

PERSONAL *weekly* COMPUTER

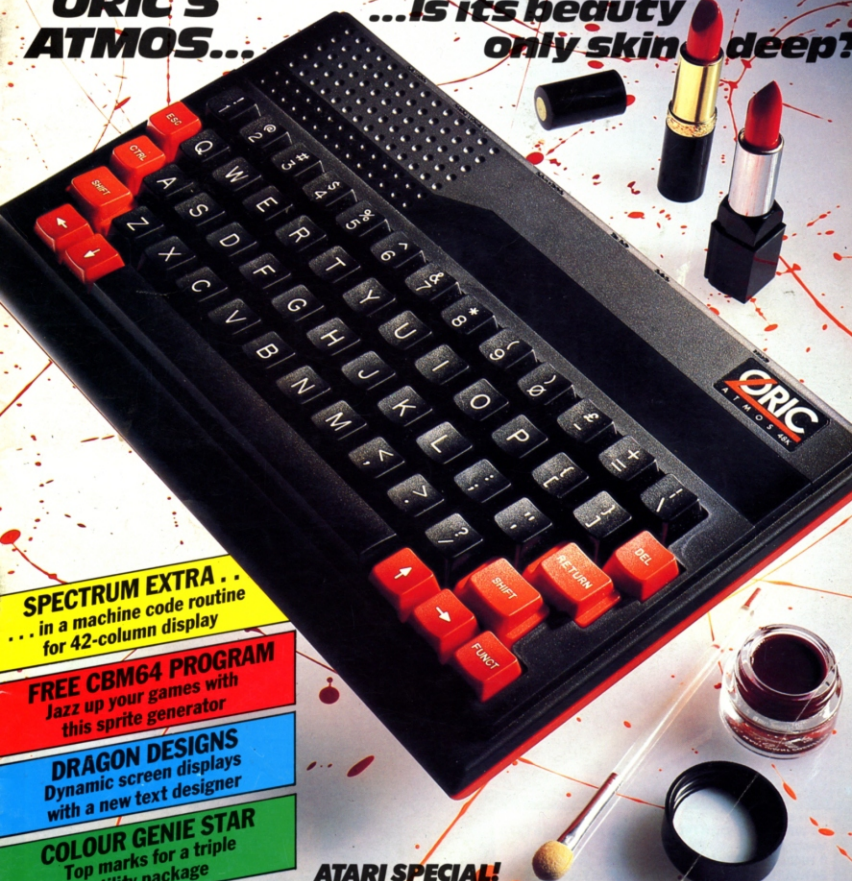
50p February 18, 1984 No 49

NEWS

BRITAIN'S BIGGEST WEEKLY

**ORIC'S
ATMOS...**

*...Is its beauty
only skin deep?*



SPECTRUM EXTRA . .
... in a machine code routine
for 42-column display

FREE CBM64 PROGRAM
Jazz up your games with
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DRAGON DESIGNS
Dynamic screen displays
with a new text designer

COLOUR GENIE STAR
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ANIROG

COMMODORE
64

NEW

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Spectrum Screen 29

Break out of the Spectrum's limited screen format with Kevin Ball's machine code routine for a 42-column display.

PCN MENU

February 18, 1984

No 49



Cover photograph, Howard Kingsnorth

Cover story

Oric's Atmos 18

Beauty only skin deep? Oric has tried to put old wrongs right in its new-look Atmos. Bob Maunder measures its success.



MICROPAEDIA

Pull out and keep
ATARI ADD-ONS

The third instalment of our Atari Micropaedia looks at the peripherals and add-on devices available for Atari's range of computers and concludes our look at Atari Basic.

Competition

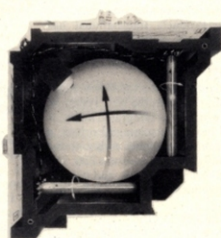
Win an Atari 600XL

Don't miss this chance to get in on £1,250 worth of prizes. We're giving away six Atari 600XLs, copies of the Atariwriter word processor and versions of Donkey Kong to run on Ataris, Commodores or the TI-99/4A. This week you get the form you'll need to enter the competition.

PRO-TEST PERIPHERALS

The Right Track... 34

Tracker balls allow accurate control for more skillful game-playing. Piers Letcher looks at high- and low-priced versions.



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Three ways to start a conversation with your micro. David Janda does the voice test.

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Dragon Designs 50

Smarten up your text displays with Rainbow Writer, as described by Mike Gerrard.

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John Fairbairn studies Zen and the art of a package offering editor, assembler and monitor for the Genie, TRS-80 and Lynx.



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Simple programs for small children? We assess three new packages to see how good they are for learning.

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Patrol the planet Synlac or try this version of Jetpac.

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Steer your balloon through a thorny maze or rescue paratroopers.

PROGRAMS

Commodore 64 64

Free sprite generator program.

Oric shows its hand

After the Atmos

By Ian Scales

In an exclusive interview with PCN Oric Products International has revealed the shape of the micro that will succeed the Atmos, Pro-Tested on page 18.

Managing director Barry Muncaster describes the next system in the works as an integrated micro. It will incorporate integral drives, a modem — probably with autodial — and could be based on a Z80. The likely name is Stratos, and it is due to be launched in the first half of this year.

The key to Oric's development plan is to provide a full family of products. Dealers regard this approach as a draw card, as it enables them to sell customers up the range — either on the spot or as an upgrade later. Oric feels that the buying pattern of micro enthusiasts is going to shake out many of the current manufacturers, leaving about four to take most of the home market. Apart from Oric (of course) we will find (in descending order) Sinclair, Commodore, and Acorn. Oric aims to stay at the crease through of its 'family' approach.

To complement this plan it is also cultivating a new image. The first

shot in the battle to bring you an understanding of the 'new' Oric Products International was, of course, the Atmos.

Later in the year, Oric hopes to produce yet another member of the Oric family, this time based around the 8086 processor.

Hard soft sell

By Bryan Skinner

Oric plans a software blitz which could have far-reaching effects not only on Oric/Atmos owners but also on how software is sold in retail shops.

It claims that large retailers like Boots and WH Smiths tend to avoid buying programs in quantity from software houses because of the variable quality of many games. It hopes to arrange contracts with both sides which would involve programs being marketed in a similar way to the arrangement between Sinclair and Psion. Programs would be packaged under the Oric banner and the company would handle the marketing by placing point of sale stands in retail shops.

Oric would select the best titles from software houses on the basis of sales volume, technical quality and possibly the judgement of an independent panel of reviewers. Software will have to be Oric/Atmos

compatible and programs will cost the same.

Oric would charge both sides for its services and this could have the effect of raising, rather than lowering, prices. In the long run the plan could mean that you will end up with less choice, since smaller software houses may not want to get so heavily involved with Oric Products.

Clever cable

By Fiers Letcher

ITL has beaten Oric to the mark with a hybrid cable that gives you the facility to attach your Oric 1 or Atmos to almost any disk drive.

Not the least remarkable thing about the hybrid cable is that it appears to cure all the known bugs in the Oric ROM. It also adds new commands to the Oric Basic, and gives you the facility to save both sequential and random files — a feature missing from the Oric drives.

It doesn't have to be used with the ITL Byte drives either: PCN has tried it with several others, including both 40 and 80 track drives and 3.25 and 5.25in disks. The format program allows you to choose the number of tracks you require to the extent that 81 tracks can be formatted on an 80 track disk.

Oric has been offered the hybrid

cable by ITL, but has not accepted it — presumably because its own drive is nearly ready. However, the Oric's drive utilities are stored on the disk — the hybrid not only offers over three times the number of commands, but also puts them all into your Oric at the outset.

The Hybrid cable costs £99.42, and the package includes the master disk and a manual. For £299 you can get the Byte drive 500, including power supply, hybrid cable, manual and disk. The hybrid is in production, and will be available from retailers within the next few weeks.

PCN will have an exclusive pro-test of the Hybrid in Issue 52.

Upgrade doubt

You probably won't have to fork out £50 for an upgrade from your old Oric 1 to an Atmos.

The upgrade involves a new ROM (version 1.1) fitted to your Oric and the circuit board put in a new case with a moving keyboard.

Reports that the upgrade would cost £50 have been denied by Barry Muncaster but he would not give a specific price.

The 'new' ROM offers several extensions to old commands, mostly to do with cassette handling, and cures many of the gremlins that afflicted version 1.0.

Tiger stays in suspended animation

The Tiger micro is still in suspended animation following the collapse of Harrison Industrial Developments at the beginning of last month (Issue 45).

William Roberts, the company's receiver, said that although a 'handful' of companies had expressed an interest in Harrison's HH Microcomputers division he has not yet received a firm offer.

'We are in discussions with various companies who have already been up to take a look at the operation,' he said.

HH Microcomputers is still continuing to trade, he added, but that is more a statement of its legal position than a reflection of actual fact.

A number of machines had been sold before the company ceased trading, but the Tiger was still at an early stage of development. A few individual machines had been sold since and many of the project team are still in employment but in practice it is in state of hibernation awaiting the arrival of a willing buyer.

Portico, maker of the Miracle, also faces problems but is trying to trade through them.

Lynx price slashed in new deal

By Ralph Bancroft

Computers has slashed £65 off the price of the 48K Lynx. But the special offer price of £159.99 (including VAT, post and packaging) is only open to mail order customers.

And the company is considering some form of money back guarantee for customers who send off orders for the machine, to be renamed the Leisure, but fail to get a speedy delivery.

Meanwhile it has said that the Laureate business system running CP/M on a 96K Lynx will not now be launched until March. It has already started to advertise the system.

The new arrangement should come as a welcome boost to the company's finances. The Lynx did not sell well before Christmas, compared to its competitors, and it is known that the company has, for a few months, been trying to raise an additional £1 million through financial institutions, so far without success.

Anyone wanting to order a Leisure should write to Computers PLC, 33a Bridge Street, Cambridge.

Sinclair looks after loose ends

Sinclair Research is trying to clear up confusion over deliveries of its new QL computer with a promise that it will start first deliveries of the machine by the end of this month.

This does not mean, however, that QLs will necessarily be delivered within the standard 28-day delivery period — although many cheques included with orders for the machine have already been cashed. A Sinclair spokesman said last week that the company had sent out letters to people who have ordered QLs (Issue 48) describing

the difficulties in meeting delivery dates.

The spokesman added that if Sinclair does not meet the 28-day delivery period on a given order, the customer has the right to cancel their order and receive a full refund. But this only applies to orders placed with a money order or cheque — the rules governing credit card purchases by mail order dictate that no money changes hands on an approved credit purchase until a few days before the company is due to send its product out.



Sinclair nerve centre in Cambridge — tidying up QL deliveries

ACT moves in as Victor fails

Victor Technologies, manufacturer of the Sirius, entered its final death throes last week as the firm's creditors took formal steps to have the company wound up.

But ACT, which distributes the machine in the UK and is Victor's largest customer, is confident that the machine will continue to be made and that existing users will not suffer because of Victor's demise.

Victor ran into financial difficulties following the launch of the IBM PC in the US. Victor found itself unable to compete against the marketing might and selling power of a product bearing the IBM label.

The picture in Europe was radically different. Because of the one year delay before the PC was launched in the UK, ACT was able to get a head start with the Sirius and has since maintained at least an equal position with IBM.

With debts around \$100 million, Victor has sought protection from its creditors under chapter 11 of the United States bankruptcy laws. The creditors had failed to have the company wound up.

ACT has reacted by sending a team of directors to the US to negotiate to buy the manufacturing rights to the machine. It is not the only bidder — ACT's partner in the Far East, Swire Pacific, is also interested as are a number of other international corporations.

'We are confident that the sale of manufacturing rights will be completed very shortly,' said Peter Oldershaw, an ACT director, 'probably in less than a month.'

ACT is well placed to manufacture the machine. Under an existing agreement with Victor it manufactured a trial batch of machines at its new factory in Glenrothes in Scotland.

The factory was originally built to make the new ACT Apricot and ACT has recently extended it by 50 per cent.

Mr Oldershaw refused to say whether this was the likely option. 'We would rather not say at this stage where we would carry out the manufacturing. Let's sort out the manufacturing rights first,' he commented.

Dragon gets boost from GEC deal

By Ralph Bancroft

Dragon Data has tied its fortunes to GEC, the cash-rich electronics giant, in a deal that should give the micro maker a very welcome boost.

Dragon has signed a deal with GEC McMichael, the consumer products division of the GEC group, to market and distribute the Dragon 32 and 64. Under the deal GEC will take over responsibility for all of Dragon's sales and marketing operations.

Brian Moore, Dragon's managing director, said that GEC approached Dragon. 'It already sells a wide range of products including telephones, TVs and videos into High Street stores. The one product they didn't have was a home computer.'

At the moment the arrangement is restricted to sales and marketing. GEC is not intending to invest money in Dragon or buy a shareholding in the company.

The deal has two main benefits for Dragon. 'It can supply to us a large marketing organisation and the company has a good standing in the marketplace that will improve

Dragon's image as a solid and respectable company,' Mr Moore said.

Dragon could certainly do with that. Its image was dented towards the end of last year when overproduction and flagging sales forced its shareholders and bankers to launch a £4.5 million rescue package to keep the company going.

The GEC deal was signed at about the same time that Dragon was making 28 people redundant, bringing down the number of staff employed by Dragon from a peak of almost 300 just before Christmas to 150.

Mr Moore says that the company sold 100,000 computers last year, well under the 300,000 estimate made before last Autumn's rescue package. By comparison Dragon sold 32,000 Dragon 32s between August and Christmas in 1982.

But Mr Moore is not dissatisfied with the company's performance. 'We did reasonably well in the run up to Christmas and were more or less on plan. The facility we provided by the financial reorganisation was adequate,' he said.

'Most of the people we laid off after Christmas were temporary workers taken on to deal with the Christmas rush,' said Mr Moore. 'The 28 were the only full-time staff made redundant. They worked in different parts of the company and their departure is part of a process of tightening up on costs.'

Competition results

All the entries have been counted in PCN's Spectrum software competition and we have drawn some winners. Here are the answers.

1) The arrow in the competition picture was pointing to the Z80.
2) The man in the picture is Sinclair managing director Nigel Searle.
3) It uses videotape.

4) The Spectrum equivalent of the ZX81's UNLOAD command can roughly be said to be OVER.

5) In Ultimate's Jet Pac game, the hero is working for the Acme Interstellar Transport Company.

The winners are: A Butler of Aberdeen, G Richardson of Guiseley, Leeds, Gareth Riekey from Nottingham, A M Jones of West Yorkshire, Kavan Gilmore from Norfolk, Ken Fagan of Garston, Liverpool, Simon Ng from Leeds, John Swan of Edinburgh, Scotland, B Walton of Tyne and Wear, A Fagg from Woodnesborough, near Sandwich, David Mitchell of Pitlochry, Perthshire, David Cochrane from Houghton on the Hill, Daniel Dooley of Carlisle, Cumbria, Stephen Grant from Glasgow, Ralph Kimber of Loughborough, Owen Foreman from Melton Mowbray, Simon Rees Thomas of Cowbridge, South Glamorgan, P J Flint from Wellingborough, S Fifer of Enfield, Middlesex and Harris Irfan from Sedgley.

MSX code in dispute

A controversy over the Spectravideo 318 and 328 systems (Issue 48) has highlighted what could be a fatal weakness in Microsoft's attempt to establish a home computer standard with MSX.

The idea of MSX is that a number of micros with similar Basics can use the same peripherals and ROM cartridges. MSX is coming, but in this country the nearest thing to an MSX machine is the Spectravideo 318/328 and now it transpires that this design, although '99 per cent MSX compatible', is not compatible with the MSX standard for peripherals or ROM cartridges.

This has come as something of a bombshell for The Gamekeeper, a co-operative micro dealership which has probably been the major supplier of Spectravideo micros in this country since the machines first arrived.

But it was only two weeks ago that The Gamekeeper learned that the Spectravideo was not 100 per cent MSX compatible. 'We nearly sent the whole lot back,' says The Gamekeeper's Tony Noble.

The kernel of the problem seems to be that the Spectravideo machines have non-standard printer interfaces, and take non-standard cartridges, and standardisation in these areas is crucial to MSX.

Can they actually be termed MSX machines? A Spectravideo

spokesman claimed that the Spectravideo 318 and 328 machines had actually been MSX standard when the standard was first arranged, but that after the machines had come into production, the standard had been changed. So Spectravideo claims that its own machines were produced to the MSX standard and that, as the Scots granny said, 'they're all out of step but our Jock.'

According to the UK distributor of the machine, CK Computers, the Far Eastern manufacturers had 'misinformed' the company as to the Spectravideo's MSX-compatibility. CK originally released the machine with an MSX flourish — this attribute was loudly trumpeted

in the initial advertising, although this was drawn up by Spectravideo itself.

CK Computers will make an adaptor available so that the machines will be able to take the standard MSX games cartridges. The 'upgrade' will cost customers £30 a shot. This time, claim Spectravideo and CK, the machines will be fully compatible.

But here is the crunch — if the standard is so ephemeral that it caused Spectravideo to foul up the supposed standard in the first place — how can it be sure that the standard will turn out to be any easier to pin down second time round?



Spectravideo — standard bearer or weak link in the MSX drive?

VIEW FROM AMERICA



Apple faces Redskins' fate in Superbowl

By Chris Rowley

My sources tell me a certain amount of American football has been blitzing across your television screens recently. Alas, this year's Superbowl was a bit of a dud — the equivalent of Liverpool beating Spurs 6-1 in a Cup Final.

Much more electrifying than the game, at least for that sizeable number of viewers interested in micros, was the intermittent battle of the micro advertisements.

