baud interface, 80/132 column, full documentation, excellent condition, £250. Modem 2A in good order, £40. Both collect. Tel: (0242) 27588.

Mattel Intellivision plus 23 cartridges: Pitfall, Star Strike, TRCM, Dungeons and Dragons, Lock'n Chase Space Armada Skiing etc. Worth £560+, £250 on. Tel: Pudgey 561760.

Sharp 1500 with CE150 printer/interface, CE153 software board, CE155 8K RAM module with all manuals and several business programs. Bargain at £300. Tel: Huntingdon 830505.

Atari Software: Disk cartridge and cassette. Most under half price. Over 30 titles including Donkey Kong, Qisc Skyblazer and SAM Speech Synthesiser. Tel: Quorn 413745 after 4.30pm.

Pair of Memorex 552 8" dual sided disk drives, as new, £320 on the pair. Will separate. Tel: Mike on Guildford (0483) 38177.

Texas TI994/A, seven weeks old, four modules including Chess, Parsec, seven cassettes, joysticks, £235. 3 Newbury Road, Houghton Regis, Dunstable, Bedfordshire. Tel: 0582 863606.

ZX81 16K, Bipak sound unit, m/c book, £90. Quality software, all for £55 on. May split. Tel: Richard on (Birmingham) 021-308 5201.

Atari 400 recorder, Basic, two joysticks, Protector II, Submarine Commander, Airstrike, Jumbojet Pilot, Picnic Paranoia, Galactic Chase, Ghost Hunter Zaxxon. Worth £500. Accept £275. Tel: Stourbridge (03843) 75141 evenings.

16K ZX-81 manual and leads, Filesixty keyboard, software including Pimania, Winged, Avenger, Galaxians, M. Orwin cassette (4), etc. £80 on. Tel: Paul on Motherwell 63421 for details.

Vic-20, nearly new, plus C2N, nine tapes, including Gridrunner, Annihilator, Crazy Kong, 16K Rampack, Competition joystick. Worth excess £300, will

accept £250. Tel: John Tudor on Lyndhurst (Hampshire) 2446.

ITT 2020 48K AppleSoft Basic, £300. DS disk drive plus controller, £300. £550 together including lots of software. Tel: Robin on (0323) 639351 (day).

Spectrum software to swap. Don't be bored with your same old games, swap them with mine — 16K or 48K. Tel: Vicki on Potters Bar 53596.

Newbrain Model A virtually unused, £205 includes beginners guide, printer cable and manufacturers warranty. Rob, 41 Woodhouse Lane, Sale, Cheshire M33 4JZ. Tel: 061-969 3223.

Vic-20 + C2N cassette + "Introducing Basic", "Gortek", loads of books, magazines, cassettes, cartridges, nine months guarantee, as new, £130 on. Tel: 01-958 8789.

Bargain 16K ZX81 plus £90 of best software for only £90 on. Tel: Simon on 01-202 7798 after 5pm.

BBC Model B, new 1.20S with £300 of the best and latest software, £370 on. Can deliver to your door. Tel: 074574 796.

Spectrum 48K complete with tapes and books, still in guarantee until March '84. Worth £192 new, sell for £100. Tel: 01-262 0468 after 6pm.

Atari 800 48K, Basic cartridge, manual and 410 programme recorder, still under guarantee, £240. Software and books negotiable. Tel: 01-555 5559.

Oric software, 16K RAM pack, clicky keyboard, cassettes: Avenger, Catacombs, Night Gunner, Scramble, Asteroids, Fantasy Games 2, Sell £45 on. Wanted Spectrum. Tel: 0925-382393 mon-fri 7-9.00pm.

Texas TI99-4A software for unexpanded machine, seven separate cassettes would cost £20, will sell for £15 or separately for different prices. Tel: 01-940 3531 evenings.

BBC model B, OS1.2, Basic2, DFS, Veng, BCPL, other software, 400K disc drive with Dyan discs: all for £800. Tel: 0245-58863.

Newbrain model A, power and cassette leads, manual, beginner's handbook and cassette. Tel: 01-304 4772, £190 on.

PET 32K, cassette deck, toolkit, dustcover plus much literature. All in excellent condition. Quick sale needed therefore only £295. Tel: 0632-618804 late evening.

Oric 48K with software and carrying case. Tel: (Weybridge) 41869, £130 on o.n.

Monitor Tandy TRS 80 model 1110V, but works perfectly on 240V with small transformer £30. Tel: 01-839 7453 day-time 01-720 3445 evenings.

TRS-80 LII 16K with monitor, recorder, leads, manuals, books and cassettes. Price £275 on. Tel: Birmingham 021-444 8688 after 6.30pm.

Swap Atari 400 + Basic and new Colour Genie both 16K with manuals for 48K Atari 800 under guarantee. Tel: 06285-20128.

Atari 400 (48K), cassette, disk drive over £550 of software and books. Worth over £1,160, will accept £825. S. Batchelor, 269 Walsall Road, Perry Bar. Tel: Birmingham 356 4650.

Spectrum 48K three months old plus software Jetpac, Frogger, Avenger, Starfire, Flight Simulation, cost over £150, sell for £100. Tel: 01-998 9509 after 5.30pm.

Atari VCS cartridges, all working. Basketball 88, Superman, Space Invaders £17 each, Air Sea Battle, Adventure, Video Chess £14 each. Tel: (0202) 43225 evenings.

Wanted Dragon 32 users for the Slough users Group, Free entry. Tel: John on Slough 35268.

Dragon 32 under guarantee, boxed, with cover, over £50 software including Computavoice, the King plus two joysticks and cartridge expander 'Hi-Res'. Only £189. Tel: Leyland 23864.

Dragon 32 software, half price, Evictor (Wizard), Golf (Apex), Nightlight (Salamander), Jerusalem Adventure (Microade). All originals and in perfect condition. £13.00. Tel: 051-430 6153.

Tandy Linewriter, VII, still boxed (similar Seikosha GP100), Centronics and RS232 interface, perfect, ideal BBC. Dragon Tandy, £135. Tel: Hemel Hempstead (0442) 67918 (eves).

Texas TI99-4A 16K + joysticks, cassette leads, Basic tutor, Connect Four cartridge, manuals, still under guarantee for eight months, £100. Tel: Jim 0202-518828.

Vic-20 tape deck, 16K, super expander, machine code monitor, Jelly Monsters cartridge, introduction to Basic 1, lots of games, £220. Tel: Nelson (Lancs) 691281 after 6pm.

TI99-4A modules, Parsec £15. Munchman £15. Tombstone City £12. Attack £5. Teach Yourself Basic cassette £5. Winging It £5. Decathlon £3. Tel: Huddersfield (0484) 603337.

Wanted any adventure for Spectrum by Digital Fantasia. I have programs to swap or will consider purchase. Contact Graham Tel: Crawley (0293) 541988.

BBC model B with 1.20S, £380 including 12 games cassettes worth more than £100 free. Also cassette and user guide. Tel: (0484) 842165.

BBC micro model B with 1.20S boxed as new, hardly used, complete with manuals etc., and BBC Basic programming book, £355. Tel: Tony 041-636 1239 (Glasgow).

ZX81 and 16K RAM and mags — £30, Vic-20 and cartridge — £105, Atari cartridges — £40 for six inc. Missile Command, Vic-Panic and Gridrunner — £10. Tel: David on 01-767 7341.

Dragon Skiing cartridge. Swap or sell for £18 on o.n. Tel: Abergelle 823630 STD 0745.

80 Column Osborne with monitor and Epson FX80 printer, both still boxed £1600. Will split. Tel: 0707 55700 (ev), 01-440 5432 (day).

Teletype model 43 printer, nice machine, cost £1,500 three years ago, £150 on a.k. Tel: 0959-34308.

Atari, backup any disk with happy disk modification. Fits 810 disk drive as advertised. Antic analog four months old £1200 on o.n. Clive work Tel: 01-248 5140.