Apple, IBM, Atari — every time they cut back from a mountain of helmed muscle for another \$800,000's worth of the prime time of all, there was Alan Alda or Charlie Chaplin thrusting keyboards at you. By all accounts Apple's \$400,000 extravaganza, in which the young female athlete in Apple-coloured shorts flies through colourless Kafka-esque corridors to the room of 300 dusty grey-clad extras and the huge talking head, is becoming a video freak collector's item.

Apple is to spend \$25 million on the Mac campaign, while IBM will splash out \$40 million to introduce the PCjr.

Certainly the Mac has struck sparks aplenty from the media. Neat as a gazelle at 25lbs and \$2,500 it has dominated the computer press; indeed through all the Mac chatter there has been hardly a peep about the Sinclair QL. One reason for all the attention is the knowledge that the Mac might be Apple's last big shot, and that it must do well among small business buyers to stand a chance and assure us of a world that is not simply IBM-compatible. So a lot of thought has gone into the Mac, from the three years spent on the ultra-tight 64K ROM code to the planning of the \$20 million super-automated MacFactory which can churn out one million Macs a year and beat even the Japanese on the assembly line.

Advanced Cuteness Note: Mac's name originally came from staff mis-spelling the fruit, which is 'Mc' — Apple also dropped the original names for MacDraw and MacWrite, Macelangelo and Macauthor.

But as far as computer buyers for Fortune 1000 companies are concerned it already is an IBM world. A recent survey found that 67 per cent of such executives would automatically choose an IBM PC, and despite shortages of PCjr's announced by IBM, analysts expect 750,000 Juniors to be sold this year along with two million PCs. By contrast, Apple is expected to move 400,000 Macs in the same period.

The 24,000 elite purchasers of the \$10,000 Lisa edition 1 were given a free upgrade. It should be noted — through the barrage of MacWares — that the Microsoft-designed Mac Basic runs ten times faster than MBasic on the PC. We should also note that IBM is rushing out its PC Unix system for this spring, and that Unix is by far the most popular operating system on US campuses. Nor should we overlook last week's announcement from AT&T of an enhanced Unix specially slanted for software development on the Motorola 68000.

IBM, however, is developing the market in many different ways. An IBM lap machine for \$1,000 is said to be in the works; it will use the Harris CMOS 8088 chip and Sharp's 80 by 16 display, and be PC-compatible. IBM thus intends to battle the Japanese onslaught of PC-compatible book-size machines being prepared for next Christmas.

But there was also plenty of activity elsewhere in the micro world this week — dozens of hardware offerings, hundreds of software. The Murdoch/Warner/Chris Kraft struggle continues, both on Wall St and in the courts. Mattel, which took a battering in the micro arena last year, returned the rights on its Aquarius to its developer, Radifon Electronics, and laid off more workers. Industry observers predict Mattel will leave the market.

In Las Vegas, home of the overkill, electronics show folk were reportedly 'grossed-out' by Spectravideo's low-end marketing style as it cut Coleco Adams in half with chain saws and three Cabbage Patch Dolls into a handily placed toilet.

Wordplex next in IBM PC race

One of the big names of the word processing world has moved into the IBM PC compatible race. But Wordplex UK is taking an unusual approach in its challenge to the industry giant — it is charging more.

The basic price of its WPX PC, £2,402, is £10 higher than IBM's equivalent. The Wordplex system includes MSDOS, GWBasic and PC Tutor, but even so, it is almost unprecedented for a compatible manufacturer not to undercut IBM by at least ten per cent.

Wordplex has also launched a hard disk version, the WPX PC-XT, costing £4,002 — the IBM XT is £4,258.

The third element in its package takes it ahead of IBM into the realms of portability — the WPX

Portable PC. This has the same 128K memory as the PC, the same twin 320K floppies, a UK keyboard, and the same bundled software products. It has a 9in screen and weighs 28lbs. The price for this configuration is £2,550.

Wordplex's reputation rests solidly on dedicated word processors, and it regards the PC line as an extension to the office products it can offer to office managers intent on automating. But the three systems, each built around an 8088 and running MSDOS, could be attractive to anybody in the market for a PC with a degree of IBM compatibility, whatever their line of business.

The systems are due to be available from March.



Wordplex — the latest challenge to IBM with a compatible range.

Piper doubles up in comms

From now on you can get twice as many RS232 interfaces with a portable Pied Piper computer.

The company is adding a second communications plug-in as part of its move into promoting electronic mail and machine-to-machine communication on the £1,225 Canadian portable. To facilitate this, the company is also offering a new communications package and a modem. The communications package will sell for £230 and the hardware 'Buzbox' modem from Dacom for about £80.

STM Europe, the company that distributes the Pied Piper in the UK, has also registered on the Comet electronic mailbox system through which it can offer technical support to users.

The company also hopes the introduction of the second RS232 plug and the communications package will encourage software houses to make more use of the Pied Piper.

Last week the company announced plans to introduce a 16-bit IBM compatible portable (Issue 48) this September — and that new machine could replace the Pied Piper. The company wasn't willing to say firmly when and if the Z80-based CP/M Pied Piper will be phased out.



Pied Piper — calling the time with a second RS232 interface.

The Peanut is buttressed

By Geoff Wheelwright

You will soon be able to buy a Peanut computer in the UK. But this isn't the widely discussed machine released by IBM in the US in December. The Peanut PC 2000 is a 64K, twin-disk 8-bit CP/M business computer made in Taiwan and due for release in this country in two months.

It will be sold here by Peanut Computers for what many business users may consider a nutty price: £795 for the base machine including CP/M, two 125K single-sided drives, dual processors (a Z80 and 6502), a parallel printer socket, an

RS-232 plug, a composite video and an RGB colour monitor socket. The machine can handle up to six disk drives (each of which can be a single-sided, double-density model) and a 10Mb hard disk.

Tony Roberts, who runs Peanut Computer with his brother Chris, said that although you'll get CP/M thrown in for the price of the PC-2000 no CP/M bundled software is included.

Anyone interested in cracking the Peanut can contact the Roberts brothers at Peanut Computer, Unit 22, Low Mills, Dewsbury, WF 13 3LX or phone them on 0924 499366.

didn't receive deliveries until afterwards, and are now hoping for quick sales.

Although the official price for the 64 remains at £229, there has been an unofficial price drop to £199. Commodore has said that it thinks this price cut unnecessary, as it is barely meeting present demand. Supposedly, it's for this reason that the UK plans for the new machines (Issue 48) are still not finished.

Commodore's low costing

Thinking of buying a Commodore 64? This may be the perfect time as you might be able to find one for as little as £180.

One reason for this abrupt drop in price is that several distributors who ordered 64s before Christmas

Fidelity throughout the home

A novel solution to domestic arguments about using the family TV for your micro is now available from Fidelity.

Its all-in-one AVS 1600 audio visual rack system combines a 16in television (with RGB and composite video inputs) with stereo record deck, cassette deck and radio for a retail price of around £400.

For micro users its main attraction is as a colour monitor. Not only do you get the option of RGB or composite video inputs in addition to the usual TV aerial but you can

also have a spatial sound effect (if your micro can output sound through the TV) via the two speakers or headphones.

The headphones could be useful when someone in the household wants to listen to the radio or a record. You can play a game using the TV and the headphone output.

At the launch, the quality of the video display appeared to be more than acceptable for high-resolution graphics and 80 column screens.

More's the pity, then, that a lack of foresight meant that the designers have left out ear and mic sockets at the rear of the box so that you can use the in-built cassette deck for recording and playing back computer tapes.

This is Fidelity's second major launch for home micro users, following its sub-£200 monitor.



Fidelity — anything for a quiet life with the AVS 1600.

SOFTWARE

The new releases

Games

Adventure: Coming to your screens shortly — graphic adventure games featuring Spiderman, the Incredible Hulk and Captain America. Birmingham-based Adventure International has signed a licensing deal with Marvel, the US company that publishes comics featuring these super heroes. First off will be the Hulk. Out in May it will come with a comic that leaves the reader at a certain point in the story that is continued in the game.

Spectrum: There is science fiction and fantasy galore in this week's releases. You can bring a monster to life in Dr Frankly and the Monster from Virgin or race through eight screens and zap 18 different kinds of alien in Moon Buggy from Visions. Also from Visions are Arcturus and 1994. Meanwhile, CDS Micro Systems is offering chivalry and sorcery in Winged Warlords and Magic Meanies. Prize for the most patronising software of the week goes to Cases Computer Simulations which has brought out three 'Games for Girls': Hickstead Mathstest ('a showjumping simulation of that well known event') Jungle Adventure ('a test of mental ability and coordina-

tion') and Diamond Quest ('an adventure full of colour and diamonds').

Commodore 64: 'A game of gratuitous violence' is how Visions describes its latest offering. It is for two to four players whose objective is to take over parts of the world allocated to other players. You can also play the nasty in two other Vision games. You can play the dictator of a banana republic in Banana Drama or a budding JR in Gusher. Virgin, by comparison, is offering heroism and romance in Hidesous Bill and Gi-Gants. Can you rescue your true love Greta from the clutches of the Gi-Gants? Rabbit Software has popped out of its warren with Troopa Truck ('the galaxy's most lovable battle wagon') and has in gestation a couple of adventures called Kolk's Castle and Galleons and arcade action games called Navarone and Protector.

Vic 20: Micro-Antics (09074 5147) has brought out Chariot Race. It is claimed to be the first game on the unexpected (sorry, unexpected) Vic that can handle two players simultaneously.

Business

BBC: CYB Design Services (01-839 4031) has come to the rescue of

small businesses wanting a low cost way of computerising the payroll. Its payroll program for the Beeb costs £49.95 and can handle up to 150 employees on a 100K disk and 600 employees on a 800K disk.

Commodore 64: Magpie is a database that comes on a cartridge from Audiogenic (0734 586334), better known for its games software. An overlapping menu display helps the user keep track of where they are and compatibility with Wordcraft 40 opens up the possibility of merging standard letters and information held on the database. Anagram Systems (0403 59551) has converted its

Purchase Ledger and Sales Ledger programs for the Commodore 8000 to run on the 64. They cost £75 each.

Commodore 8000: Building Contractor Management System and Taxi Management System are two new products from Software Services (0276 684011). The price of £1,140 includes a 48K printer buffer.

Education

Sharp MZ-700: 35 packages are in the offing from Solo Software (0905 58351). They will cover age groups from four years up to 'A' level in maths, languages, history, geography, music, physics, biology and other subjects.



Tales of mystery and imagination from CDS Micro Systems.

ZX fair and square

By David Guest

Advanced technology was on the blink at the tenth ZX MicroFair in London last weekend — the coffee machine was out of order.

Elsewhere in the hall it was business as usual. Voices, synthesisers, and voice synthesisers raised a cacophony that would have drowned out the noise of the Arsenal fans down the road. But they were probably outnumbered — it may be time to move the ZX Microfairs for the crowds' sake. People queued twice around the pavilion at the Alexandra Palace and shuffled patiently through the entrance, but once inside there was hardly room to move and the temperature was tropical.

The number of exhibitors, by contrast, was down on previous events — at one end of the hall there were acres lying fallow or populated only by the impromptu bring and buys that give the place the air of a south-east Asian street market.

Business as usual was unusual in several respects. At the Fuller stand FDS keyboards were on sale — by late Saturday morning an estimated 60 units had been sold. Yes, it had to be seen to be believed, and around the hall a number of sceptics took quite a bit of convincing.



Alexandra Palace Pavilion — time for a change of venue for the Microfairs?

Fox Electronics, at one time a possible FDS distributor but now disaffected in a big way, had a prototype Stonechip Spectrum keyboard. This will take the Spectrum inside its case and won't interfere with add-ons, and it also includes an internal amplifier. It will cost £60 and is due to be available later this month. The prototype looked appalling, but prototypes often do. Look at the Volkswagen Beetle . . .

Another feature of the show was the large number of joystick interfaces. Rainbow Electronics had an Atari-compatible model that includes an amplification unit to boost the Spectrum's warbling

tones. It is programmable and, according to Rainbow, conversion tapes aren't needed with any games software. The price is £24, plus £1 P&P.

A cheaper model from Micro Pad, costing £18.50, offers you the intriguing possibility of changing the programming during the running of the program you're playing. Rainbow is on 0993 72653 and Micro Pad 0932 42882.

Apart from the squawk boxes there was plenty of software going cheap — the bargain of the day must have been The Hobbit for £10. It may have been possible to find better buys at the jumble sale end of the hall, but the scrummaging there

would have put the English pack to shame and noting price tags was out of the question.

This may well have been the last ZX Microfair of its kind. Should deliveries of the QL proceed according to plan the next fair could be dominated by businessmen. The present mixture will survive for a while, but eventually helium-filled balloons will be thought too frivolous, and no longer will they float upwards to meet helium-filled tanks in the roof. No longer will Automata UK's staff be permitted to make a nuisance of themselves with their imitation fair-ground barking. The doors will finally close on rogue Vic-20s.

The QL, incidentally, is supposed to be on a 28-day delivery schedule. This is the word from a tracksuit-clad person in the Sinclair enclosure — perhaps the tracksuits are to suggest Sinclair will be hurrying QLS to buyers with a team of finely-tuned joggers standing by at various staging points around the country.

Apart from the tracksuit there wasn't much fancy-dress about — one or two exhibitors looked like refugees from Woodstock but that can't have been intentional, while on the CompuSound stand there was a startling pair of fishnet tights just visible. But the Microfairs are not big public relations exercises — witness the way the public is treated — and 'fair' is in many respects the least appropriate description.

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Nite Fite
Meteoroids
Gulman
Cosmic Guerilla
Kong
Armageddon
Mission Impossible

Penetrator
Atak Atak
Brain Damage
Last Sunset
Mazeman
Galaxians
ETX
Frenzy
Joust
Knight in 3D
Assblaster
Extremator
Detective

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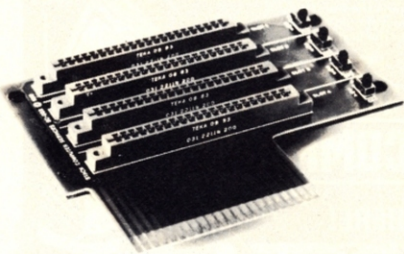


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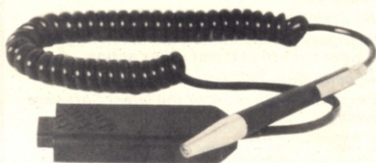
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BMA on home straight

The British Microcomputing Awards are into the final straight that leads to the Royal Garden Hotel, Kensington, on March 28 when the winners will be presented with their prizes.

The companies and products that you nominated and voted for in enormous numbers have already been whittled down into short-lists in each category,

and all that remains is to announce the winners. The selections have actually been made, by secret ballot, but the names are being kept under lock and key while the finishing touches are put to what should be a glittering event on March 28.

Besides the lists below *The Sunday Times*, co-sponsor of the awards, is to make three further presentations and a

separate award for innovation. It will give honourable mention to a selected educational product, an aid for the disabled, and to the group or individual which it considers has used a micro in the most socially useful way.

The winners in each category will receive a trophy designed by artist Catherine Hough, and all the companies short-listed will be able to show a certificate

for their achievements.

The other side of the coin is a scheme that has been borne of the awards and which will be funded by the presentation ceremony. Some £10,000 to £20,000 is expected to be raised by the event. The money will be made available in bursaries to be used for such purposes as helping young disabled people to use micros as communicating devices.

British Microcomputing Awards 1984

List of Finalists

Category 1: VLI Computer People Business Microcomputer Award

Apricot — ACT
Lisa — Apple
Sirius — ACT

Category 2: MicroDecision Business Software Award

Delta — Comsoft
Friday! — Ashton Tate
Lotus 1,2,3 — Lotus Development Corporation
Wordstar — Micropro

Category 3: What Micro? Home Microcomputer Award

BBC Model B — Acorn
Commodore 64 — Commodore
Sinclair Spectrum — Sinclair Research

Category 4: Thames Television's 'Database' Home Software Award

View — Acornsoft
Vu-File — Psion
Vu-Type — BBC Publications

Category 5: Computer Answers Creative Software Award

Atari Logo — Atari
Lisa's Operating System — Apple
Pinball Construction Set — Budge Co

Category 6: Personal Computer Games Game of the Year Award

Ant Attack — Quicksilver
PSSST — Ultimate
The Hobbit — Melbourne House
Valhalla — Legend

Category 8: Personal Computer News Peripherals of the Year Award

Epson RX80 — Epson
Prism VTX 5000 — Prism
Torch Disk Pack — Torch

Category 9: Thames Television's 'Database' Software of the Year Award

Concurrent — Digital Research
Flight Simulator — Microsoft
Friday! — Ashton Tate
Lotus 1,2,3 — Lotus Development Corporation

Category 10: Personal Computer World Microcomputer of the Year Award

Apricot — ACT
Lisa — Apple
Tandy 100 — Tandy

Alison Newell — Computing Services Association president, standing in judgement...

... with David Fairbairn, director of the National Computer Centre. Other judges were David Firnberg, Professor Margaret Boden, and Philip Virgo.





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PCN charts

Hardware Top Ten up to £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
►1	(1)	Spectrum	£99	(SI)
►2	(2)	CBM 64	£229	(CBM)
▲3	(5)	VIC 20	£140	(CBM)
▲4	(9)	DRAGON 32	£175	(DD)
▼5	(3)	ZX81	£40	(SI)
▼6	(4)	BBC B	£399	(AC)
►7	(7)	Oric 1	£99	(OR)
▼8	(6)	Atari 600XL	£150	(AT)
▲9	(18)	Electron	£199	(AC)
▲10	(13)	Apple IIe	£750	(AP)



These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets from January 25 to February 9. The games chart is updated every week.

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

PCN Charts are compiled exclusively for us by RAM/C.