Wanted ZX Spectrum 16K for around £60, or 48K for around £80. Tel: 01-574 4122 between 5pm-9pm.

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SOFTWARE

	Price inc vat	Machine/Operating System	Other versions	Title	Memory required	Media Supplied			Hardware Required			Publisher/Distributor	Comments
						Cassette	Disk	Cartridge	Mail order avail.	Disk drive	Joystick		
BUSINESS													
Accounting	£3,320	Apple II	●	Financial Controller	48K	●	●	●				S1	Also on Apple IIE. 8 modules (£402.50 each) — sales, purchase, invoicing, etc.
	£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	●	●	●				G1	Contains accounting system modules plus invoicing + stock.
	£172.50	Apple II	●	Micro-General Ledger	48K	●	●	●				I1	Also on ITT 3030 and Basis 108. Goes through profit/loss + balance sheets.
	£402.50	Apple II	●	Nominal Ledger	64K	●	●	●			●	J1	Also on Sirius, IBM PC, Apple III + UCSD. Requires 132 column printer.
	£431.25	Apple II		Payroll	48K	●	●	●				C1	Supports weekly, monthly, + per monthly. Up to 350 employees per disk.
	£402.50	Apple II	●	Purchase Accounting & Cost Control	64K	●	●	●			●	J1	Requires 132 column printer, also Sirius, IBM PC, Apple III, UCSD.
	£402.50	Apple II	●	Sales Accounting System	64K	●	●	●				J1	Also on Sirius, IBM PC, UCSD. Provides conventional ledger.
	£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.
	£2,052.75	Commodore 8000		Data-Lex	32K	●	●	●				D1	Designed for solicitors + others who need to separate office & client's accounts.
	£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.
	£2,900	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.
	£1,437.50	CP/M		Aurora Integrated Accounting Package	64K	●	●	●				G1	Five stand alone modules. Sales, invoicing, purchase, nominal and stock.
	£2,760	CP/M		Boss	64K	●	●	●				F1	Seven stand alone modules. Can link to Autowriter & Autoindex.
	£805	CP/M	●	Cash Book Accounting	64K	●	●	●				S2	Also on CP/M-86 and MS-DOS. Amalgamation of sales, purchase & nominal ledger.
	£2,900.00	CP/M		dBFlex	48K	●	●	●				E1	Open item six module accounting system. (£575.00) per module. Works with dBase II.
	£402.50	CP/M	●	Exact	64K	●	●	●				S3	Also on MS-DOS. Includes six modules — invoicing, ledgers, stock and payroll.
	£1,840	CP/M	●	ISBS-S	48K	●	●	●				G2	Also on CP/M-86. Contains seven modules.
	£2,271.25	CP/M	●	Multi-Index	64K	●	●	●				B1	Also on MP/M & PC-DOS. Contains five modules. Sales, nominal, VAT & stock control
	£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 inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied			Hardware Required		Publisher/ Distributor	Comments
						Cassette	Disk	Cartridge	Disk drive	Joystick		
	£45.42	Sharp MZ80A	●	Easy VAT	48K	●	●	●	●	●	K1	Also on Sharp MZ80B & M200K. VAT record system.
	£2,460	MS-DOS	●	Hai-line Integrated Accounting Suite	64K	●	●	●	●	●	H6	Also available on PC-DOS, HAI-BAS, CP/M.
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	●	Cydepress Clients Recoverable Costs	48K	●	●	●	●	●	C7	Also on Rair Black Box. Designed to keep record of incurred expenditures.
	£1,121.00	Apple II	●	Cydepress 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	●	Bisucalc	16K	●	●	●	●	●	S5	Also on Hytec & ICL PC. 96K version available. Helps decide on financial strategy.
	£188.60	Apple II	●	VisiCalc	48K	●	●	●	●	●	P1	Also on Apple III, Commodore & IBM PC, etc. The classic spreadsheet.
	£345.00	CP/M	●	Bottom-Line Strategist	48K	●	●	●	●	●	R4	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	64K	●	●	●	●	●	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	●	PADA/C	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 in 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	●	●	●	●	●	B2	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.