Top Ten over £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
►1	(1)	IBM PC	£2,390	(IBM)
►2	(2)	ACT Sirius	£2,525	(ACT)
▲3	(9)	DEC Rainbow	£2,359	(DEC)
▲4	(5)	Apple III	£2,780	(AP)
▼5	(3)	ACT Apricot	£1,760	(ACT)
▲6	(—)	ICL PC	£2,065	(ICL)
▲7	(—)	Kaypro 10	£2,595	(CKC)
▲8	(—)	Wang Professional	£3,076	(WANG)
▲9	(—)	NCR Decision Mate	£1,984	(NCR)
▲10	(10)	Epson QX10	£1,995	(EP)

Distributors: AC Acorn ACT ACT/Sirius AP Apple AT Atari BW Brainwave CA Computers CKC CKC Computers CO Commodore DD Dragon Data DEC Digital Equipment EP Epson HP Hewlett-Packard IBM IBM LO Lowe Electronics MA Mattel MD Mideltron OR Oric SH Sharp SI Sinclair SO Sord TA Tandy TI Texas Instruments
Machines: SP Sinclair Spectrum AC Acorn BBC 64 Commodore 64 V20 Commodore Vic 20 81 Sinclair ZX81 DR Dragon OR Oric AT Atari

Games Top Thirty

	GAME TITLE	PUBLISHER	MACHINE COMPATIBLE										PRICE
			SP	AC	64	V20	81	DR	OR	AT	OTHERS		
▲ 1 (7)	Hunchback	Ocean	*	*	*				*			£6.90	
▼ 2 (1)	Manic Miner	S/W Projects Bugbyte	*		*							£7.95	
▼ 3 (2)	Atic Attic	Ultimate	*									£5.50	
▲ 4 (8)	Stonkers	Imagine	*									£5.50	
▲ 5 (—)	Space Shuttle	Microdeal	*	*	*				*	*		£8.00	
► 6 (6)	Death Chase	Micromega	*									£6.95	
▼ 7 (4)	Chequered Flag	Psion	*									£6.95	
▲ 8 (9)	Flight	Psion	*									£7.95	
▼ 9 (5)	3D Ant Attack	Quicksilva	*									£6.95	
▲ 10 (13)	Mr Wimpey	Ocean	*									£5.90	
▼ 11 (3)	Alchemist	Imagine	*									£5.50	
▲ 12 (23)	Fighter Pilot	Digital	*									£7.95	
▼ 13 (12)	Lunar Jetman	Ultimate	*									£5.50	
▲ 14 (15)	Horace Goes Skiing	Psion/Melbourne	*		*							£6.95	
▼ 15 (11)	Arcadia	Imagine	*		*	*						£5.50	
▲ 16 (25)	Rev Of Mutant Camels	Llamosoft	*		*							£5.95	
▲ 17 (30)	Dragrunner	Cablessoft	*						*			£6.00	
▼ 18 (10)	Jet Pac	Ultimate	*			*						£5.50	
▲ 19 (28)	Birds & The Bees	Bugbyte	*									£5.95	
▲ 20 (—)	Wizard & Princess	Melbourne	*									£6.95	
▲ 21 (27)	Pyramid	Fantasy	*									£5.50	
▲ 22 (—)	Pool	CDS	*									£5.95	
▲ 23 (26)	Kick Off!	Bubblebus	*		*							£6.99	
▼ 24 (18)	Kong	Ocean	*									£5.90	
▼ 25 (16)	Valhalla	Legend	*									£14.95	
▼ 26 (14)	Harrier Attack	Martech/Durell	*						*			£5.95	
▼ 27 (21)	Hungry Horace	Poison/Melbourne	*		*				*			£5.95	
▲ 28 (—)	Twin Kingdom Valley	Bug-Byte	*		*	*						£5.95	
▲ 29 (—)	Snooker	Visions	*	*	*	*						£8.95	
▼ 30 (17)	Hovver Bover	Llamosoft	*		*							£7.50	

Project must be done on school micro

I suggest David Harrison (Issue 45) makes a further study of his syllabus.

According to the JMB, staff must guarantee that 'every step has been taken to ensure that the work assessed is that of the candidate concerned'.

As I see it this means that all project work must be done at school, and is therefore restricted to the computers owned by the school.

Hugh Lorimer
Ilkley, W Yorks

Microdrive owners need patience

I must reply to impetuous Specter sent by impatient Sinclair Spectrum owners criticising the 'waiting time' for the ZX Microdrive order form.

I received my ZX Microdrive order form on December 19th. I returned it without delay and received my twin drives and Interface 1 on the 31st of December.

Surely it was more sensible all round for Sinclair to send out order forms in strict rotation rather than have all the commotion caused by the launch of the Spectrum through magazine advertisements?

To all future Microdrives owners — 'Just be patient', they are worth waiting for.

Eric Smith
Stirlingshire, Scotland

Duplicate delivery for Microdrives

I have just received my Microdrive order form and I would like to take this opportunity to advertise the Microdrive order form order form.

This has been developed to ensure maximum redistribution of wealth among computer owners — simply write to me and you will in strict rotation according to receipt of application (first to hit the doormat), be sent an MOF² (please use this ref in all communications). Allow 28 days delivery. Highest offer secures. You could in 56 days only be the proud owner of Clive's drive!

Name and address supplied

This must be some form of piracy ... Ed

Two viewpoints penned together

I reply to two letters in PCN. First the one from K Phillips (Issue 45) about the Microdrive. Yes they exist, yes they work.

As for delivery and production, Sinclair is now supplying Microdrives to those who purchased Spectrums (mail order) by the beginning of last year, and should place them on general release before the end of this year.

Also, there is no limitation on the

RANDOM



ACCESS

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quantities of Microdrives you can purchase (hence the inclusion of them in the QL), but only one Interface 1 may be purchased. (By the way, I ordered my Spectrum in December 1982, and received a Microdrive form this month.)

Next, in reply to R Pierrepont (Issue 43), is he suggesting that I should have spent £1,500 on an Apple II and disks like my school one, instead of my ZX Spectrum? If he and his fellow pupils can understand Sinclair Basic but not BBC, the answer is simple — ask their teacher, or read the manuals.

We have to submit two programs, as well as documentation of 15 others, all written on an Apple II, but just because I have a Spectrum, it does not mean I cannot achieve this. In fact, I can program most home computers, in Basic, Fortran, M/C etc, but am no genius. I simply read the manuals, or teach myself by programming and reading other programs, which I suggest poor R Pierrepont tries.

Keith Noble
Aberlour, Banffshire

Program change for Newbrain

I noted one minor fault in your Newbrain word processor appears to have been overlooked. At lines 10300 and 10400 xx is set at 16, but this has to be 18 if the page numbers are to appear between the colons, rather than to the left of them. I also found that the new subroutine from 25000 onwards does not appear to be necessary if, as in the new version, GRAPHICS/P is used as an end of page marker, since this character does not print in any case.

I have, therefore, changed the program to give wordwrap on printer output by modifying line 22020 of Pump to send strings without a trapping to line 23000, as well as those with an end of page marker. Line 23000 as before directs non printer output to line 22400, but printer output now goes to a new wordwrap subroutine at

line 22800. This takes a line at a time from the pumpstring, and searches

PCN £10 Star Letter



for a space. If found within the last ten characters the line up to this point is printed, and the process is repeated with the next line of characters being taken from this point. If not, the line is printed in its original form.

R J Williams
London NW3

Reflective Dragon upgrades to the 64

I write to reply to your article regarding Dragon trade-ins (Issue 43). As chairman of the Northern Ireland Dragon User Group, I quite welcomed the low Dragon Data valuation of £85 on a 32.

Admittedly, my first reaction was one of horror but on reflection I changed my mind.

Quite a number of my contacts upgraded to the 64 by selling their 32 through the papers. The average received was £130+ per machine while those able to off-load lightpens, joysticks or unwanted software were able to get much more — all for the cost of approx £1 per ad.

The result was that for everyone who changed to the 64 there is now an additional 32 in circulation, which can only do good for the Dragon market for hardware or software.

Perhaps Mr Kennedy should have considered these along with any increase in club membership he may be enjoying, before having his comments printed in PCN.

Peter Leach
Antrim, N Ireland

Software cowboys abuse Billboard

After replying to several adverts in Billboard, I was amazed at the check of some people using your Billboard service to make a profit from copied software tapes. As everyone knows this is illegal and unfair to genuine users of Billboard.

I was offered copies several times, the last time from a boy advertising in issue 44.

However, I have never been offered an Automata copy, a company which offers a reward for information leading to successful prosecution of illegal copying.

Whether it is right to earn money in this way is another matter, but software cowboys should be aware that people are willing to report them.

A W Rimmer
March, Cambridgeshire

We do our best to rid Billboard of these ads since we outlaw all commercial entries anyway. No reward, but do let us know when we fail ... Ed.

Changes for Tandy 100 User's Club

Your news item on the NEC portable (Issue 44) missed one point. The Tandy Model 100, NEC PC-8201A and Olivetti M10 are all essentially the same machine — the one made by Kyocera of Japan. The differences are merely changes made to the basic design in accordance with each company's perception of market requirements.

Because of the similarity, the Tandy Model 100 Users Club is now the Tandy Model 100/NEC PC-8201 Users Club. In due course we shall also be covering the Olivetti M10.

If any users are interested in joining the club, they should write to John Noyce, PO Box 450, Brighton, enclosing an SAE.

John Noyce
Brighton

Though we don't think we did really miss this point, you raise an interesting question: how do machines differ? It could be argued that all the Z80/CP/M machines are essentially the same, or all MSDOS/8088 machines. The NEC, Tandy and Olivetti are built by the same company — but who's going to worry about that when buying? ... Ed

Share your thoughts in the UK's liveliest micro weekly letters columns. Funny, feisty or fanciful, your letter could win you £10 if it's of star status.

WRITE TO: Random Access, Personal Computer News, VNU, Evelyn House, 62 Oxford Street, London W1A 2HG.

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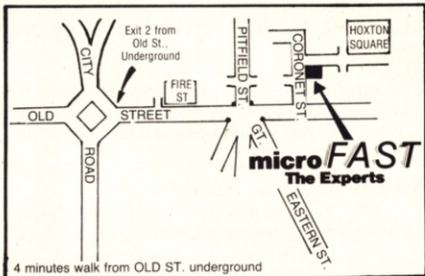
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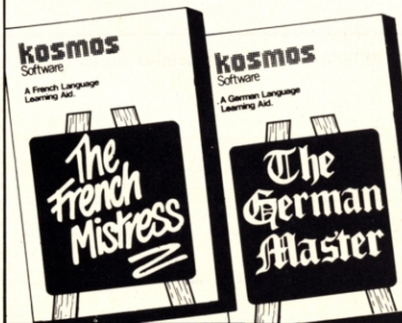
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Modems for Commodore machines

Q I own a Commodore 64 and I have always wondered how a personal computer can link up with a user service such as Prestel. Does it just use the computer as a dumb terminal or is any memory used?

A I would like to know the approximate cost for modems and who makes them for the 64. Simon Webster, Aylesbury, Bucks.

Q I own a Vic 20 and can buy a modem in kit form. Unfortunately, one thing is holding me up. I don't know where, or if, I can buy a plug for the user port. The plugs for other computers have different spacings.

Jason Sampson, Newport Pagnell, Bucks.

A 1984 looks like being the big year for micro communications and the price of modems is dropping all the time. Unfortunately, Commodore machines have been rather poorly supported in this area until now.

The theory behind telephone communications is quite simple. All you need is a modem (modulator/demodulator)

which takes the output from the computer and converts it into a signal which can be transmitted over a telephone line, and reverses the process for incoming signals, and some software to drive the equipment.

Micros such as the 64 can be used either as a dumb or 'smart' terminal, depending on which service you are using.

For example, hooked up to Prestel it would largely be a dumb terminal simply accessing the different pages and displaying them on screen. The only memory used would be to hold the software to drive the modem and the screen display. However, on more interactive services such as Micronet or some of the computer bulletin boards, you could use more memory for such things as transmitting and receiving mail or software.

With the Commodore

machines, finding a modem is complicated by the fact that neither supports a true RS232 standard interface, commonly used for modems. However, a variety of interfaces are available which allow you to hook up the modem of your choice. The next problem is the software needed. It probably wouldn't be too difficult to write your own since there is a lot of helpful information in the Programmer's Reference Guide, or if you are prepared to buy mail order from the US, there are a lot of packages there.

For dedicated Commodore packages there seem to be only two options in this country. Commodore recently launched its own modem for the 64 and looks like a good bet at around £100.

For the Vic 20, Maplin Electronics of Rayleigh, Essex sells a modem in kit form. For connecting other modems, or any peripherals, to the user port, you need not a plug but a 24-pin edge connector. Try Maplin again, or any good electronics store.

It is in these sorts of subject that user groups come into their own since it's a fair bet that somebody else has been through all this before. See Clubnet in back issues of PCN for your nearest branches of the Independent Commodore Product User Group (ICPUG). They'll probably have terminal emulator software too.

Learn to use Basic proper

Q I am in the process of shopping around by post for a home computer system in the £1,000 range. My knowledge is minimal and all gleaned from books and magazines like yours.

A However, while I am waiting I would like to learn Basic, if possible before the micro arrives. Please recommend a suitable book and agent for its purchase. Your Readout article by RK in PCN 43 about 'Proper Basic' frightened me. Raaid A E Buckingham, Sultanate of Oman.

A By pure coincidence RK arrived in the PCN offices on the same day as your letter, and we have to admit you're right — he is frightening. Seriously though, it should be relatively simple to help you.

The National Computing Centre, on 01-353 4875 or Manchester 228 6333 runs a number of courses and sells various educational books. You'd deal with the international department of the Birmingham office, and we've arranged for you to be sent various brochures on the subject.

The NCC is an educational body, and therefore has courses and books to suit a variety of needs. The '30 Hour Basic' packages in particular are geared for both actual and prospective micro owners.

Oric machine code programming

Q Now there are disk drives for the Oric (Byte Drive 500 and the fabled Oric micro-drives), will I be able to put all my cassette software on disk? Will I need any utilities to copy protected software?

A Also, if I write a program in 6502 machine code, will it run on a 6502 based micro?

A Finally, will machine code programs written on the Oric-I work on the Oric Atmos?

Tony Ball, Croydon, Surrey.

A Apparently, the Oric drives have been postponed (again). Release was scheduled for January 17. We don't think the Byte Drives are available just yet, but we'll be Pro-Testing one very soon.

If you copy commercial software from cassette to disk, you may be violating the copyright of the publisher and therefore liable to prosecution in a court of law. However, the copyright law is still somewhat vague as far as software is concerned.

Nevertheless, it is very likely that companies will soon be offering programs which will allow you to back up your own programs, even if you have protected them yourself. The implications of this are clear.

In principle at least, a program written in 6502 assembly language will run on any 6502 based machine, but most of the addresses, such as the screen, will not be the same so it won't work as it should. Moreover, if you CALL any ROM routines (for printing a character, making a sound etc) the program

will probably crash, because the ROM routines will not be at the same locations.

Programs written on the Oric-I will run on the Atmos, provided you don't use ROM calls, as these have been altered in some cases. The screen locations and so on are identical.

Vanishing Oric light pen mystery

Q Monitor, Issue 43, on the Your Computer Christmas Fair mentions a light pen for, among others, the Oric. Can you give me some details?

Simon Lee, Christchurch, Dorset.

A The light pen in question is reproduced by Add-On-Electronics of Saffron Walden. But the only machines for which it is available, or ever likely to be, are the Spectrum and the BBC. How then do we account for our report? Was our reporter drunk?

A No. Did one of Add-On's staff at the show get carried away?

No. The Your Computer Christmas Fair Guide says:

'Add-On-Electronics . . . will also be launching light pens for Spectrum, BBC, Oric, Dragon, Vic-64 (sic) and Vic-20.'

Add-On-Electronics tells us they won't. A change of plan?

Adjust the recorder's playing head

Q I've tried various unsuccessful methods of getting my tape recorder to work properly with my Oric. Maybe the playing head is out of line?

Ian Dundas-Collins, Worthing, Sussex.

A If it's the play head, it's fairly easy to fix. Look at your tape recorder around the area of the play head till you find a small screw. In most cases you can see the screw through a tiny hole. By turning this screw ever so slightly, you can adjust the head.

The easiest way of checking alignment is to listen to a music tape while you do it, so you get the best quality.

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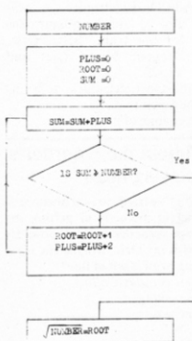
If you've got something to crow about... a bit of magic that'll make the world a better place for micro users, then send it to **PCN Microwaves**—our regular readers' hints and tips page. We'll pay you £5 if we print it. We'll pay you even more if your little gem gets our vote as microwave of the month.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

Rooting around in graphics routines

Square rooting is especially useful in graphics routines when plotting trajectories or using Pythagoras to find distances. However, when graphics routines are converted to machine code it seems that this useful function has to be forfeited.

To get around this a table could be set up, but the following algorithm is much more compact. It gives the nearest integral (whole number) answer, ideal for graphics routines.

Tim Love,
Portsmouth, Hants



Lynx graphics get animated

Animated graphics can be achieved on the Lynx by flipping between different sets of user-defined graphics. For example, suppose the character to be animated has Z frames. Place the data for each frame in

a CODE line, consecutively numbered:
1 CODE XX XX XX data for frame 1
2 CODE XX XX XX data for frame 2
up to the required number of frames.

DIM an array with Z subscripts, eg DIM U(Z), and place the address of the start of data for each frame into the appropriate element:
FOR X=1 TO Z
U(X)=LCN (Start of code line No.+X)

NEXT X
Put the print instructions in a loop and animate the character by changing the graphic (UDG) pointer:
FOR X=1 TO Z
DPOKE GRAPHIC, U(X)
PRINT CHR\$(whatever)
NEXT X

Using this method, a character need only be represented by one CHR\$ code, thus aiding debuggers. If more than one UDG is needed in the program, care should be taken to ensure that the GRAPHIC pointer is in the necessary position.

M S Fowkes,
Barnard, Durham

Restoring an Oric NewEd program

Have you ever spent hours typing in your new masterpiece on your Oric-1, then accidentally typed NEW before saving your program to tape? Here is the answer to your prayers: given that the address 1281 contains the address of the second line of Basic coding in your program, and you know exactly what the first line consisted of, proceed as follows:

a) Write the first line down, eg 10 REM THIS IS MY PROGRAM
b) Count the number of characters in the line including all the spaces but counting one for each Basic command, eg REM=1, and exclude the sequence number completely.

REM=1
4 blanks
15 Alpha characters
=20

c) Then add 1 for end of line. Oric stores a 0 at the end of each Basic line. +2—This is the length of the address at 1281 to point the second line of Basic. +2—These two bytes contain the line sequence number of the first line of Basic. +1—Start of the next line. Therefore 20+1+2+2+1=26.

d) Enter the command:
DOKE 1281,1281+26
then LIST the program.

You should find that the program has now reappeared.

This works because New Sets only the address 1281 to 0 without actually deleting the lines of your program. Hence restore the address and you restore your program.
C R Burnham,
Rose Hill, Oxford

64 characters walking tall

One of the facilities missing on the Commodore 64 is the ability to print double height letters. I have included a routine that will allow you to print the first six letters of the alphabet in double height. With a few adjustments, you can print up to 127 double height ROM characters.

The loop in line 4 (using I), is the loop telling the computer how many letters are wanted to be copied. By changing the loop number and the data statements in line 10 you can choose the letters you want, eg if you want to print the letters a-f and @, in double height, then change line 4 to:

4 Z=12288:FOR I=0 TO 6:READ D:D=D*(8) AND 3246:FOR I=0 TO 7:A=PEEK(D+1)
then add a 'O' to the data statements:

10 DATA 0,1,2,3,4,5,6

Line 5 is important because:
1) It checks the current location used for your new character set is not equal to a ", then the computer is told to jump to the next usable location (£).
2) Because you cannot print a " on the screen, it would be pointless if you defined the (shift/2) key, so line 5 jumps this location.

To use your new character set, use POKES3272, (PEEK(53272) AND 240)+12:

To print each double height letter you have to type the corresponding key to the character wanted, then the next symbol, found by using the screen display codes on pages 132-133 in the CBM 64 users' guide.

To print the letters in the example use:

@BDFHJ
ACEGK

NB The data statements use the screen display codes on pages 132-133 in the CBM 64 User's Guide.

```

1 POKE 52,48:POKE 56,48:CLR
2 POKE 56334,PEEK(56334)
3 AND 254
4 POKE 1,PEEK(1) AND 251
5 Z=12288:FOR I=0 TO 7
6 S:READ
7 D:D=(I*(8)+53248):FOR
8 I=0
9 TO 7:A=PEEK(D+1)
10 IF Z=(34*8)+12288 OR
11 Z=((128+34*8)+12288) THEN
12 Z=Z+8
13 POKE Z,A:POKE
14 Z+1,A:Z=Z+2:NEXT I,1
15 POKE 1,(PEEK(1) OR 4)
16 POKE 56334,PEEK(56334)
17 OR 1
18 DATA 1,2,3,4,5,6

```

Graham Hutchings,
Bognor Regis

Spectrum screen highlights

Here is a useful routine for highlighting the screen on the ZX Spectrum. Whatever is printed on the screen will flash through the colours and make a Laser sound. However, it must be printed in black on a white paper with white border. If it is allocated higher up in the memory it will become a different pitched note.

5 REM FLASHING LETTERS
10 CLEAR 29999

20 FOR N=30000 TO 30048

30 READ A:OKE N,A

40 NEXT N

50 DATA 30,8,33,0,88,14,24,6,

32,126,60,254,64,32,2,62,56,

119,35,16,244,13,32,239,14,

255,22,2,62,23,211,254,65,

16,154,62,7,21,32,246,13,13,

13,32,237,29,32,210,201

The routine is run by

RANDOMISE USR 30000.

John Pitcher,
Culter, Aberdeen

From A to Z with care

The following program can be used to practice touch typing. Just type in the letters A to Z in order. If you get one wrong the machine will beep.

```

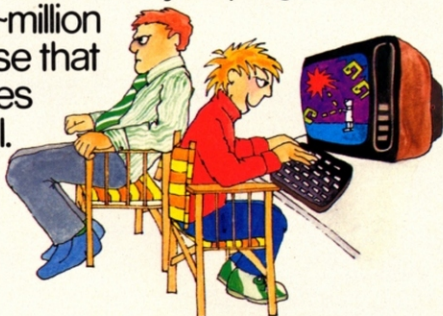
10 CLS
20 FOR T=65 TO 65+25
30 AS=INKEY$
40 IF AS="" THEN 30
50 IF AS=CHR$(T) THEN 30
60 THEN MENU
70 IF ASC(AS)>T THEN BEEP:
80 GOTO 30
90 PRINT AS;
100 NEXT T
110 PRINT
120 GOTO 20

```

Keith Gant,
Wirral, Merseyside

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It's enough to blow the mind of any micro!



One of the many faces on Prestel

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Oric have attempted to put old wrongs right. Bob Maunder measures their success.

Oric could not have chosen a worse time to unveil its new Atmos. It must have seemed a suitable occasion — mid-January when everyone had recovered from Christmas festivities, and at the 'Which Computer' Show when very little else for the micro hobbyist would appear.

And then came Sinclair's QL, and the Atmos was knocked off the first pages of the micro magazines.

Despite this inauspicious birth, the Atmos does have a good family history. It was conceived to replace the Oric-1 which appeared on the market end of 1982, and grew from the expertise of Tangerine, specialists in kit systems.

The Oric-1 was a novel and attractive machine and particularly drew acclaim for its sound facilities. It was thoughtfully designed, with a monitor as well as television output, and a standard Centronics port to which many types of printers could be directly connected. However, there were early criticisms of bugs in the ROM, and Oric Products were quick to reply that a new ROM was on its way. Nevertheless, Oric observers did not expect a new machine encapsulating the ROM.

Presentation

The Atmos has a dashing red and black livery with a professional keyboard. Even the old Oric logo is restyled with a red go-faster stripe. For £169.95 the buyer gets a 48K Atmos, mains connector, TV and cassette DIN leads, manual and introductory cassette. There are no immediate plans to produce a 16K model for the UK market, though this could change if there is sufficient demand. Also included is a voucher allowing £40 off Oric's colour printer, continuing the offer on the Oric-1.

A further insert advertises the Oric User Group and its magazine 'Oric Computing'. Is this a diminution in loyalty to Tansoft's useful 'Oric Owner' magazine, an issue of which used to be given away free with the Oric-1, and was developing into a user group format? The new OUG appears free from organisational ties with Oric, and its magazine is designed more for the enthusiast.

ATMOSPHERICS

Documentation

The 294-page manual was the next mode of approach. It was written by Ian Adamson and published for Oric by Pan. It is aeons ahead of the Oric-1 manual in terms of technical detail, containing lots of facts and figures on system variables, memory organisation, ROM routines and so on. Its twelve appendices contain information for which many Oric-1 owners would have happily sold their grannies. Gone, however, are the cartoons, the bad jokes and the typesetting errors which graced the Oric-1 manual. Some readers might find the approach too technical, but those already familiar with Basic will find it very satisfactory.

Construction

More detailed examination reveals the machine's radical restyling to be a little cosmetic. The shape and dimensions are those of the Oric-1, with the chunky wedge-shaped unit angling the keys nice-

ly for the user. Only the top moulding is new while the plastic moulding of the base and sides is identical to that of its predecessor. The stippling at the top left of the keyboard is not a speaker grill but merely adornment — the speaker grill remains on the base.

The key layout differs in only one respect, an extra **FUNCT** key appearing at the bottom right, but of course the keys themselves are now full size. **FUNCT** is not documented in the manual and apparently it is not used by the Atmos system software (available 'for future expansion' according to Oric technical staff). Normal characters are on black keys while cursor movement, shift, control, delete, function and return keys are red. The redesigned



A familiar sight for Oric owners: from left, TV socket, RGB and tape sockets, printer interface, expansion port and power input.

case-top now labels the back connectors, namely, from left to right, power (9V DC) in, expansion edge connector, Centronics parallel port, tape DIN, monitor DIN, and TV output. The **RESET** key is concealed at the bottom of the case and is inaccessible without long sharpened fingernails or a pencil. It is unfortunate that an on/off switch was not included.

In use

When switched on, the Atmos identifies itself with a message "ORIC EXTENDED BASIC V1.1" and shows how much memory is available by "37631 BYTES FREE" for the 48K model. Certainly the new ROM is more honest than that in the Oric-1, which

attempts with the cassette on the other side, wound on, and with other recorders still proved fruitless, and as the manual gave no information on the 'WELCOME' cassette, it did not live up to its title.

Language

To avoid boring Oric-1 experts it is perhaps best to consider the language of the Atmos in two parts. First consider how it differs from that of its predecessor, and then look at the features carried over. A Basic keyword summary is shown in Table 1.

There are only two new keywords, namely **STORE** and **RECALL**. **STORE** saves the contents of an array on cassette, and options are available for real, integer or string arrays and in faster or slow recording modes. **RECALL** is the accompanying command for loading the array from tape into memory.

Other commands and instructions have been improved upon. **CLOAD** now has 'j'

more, although the user must remember the tabbed position must be counted from the first protected column position.

Other former problems such as the erratic **ELSE** and the spurious **STR\$** have also been cleared up.

Calculations Numbers are assigned values using the normal **LET** statement (with or without the **LET** keyword) and all the normal operators and functions are available. String handling follows the Microsoft standards with **LEFT\$**, **RIGHT\$** and **MID\$** functions providing slicing operations. Concatenation and string comparison also appear.



The MCP Printer/Plotter — the smart tivery resembles the emperor's new clothes.



Microdiscs: pukka disks, not tape cartridges.

Conditions and Loops The **IF-THEN** instruction with its optional **ELSE** clause, now bug-free, allows conditions to be tested. The computed jump and subroutine call **ON-GOTO** and **ON-GOSUB** extend this facility. **WAIT** causes program execution to pause for a given multiple of ten milliseconds. Two constructs enable to repeat sections of code, **FOR-NEXT** and **REPEAT-UNTIL**.

Subroutines and Functions Basic subroutines are invoked by **GOSUB** while machine code routines use **CALL** or the **USR** function. The full list of string and numeric functions are at the programmer's fingertips, plus a useful decimal-to-hexadecimal convertor function **HEX\$**. A novel feature is the ability to define your own function in machine-code and invoke it by '&'. This is the low level equivalent of Basic's **DEF FN** which is also provided. A similar facility to the **&** function is used to define a new instruction.

Machine Level In addition to the great advantages of **&** and **!**, the machine-code aficionado can also use **PEEK** and **POKE** and their two-byte equivalents **DEEK** and **DOKE**. Coupled with **CALL**, **USR** and **HEX\$** these provide a formidable arsenal of machine level power. As all this was on the Oric-1, one could never understand why the manufacturers gave away so little about the guts of the ROM. This has now been remedied — the Atmos manual reveals all. **Sound** Shoot 'em up fans will continue to delight in the sound features of the Atmos, identical to those of the Oric-1. Predefined sounds **EXPLODE**, **PING**, **SHOOT** and **ZAP** provide great attention-grabbing noises. **SOUND**, **MUSIC** and **PLAY** give a full range of musical and non-musical sounds for the more serious user.

Graphics Oric-1 sales literature took the unusual approach of making a great virtue of its graphics features, though its method of using serial attributes was rather primitive. This method is again carried

and 'v' options, ie joining and verifying respectively. The **join** facility allows a program from tape to be appended to that currently in memory: the modules are not merged, and duplicate or lower line-numbers in the joined section are not allowed. The verify option lists any errors resulting from storing information on tape with **CSAVE**. **CLOAD** will also give more messages on the screen — it lists programs or data by name as they are encountered on tape, and can produce an 'Errors found' message on a faulty load. It even shows whether the program being loaded is in Basic or machine code. One final supplement is to the **PRINT** instruction. **PRINTING** at a specified screen position is now available with the @ option followed by column and line values (low-resolution modes only).

Many of us were keen on the old Oric-1, warts and all, but the bugs have been dealt a mortal blow on the new machine. The most infamous vermin, the **TAB** bug is no

used to claim "47480 BYTES FREE", totally ignoring those bytes gobbled up by system variables and the screen display.

Having switched on, the reviewer turns to the supplied cassette, pleasantly labelled 'WELCOME TO ORIC ATMOS', with **CLOAD** on one side and **CLOAD** on the other, but lacking further instructions for use. On typing in the appropriate command, the message 'Searching...' appears at the top of the screen, soon followed by 'Loading * C' and then 'Ready'. Instinct further dictates the result of 'Ready', giving the disappointing result of another 'Ready' message. Further

PEDRO

“Vengo”

“Vengo”

“Vengo”

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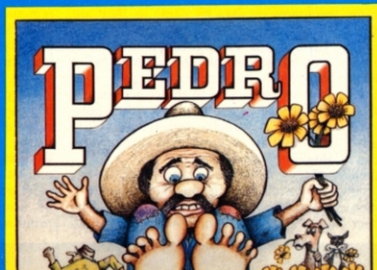
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over to the Atmos. The theory is that the machine works at two graphics resolutions, low (27 lines of 40 characters) and high (200 by 240 pixels). Colours, double height or flashing symbols are set up by placing special non-printing characters at screen positions preceding where their effect is to take place. Subsequent 'attribute' characters may alter the effect of previous ones. This approach is the same as on Prestel.

The great advantage is that much less memory is used up, compared with most other low-cost micros, but the disadvantage is that complex colourful screens can be a nuisance to set up. If the Oric model had appeared earlier this teletext-compatibility would have been much more reasonable. As it is the modem is not mentioned in the Atmos brochure, though the printer and forthcoming micro disks are.

The Atmos has three low-resolution modes. In TEXT and LORES0 the 27 x 40 screen can be modified by PLOT and PRINT. The new PRINT @ feature effectively extends what PLOT did on the Oric-1, but PLOT is still preserved. LORES1 displays all characters as Prestel-style graphics block. HIRES invokes a 200 x 240 grid with a couple of lines at the base of the screen for messages.

Cassette Handling Two speeds of loading (CLOAD) and saving (CSAVE) on cassette make the Atmos very flexible with most recorders. Most Oric-1 software suppliers send out their programs recorded in both modes and no doubt this will continue for the Atmos. Oric-1 Basic programs on cassette will not load correctly onto the Atmos — the Basic is compatible but the system variables are not. CLOAD's extensions of joining and verifying look useful.

Control Codes A number of control characters give handy system functions. CTRL T switches between upper and lower case (a new CAPS key would have been better), CTRL F toggles the audible keyclick on and off, CTRL L clears the screen and the more obscure CTRL S can switch off the display. All these codes are accessible from programs as well. Control characters and cursor movement keys are used in editing, not one of the machine's best features.

Hardware

Having seen that the Atmos and its predecessor have almost identical Basic, massive innovations in hardware are not to be expected.

The base lifts off to reveal... a board with the insignia 'ORIC-1' designed by Tangerine Computer Systems'. It is the issue 4 Oric-1 board containing the single ROM chip as IC9, the only difference being that the ROM is labelled ORIC BASIC V1.1 instead of V1.0.

The ROM

The overall memory map of the Atmos is yet another feature identical to the Oric-1. The ROM occupies a slot at the top of memory from address C000 hex onwards. Experiments with a few memory display routines reveal that data tables remain in the old Oric-1 positions, give or take a few bytes.

Atmos Basic Keywords (New or Supplemented words are *italics*)

ABS	CSAVE	FALSE	INK	MUSIC	POKE	RUN	TEXT
AND	CURMOV	FILL	INPUT	NEW	POP	SCRN	THEN
ASC	CURSET	FN	INT	NEXT	POS	SGN	TO
ATN	DATA	FOR	KEYS	NOT	<i>PRINT</i>	SHOOT	TRUFF
AUTO	DEEK	FRE	LEFTS	ON	PULL	SIN	TRON
CALL	DEF	GET	LEN	OR	READ	SOUND	TRUE
CHAR	DIM	GO	LET	PAPER	<i>RECALL</i>	SPC	UNTIL
CHRS	DOKE	GOSUB	LIST	PATTERN	RELEASE	SQR	USR
CIRCLE	DRAW	GOTO	LLIST	PEEK	REM	STEP	VAL
CLEAR	EDIT	GRAB	LN	PI	REPEAT	STOP	WAIT
<i>CLOAD</i>	ELSE	HEXS	LOG	PING	RESTORE	<i>STORE</i>	ZAP
CLS	END	HIMEM	LORES	PLAY	RETURN	STRS	
CONT	EXP	HIRES	LPRINT	PLOT	RIGHTS	TAB	
COS	EXPLODE	IF	MIDS	POINT	RND	TAN	

Many of the ROM routines have different start addresses on the Atmos and this means that most machine code programs written for the Oric-1 will require changes. Apparently, most software houses have been told about the proposed changes well in advance, so Atmos software should appear very soon. Much of the Oric-1 convoluted code seems to have been untangled and this results in more efficient processing. A few simple timed tests matching the Atmos against an aging version-3 Oric-1 proved the Atmos to be up to twice as fast.

Peripherals

The MCP-40 Printer/Plotter has been refurbished in the new Atmos livery, but remains the same inside. The long-awaited Microdisks also appear in the Atmos brochure in red and black. These have not been examined but their specification looks impressive. They are pukka disks, not tape cartridges, and are in the Hitachi 3in format. 160K can be stored on each side and a transfer rate of 250 Kbits per second is quoted.