Management	£226.16	CP/M	●	Scratch Pad 3.0	48K	●	●	●	●	M4	Also on CP/M 86, MS-DOS & PC-DOS. Spreadsheet using virtual memory.
Medical	£517.50	Apple II	●	Medical System	48K	●	●	●	●	A2	Also on Apple IIE, III & Sirius (£573.85). On hard disk. Age/sex register.
Office Information	£402.50	Apple II	●	Prophet II	48K	●	●	●	●	A4	Also on IBM PC & Corvus Concept. Information system which acts as a noticeboard.
Payroll	£69.00	Apple II	●	Payroll	48K	●	●	●	●	H1	Also available as cassette for Spectrum ZX81 (£25.00). Needs printer.
	£287.50	Apple II	●	Tabs Payroll	48K	●	●	●	●	T3	Also on CP/M & MS-DOS (64K). Up to 2000 employees, nine pay schemes.
	£977.50	CP/M	●	Powerday	48K	●	●	●	●	O2	Also on MP/M & MS-DOS. Integrates with Omicrons nominal ledger. Handles SSP
Project Management	£747.00	IBM PC	●	Micronet	48K	●	●	●	●	T2	Also on ICL PC, Sirius, Superbrain, Apple II, & others. Critical path analysis.
Project Planning	£1,150.00	Commodore 8000	●	Hornet	32K	●	●	●	●	C3	Has eight optional variants (all eight £4,025). Network logic & variety of screen display.
Property Management	£517.50	Apple II	●	Property Management System	48K	●	●	●	●	A2	Also on Apple III, Apple IIe & Sirius. Prints rent reminders, demands etc.
Purchase Ledger	£287.50	Apple II	●	Tabs Purchase Ledger	48K	●	●	●	●	T3	Also on CP/M & MS-DOS (64K). Open item ledger — automatic payment facility, etc.
	£805.00	CP/M	●	Powerbought	48K	●	●	●	●	O2	Also on MP/M & MS-DOS. Integrates with Omicron's Nominal Ledger System.
	£14.95	Spectrum	●	Purchase ledger	48K	●	●	●	●	K6	Meets all accounting, auditing and VAT requirements.
Sales Ledger	£287.50	Apple II	●	Tabs Sales Ledger	48K	●	●	●	●	T3	Also on CP/M & MS-DOS. Part of integrated system. 300 analysis codes.
	£805.00	CP/M	●	Powersales	48K	●	●	●	●	O2	Also on MP/M & MS-DOS. Multi-user system based on mainframe software.
	£325	DEC Rainbow 100	●	Sales Ledger System	64K	●	●	●	●	D2	Also on DEC Mate II. Invoicing & monthly statement generating system.
	£14.95	Spectrum	●	Sales Ledger	48K	●	●	●	●	K6	Up to 250 accounts.
Sales Order Processing	£805.00	CP/M	●	Compact Sales Order Processing	64K	●	●	●	●	C2	Also on CP/M 80, 86 & MS-DOS. Comes on hard disk. Control, stock, ledgers.
Sales, Purchase, Nominal Ledger	£1,207.50	CP/M	●	Compact Sales, Purchase & Nominal Ledger	64K	●	●	●	●	C2	Also on CP/M 80, 86 & MS-DOS. Follows standard accounting procedures.
Sick Pay	£80.50	Apple II	●	Statutory Sick Pay (SSP)	48K	●	●	●	●	H1	Also on Spectrum. Does all SSP calculations.
Statistics	£172.50	Apple II	●	Inter-Stat	48K	●	●	●	●	G1	Also on Basis 108 & ITT 3030. Needs printer.
	£287.50	Commodore Pet	●	Statistical Package for PCs	32K	●	●	●	●	P7	Also on Commodore 64 (two modules at £99 each) & Sirius. Fully interactive.
	£9.20	Sharp MZ80A	●	Statistical Analysis	48K	●	●	●	●	K3	Also on MZ80K. Calculates mean & standard deviation for up to 100 items.
	£15.00	Sinclair ZX81	●	Critical Path Analysis (CPA)	8K	●	●	●	●	H1	Also on Spectrum (16K). Activities entered & standard from arrow diagram. Finds critical path.
	£977.50	UCSD-P System	●	Trend Plot	128K	●	●	●	●	P5	Needs Hewlett Packard plotter. Developed to analyse historical time series data.
Stock Control	£3,289	CP/M	●	M-SIS	48K	●	●	●	●	T2	Stock control system for manufacturing industry.
	£33.92	Newbrain	●	Stock Control 40/4	32K	●	●	●	●	E2	Stores large quantities of stock, accumulates new stock levels & checks stock level.
	£25.00	Sinclair Spectrum	●	Stock Control	48K	●	●	●	●	H1	Also ZX81. Fast fwd/add/delete item. Prints complete or selective lists & total value.
	£14.95	Spectrum	●	Stock Control	48K	●	●	●	●	K6	Over 500 items per file.
	£12.50	Sinclair Spectrum	●	Stock Controller	48K	●	●	●	●	D5	Can be used with or without ZX printer.
Word Processing	£92.00	Apple II	●	Piewriter	48K	●	●	●	●	M5	Needs 80 column card. Allows entry, editing & print formatting of any text type.
	£125.35	Apple II	●	Wordhandler	48K	●	●	●	●	P4	Word processor for the non-professional — minimum Apple system.
	£152.95	Apple III	●	Apple Writer 2	48K	●	●	●	●	P6	Also Apple II. Has word wrap, glossary & word processing language.
	£28.50	BBC Model B	●	Alphabeta	32K	●	●	●	●	H3	Also available on disk. Suitable for home & business.
	£10.50	BBC Model B	●	Word Pro	32K	●	●	●	●	I4	Includes DELETE, INSERT, SAVE, Date etc.
	£90.85	Commodore 64	●	Infomast	64K	●	●	●	●	R2	Combined programmable word processor, Database and calculator.
	£89.00	Commodore 64	●	Paperclip	64K	●	●	●	●	K5	Also Commodore 8000. Compatible with WordPro & SpellPro.
	£488.75	Commodore 8000	●	Wordcraft	32K	●	●	●	●	D1	Also on SuperPet, Sirius 1, IBM PC & CBM 64. Routine correspondence, mailing, etc.
	£51.75	Commodore Pet	●	Papermate +	16K	●	●	●	●	S5	Also on Commodore 64, 3, 4, & 8000. Available on floppy (£53.49).
	£145.00	CP/M	●	Mail Merge	64K	●	●	●	●	X1	Also on CP/M 86 and PC-DOS. An optional MERGE, PRINT, extra for Wordstar.
	£295.00	CP/M	●	WordStar 3.3	56K	●	●	●	●	M10	Also on IBM PC, MS-DOS. Integrates with CalcStar, InfoStar, Mail Merge, SpellStar.
	£287.50	CP/M	●	Peachtext	48K	●	●	●	●	P1	Also MP/M & MS-DOS. Needs high quality printer. Contains proof reader.
	£339.00	CP/M	●	Perfect Writer/Speller	64K	●	●	●	●	S3	Also MS-DOS & Apple DOS. Contains quick reference card.
	£431.25	CP/M	●	Select Word Processing System	64K	●	●	●	●	B1	Also MP/M & PC-DOS. Screen-oriented system.
	£316.25	CP/M	●	Spellbinder	48K	●	●	●	●	E1	Also on Oasis. Word processing & office management system.
	£333.50	CP/M	●	WP2020	48K	●	●	●	●	G2	Menu-driven, machine independent. Set of key-tops provided.
	£225.00	IBM PC	●	Easywriter II	64K	●	●	●	●	X1	Bold face & underscoring on screen. 80,000 word spell checker extra (£43.15).
	£340.40	IBM PC	●	VisiWord	64K	●	●	●	●	R6	Mail merge facility with Visi file.
	£339.25	MS-DOS	●	WordStar	128K	●	●	●	●	A1	Also on CP/M. Needs printer. Complete screen-based WP.
	£40.25	Newbrain	●	Word Processor 40/12	32K	●	●	●	●	E2	Automatic word wrap, editing, saving paragraphs, deleting.
	£325.00	OS9	●	Stylograph	32K	●	●	●	●	S6	Expandable system with modular design.
	£45.42	Sharp MZ804	●	Wordpro	48K	●	●	●	●	K1	Also on MZ80B + K. Available on disk (£91.94). One of few WP packages for Sharp.
	£49.95	Tandy TRS 80 I	●	AJ Edit	32K	●	●	●	●	M6	Also on Genie I & II. Needs printer.

EDUCATION

Basic Course	£13.95	Texas Instruments 99/4A	●	Teach Yourself Extended Basic	16K	●	●	●	●	T5	Needs extended Basic module.
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	Price inc. Vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied			Hardware Required			Publisher/ Distributor	Comments
						Cassette	Disk	Cartridge	Mail order avail.	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	●	Face Hanger	48K		●		●	●		P4	Also on IBMPC. 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	●	Multilinguist	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	CP/M	●	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.
GAMES													
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 MZ80A. '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		Atlantis	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 PCN 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'.
	£21.95	TI 99/4A		Parsec	16K	●	●	●	●	T5	'Increasingly difficult. After four onslaughts pass through to next stage'.
Flight Simulator	£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 inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied			Hardware Required			Publisher/ Distributor	Comments
						Cassette	Disk	Cartridge	Mail order avail.	Disk drive	Joystick		
	£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'.
Maze type	£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'.
Pacman Type	£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		Scarman	32K	●		●				M12	'Based on Pacman'.
	£4.95	Spectrum		Gnasher	16K	●		●				R3	Joystick optional. 'Based on Pacman using Beano characters'.
Pool	£8.50	BBC Model B		Billiards	32K	●		●				H3	Available on disk. 'A game for all ages'.
Racing	£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'.
Science Fiction	£19.95	Apple II		Lunar Leeper	16K		●		●			S12	Reviewed in PCN week ending April 22.
Shooting	£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'.
Space	£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		Schizoids	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'.
Space Invader type	£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. After every two screens a new character appears'.
	£3.95	Sinclair ZX81		Invaders	4K	●		●				S9	'Based on Space Invaders'.
Sport	£33.35	IBM PC		Decathlon	64K	●	●		●		●	I3	Needs colour graphics adaptor & direct drive colour monitor. 'For up to six players'.
Strategy	£7.95	Dragon 32		Wizard War	32K	●		●				S7	Reviewed in PCN week ending April 8.
Variety	£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'.
Various	£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 Kalmir	16K	●		●				A8	'The aim is to retrieve a chalice from a temple'.
Clubs and Sports	£78.00	Sharp MZ80A		Clubman	48K	●		●				S8	Golf handicapping and competition results system complying with 1983 regulations

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

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 of 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 async 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	●	Infomex Database System	48K	●	●	●	I1	Database system which can be used to & update info on any type of record.
	£402.50	Apple II	●	Mallist	48K	●	●	●	A4	Also for IBM PC & Corvus Concept. Requires hard disk. A networking product.
	£96.60	Apple III	●	PF5: 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	●	Filer	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 Calstar.
	£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 I16	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	Sinus, 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 CIS-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 & few 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.
	£50.60	CP/M		CP/M Graphics	64K	●	●	●	D4	Range goes up to £421.70 & conforms to GKS Graphics Standard.
Language	£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-compat 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 PC/N week ending April 8. Pascal compiler and screen editor.
	£421.70	Any 8 or 16 bit machine		PL1	48K	●	●	●	D4	A compact implementation based on ANSI standard general purpose subset of PL/1.
	£350.75	IBM PC	●	Lattice-C	64K	●	●	●	L1	Also on MS/DOS. C' Compiler for 16 bit machines — full implementation & execution.
	£172.50	UCSD p-System		UCSD Pascal	48K	●	●	●	D4	Portable Pascal for systems development or commercial applications.
Linker	£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 MC6800/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 Televideo 802. Enables automatic sending-receiving or telex by micro.
Testing Tool	£95.82	CP/M 80	●	Diagnostics II	32K	●	●	●	M4	Also on CP/M-86 and MS/DOS. Tests systems.
Time Recording	£862.50	Commodore 8000	●	Minuteman	32K	●	●	●	C4	Also on Commodore 4000. Time recording system. Can produce range or reports.
	£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.
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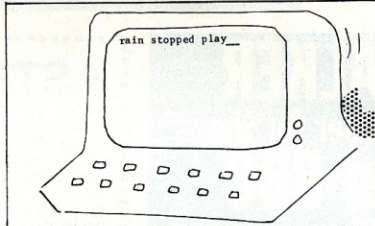
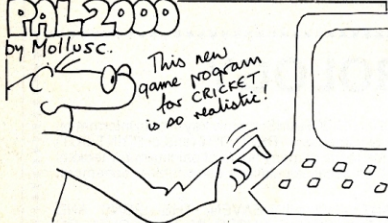
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Tandy PC1 hunters may have noticed that the phone number we printed in a Billboard ad did not connect you with a Tandy PC1 seller. The number fell foul of a printing error; it should have been Bristol (0272) 735419.