Conclusion

The Oric Atmos carries on the Oric-1 tradition with a few changes. All the laudable features remain, keeping it well ahead of many other machines despite changes in the market over the past year. The niggling errors and inconsistencies of its predecessors seem to have been cleared up too, and the keyboard is much easier to use.

Oric-1 owners waking up to find their micros outdated may be encouraged to know that an upgrade service is planned, whereby an Oric-1 may be equipped with a new keyboard and ROM for around £50.

The Atmos sits uneasily at £169.95 between the Spectrum and the Commodore 64 both in price and capabilities. If the

Microdisks live up to expectations, the Atmos should prove to be a good step forward for its manufacturers.

Second opinion

I don't see how anyone can call the Atmos a new product. Put bluntly, it's a repackaged and slightly improved Oric-1. Apart from PRINT @ and a few new file-handling commands (which some say should have been included in the original machine) it has the same features as the Oric-1.

Most of the bugs in the old ROM have been ironed out, but TAB still prints spaces instead of just moving the cursor. The serial attribute system is still used in exactly the same way and even the screen addresses are the same.

Several of the ROM routines' addresses have been altered, which means that some software with CALLS to the ROM will hang up.

Despite the fact that the Oric's been around for almost a year, there's still precious little software available for it compared with machines like the Spectrum or Dragon, while programs for the 16K Oric are as rare as hens' teeth.

If you choose to upgrade your Oric-1 to an Atmos all you get for the £50 conversion fee is a new ROM, a red case and a different keyboard. £50 seems rather steep.

At £170 for a 48K micro, the Atmos is considerably more expensive than its competition. Being so similar to the Oric-1, it offers much the same competition to machines with similar features as the Oric-1 did — virtually none.

If Oric Products International want to be successful in the micro market they'd do well to try to gloss over the initial setback of producing the Oric-1 and come up with something really new.

Bryan Skinner

SPECIFICATIONS

Price	£170 (48K)
Processor	6502A
RAM	48K
ROM	16K
Text screen	28 lines of 40 characters TV or RGB outputs
Graphics screen	57 by 240 pixels
Keyboard	57 full moving keys
Storage	cassette interface — (drives coming)
OS/Language	Extended Microsoft Basic
Distributor	Oric Products International (0990) 27686. Available Dixons, Laskys, Comet, Wigfalls, Rumbelows and various computer stockists.

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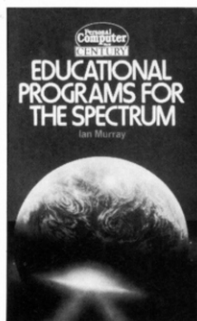
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Suffering from keyboard finger? Take a break with a book.



'Educational programs for the Spectrum' by Ian Murray, published by Century Publishing, at £5.95 (paperback 183 pages)

Isn't it time educational programs achieved greater originality? Not many would disagree, but this book contains only the usual batch of fun-type educational games.

Ian Murray has collated 25 programs covering areas such as science, economics, geography, history, spelling and computer science, pitched at different age groups.

In each case there's a general description of the program and what you're supposed to achieve followed by a detailed description of the program and explanatory notes. Following this is a tract pointing out the program's educational aspect and how best to use it.

It's a useful format if you want to explore educational uses of the Spectrum and there's a cassette available from the publisher to save you typing in the listings.

SG



'Computer Playground: Commodore 64/Vic 20' by M J Winter, published by Prentice Hall at £12.50 (paperback, 128 pages)

This is a cross between a costly

colouring book, and a guide to the rudiments of computer use. Since most schools use BBCs and Spectrums, there'll be little educational market for this American offering here.

In this country you'll find this useful only as a first guide to CBM machines for children who have not yet got past the crayon age. There are 42 problems to solve, each illustrating features of Basic, and polishing up on maths and English. You start with statements like PRINT, GOTO, and INPUT, and progress to IF, THEN, PEEK, and POKE.

As with most conventional workbooks, there's space on the page for answers, but at £12.50 it seems unforgivable to scrawl over the pages. Crayons will be useful, too, for colouring the large figures used as illustration.

This is what is intended — to get the child learning while having fun. But at this price you might want a book with more lasting appeal. Once coloured in and when the problems are solved, there's little left.

SG



'Mastering the ZX Spectrum' by Lawrie Moore, published by Ellis Horwood at £5.95 (paperback, 180 pages)

This compact meaty book will satisfy Spectrum users who want to know the ideas behind programming techniques.

Lawrie Moore wastes no time getting to simple programming. After introductory chapters about the keyboard, storing information and so on — you get to loops and then on to new aspects of programming in separate chapters. Clear concise examples are given.

The author leaves no stone

unturned. There are 18 chapters of information which are clear and easy to understand.

Smallish programs are used as mini projects linked together as subroutines for a large project which produces the Music Program game comprising 25 subroutines. Each is introduced as a separate programming problem.

Having tackled a programming project in Basic the book then looks at other languages. Chapter 18 contains a comparison of Basic and Pascal and the appendices contain extra information, such as how to save and verify programs.

All in all, it's a good reference guide.

SG



'A Pocket Handbook for the Commodore 64' by Pete Gerrard and Danny Doyle, published by Duckworth at £2.95 (paperback, 93 pages)

The first reaction to this book was, 'Hmmm, useful' quickly followed by, 'I wonder who'll buy it?'

On further consideration I decided that both were valid. There's no disputing it is a great help to have all the Basic syntax, character codes, memory maps and useful locations to hand while programming. However, there is little if anything here that isn't available from other sources.

What the authors have done is pull these necessary bits and pieces together in one neat package although the 'pocket handbook' title is a bit of misnomer, more suitable to a machine you move around a lot.

So what do you get for your £2.95? In addition to the features already mentioned, there are full maps of RAM and

ROM including Basic and the Kernal, the complete machine code instruction set, everything you wanted to know about the 1541 disk drive including commands error messages and disk formats, pinout diagrams and a guide to the RS232 standard, plus the usual character and screen codes.

If you do a lot of programming I suspect it would eventually become indispensable. Similarly, if you have bought the portable version of the 64, the SX, it will make life a lot easier. But most 64 owners can manage without.

PW

'Getting the most from your Dragon 32' by David Bannister, published by Penguin at £4.95 (paperback, 118 pages)

This book, part of a Penguin series, takes whole chunks of text word for word from its sister publications, though in some cases they are unsuitable for it.

Large paragraphs of small type and too few sub-headings make it difficult to find information. There's no index and content is muddled. Information about Basic is fragmented and, for instance, the section on program writing contains hints on cassette handling. The chapter on 'How the computer works inside' is sadly condensed to the point of confusion.

The sections directly relevant to the Dragon, such as those on sound and graphics, are useful but rather short while the question and answer style program exercises are good but truly useful illustrations are sparse.

Quite what Penguin intended this book to be is difficult to guess. It isn't a reference book and it isn't easy reading. At £4.95 this is a luxury Dragon owners might not miss.

IT



PAGE 6 THE MAGAZINE

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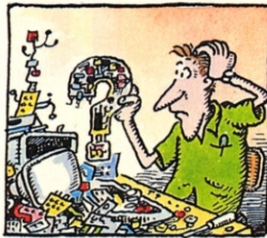
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John Lettice takes a look at Computereze — and some definitions make a good deal of sense.

Jocular jargon

The best computer magazines carry a jargon cruncher page for beginners, and perhaps even the seasoned programmers who're still human. Well, now, PCN is no exception. If you've ever wondered what a full duplex asynchronous gigadoobry is, toggle up your dingles and check out PCN's antidote to starters' pages.



The naming of the parts

One of the first problems you'll run into when your new micro falls apart is, what do you call all this... well... stuff on the inside? First of all, you can rule out the blobs of amber (molten glue) and silver (loose solder) detritus. Then it's just a matter of working out which of these the relevant bit is:

CPU — Communist Party of Yugoslavia.
UHF or VHF modulator — ecclesiastical gentleman, eg modulator of the Church of Scotland.
Video circuit — facility for showing snuff movies.
ULA — University of Los Angeles.
Uncommitted Logic Array — Philosophy department of the University of Los Angeles.
Logic gates — entrance to the Philosophy Department of the University of Los Angeles.
Video RAM — hill farmer's technical term, from the Latin 'I see the sheep.'
Virtual memory — RAMpack undergoing design.



Outer limits

When you've finished looking at all the high technology inside (taking care, of course, that none of it falls into the hands of the Russians), you'll have to cram it all back in the case. Use a system of wedges to keep it in place (hardware support) and sticky tape (software support) to stop it falling apart again.

Now you've discovered sticky tape you'll want to stick more on your micro. These are called add-ons, and include:

Centronics interface — technical term used in mail order departments, as in 'You stupid nitwit, you've sent Ron Nick's interface.'

Serial interface — argument over break-fast.

Joystick interface — grievous bodily harm.

Printer interface — manslaughter.

S100 bus — one every ten minutes during peak hours.

Expansion slot — facility for manufacturing a machine with a crucial piece of hardware missing.

Expansion card — hideously expensive crucial piece of hardware.

Floppy disk — unsuccessful piece of software.

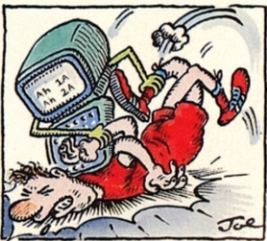
Hard disk — large and impenetrable database program.

Half duplex — wrestling throw.

Full duplex — grievous bodily harm.

Speech synthesiser — politician's gag writer.

RAMpack — see hill farmers, above.
Dedicated cassette recorder — device designed by manufacturer dedicated to extract an extra £40 from you after you've bought a micro.



Software shopping

We've already encountered software (see software support, above).

This often comes on tape, but you'll probably find that most of the major brands of sticky tape aren't compatible with your micro. So you'll have to buy more expensive cassette tape. Despite the higher price, this isn't nearly so good for holding broken micros together.

Software comes in two varieties, serious and games, but as serious software is much more expensive, and the sound isn't nearly so good, you'd probably best concentrate on games. But if you insist on messing around with the serious stuff, you'll encounter some of the following terms:

High level language — Knightsbridge Basic.

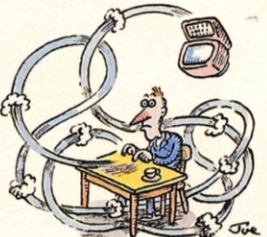
Assembler — factory sub-contracted by micro designer to build the machines, or alternatively, to repair them. This latter is known as top down programming.

Routine — area of a program where the machine gets into a continuous and inescapable loop.

Subroutine — area of a program where the machine sometimes, and without warning, gets into a continuous and inescapable loop.

Machine code — method of making the machine go round and round faster in continuous and inescapable loops.

Disassembler — blunt instrument used to stop machine going round and round in continuous and inescapable loops.



The industry

Now you've got to grips with your own machine, you're on the brink of becoming an expert — but in order to get on TV and radio programmes you'll still need some background knowledge about other machines, and about the companies who make them. Most of the terms you'll encounter are self-explanatory — eg a hackers' machine has a built in ashtay — but there are still a few we should list:

Peripheral manufacturer — one man outfit based in the suburbs.

Dynamic young company — one man outfit with a blueprint for a micro (not yet in production) and promising to hire a lot more staff.

Industry giant — marketing company which also makes micros.

Industry heavyweight — mainframe manufacturer.

IBM lookalike — business machine using the 8088 processor.

IBM PC — business machine using a version of the 8088 processor that is apparently £1,000 more expensive.

PCN

Three c amn



A rubbish bin for your old
has been.



Yet more money
bolt

■ Believe it or not, computers often suffer from amnesia.

99% start off with large enough memories, but operating functions like text, colour, sound and more particularly high resolution graphics, take large bytes out of them. Leaving very little "useable" memory for programming and games.

Not so the new Oric Atmos 48K.

This is the one home computer that takes these normal working functions in its stride.

Unlike other home computers it uses the highly sophisticated serial attribute handling method used by Viewdata and Teletext,

in which the attributes are stored on the screen alongside the data, instead of taking up space in the memory.

Thus the Oric Atmos never offers less than a healthy 37K of useable memory – even when the new colour printer and disc drive unit are attached. (Technical buffs see details overleaf).

So it rivals the performance of the supposedly larger, more expensive Commodore 64K, which unfortunately loses 26K of its "elephantine" memory in high resolution graphics.

It beats its immediate competitors like the Sindair Spectrum, Dragon 32K, Vic 20 and Atari 600.

ures for esia.



or yet more
ons.

The new Oric Atmos 48K.

It beats the Lynx 48K, which costs over a third more, yet loses 34K.

It even beats the Acorn Electron and the BBC Micro which costs more than twice as much, yet loses 23K in high resolution graphics.

And while this may surprise you, it's totally in keeping with a company recognised in the computer industry for performance and innovation.

Like its predecessor, the Oric-1, the Oric Atmos has the powerful loudspeaker and amplifier unit that prompted "Which

Micro" (November issue) to comment... "Its sound facilities have more in common with those of the £400 Beeb, than the rather pathetic beep of the Spectrum. At full volume it can compete with most arcade games..."

Yet the Oric Atmos 48K costs a mere £170, including all the leads and adaptors you need to get it going.

So if you're buying a computer, remember our name. We could save you a fortune on bolt-ons... or wastepaper bins.

The new Oric Atmos 48K. **ORIC**

Now we've whetted your appetite, here's something to get your teeth into.

Printer Technical Specifications

Printer/ Plotting system	Ball Point Pen, 4 colour
Plotting speed: (horizontal)	52 mm/sec (2.05ips)
(vertical)	73 mm/sec (3.08ips)
Printer Speed	12 characters per second
Resolution	0.2 mm/step (0.00787 inch)
Effective plotting range	96 mm (3.804 inch) x axis, divided into 480 steps. (No limit in y direction)
Characters per line	80 or 40 text mode (determined by software in graphics mode)
Characters per line	INT (480/n + 1) * 6 for 0 < n = 15
Accuracy (repetition)	0.2 mm max
(movement)	0.3 mm max
(distance)	0.5% max (x-axis) 1% (y-axis)
Pen life	250 metres (825 feet)
Parallel interface	8-bit parallel Uses STROBE and ACKNOWLEDGE
Temperature range	18.3 to 35°C (65 to 96°F)
storage	-40 to 71°C (-40 to 160°F)
Humidity range	10% to 80% relative non- condensing
Power supply	Switching power supply input 100-120 VAC 200-240 VAC
Dimensions	10 3/4" wide 6 7/8" deep 2 1/2" high

Atmos Technical Specifications

CPU	6502 A
Memory	Choice of 16K or 48K RAM
Memory (48K Model)	Minimum 48K RAM, max 64: 16K ROM external control signals allow use of full 64K RAM or maybe used externally to increase ROM/RAM
Language	Extended Microsoft basic
Keyboard	Typewriter style and pitch, 57 keys, standard computer layout, additional cursor control keys, autorepeat facility, tactile and acoustic feedback
Display	Output for B&W or colour TV, RGB output for colour monitor. 40 line x 28 rows
Text format	Similar to Teletext format, standard ASCII double height, flashing, 80 user definable characters
Character set	240 x 200, 8 colours Points, lines, circles
Graphics	Internal loudspeaker and amplifier. 3-Channel sound synthesiser envelope control, amplitude control 8 octaves, noise channel
Graphic Facilities	Most cassette recorders via DIN socket 300 or 2400 BAUD. Disc Drive.
Sound	Centronics, expansion port, Hi-fi, RGB Monitor, UHF TV, cassette recorder
Storage	Warm reset to regain control without clearing program or data
Interface	
Other	

Micro Disc Technical Specifications

Formatted Capacity	160K bytes per side (double density as standard)
No. of Tracks	40 (80 available as option at future date)
No. of Sectors	16
Bytes per Sector	256
Transfer Rate	250K Bits/Sec
Supports up to 599 files per side, four drives single or double sided, 40 or 80 track. User definable configuration allows mixing of drive types including 5 1/4" (five and a quarter inch) Extensive wild card facilities Copy allows merging of basic and machine code files	
<u>Utilities</u> The Utilities are as follows:	
1. Backup	Copy a whole disc
2. Copy	Copy a file to another
3. Del	Delete a file allowing wildcards
4. Dir	Display directory listing
5. Drv	Set the default drive number
6. Format	Format and initialise a disc
7. Load	Load a file (code data or basic)
8. Protect	Change protect status of file
9. Recall	Recall a basic array from a file
10. Ren	Rename a file
11. Save	Save a file (code, data or basic)
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ORIC

Break out of the narrow confines of the Spectrum screen with Kevin Ball's machine code routine.

The big screen

The Spectrum's display format is somewhat limited in that it only has 22 (Basic usable) rows down the screen, and 32 columns across. This makes the machine unsuitable for word processing applications, and for many situations where a large output of text is required.

But it is possible, with careful manipulation of the display file's memory, to display up to 42 characters on each row. This enables 924 characters to be placed on one screen, an increase of 22 characters over the normal display.

I have written a machine code routine to enable a string of 12 characters to be displayed on any one row of the screen. The machine code routine itself is only 26 bytes long, but the total set-up in memory takes slightly over 1K. The extra space is occupied by a 42 byte input buffer, a 32 byte temporary buffer (used by the routine), and an alternate character set. This is necessary because the Spectrum's characters are too wide to be able to fit 42 on one line.

To load the machine code and the alternate character set it is only necessary to type in the program and then RUN it.

The first (and longer) batch of Hex codes is the alternate character set, so mistakes made when typing this in won't cause the system to crash, and should be fairly easy to track down. The second batch (after the REMstatement) is the actual machine code, and care should be taken when typing it in, as mistakes can be hard to find later.

Although the code is not relocatable in the strict sense of the word (ie it does contain absolute address), it is possible to position it anywhere in empty RAM, because the Basic program works out any address used, relative to the start address of the alternate character set which is specified at the start of the program. It then pokes these addresses into the RAM containing the code at the correct places, which are again worked out relative to the initial value specified. As it stands (without you altering anything) the routine peeks the system variables to detect a 16K or 48K Spectrum, and sets the value of A accordingly so that the routine is placed as far up in RAM as it can go, to save wasting space.

Adventurous use

The routine is also placed under the user defined graphics, so these may be used elsewhere in the program.

If you are using the routine in a Basic program (for instance, an adventure game with large amounts of text output) and you wish to place the routine elsewhere in memory, change the relevant value of A in line 1 (remember this is the start of the alternate character set).

It is worth noting that when you change

the base address on line 1, you alter not only the position of the alternative character set, but also the machine code and the two buffers. Relative to each other they stay in the same place. If you choose to move one on its own, say the 42 byte input buffer, the routine will not work unless you POKE the input buffer's new address into the relevant part of the machine code (not recommended unless you know what you are doing).

After you have finished typing the program in, it is wise to save it on tape, as when you RUN the program it first loads the alternate character set, then the machine code, and then it calls the machine code to demonstrate the output. If you have made an error in typing in the code and the routine crashes the system, you can then load it back from tape and carefully check the DATA lines between 140 and 340, and especially the section of program from line 500 to 540, which works out the addresses and POKES them into the code. Correct any errors, re-SAVE, and re-RUN.

When you RUN the program, you will see numbers printed in the middle of the screen: they indicate the line number that the DATA is being read from. If the program stops with an error such as 'Integer too Big' or 'Variable not found', then the number on the screen will indicate which line contains the offending DATA statement.

When the routine is working correctly, check all the characters by using the routine to print them all out. The DATA on lines 32 to 127 inclusive represent the characters with codes 32 to 127 inclusive. Therefore if any characters appear incorrect or misformed, the code of the character will be the same as the line number containing that character's DATA.

Once you type in the program and have got it working, you can save the bytes on tape to use in your own programs. Use the command:

SAVE "42 COLUMNS" start address, 1054 which saves the routine and the alternate character set together. Don't forget to lower RAMTOP before loading back off tape.

When using the routine, you have to POKE the codes of the characters into the input buffer before calling it. Running through a loop from 1 to 42 to POKE the codes every time you want to print a line of characters does take a small amount of time, but outputting text in an adventure game is better at reading speed, so you may have to insert a PAUSE statement as well.

If speed is necessary, the best way to achieve it is to store all the different strings as ASCII codes in a protected area of memory, and to use a small machine code routine with an LDIR instruction in it to transfer the 42 bytes of the string into the 42

```

1 CLEAR 31545: IF PEEK 23
733=255 THEN CLEAR 64314
2 LET A=31831: IF PEEK 2
3733=255 THEN LET A=644
00
4 POKE 23658,8
8 GO TO 400
10 FOR N=ST TO FN STEP 5:
  READ Z$: PRINT AT 10,
  141N
15 FOR F=1 TO LEN Z$-
  1 STEP 2
18 LET H= CODE Z$(F)-48
  -7*( CODE Z$(F)>64)
20 LET L= CODE Z$(F+1)-48
  -7*( CODE Z$(F+1)>64)
21 POKE A, (H*16+L): LET
  A=A+1
22 NEXT F
24 NEXT N
30 RETURN
32 DATA "0000000000000000"
33 DATA "0010101010001000"
34 DATA "0028280000000000"
35 DATA "00287C28287C2800"
36 DATA "00103C5038147810"
37 DATA "46464010204C4C00"
38 DATA "00102810244A3A00"
39 DATA "1808100000000000"
40 DATA "0008101010100800"
41 DATA "0010080808081000"
42 DATA "0000108438541000"
43 DATA "000010107C101000"
44 DATA "0000000000180810"
45 DATA "000000007C000000"
46 DATA "0000000000181800"
47 DATA "00040A0810204040"
48 DATA "00384C5A64443800"
49 DATA "0010301010103800"
50 DATA "0038404038407C00"
51 DATA "0038441804443800"
52 DATA "00081828487C0800"
53 DATA "007C407804443800"
54 DATA "0038407844443800"
55 DATA "007C404810202000"
56 DATA "0038443844443800"
57 DATA "003844443C043800"
58 DATA "0000101000101000"
59 DATA "0000181800180810"
60 DATA "0000081020100800"
61 DATA "00000030030C0000"
62 DATA "0000201008102000"
63 DATA "0038404010001000"
64 DATA "003C425A4E403C00"
65 DATA "003844447C444400"
66 DATA "0078447844447800"
67 DATA "0038444040443800"
68 DATA "0078444478404000"
69 DATA "007C407840407C00"
70 DATA "007C407840404000"
71 DATA "003844404C443C00"
72 DATA "0044447C44444400"
73 DATA "007C101010107C00"
74 DATA "00040A0404443800"
75 DATA "0044485070484400"
76 DATA "00040A040407C000"
77 DATA "00446C5A44444400"
78 DATA "00465A4C44444400"
79 DATA "0038444444443800"
80 DATA "0078444478404000"
81 DATA "003844445A4C3800"
82 DATA "0078444478404400"
83 DATA "0038403804443800"
84 DATA "007C101010101000"
85 DATA "0044444444443800"
86 DATA "0044444444281000"
87 DATA "004444445A5A2800"
88 DATA "0044281028444400"
89 DATA "0044442810202000"
90 DATA "007C081020407C00"
91 DATA "0018101010101800"
92 DATA "0020201008040000"
93 DATA "0018080808081800"
94 DATA "0010385410101000"
95 DATA "000000000000007C"
96 DATA "0018247020207C00"

```

byte input buffer of the routine.

When printing a string of less than 42 characters with the routine, it is not necessary to run your FOR NEXT loop right up to 42 to obliterate any characters left in the buffer from the last line of printing. The loop can run from 1 to the LEN of A\$ (or whatever string you are using).

Filling in spaces at the end is not necessary because every time the routine is used, right at the end it fills the whole input buffer with 32s (the code for a space), therefore eliminating any overlap problems with your text.

If you want to use the routine in an application where continuous frequent printing of the same string is needed, the routine can be changed to prevent the input buffer being cleared after every printing. You can do this by simply changing the character "B" from a zero ("0") on DATA line number 340.

You will notice that my program, when printing the demonstration string at the end, outputs the text in the middle of the screen (PRINT at line 10 in fact). This is variable and can be changed to suit your needs. Whatever line you wish your text to be printed on, just POKE the line number into the one byte buffer in the system variables that the routine uses.

Every time you call the routine, it looks at this byte (location 23681) and takes it to be the line number down the screen. The display file address for the output is then worked out from this value. As you may wish to print on the same line each time (obviously with a scroll after calling the routine: RANDOMIZE USR 3280 in case you didn't know), the routine preserves the value in this byte. It is only necessary in this case to set the byte to the desired value initially.

Remember that the 1 byte buffer is located in the system variable and its location remains unchanged wherever the routine goes in memory, whether 16K or 48K RAM.

Although the routine is placing 42 characters on a line, it is unable to change the way the display file is organized, ie there are still 32 character positions across the screen, each one byte wide. What the routine does is squeeze one and a bit characters into every character position. When you alter the colour of a character position, you alter the whole character position's attributes (because the attribute file has one byte per character position). Therefore if you change the colours on part of the line containing the 42 characters, you will probably get a very strange effect, with characters overlapping the edge of the colour block; try it and see.

When playing around with different strings to display in 42 columns, especially while a program is under construction, it is very easy to accidentally POKE in a string of length more than 42 characters, especially when your loop runs from 1 to LEN A\$. Don't worry as this will not hurt the routine. It will still function but the extra characters will just be ignored. This is because I have placed the 32 byte working

buffer directly after the 42 input buffer.

The working buffer is only used by the routine itself, and only while the routine is working. It does not store important values in the buffer between calls. Therefore, if your string is slightly over 42 bytes (characters) long, the extra bytes will just overflow into the working buffer. The routine will ignore them, and the first time the routine uses the buffer, they will be over-written.

So long as the total length of the string is not over 74 characters (42 + 32), you will not harm anything. Any string longer will overwrite the first bytes of the alternative character set.

Theory and practice

Although the routine does print on the screen, none of the ROM printing routines have been changed or used within my routine. The printing on the screen of the 42 characters is achieved totally by manipulations of the display file bytes in the routine. This means that because the normal PRINT routines have not been changed, when not using the routine (ie when printing normally on the screen, with its normal 32 columns) all printing uses the original ROM based characters. It can be very effective if both types of display are used in a program. (Hobbit owners will know what I am talking about).

The way the routine works is as follows: the Spectrum's characters are drawn on an 8 x 8 pixel grid, with one blank space at each side of the character. Therefore, characters occupy six bits across the block, with two spare bits (pixels) between characters. If we consider three character blocks next to each other, this is a line of (3 x 8) 24 bits.

Now consider characters drawn on a six by eight grid: the character takes up five bits, and only has one spare spacing bit at the end. Each character is the same height but is one pixel thinner, and the spacing between characters is one pixel instead of two. This means that in three 8 by 8 character positions (total width of 24 pixels) we can fit four 6 x 8 characters. The total number of characters per line is therefore 42.

The routine uses a large loop from 1 to 10 and treats the display file in blocks of three characters. The 32 byte working buffer is used to temporarily store the image bytes (8 per character) for the four characters to be placed in the three blocks (4 x 8 = 32). Then the routine works out what bits of each character go into each character position on the screen and rotates the relevant image bytes around before loading them into the display file.

In this way half a character can be loaded into one character position, and the other half into the next character position.

The two spare character positions at the end of the line (total width 16 pixels) store only two 6 x 8 characters (total 12 pixels wide) and four pixels are left unused right at the end of the line. This, however, is only noticed when printing the full 42 characters on the screen with a different border colour from the paper colour.

```

97 DATA "000038043C443C00"
98 DATA "0040407844447800"
99 DATA "0000384440443800"
100 DATA "0004043C44443C00"
101 DATA "0000384478403C00"
102 DATA "0018203020202000"
103 DATA "00003C44443C0438"
104 DATA "0040407844444400"
105 DATA "0010001010101000"
106 DATA "0004000404042418"
107 DATA "0020242830282400"
108 DATA "0010101010100800"
109 DATA "0000685454545400"
110 DATA "0000784444444400"
111 DATA "0000384444443800"
112 DATA "0000784444784040"
113 DATA "0000384848380800"
114 DATA "00001C2020202000"
115 DATA "0000384038047800"
116 DATA "0010381010100000"
117 DATA "0000444444443C00"
118 DATA "0000444428281000"
119 DATA "0000444454542800"
120 DATA "00002428028400"
121 DATA "00004444443C0800"
122 DATA "00007C0810207C00"
123 DATA "0018102010101000"
124 DATA "0008080808080800"
125 DATA "0018080408081800"
126 DATA "0020540800000000"
127 DATA "3C425A525A423C00"
130 REM *****
140 DATA "21815C7E618F640577E"
150 DATA "0F0F0FE6050AF32B05C"
160 DATA "2100000EAD506041100"
170 DATA "00C5E6260001000029"
180 DATA "290906087E12231310"
190 DATA "FAE123C110E7B1E52100"
200 DATA "00D506087ECB27122314"
210 DATA "10F8D1E5056087ECB3F"
220 DATA "CB3FCB3FCB3FCB3FE8B6"
230 DATA "77EB231410EDD113E1D5"
240 DATA "06087ECB27CB27CB2712"
250 DATA "231410FAD13AB05C3C3D"
260 DATA "2047E5D506087ECB3FCB"
270 DATA "3FCB3FEB8677EB231410"
280 DATA "F1D13E1D506087ECB27"
290 DATA "CB27CB27CB27CB271223"
300 DATA "1410FAD1E506087ECB3F"
310 DATA "EB8A77E2031410F5D113"
320 DATA "E10DC200003E132B05C"
330 DATA "C30000E1210000110000"
340 DATA "012A00EBD0C9"
400 LET ST=32: LET FN=127: LET
    S=1: GO SUB 10
410 LET A=A-1052
420 LET ST=140: LET FN=340: LET
    T=S=10: GO SUB 10
430 FOR F=A+3 TO A+45: POKE F,
    32: NEXT F
440 LET B=A+4: LET C=A+46: LET
    D=A-178: LET E=A-181
450 LET A=A-206
500 DATA 21,8,29,C,37,D,59,C,
    193,E,191,E,195,B-1,198,B
510 RESTORE 500
520 FOR F=1 TO 8
530 READ Z,G: LET Z=Z+A: POKE
    Z+1,INT (G/256): POKE Z,
    G-256*(INT (G/256))
540 NEXT F
550 POKE 23681,10: REM row
    down the screen
560 LET A$="ABCDEFHGHIJKLMNOPQ
    RSTUVWXYZ-1234567890:;>?*"
570 LET J=1
580 FOR F=A+210 TO A+209: LEN
    A$
590 POKE F, CODE (A$(J)): LET J
    =J+1
600 NEXT F
610 RANDOMIZE USR A
620 REM 1983 Kevin Ball.

```


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ACORNSOFT

On the right track

Piers Letcher discovers the unique properties of tracker balls.

Tracker balls were developed for military and avionics use, and were only recently made available for micros. They are particularly well suited as controlling devices since they are almost analogous to the movement of the hand. Like light pens and graphics tablets they are much more 'user-friendly' than keyboards.

They are mostly used to replace joysticks as micro games controllers, but while joysticks cost around £7, tracker balls start at about £40, though the extra money also buys you more power.

The tracker ball is similar to an upturned mouse, with the added advantages that it takes up far less space (mice need room to run around), and is much cheaper, although a top model can be very costly.

Tracker balls are differential devices. A joystick is generally an indicator to the program that a certain direction is to be taken while the tracker ball can indicate speed of movement too — gentle movement or spinning give different results. Furthermore, it is simple to accurately position the cursor or game icon with a tracker ball.

We tested tracker balls from different ends of the market: the Atari Trak-Ball, selling at under £40, and the Marconi 3in RB3, likely to cost between £150 and £200, the latter was used with a BBC micro.

First impressions

The Atari Trak-Ball is a sealed black plastic unit containing a fairly solid sphere. The fire power is provided by two flat push buttons top left and top right (for left- and right-handed people). There's also a switch marked JS/TB (joystick/tracker ball) and the traditional dual Atari peripheral sockets.

As a contrast to this, the Marconi model has a bulky and industrial looking box housing a three inch yellow billiard-type ball as well as control rods and circuit boards. Normally the tracker balls are sunk



The Atari Trak-Ball — it's small enough to hold comfortably in your lap.

into desk tops so the bulk wouldn't be seen. The RB3 reviewed here is the precursor to a new range of 2.25 inch balls costing between £50 and £100, though it's not yet sure with which micros they will be compatible.

Both balls were as simple as joysticks to set up — just plug them in. Since setting up and using them is intuitive, documentation is not necessary, though Atari provides a multi-lingual booklet (one page of English) explaining how to look after your Trak-Ball — such things as the dangers of spilling liquid into it...

How they work

Both these tracker balls were smooth in use, and didn't have the sticky feeling noted in our test of the TG Track Ball (Issue 12). Both continue to spin if allowed and, not surprisingly, the Marconi wins over the Atari, though whether the new

and cheaper range will be as good remains to be seen.

We couldn't open up the Atari to look in, but Atari says that it works in much the same way as the TG, with twin wheels measuring the ball movement. The Marconi ball sits on perpendicular metal rods, the speed of which is measured electronically. A ball bearing provides the third support, enabling the ball to move freely in any direction.

In use

Used with a number of cartridges, the performances of the Trak-Ball varied. With Tennis it was more hindrance than help, since it was easy to waste time spinning it to try and retrieve a missed service, and with Donkey Kong there was little difference between joystick or Trak-Ball.

But the Trak-Ball really came into its own with Pole Position. Compared with arcades the micro version was disappointing, primarily due to joysticks not behaving like steering wheels. The Trak-Ball returns some feeling to the game, and for the first time I completed it.

With the drawing kit that comes with the Atari colour printer/plotter the Trak-Ball behaved like a joystick and the on-screen cursor moved very slowly, though this is almost certainly due to the software.

In the absence of the TB option, we used the Trak-Ball switched to JS with each game. The correct facility would make games like Pole Position better still, and only when they are written with the Trak-Ball in mind will this device come into its own.

The Marconi also performed well, as you would expect for the price, particularly on BBC games like Rocket Raid, where speeding up and slowing down quickly are important.

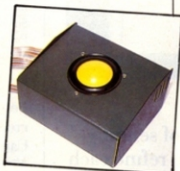
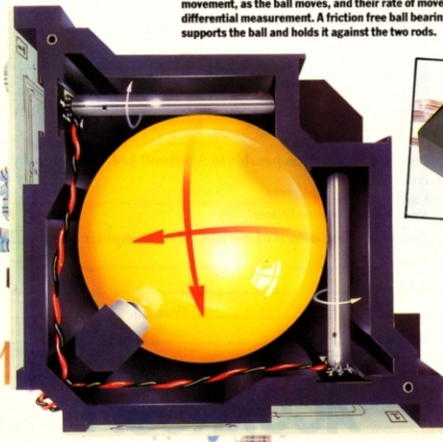
Verdict

Tracker balls have not yet come of age as common extras, and the useful things that they could do haven't been exploited, such as for word processing or indeed any field where you want to reach a screen position quickly and accurately.

At the moment they are too expensive for designers to consider putting in tracker balls instead of cursor keys as an integral part of a keyboard.

Product Atari Trak-Ball **Manufacturer** Atari
Price £39.99 inc. VAT **Interface** Atari joystick port **Outlets** retail
Product Marconi RB3 Tracker Ball
Manufacturer Marconi Electronic Devices Limited, Duddington Road, Lincoln, LN6 0LF (0522) 688121 **Price** £150-£200 (2.25 inch to be released in £50-£100 range) **Interface** To be decided

The Marconi RB3, from underneath. The two metal rods give an X and Y movement, as the ball moves, and their rate of movement gives the differential measurement. A friction free ball bearing on the left hand side supports the ball and holds it against the two rods.