Come in Kaminiski

Anyone calling the number given for Tony Kaminiski at Couchmead Communications (last week's Datelines) may be wondering why the number is that of a school. Apparently the old number of 01-788 1102 has been changed to 01-633 1102.

Oric attains ovality

Did you hear the one about Oric's disks?
— They're oval. Oric used an Oric to design them.

NEXT WEEK

Face to Interface — Sinclair's slot-in Interface 2 Pro-Tested.

Conquistador Cortex — A close-up on CW/P's micro.

Good Friday? — d Base II tamed for easy office use.

Gameplay — PCN gives a perspective on the new-look 3D games.

Micropaedia — Part Four of the pull-out programming course.



If you were sharpening your wit for the last laughline contest don't put it away or let it go rusty — have ago at this one. The gentleman framed by the printer silencer is Dick Sheppard, sales director of Action Computer Supplies. If you could hear him, what would he be saying? Send us your suggestions and we'll send £20 for the funniest. Entries by October 27 to PCN, laughline, 62 Oxford Street, London W1A 2HG. The result will be published in issue 35.

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
COMPEC Computer Graphics European Conference & Exhibition	November 15-18 October 17-20	London Olympia Wembley Conference Centre	Reed Exhibitions, 01-643 8040 Online Services, 09274 28211
International Business Show Microcomputer or Word Processor? Computer Open Day Exhibition	October 18-26 October 20 October 27	NEC, Birmingham Piccadilly Hotel, Manchester Park Hotel, Cardiff	Beta Exhibitions Ltd, 01-405 6233 IWP Association, 01-242 8699 Tony Kaminiski, Couchmead Communications Ltd, 01-633 1102 Brian Sheldon, 0524 61831
Lancaster & Morecambe Computer Club Open Day Software Expo	October 29 November 8-10	Lower Town Hall, Lancaster Wembley Conference Centre, London	Intero, 01-948 3111
Malvern Micro Fair	November 12	Malvern Winter Gardens, Worcestershire	Personal Computer Fairs, Worcester 22659
Manchester Apple Village Humberside Computer Fair	November 13-16 November 20	Belle Vue, Manchester Winter Gardens, Cleethorpes	Database Publications, 061-456 8383 Jenson Lee, Grimsby Computer Club, 0472 42559

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Computer Systems International Trade Fair & Congress Computer Technology Exhibition	October 17-21 October 18-21	Munich, West Germany Kuala Lumpur, Malaysia	ECL Exhibition Agencies, 01-486 1951
Asian Personal Computer Hardware & Software Show	October 19-22	Hong Kong	Conference & Exhibition Management Services SDN BHD, 9-A Jalan SS24/8, Taman Megah, Petaling Jaya, Selangor. ECL Exhibition Agencies Ltd., 01-486 1951

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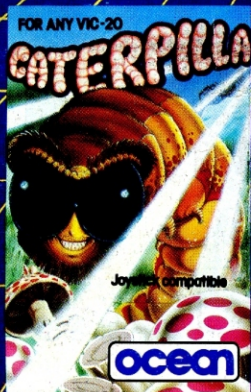
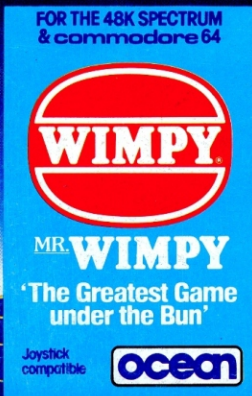
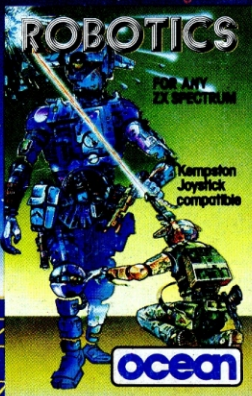
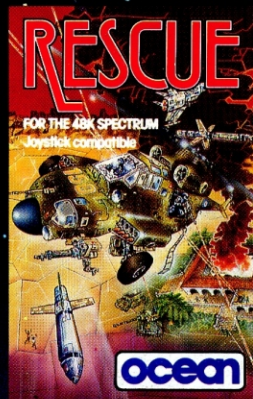
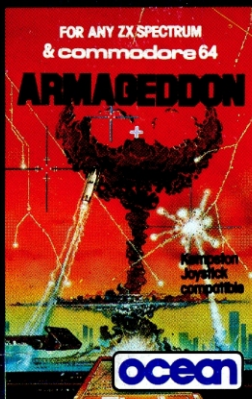
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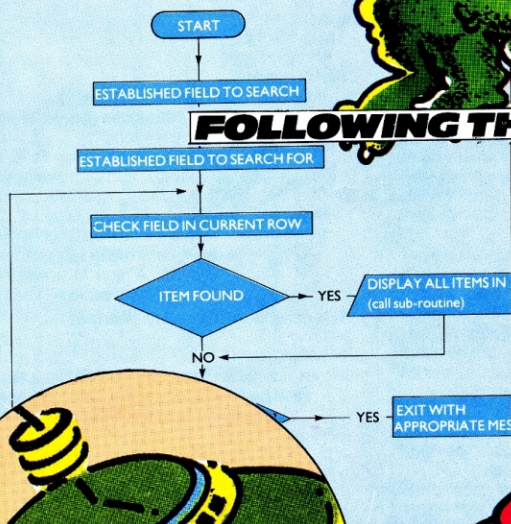
micropaedia

Vol 11 Part 3

BUGS BEATEN AND BANISHED

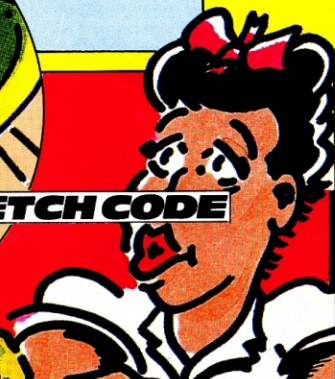


In Part 3 of Everything You Always Wanted to Know About Programming... But Were Afraid to Ask, we introduce you to arrays, show you how to follow flowcharts and add to your sketch code skills.

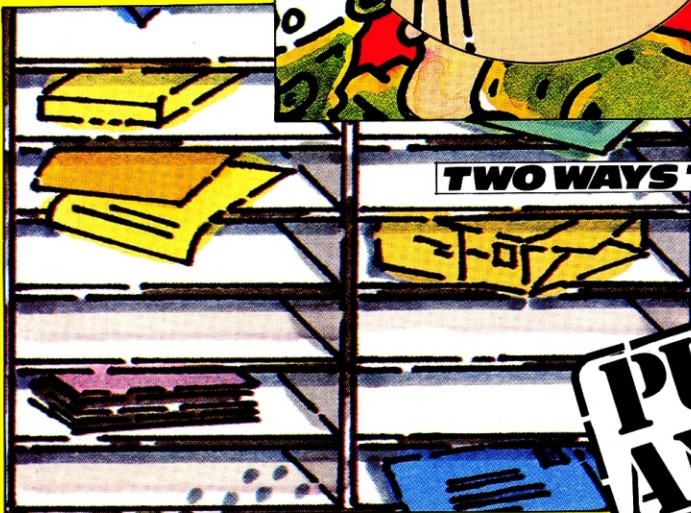


FOLLOWING THE FLOW

SPACESHIPS AND SKETCH CODE



TWO WAYS TO ARRAY



PULL OUT AND KEEP

ACTIONS AND OBJECTS

Last week you saw how the English language could be used to describe in outline the events in a program. This week we discuss the similarities between the actions (verbs) in a program and the objects (nouns).

We'll use the same type of 'sketch code' programming as last week to describe the elements that make up this form of design.

Something not often realised about so-called 'natural' languages is that we draw an artificial distinction between actions and objects. A distinction which is all the more absolute by virtue of its being unmentioned.

Considered as 'events', both actions and objects are identical. That is, as time passes, they 'occur'.

Since we have shown that a program may be quite adequately described in a natural language (English in this case), it is not impossible to apply identical rules to data. If you apply this principle to data-structures what can you do, if you use the best, most elegant, and correct grammar to describe it?

Well, look at this, for example... a restatement of the job originally given. First we will separate everything which is concerned with describing data-objects into one place, leaving all the actions until later.

Cobol programmers will recognise the technique, it's the old DATA DIVISION again. Pascal, PL/1, Ada and C programmers will recognise it as a declaration, but Basic has never heard of the idea.

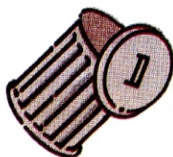
LOGIC OF THE LANGUAGE

Begin:

There are things called:

Object, Type,
and lists called:

- Position, with two values (X, and Y),
- Application, with three values (Game, Mouse, Editor),
- Ikons, with some values (empty),
- Cursors, with four values (Flashing, Solid, Underline, Query),
- Things Like Spaceships, with some values (empty),
- Channel, with four values (Keyboard, JoystickX, JoystickY, Mouse),
- Reply, with four values (Key, JoyX, JoyY, Squeak),
- Move which has four lists called Directions (Up, Down, Left, Right), each being two lists called Key and Squeak, each being lists with three parts ("Q", "W" and "E"), ("E", "D" and "C"), ("C", "X" and "Z") and ("Z", "A" and "Q")), and ((8, 1 and 2), (2, 3 and 4), (4, 5 and 6) and (6, 7 and 8)), and a number called Bias value (-1, +1, -1, +1).



/* This could be written more clearly as:

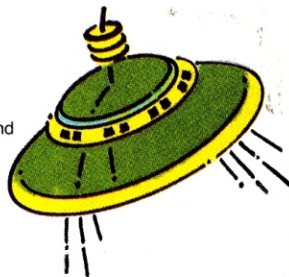
Move which has

- four lists called Directions (Up, Down, Left, Right),
- each being two lists called Key and Squeak,
- each being lists with three parts

- ("Q", "W" and "E"),
- ("E", "D" and "C"),
- ("C", "X" and "Z") and
- ("Z", "A" and "Q")),
- ((8, 1 and 2),
- (2, 3 and 4),
- (4, 5 and 6) and
- (6, 7 and 8)),

and

and a number called Bias value (-1, +1, -1, +1).



or maybe:

Move which has four lists each being two lists, (each of which are lists with three parts), and a number, called Directions ((Up, Down, Left, Right), (Key ("Q", "W" and "E"), ("E", "D" and "C"), ("C", "X" and "Z") and ("Z", "A" and "Q")), and (Squeak, ((8, 1 and 2), (2, 3 and 4), (4, 5 and 6) and (6, 7 and 8)), and Bias (-1, +1, -1, +1).

which would be written more clearly as:

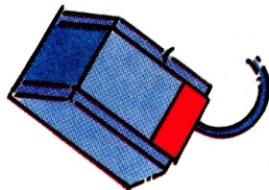
Move which has four lists each being two lists, (each of which are lists with three parts), and a number, called

Directions ((Up, Down, Left, Right),

- (Key ("Q", "W" and "E"),
- ("E", "D" and "C"),
- ("C", "X" and "Z") and
- ("Z", "A" and "Q")),

- and (Squeak, ((8, 1 and 2),
- (2, 3 and 4),
- (4, 5 and 6) and
- (6, 7 and 8),

and Bias (-1, +1, -1, +1).



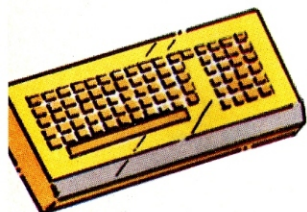
both of which are effectively the same as:

Move	Up	Key	("Q", "W" and "E")
		Squeak	(8, 1 and 2)
		Bias	-1
	Down	Key	("E", "D" and "C")
		Squeak	(2, 3 and 4)
		Bias	+1
	Left	Key	("C", "X" and "Z")
		Squeak	(4, 5 and 6)
		Bias	-1
	Right	Key	("Z", "A" and "Q")
		Squeak	(6, 7 and 8)
		Bias	+1



and carrying on with the code

*/



Select the Type from the list Applications
 If Type is a Game: the Object is in the list ThingsLikeSpaceships
 If Type is a Mouse: the Object is in the list Icons
 and default to: the Object is in the list Cursors

loop around is here:
 go to the point given by positions (X and Y) and display the Object. For the number of Channels,
 Reply (number) is what's found in Channel (number).
 If Reply (Key) is "S", repeatedly, Reply (Key) is what's on the keyboard until Reply (Key) is "S" /*
 Loop until "S" is pressed again */
 If the Reply (Key) is not "L" do Orderprocessing, do Anythingelse, and go to Loop around.
 End.

Orderprocessing is:
 For each Move (direction), for Reply (Key and Squeak), if Reply (Reply number) is in Move (Key for
 the Direction) or Reply (which will be JoyY
 if Move (Direction) is UP or DOWN, and JoyX if LEFT or RIGHT) is the same as the Move (Bias for
 the direction) then the Move (Bias for the Direction) to Position (which will be Y if Move (Direction)
 is UP or DOWN, and X if it's LEFT or RIGHT).

/* Or in better English: */
 For each Direction of Movement, for the Replies from Key and Squeak, if the Reply N is in the Keys
 for the Direction of Movement or the Reply (which will be JoyY if the Direction of Movement is UP
 or DOWN, and JoyX if it's LEFT or RIGHT), is the same as the Bias for the direction of Movement
 then add the Bias for the Direction of Movement to the Position (which will be Y if the Direction of
 Movement is UP or DOWN, and X if it's LEFT or RIGHT).
 Go back.