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J. J. Warren 1983
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J. J. Warren 1983
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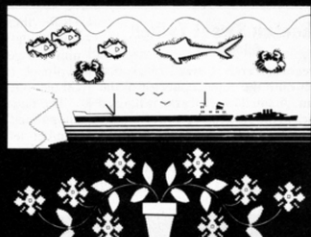
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SpectrumSpeak

Spectrum speech synthesis: David Janda says it all.

The choice of speech units available for the Spectrum is increasing and it's hard to find a magazine without at least one advertisement for something 'new and exciting' in this field. We compared the Cheetah Sweet Talker with two already reviewed, the DCP (Issue 1) and the Currah (Issue 34).

Speech synthesisers can be either allophone or digital. Advertisements for the former usually say they'll speak any word you like, but each word must be built up from a set of allophones, in what can be a time-consuming trial and error process.

Furthermore, the allophone systems tend to sound like Daleks.

Digital speech synthesisers don't sound so bad but neither are they crystal clear. They use words, letters or numbers digitally encoded onto a ROM or ROMs. To get the machine to say something, a number corresponding to a word is sent to the synthesiser, eg 1 = hello, 2 = goodbye, . . .

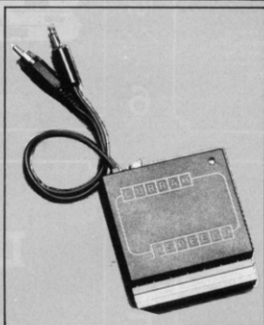
Since both methods need lots of memory, chunks of the speech unit's memory are transferred in turn, via a buffer in RAM.

Currah Microspeech Allophone

This unit superimposes sound through the TV speaker, which can also be fed into an external tape or Hi-Fi. Pressing any key causes the appropriate letter sound to be spoken.

Like the Sweet Talker, it comes with a demo cassette, but its advantage over the Cheetah is that getting it to say something is more natural than sending numbers to a port — with Microspeech you put words into the string \$\$, enclose the allophones in brackets, and the unit does the rest.

Currah's unit still seems to be the best allophone speech synthesiser for the Spectrum, though upgrades on existing models like the Computer Add-ons Speech Unit, will be interesting.



Cheetah Sweet Talker Allophone

The Sweet Talker is a small black box which fits onto the edge connector of the Spectrum. A small loudspeaker is housed at the back of the unit, facing away from the user.

There are no volume controls, and no means of connecting it to a tape recorder or

Hi-Fi, thereby eliminating one way of improving synthesized speech. With the unit you get a demonstration tape and a two-page manual, keeping the package simple, but limiting control.

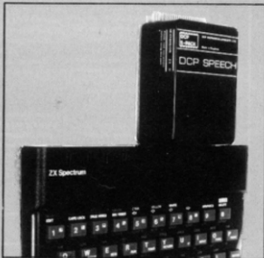
The document contains a list of the 63 allophones available, along with a data number, letter and example for each. They give a good indication of how the allophone will sound, but there are no



DCP Speech Pack Digital

Digital speech packs can cost up to twice as much as the more conventional allophone equipment, and they have a limited vocabulary. The DCP pack has just 71 entries in its initial directory of numbers, letters, and a few useful words. These are stored in a ROM, and up to three extras can be fitted with more useful words — at a price — to give a total of about 250 words.

Accessing the words is simple: when the number corresponding to a word is entered, the word is spoken. This is done with the Spectrum's OUT command, and the PAUSE statement gives gaps mid-speech.



The unit attaches to the edge connector, and includes a volume control, though you'll need a screwdriver to adjust it.

Digital speech is better than the allophone variety and can be further improved by feeding the pack's output to your amplifier from the audio socket provided — adding a little bass can improve the sound dramatically.

details about what memory the unit uses or how it uses it, and machine code programmers will need to know this.

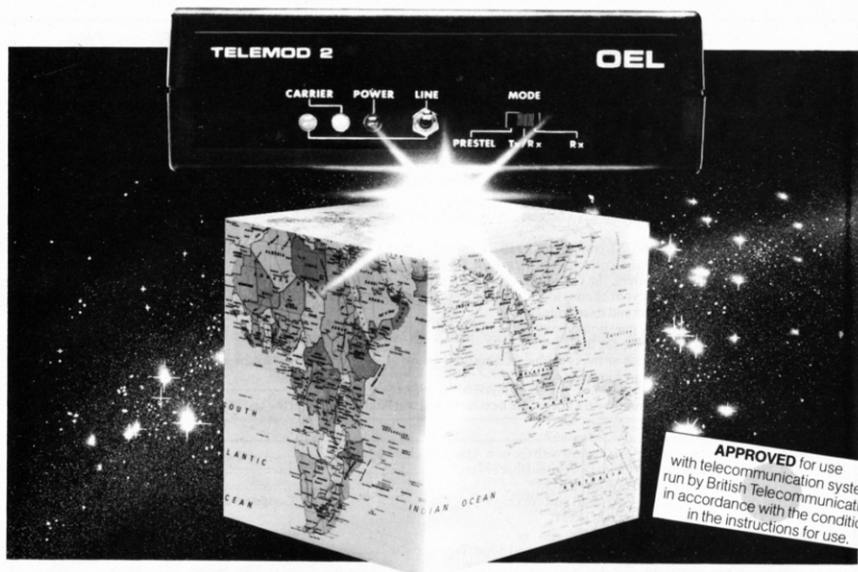
The unit runs with a rather annoying buzz, which continues as it speaks, adding to the mechanical nature of the sound. However, you get used to this and it's not difficult to get simple sentences spoken. The fact that the sound remains on until switched off means you can add emphasis and lengthen words, though this takes time and a good deal of practice to get it to sound realistic.

It is unfortunate, though, that there is no speech editor with the demo tape, which would enable you to bash in sentences which would be translated into codes and then be spoken. This wouldn't need a mammoth piece of code, and it's a pity that Cheetah didn't supply it.

Product Sweet Talker Manufacturer Cheetah Marketing, 24 Ray Street, London EC1 Tel 01-278 6954 **Price** £29.75 inc VAT.

Product DCP Speech Pack Manufacturer DCP Developments, 2 Station Close, Lingwood, Norwich, NR13 4AX, Tel 0603 712482 **Price** £29.95 inc VAT. (Extra vocabularies £12.95 each.)

Product Microspeech Manufacturer Currah Computer Components, Graythorpe Industrial Estate, Hartlepool, TS25 2DF Tel 0429 72996 **Price** £30 inc VAT.



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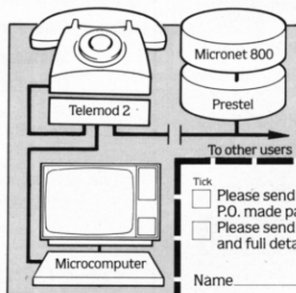
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- 1) What was Atari's first successful video game?
- 2) How much RAM memory comes standard with the new Atari 800XL computer?
- 3) Which Atari computer has TWO slots for cartridge software?
- 4) Which large American corporation owns Atari?
- 5) Which of the following is NOT an Atari custom chip?
 - a) ANTIC
 - b) POKEY
 - c) GTIA
 - d) VIC
- 6) Atari Basic for the 600XL computer comes on a cartridge. True or False?

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/// keyword conclusions

● Atari in print

◻ Peripherals and plug-ins



Above you see some of the new range of Atari peripherals; the new 1010 data recorder, the Touch Tablet, the trak ball and the Letter Quality Printer.

The data recorder is a dedicated device that can only be used with Atari computers and offers the capacity to do split recording.

The trak ball is one of the latest Atari game controllers and really goes down a treat when playing games like Missile Command.

The Touch Tablet is a powerful and easy method of drawing on-screen colour pictures.

The letter quality printer is offered as an inexpensive alternative to traditional daisywheel printers.

Atari add-ons and more...

Along with Atari's new computers, a number of new peripherals were released. All these are of the same modern style as the computers and can be connected directly to any Atari computer, new or old, without requiring any further interface.

The replacement for the 810 disk drive is the 1050 drive. The 410 cassette recorder has been replaced by the 1010 and Atari's discontinued range of printers has been replaced by three new machines. These additions to the peripheral library of the Atari, together with existing additions, provide a great variety of hardware add-ons for most of the Atari computers.

1050 Disk Drive

The 1050 operates in much the same way as the 810, for obvious reasons of compatibility. The 1050, however, has the ability to go into an enhanced density mode. When DOS III becomes available soon, the Atari 1050 will be capable of

storing 127K of information on a single sided diskette. The disk drive is currently supplied with the DOS II and accesses only about 88K.

As with the 810, this 5¼in disk drive comes with a built-in 6507 microprocessor and additional ROM providing the controller. Up to four disk drives may be accessed from the computer although the most normally used at one time would be two for business purposes. The disk drive has an automatic eject feature whereby the disk is pushed out of the drive when the latch is opened. When pushed into the drive the disk clicks into place, and closing the latch causes the drive to start up on what appears to be an aligning procedure. The disk drive is packaged with the mains transformer and a cable to connect it to the peripheral port of any Atari home computer. The disk operating system occupies about 6K of RAM and makes a 16K machine unsuitable for running the drive.

On the front of the drive are two lights. One is next to the power switch and shows that power is being supplied to the drive. The second nearby light shows whenever the drive is 'busy' (and diskettes should not be inserted or removed). Along the rear of the disk drive, as with the 810, are two peripheral ports.

One of these connects to the computer via the input/output supplied, and the other is left free to 'daisy-chain' other peripherals to the computer, such as the program recorder. Here too are the switches to determine which of the four drive numbers this drive is.

1010 Program Recorder

A major criticism commonly made against the Atari computer system is that you have to use Atari's own tape recorder at an extra cost of almost £50. However, there are many advantages to using a dedicated program recorder. One important problem area of any computer system is cassette loading/saving. Atari tried to get around this problem with a dedicated recorder, and although Atari's recorders are not free from loading problems, compared with others they are relatively trouble-free. One immediately noticeable advantage is all Atari cassette programs should load from all Atari program recorders.

This compatibility cannot be matched by any non-dedicated system. Even so, how can Atari justify £50 for their recorder? First, this price includes the connecting lead and the power adapter for the recorder as well as a reasonable quality machine with a power indicator light and tape counter.

Also Atari has what it calls 'Sound-through'. The recorder is, of course, stereo. So while one channel stores the program data the other can be used for another purpose with the Atari hardware. Already some educational and game titles take advantage of this split recording facility. Atari produces a range of Conversational Language courses in French, German, Spanish and Italian. One channel of the tape sends program data into the computer's memory, while the second contains a voice channel in the relevant language saying words in time with the text and the pictures generated by the program. Moonbase 10, a game with a cassette sound track by PDI, is enhanced by voices and alien-type noises.

Some programs, such as European Countries and Capitals, have a voice telling you how to operate the program while it loads. 'Sound-through' makes the Atari recorders special. Although there is not a great deal of software yet using this system, Atari, PDI and others will almost certainly be bringing out more titles.

The data part of the recorder transmits information at a rate of 600bits per second (600 baud). Most 16K programs take about three or four minutes to load. On a C60 cassette you should be able to record about 100K of data. However, the Atari operating system does not include a search function in the loading of programs, so the tape must be positioned at the right place at the start of a program before the loading command has been entered. It's inadvisable to store too many programs on one cassette due to problems in finding the start of programs in

the middle of the tape. The volume control is handled automatically by the recorder, to some extent by the computer. All the standard recorder buttons are included—even a pause button. The 1010 recorder also has two I/O ports on the back to allow for daisy-chaining of peripherals.

There are a number of ways to interface an Atari computer to a printer. One way on the 400 and 800 is to use a cable from the joystick ports and a program in memory to send printer data through the ports. Although cheaper than an expansion box, it isn't as versatile as it works with only a handful of machine language programs and is therefore suitable for use only with Basic. This method would not work on the new machines as it requires use of three joystick ports, and the new machines have only two.

Atari used to supply the 850 interface module at around £135. This module is now almost impossible to get hold of though its XL equivalent is due for release soon. The 850 had a single parallel 'centronics' type port for attaching to a printer and four serial RS232 ports suitable for connection to acoustic modems, other computers and so on.

Atari's new expansion box has not yet been released. It would appear that this box is for XLs only as it connects via the new parallel bus interface on the rear of the XL machines. It will provide eight expansion slots, two RS232 ports similar to those supplied on the 850 Interface Module and a bi-directional parallel bus. Although it all sounds very good, it gives little comfort to the 400 and 800 owners who wish to connect to a printer but who don't have the parallel bus.

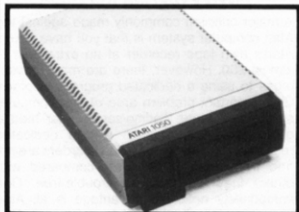
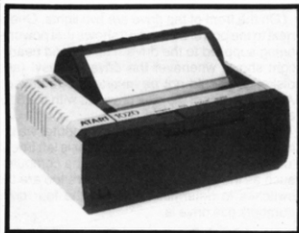
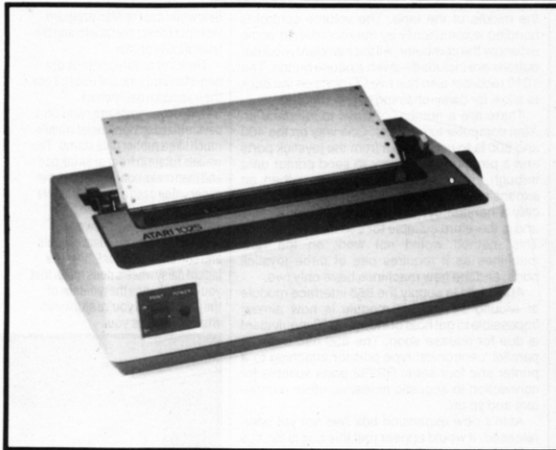
continued next page

Below you see the Atari program recorder (described at left) and the letter quality printer.

The letter quality printer is of a non-standard type and doesn't use the traditional daisywheel technology—instead it relies on a device that uses four metal wheels much like a rubber date stamp. The wheels rotate in front of an ink pad and then make contact against the paper when each of the characters are in proper position.

The printer costs, however, much less than most daisywheels and currently sells for £299. The lack of daisywheels does mean that you can't change the typeface of the printout and you're stuck with what Atari gives you.





Continued from previous page.

However, salvation is at hand in the form of a printer interface box which plugs into the serial port on all the Atari computers. This has an Atari-type cable for connection to the serial peripheral port of the computer, and another cable to a centronics-type printer. This box should be available shortly for about £99.

Atari's other new expansion due for imminent release is a CP/M module. CP/M is the standard for small business micros and minis. Atari's module will connect to any Atari computer via the serial peripheral port and will allow the Atari to run CP/M business software on an 810 or 1050 disk drive. The module will contain a Z80 Micro-processor with a speed of 4 MHz, as well as an additional 64K of RAM, and will have the CP/M 2.2 operating system included. It will be like connecting the Atari to a second computer although it will also give the Atari owner 40- or 80-column output (switchable), a serial input and output port and a monitor output.

Printers

Atari has released three new printers. The first distributed in the UK for use specifically with an Atari in the UK was the Centronics 737. This was an 80-column dot matrix machine similar in capability to one of the old Epson printers. The Centronics was not in fact Atari's printer but it was the most available equivalent to the Atari 825 (the American Atari printer made by Centronics). To connect this printer to the micro you needed an 850 Interface Module and printer cable. The 737 was distributed by Ingersoll Electronics before Atari UK was formed. UK Atari discontinued the Centronics distribution but continued the availability of Atari's second printer, the 822 thermal printer. This 40-column printer connected directly to the Atari and produced reasonable quality printing of text and graphics.

This printer was discontinued a few months ago to be replaced by Atari's three new models,

the 1020 colour printer/plotter, the 1025 80-column dot matrix printer and the 1027 letter quality printer.

The 1020 Colour Printer/Plotter

The 1020 is a four-colour printer and plotter. Using little pens in a rotating head, this machine is controlled by the computer to perform most of the standard graphic plotting and drawing, but instead of just dumping a screen, the picture is actually drawn on the paper by moving the pen left to right and moving the paper up and down. The paper is held by small rollers with points on them and moves the paper backwards and forwards in front of the pens.

The standard character size will print ten characters to the inch. The printing area is four inches wide giving 40 characters per line in standard text mode.

In this mode the printer will print at a rate of ten characters per second, not very fast at printing although fast at graphics.

The printer can be programmed to print characters in any of 64 sizes. It also has two standard printing size modes besides the 40 column mode. The printer can be set up to print in either 20 or 80 columns per line though the 80 column print requires a magnifying glass for most people to read it. The printer comes with a generous roll of paper and two sets of pens, and cable to connect it to the computer, as well as the power transformer.

A cassette comes with the printer, including six good demonstration programs which can be listed and altered, and a drawing utility that can reproduce your drawing on the printer.

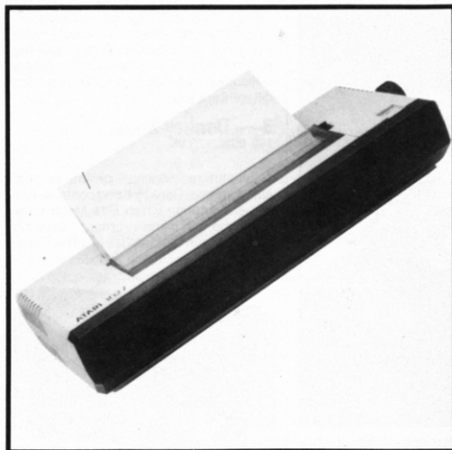
Along the front of the printer are various control switches: a power switch with a light indicating when power is on or off, a pen button that readies the head for changing the pen colour manually, a colour button for rotating the head manually to bring another colour into line and a paper button to feed the paper manually. The reverse of the

In addition to the data recorder and printer pictured on the previous page, Atari has also released other new storage and printing devices.