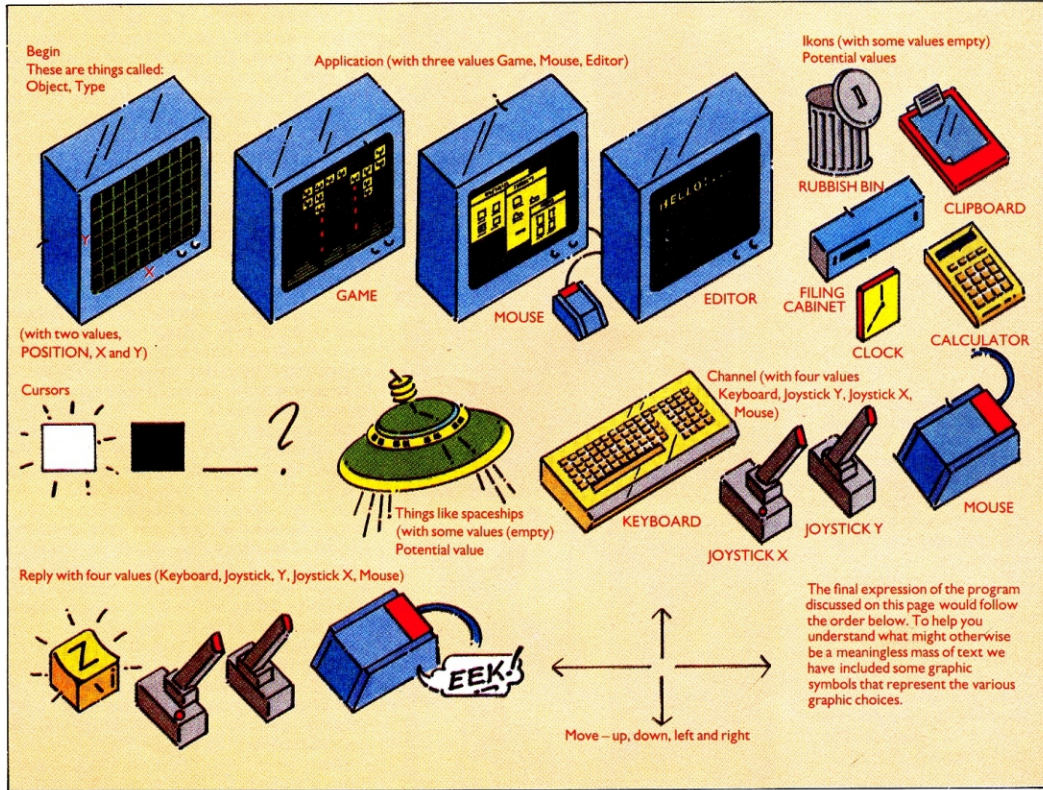
Anythingelse is:
 (the rest of the program goes here)
 Go back.

SKETCH CODE VOCAB.

In the series of diagrams below you'll see what the sketch code program actually looks like. When the code indicates that the computer needs to know about input devices, it actually means keyboards, mice and joysticks. This could, however, be extended to include light pens, track balls and various other ways of communicating with the computer.

Similarly, the computer knows from the program that it must generate either a flashing square, solid square, underline or query when a cursor is required.

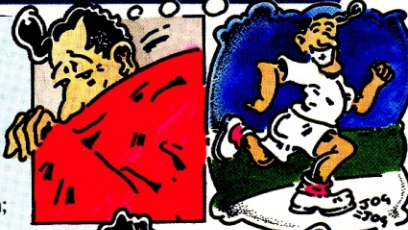
After the terms have been defined in the sketch code, the program can start to do things with them.



PROCEDURE Get up;
BEGIN

Get out of bed;
Put on dressing gown;

END



PROCEDURE Wash;
BEGIN

Wash yourself;
Shave;
Brush teeth;
Comb hair;

END



PROCEDURE Eat breakfast;
BEGIN

Sit down at table;
Eat cereal;
Drink coffee or tea;

END



PROCEDURE Go to work;
BEGIN

Get coat and briefcase;
Kiss wife goodbye;
Leave for work

END



PROGRAM Breakfast;
BEGIN

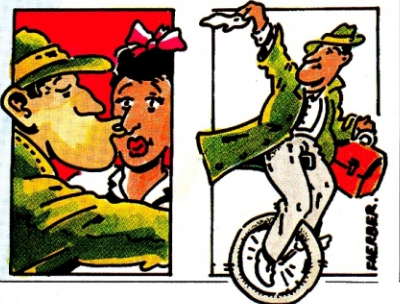
Get up;
Wash;
Eat breakfast;
Go to work

END.



When writing Pascal in pseudo-code, the Pascal words are typed in boldface. In this example, you are shown the modules or "procedures" that comprise the business of breakfast and getting going in the morning.

The four procedures are Get up, Wash, Eat breakfast, Go to Work and then in the main program all those procedures are "called" in the order in which they should be executed. You can see them being called in the "listing" of breakfast, the main program.



GO WITH THE FLOW

This week we continue our investigation of program flowcharts, how you write them and what you do with them, and follow it up with an introduction to algorithms.

■ **Program flowcharts** — So far the types of flowchart discussed, block and system, do not indicate the internal operations of the computer program *ie* the code.

Program flowcharts represent the operations to be carried out by the computer. There are two types of program flowchart — the outline chart and the detailed chart. It's up to programmers whether they wish to use one type or both, but for very large programs it's a good idea to use outline charts, as they will give you a good idea of the subtasks that your program will have to perform.

The outline flowchart is the first stage of turning a systems flowchart into the necessary detail to enable the programmer to write the program. They present the computer operations that are to be performed, but only in general. The standard programming symbols are used, and when the detailed flowchart is prepared, each symbol within the outline flowchart would normally be expanded.

The detailed flowchart represents the last stage of planning before the actual business of writing the program. The detailed charts will contain the necessary steps that the program must take. Note that the detailed flowchart doesn't contain any code in a particular programming language, but statements in English such as set count to 1, Read master file, and so on. The reason for this is to be independent of any particular language, although it is possible to write a detailed flowchart with actual programming statements.

When preparing a flowchart, remember that you should show the necessary detail of the problem to enable you to write code from the final chart. Be liberal with paper and do not clutter it with lines. Look at diagram 2 (page 245), and you can see that connectors have been used instead of flow lines. This makes the flowchart easier to read. Also note that the flow lines have an arrow pointing to the direction that the control is to follow. When writing the flowchart, keep it tidy. Two rules can be followed here.

First, write the chart from the top left of the page, and go down and to the right. Secondly, when branching, draw your flow lines to the right when going down and draw them to the left when going up, diagram 2 shows this with the exceptions of E and I.

When you have completed the flowchart, follow it through. This will show any mistakes,

which can then be corrected *before* any coding is done. Looking at diagram 2, you can see that the loop G could end up with the caller waiting for a long, long time before the phone is answered.

The flowchart also enables you to optimise your code. Diagram two shows us that the process of replacing the receiver has been done twice, at E and K. This is quite inefficient and should be avoided at all costs.

Finally, remember that flowcharts are used to aid and not hinder you. At first, it may seem complicated, but after using them for a while, they can be of great benefit.

Algorithms

An algorithm is quite simply a set of instructions which are used to solve a problem. They have been used by many people for many different reasons for a very long time. The early Greek mathematicians used algorithms to solve problems, and so do you. In fact, any set of instructions can be called an algorithm.

Here is an algorithm to open a door:

- 1) Put hand on handle.
- 2) Grasp handle.
- 3) Turn handle to left.
- 4) Take one step backwards.
- 5) Pull handle towards yourself.

Looking at the algorithm, it is plain to see that it doesn't cover all possible situations. We are assuming that the handle is one that can be turned to the left, and also that the handle is one that can be turned. What the algorithm does do is show the steps involved in opening the door. Notice that instructions 4 and 5 are the ones that actually open the door — saying 'open the door' in instruction 5 would have been ambiguous.

Algorithms can therefore be used to solve problems as far as programming is concerned. Designing good and efficient algorithms can take a long time, but once mastered, will prove invaluable.

We are not concerned with the designing of algorithms in this article, but with the way they are written down for use by the programmer.

The product of writing down an algorithm for use by the programmer is called pseudo or sketch-code. They can be written down in English, Pascal-like code, Basic-like code, or your own method of writing down instructions.

But the problem with the latter is that if everybody writes down an algorithm the way they want to, then it could be very difficult for anyone else to understand it. Therefore two methods have been used frequently.

The first method is to write down the desired processes as a series of numbered steps. These can be written in plain English, and allow the reader to grasp what the algorithm is supposed to do and how it does it. You can write down the steps in any level you desire, but it is best to start from the top and then work down to a level where you can then start to program. The door-opening example is fine for small programs, but when larger problems are being tackled, it's best to define the algorithm as a number of smaller steps. The problem 'Breakfast' shows this quite well.

- 1) Get up.
- 2) Wash.
- 3) Eat breakfast.
- 4) Go to work.
 - 1.1) Get out of bed.
 - 1.2) Put on dressing gown.
 - 1.3) Go to bathroom.
- 2.1) Wash.
- 2.2) Shave (if necessary).
- 2.3) Brush teeth.
- 2.4) Comb hair.
- 2.5) Go to kitchen.
- 3.1) Sit down.
- 3.2) Eat.
- 3.3) Drink coffee or tea.
- 4.1) Get coat and briefcase.
- 4.2) Leave for work.

This method is fairly easy to get used to. It is also fairly easy to abuse. The temptation to start from the lower levels and then work up is great. Avoid it. If you do this then you can end up with a mess when it comes to writing the final code. Working top-down is more structured and modular.

In the box below, you'll see four ways of solving the same problem.

The first method (numbered 10 to 60) is a simple basic program to work out the solution to finding the cosine of numbers between one and ten. The first line is merely a Remark statement, the second a statement to print on-screen the fact that the program will print a number and then the square root of it, the third begins a FOR...NEXT loop to generate the numbers.

The second method is just an English-language six-line description.

The third method is a high-level language program: the one shown in the box below written in Pascal.

```

graph TD
    Start([START]) --> A{{C ← 1}}
    A --> B[/PRINT HEADING/]
    B --> C[/PRINT C, COS(c)/]
    C --> D[G ← C + 1]
    D --> E{C <= 10?}
    E --> C((C))
    C --> E
    E --> F([STOP])
    
```

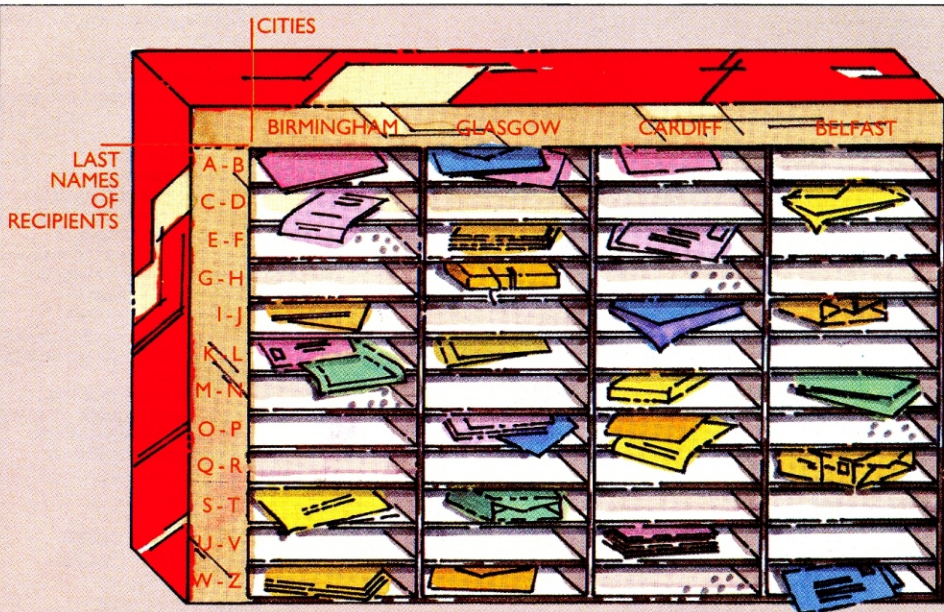
```

10 REM Simple program
20 PRINT "N", "Cosine"
30 FOR C=1 TO 10
40 PRINT C,COS(C)
50 NEXT C
60 END
                
```

- 1) Print message.
- 2) Set count to 1.
- 3) Print number and cosine.
- 4) Add one to count.
- 5) If count less than eleven then step three.
- 6) Stop.

```

PROGRAM Cosine;
VAR c:REAL
BEGIN
WRITE ("Cosine");
c:=1;
WHILE c<=10 DO
WRITE (c,cos(c));
c:=c+1;
END
                
```



Arrays can be easily imagined as a series of rows and columns whose intersections make cells which can hold information, rather like letter-racks.

ARRAY FOR PROGRAMMING

Basic supports two types of arrays — numeric and string. Numeric arrays may only hold numbers, while string arrays contain characters and can therefore be used (by devious means) to hold numbers as well.

To set up an array you use the reserved word DIM. You must also give this word values known, incorrectly, as parameters. These numbers refer to the size of the array you want to use. Such numbers are also called subscripts and allow you to access and manipulate the contents of an array.

It is easiest to imagine arrays in the form of rows and columns, whose intersections make cells which can hold information, rather like letter-racks. Another useful analogy is that of graph-paper, where a single point is referenced by both an X coordinate (column) and a Y coordinate (row). Arrays can have one or more rows and one or more columns. A single row array with four columns can be represented as:

```
Col1:Col2:Col3:Col4
```

```
Row1: : : :
```

To create such an array in RAM you

must give the array a name, RC\$, for example. It should have a size:
10 DIM RC\$(4)

Note that when you give DIM only one number it is assumed to be the number of columns and only one row is allowed. To create numeric arrays, you should leave out the \$ symbol.

This particular DIM statement could be used only once in a program, although you can set up as many arrays as there is room for in RAM. This means that you cannot alter the number of rows or columns once the array has been DIMensioned. String arrays really do gobble up RAM, so keep your arrays as small as possible and CLEAR as much variable storage space as may be needed at the start of a program to avoid 'OUT OF STRING SPACE' or similar error messages.

To set up arrays with more than one row, you need to use two subscripts, row and column, in that order. To establish an array called RC\$, having three by five columns, the statement would be:

```
10 DIM RC$(3,5)
```

This sets up an array which can be shown diagrammatically as in figure 1.

This sort of array is often referred to as a two-dimensional string array, as it must be accessed by two values — row and column.

Each cell of a string array can be thought of as a normal string variable, and can thus usually contain up to 255 characters. But you should check this in your Basic manual and by experimenting, as you may find non-referenced limitations in this area.

To put information into the array you use statements like:

```
20 LET RC$(3,5) = "PERSONAL COMPUTER NEWS"
```

This puts the character string into that cell of RC\$ which is referenced by the subscripts 3,5 — ie row 3, column 5. The following example should make this clear:

```
10 DIM RC$(3,5)
```

```
20 RC$(1,1) = "THIS IS"
```

```
30 RC$(2,2) = "HOW"
```

```
40 RC$(3,3) = "TO DO IT"
```

```
50 RC$(2,4) = "EASILY"
```

This gives the sort of format shown in figure 2. To get the information out, you can simply use PRINT, as in:

```
50 PRINT RC$(1,1)
```

This will display the contents of the cell

specified (ie "THISIS"). Or you can assign the contents of a cell to a string variable as in:

```
60 LET AS = RC$(2,4)
```

AS will now 'contain' the string "EASILY".

To use numbers in string arrays, first convert the number to its string representation:

```
100 X = 99
```

```
110 X$ = STR$(X)
```

```
120 RC$(3,5) = X$
```

Don't forget that a string thus defined will have a leading space if it is positive and a negative sign if it's not (the length of the string made by AS = STR\$(9) is 2 — not 1 as you might expect).

To get numbers out, reverse the process using VAL:

```
200 X = VAL(RC$(3,2))
```

At this point it should be obvious that to access all the columns of a given row we can use a FOR . . . NEXT loop either to put information in or get it out. Thus, if we wanted to see the contents of the cells of row two, we would write:

```
400 FOR C = 1 TO 5 for all columns
```

```
410 PRINT RC$(2,C) print contents of row 2, column C
```

```
420 NEXT next column
```

We don't want to have to repeat this for every row, so we embed this loop in another:

```
390 FOR R = 1 TO 3 outer row loop
```

```
..... inner column loop
```

```
430 NEXT R
```

A string array can be used to set up a simple database which can be sorted and searched. For example, you could set up an array to hold record titles (column one), artistes (column two) and classification, eg pop or classical (column three) to act as an index to a record collection.

The simplest way to get the data into the array is by using READ and DATA statements, although you could have the program ask the user for the information. The DATA statements would take the general form: *line no. DATA title, artiste, classification.*

For example:

```
5000 DATA SOCIAL STUDIES,CARLA BLEY,JAZZ
```

```
5010 DATA DISCIPLINE, KING CRIMSON, JAZZ
```

```
5020 DATA VAUGHAN WILLIAMS CONCERT,ACADEMY OF ST. MARTIN IN THE FIELDS, CLASSICAL
```

Notice that you cannot put commas into the information within the DATA statements because they are reserved to separate each item.

If we have 50 albums, the program could begin like this:

```
10 NR = 50:REM NUMBER OF RECORDS
```

```
20 NC = 3:REM NUMBER OF CELLS PER ROW
```

```
30 DIM RC$(NR,NC):REM SET UP DIMENSION IN RAM
```

```
32 REM
```

```
35 REM*****FILL THE ARRAY*****
```

```
40 FOR R = 1 TO NR:REM FOR EACH RECORD
```

```
50 FOR C = 1 TO NC:REM FOR EACH CELL
```

```
60 READ RC$(R,C):REM READ THE RELEVANT DATA ITEM INTO THE CELL
```

```
70 NEXT C:REM NEXT CELL
```

```
80 NEXT R:REM NEXT RECORD
```

```
90 REM*****ARRAY FILLED *****
```

Note that line 60 is a compact form of the two expressions:

```
READ AS:LET RC$(R,C) = AS
```

All that remains is to design a program to access the information in the array. To do this we must first decide exactly what users may be most likely to require. They will certainly want to be able to search the database for a title by a given artiste so we will concentrate on this first.

Next week we take a look at dimensioning arrays and continue to build up the simple database program.

Diagram 1

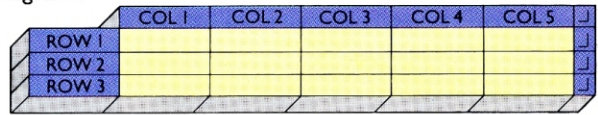


Diagram 2

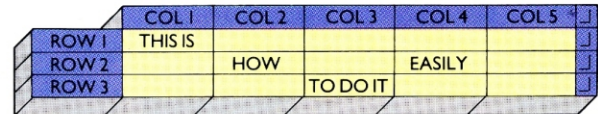
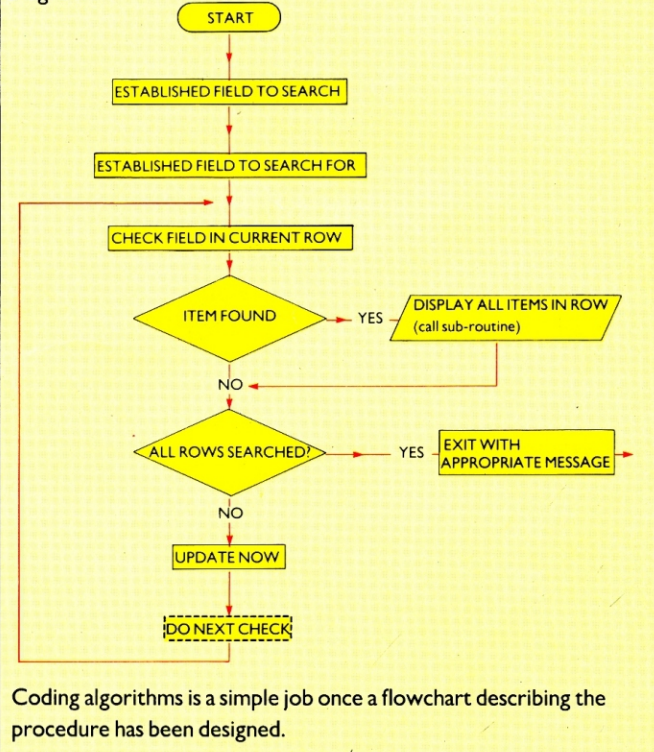


Diagram 3



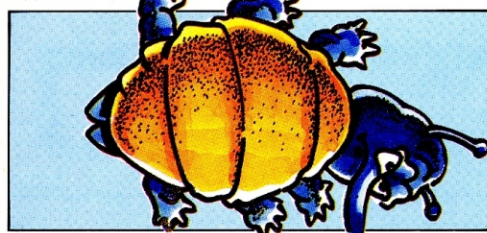
FINDING FAULT

Interpreter-reported error messages are useful in debugging programs, but they are by no means the whole story. Error messages can be misleading: they can point you to the line where the program stopped, rather than the one where the error occurred, and they can also be distinctly enigmatic.

So no matter how good your micro's error messages are, it's still useful to know a little about why errors occur in the first place.

Logical errors

These occur when your algorithm for solving a problem or performing some operation is flawed. First you should check exactly what you wanted to achieve, then go back to your notes — you did design the solution before coding it, didn't you? You might find it useful to redesign the routine on paper and recode it, then compare this with the section that doesn't do what it's supposed to do.



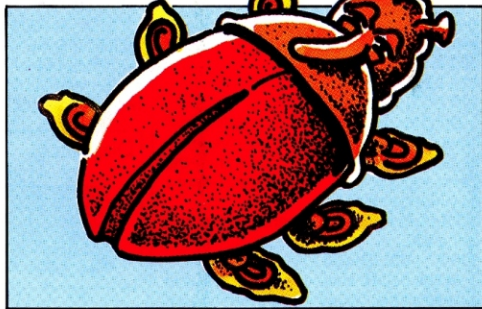
One easy mistake to make is to re-use a variable name, either because the routine that uses it is lost in a long program, or because you've forgotten the exact names you used — another good reason for having long variable names, but again something not usually provided for. It helps here to insert PRINT "X=";X statements at relevant points in order to follow changing values. You can also use an extended form: 100 PRINT "LINE 100,X=";X — but renumbering will mess this up.

Logical errors are naturally the hardest to give advice on, but here's one example often seen in various forms. It occurred in a program where, at the end, users were given a feedback message about their performance. If the score (SC) is taken to be out of 10, can you see what's wrong with the following lines?

```
1000 IF SC < 5 THEN PRINT "THAT'S NOT VERY GOOD"
1010 IF SC > 5 AND SC < 9 THEN PRINT "THAT'S FAIR"
1020 IF SC = 10 THEN PRINT "THAT'S FULL MARKS — WELL DONE"
```

Obvious isn't it? (What happens if SC = 5 or SC = 9? How should these lines have been coded?)

Similar difficulties can arise when dealing with the operators AND and/or OR. If you find yourself having to write complex



statements using these together, be careful. Use brackets to group statements and draw up a truth table if necessary. In Boolean logic most IF statements reduce to a basic form:

```
IF (condition) THEN (operation)
eg IF (X = 3) THEN GOTO 5000
```

The operation will only be carried out if the condition is TRUE; if the condition is evaluated as FALSE the operation will be ignored.

The condition may be complex, as in IF (X = 3 AND Y = 7) THEN ... The two statements will be evaluated as, is X = 3, is Y = 7? If both these are TRUE then the operation will be executed.

In a truth table the possibilities are shown clearly:

X = 3?	AND Y = 7?	OPERATION?
TRUE	TRUE	YES
TRUE	FALSE	NO
FALSE	TRUE	NO
FALSE	FALSE	NO

If we alter the AND to OR, see the difference it makes:

X = 3?	OR Y = 7?	OPERATION?
TRUE	TRUE	YES
TRUE	FALSE	YES
FALSE	TRUE	YES
FALSE	FALSE	NO

Setting out complex statements in detail like this should really be done during the development phase — not used as an *ad hoc* debugging tool.

Contributors: Richard King, David Janda, Bryan Skinner and Geof Wheelwright

Design: Nigel Wingrove

Illustrators: Kevin Faerber and John Hallet

NEXT WEEK

We give you the final word on Basic debugging, another word on numeric and string arrays, a lesson on getting out of a fix using flowcharts, and yet more on becoming the elegant program designer you've always wanted to be.

In the coming weeks you'll also get an introduction to the Forth and the high-level Pascal languages as we give you the answers to your questions about these increasingly popular program tools.