Pictured directly above is the Atari 1025 80-column dot matrix printer which is, unfortunately, neither fast nor cheap. The printer accepts either single-sheet or fanfold paper — and offers both condensed and expanded text. It uses a typewriter-style reel-to-reel ribbon and does not have true descenders.

A better option perhaps for printing out listings is the Atari 1020 colour printer/plotter (pictured top right) which uses four coloured pens to draw or 'sketch' pictures and text. It resembles several other versions of the plotter made by Original Equipment Manufacturers for the Commodore 64, the Oric and the Tandy Colour Computer.

Below that is the new Atari disk drive — which is smaller, quieter and lighter than the 810 disk drive that preceded it.



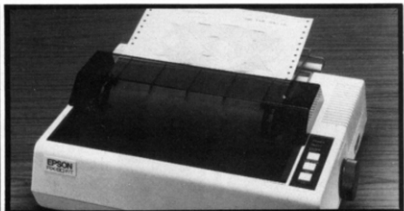
printer houses the power socket and two peripheral ports for the connection of the printer and 'daisy-chaining' of other peripherals. At £199, the 1025 printer/plotter is the cheapest way of attaching a printer to an Atari computer.

1025 80-column dot matrix printer

The 1025 is the fastest as well as the most expensive (£349) of Atari's new printers though the 40 characters per second speed of this printer does not come close to the speed of the new Epsoms. The printer will accept single sheets of paper that can be fed through with a friction roller in the machine or sprocket paper on a roll or fan folded which can be fed through tractor feeders. A number of print sizes are available including condensed and expanded text. The printer prints with the standard Atari character set as well as the XL International character set. The number of lines to the inch can be changed too. The characters are of the 5x7 dot matrix type but lower case letters do not include true descenders. As well as a power switch and light the printer has an 'online' button. The ribbon used on this printer is the typewriter reel to reel type—convenient for supplies but a little messy. The 1025 has a built-in Atari interface and connects directly to any Atari computer.

1027 Letter Quality Printer

For word processing or other applications where typewritten text quality is required, the 1027 letter quality printer is an obvious choice. As with the other two Atari printers, the 1027 connects directly to any Atari computer via the peripheral interface using the cable supplied. This printer will accept single sheets of paper, ideal where letterheads are required, but can also accept roll or fan-fold paper which can be drawn through on the friction rollers. The letters are mounted on a barrel-type head which is inked by a small roller. The printing speed is 20 characters per second.



The width of the printing page is 80-columns and the head can print in both directions. As well as standard printing of most of the Atari character set, the printer has an underlining capability.

Epson RX80

Epson and Epson-compatible printers have always been the second printers to the Atari computers. Many programs for the Atari are written in two versions, one for Atari printers and the other for Epsoms. The new RX80 is a superb quality machine but at a price.

Unfortunately, to connect almost any printer to the Atari apart from Atari's own, you must also purchase a cable and an interface module (usually coming to over £150). There are advantages to this machine, the most obvious being speed. The RX80 prints characters at 100 characters per second. Atari's 1025 dot matrix printer can manage only 40. The Epson has more pins in the print head, printing characters with a 9x9 matrix. The printer can be programmed to print lines to almost any spacing and includes a 96-character ASCII character set.

There are an additional 11 international sets built in and all sets can be printed in normal text, italic or elite text. The printer can condense and enlarge characters too. It comes in two options—with or without a friction feed roller for single sheet feeding. Feeding is also accomplished through sprocket paper feeders.

FX80

Epson also produces a big brother to the RX80 called the FX80. With sprocket and tractor feed as standard, this printer also allows you to replace its character set with one of your own (up to 256 characters). This printer will do superscripting (feeding paper forward and backward by half notches). The speed has been improved to an amazing 160 characters per second.

Otherwise this printer has all the features of the RX80, though it costs about £100 more.

A variety of printers can be used with the Atari range of machines. Pictured above are three parallel printers than can plug in: the Atari 1027 Letter Quality printer, the Epson RX-80, the Epson FX-80.

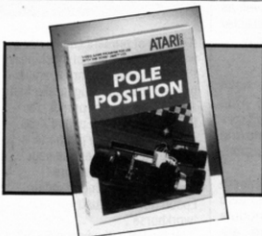
The letter quality printer is described in detail on the page opposite. The Epsoms are upgrades of the long-standing Epson MX-80 industry 'workhorse'.

At top left is the Epson RX-80 which runs at 100 characters per second, and drew excellent reviews when *PCN* looked at it in Issue 8. Barry Miles said in our pages: 'This printer has an excellent price/performance ratio, and is backed up by a company which has been widely recognised for years as producing good-quality printers with an excellent, readable font. The lack of easy access to the dip-switches is irritating, but provided you don't want to use single sheets of paper, the machine has much to offer.'

The latter criticism has been overcome by the option of a tractor feed.



Descriptions of the top six best sellers are given below. All of these will work on the XL although older versions of Miner 2049'er may give problems.



1 — Pole Position

16K ROM, £29.95

Pole Position has been available now for a couple of months and has outsold all other titles for the Atari computers. Fans of the popular arcade game will find the graphics on this cartridge very close to the original.

For those uninitiated in the game, the idea is to jump into your formula 1 racing car and pit your wits against the other drivers on the Grand Prix circuit. Before racing you must complete a qualifying lap in a set amount of time for which you will be awarded a place on the starting grid. If you don't qualify, you don't race.

Racing round the track you have a limited time to complete a lap or you're out of the race. You must avoid and overtake other cars on the track, and if you go off the track watch out for the road signs.

This cartridge has all the features of the arcade version and allows you to select from four different race levels, including one where you don't have to qualify. There is also a selection for two players.

2 — Miner 2049'er

16K ROM, £29.95

Pronounced 'Miner twenty forty niner', this is the most popular run and jump style game for the Atari. In this game you control a little man called Bounty Bob. It is your aim to follow an escaped convict into the mine, chasing him through the different levels and picking up objects that have been left behind.



You are presented with a screen containing a number of different pathways connected by ladders and gaps that you can jump across. The aim is to walk across every piece of pathway which 'fills in' as you do so. After filling in all of the pathways you move to the next level.

However, while you are doing all this you must avoid waste and ugly, radioactive goblins. Collecting an object allows you to chase after the goblins for a short while, gaining points if you catch them. Different levels require different skills and objects to complete them. Some contain slides or moving platforms, others have lifts or

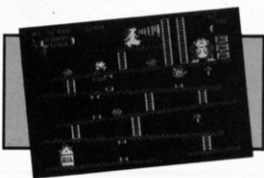
require you to do things in a certain order.

If you make it to the tenth and last screen you must jump into a cannon and fire yourself to the different parts of the screen. Difficulty is changed by selecting from ten different speeds.

3 — Donkey Kong

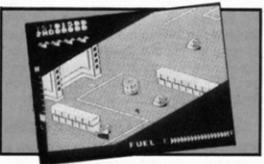
16K ROM, £29.95

A faithful reproduction of the original arcade game, Donkey Kong contains four screens through which little Mario must run, jump and climb in order to save his girlfriend from the clutches of the evil ape, Kong.



Although the concept of this game is similar to that of Miner 2049'er, the actual game play is somewhat different. Here you are the brave Mario who must scale ladders and girders, lifts and conveyor belts in order to reach your girlfriend held captive by Kong. As you try to do so, the Ape throws barrels after you which will turn into fireballs from time to time. Your only defence against these attacks is to jump them or grab a special mallet that will allow you to beat off your enemies.

You can also pick up some of your girl's possessions along the way for bonus points but you must complete the screen before time runs out. If you survive to the last screen then you can attempt to destroy the ape by removing all of the rivets holding together his supporting girders.



4 — Zaxxon

16K cassette, 16/32K disk, £14.95

Another arcade game, Zaxxon is perhaps one of the best 3D games available. Similar in graphic content to Blue Max, the idea in Zaxxon is to fly overland and through space destroying as much as

possible.

The game comes in two versions of 16 or 32K. The 32K version is only available on disk and includes extras like ground to air rockets etc. The 32K version also allows you greater manoeuvrability in the space scenes where you are being attacked by other space fighters. After a few of each type of scene you then have to face some even more deadly enemies in the form of homing missiles and destructor droids.

The game can be played by one or two players but does not include any manual variation of difficulty.

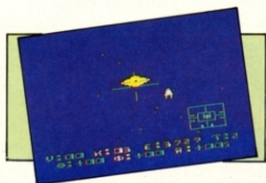
5 — Star Raiders

8K ROM, £29.95

The Star Raiders game was released at around the same time as the original Atari computers to demonstrate the graphic and gaming power of the machines and has been a top seller ever since. One of the only 3-D space games available at the time, this game probably clinched more sales single-handed than any other Atari software.

You are situated in the cockpit of an intergalactic spaceship. The screen display consists of your view out of the cockpit and various figures giving information such as fuel level, enemy range/coordinates etc. The game is played using a single joystick and certain keys on the keyboard.

There is a second view obtainable by pressing the 'G' key. This view is of a galactic map, telling you how many aliens are in each sector, where your own starbases are and distances between you



and them. Using this map you must select your destination and then press the 'H' for hyperwarp. If you then switch to the front view ('F'), you will see stars rushing past as you move to the next sector. If an enemy is in the sector you must turn on your shields ('S') and your battle computer ('C'), and blast the aliens out of space.

Difficult difficulty levels change the number of aliens you have to destroy, the amount of damage you can sustain, whether or not you must steer through hyperwarp and the number of your own starbases available. The game ends when either your ship is destroyed, the aliens succeed in destroying all your starbases, you destroy all the aliens or you abort the game, at which point you are given a rank based on your performance.

6 — Eastern Front

16K ROM, £29.95

Eastern Front is a simulation of the German invasion of Russia in 1941. You play the role of the Germans.

The game, written by the Atari master, Chris Crawford, features a map of Russia. The screen is a window onto this map and can be scrolled around the map in any direction. The map is approximately five screens wide by three-and-half screens high. Moving across this window is a small box controlled by your joystick. Using this box you may look at armies placed on the map which are represented by little



squares. The squares have different designs within them to help you recognise what type of troops are there and your armies are distinguished from the Russian armies by a different colour.

Your aim is to take Moscow or to wipe out your opposing army. That may sound very simple, but your troops vary in strength according to the terrain (forest, rivers or open ground) as well as the weather. You must program commands into your armies and then push the Start button to start the armies off to try and fulfil those commands. The date is displayed at the top of the screen, and each time you press Start the date advances one week. As the seasons change so does the colour of the scenery and the efficiency of your armies.

The cassette and disk versions do not include levels but the cartridge version allows you to change the difficulty.



The list presented here is of the next top twenty best selling Atari games. Due to the removal of some bugs in the operating system for the XL range some of the programs that used those bugs will now not run on the 600 or 800XL. Those that are known to be ok are marked with a 'Y' in the XL box of the list, those that have not been checked are marked with a question mark (?). Of all of the titles listed here, none are known to be non-XL compatible. Many manufacturers of non-working software have already stated that amended versions are going to be released as soon as possible.

(Best selling list and XL compatible list supplied by and copyright of Silica Shop, Sidcup, Kent.)

No.	Name	XL	Recommended Price	Memory in K	Cassette, Disk or ROM	Game Type
1	Pac Man	Y	£29.95	8	ROM	Gobbling dots in maze
2	Defender	Y	£29.95	16	ROM	ArCADE shoot 'em up
3	Blue Max	?	£22.95	32	C/D	3D Zaxxon shoot 'em up
4	Galaxian	Y	£29.95	16	ROM	ArCADE shoot 'em up
5	Fort Apocalypse	Y	£25.50	16/32	C/D	ArCADE rescue hostages
6	Jumbo Jet Pilot	Y	£29.95	16	ROM	Flight simulator
7	Astro Chase	Y	£19.95	24	C	ArCADE shoot 'em up
8	Necromancer	Y	£25.50	32	C/D	ArCADE adventure
9	Pharaoh's Curse	Y	£24.95	32	C/D	ArCADE adventure
10	Centipede	Y	£29.95	8	ROM	ArCADE shoot 'em up
11	Chess	Y	£24.95	8	ROM	Strategic board game
12	Sub Commander	Y	£29.95	16	ROM	ArCADE seek and destroy
13	Qix	Y	£29.95	16	ROM	ArCADE action game
14	Zaxxon	Y	£23.95	32	C/D	ArCADE adventure shoot
15	Choplifter	Y	£23.75	48	D	ArCADE rescue hostages
16	Computer War	Y	£29.95	16	ROM	ArCADE shoot 'em up
17	Snooker	Y	£14.95	16	C	Snooker simulation
18	Airstrike I	Y	£7.95	16	C/D	ArCADE Scramble shoot
19	Frogger	Y	£22.75	16/32	C/D	ArCADE jumping game
20	Shamus	?	£29.95	16	ROM	ArCADE adventure

In this final part of the explanation of some of the more commonly used commands in Atari Basic, we are going to look at nine keywords. They are: SETCOLOR STR\$ SGN SOUND STICK STRIG TRAP USR SQR.

Remember that in Atari Basic all the keywords have abbreviated equivalents you can use while typing in programs. Whenever entering any Basic keywords remember that they must be typed in with capitals (upper case) letters.

SETCOLOR

The SETCOLOR command is used primarily to change the colour of a point already plotted on the screen. You need to specify which register to change. The register determines whether it is the border colour which is being changed or the background colour or one of the coloured lines on the screen.

The second thing you must specify with this command is the actual colour to use. A number from 0 to 15 selects one of the sixteen primary colours available. The third argument in SETCOLOR is the brightness of the colour selected. Normally you can specify eight brightnesses using an even number between 0 and 14. This command effectively gives you 128 colours to choose from.

It is much quicker when typing in programs using SETCOLOR to use its abbreviation — SE. An example is shown in program two where the RND command is used to change colours and brightnesses randomly.

STR\$

STR\$ converts a value to a string. Although this command is not used very frequently, it can be handy when the user wishes to operate on a number in a way that the computer numeric variable handling capabilities will not allow but the string handling one will. The command looks like this:

AS=STR\$(1234)

or

AS=STR\$(A)

After the first command AS will include the number 1234 but the computer will not treat it as a number, only a string. After the second command the value in A will be made into a string called AS.

SGN

SGN, as the abbreviation suggests, returns a value that will tell you the numerical sign of a number. For example:

PRINT SGN(X)

will print a "1" if the value stored in X is less than 0, a "0" if the value in X is 0 or a "1" if X is a positive number greater than 0.

Using SGN is a good way to avoid errors before trying to do certain calculations such as division. If SGN returns a zero you

will know that the number checked is a zero and cannot be divided into any number without producing an error.

SOUND

This is perhaps one of the most powerful commands in Atari Basic. Through this one command it is possible to obtain an enormous variety of sound. The SOUND command has four parameters: SOUND a.b.c.d

The first parameter determines which of the Atari's four sound channels will be used (0-3). Obviously four SOUND commands can be used together to create harmonies.

The second parameter specifies the actual note that the Atari will produce. A number from 0 to 255 gives you notes over a three and a half octave range. With further programming it is possible to use two sound channels over a nine octave range.

The third parameter tells the computer to produce either a pure sound (10 or 14) or to use one of many distortions. This value must be an even number between 0 and 14.

The last parameter allows you to specify a volume at which the note will play through the television speaker. An even number between 0 and 14 will choose a volume setting.

The note will be played continuously and can be timed with a FOR...NEXT loop. To turn off a sound you must use:

SOUND 0.0.0.0

Some uses of the SOUND command are given in program two.

STICK

This command returns a number corresponding to one of nine positions of the joystick.

PRINT STICK(0)

will tell you which position the joystick plugged into port 1 is at. A value of 15 means that the stick is at the default position in the middle. These values can then be used to determine which way a character or cursor should move on the screen.

STRIG

STRIG is simply used to show whether a button has been pressed on any of the joysticks. Used in the same way as STICK, this command will return a 0 if the button is pressed or a 1 if it is not.

TRAP

The TRAP command is used to start the program executing at a specified line number if an error occurs. A TRAP will continue to be in operation after the statement is executed until an error

occurs, at which point the program goes to the specified line number and clears the TRAP.

Although mainly used to stop users of a program making a mistake, the TRAP command can be used while debugging the program along with others to record errors and the lines at which they occurred without disrupting the display. To clear a TRAP manually simply use the command with a value greater than 32767 and less than 65535.

USR

USR is a way of using machine language routines to speed up your Basic programs. Before using this command you must place your machine language program into memory. Some people use POKES while others use strings. The command actually looks like this:

X=USR(num)

The X can be used to pass results back from the routine to the Basic program but is normally just a dummy variable. The 'num' must be the address where your routine starts in memory. Additional numbers can be passed to the routine by adding them after the address, separated by commas.

SQR

SQR simply returns the square root of the number specified. For example:

PRINT SQR(9)

will print the number 3. This command is obviously useful for those whose programs require a lot of mathematics.

```
10 REM DEMO PROGRAM 1 - RESTORE
20 FOR T=1 TO 5:READ A:REM START LOOP TO
  READ DATA FROM FIRST DATA STATEMENT
30 PRINT A:REM PRINT RESULTS
40 NEXT T:REM CLOSE LOOP
50 FOR T=1 TO 3:READ B:REM START LOOP TO
  READ NEXT SET OF DATA
60 PRINT 2*B:REM USE INFORMATION READ
70 NEXT T:REM CLOSE LOOP
80 RESTORE 200:REM RESTART READING AT DA
  TA STARTING AT 200
90 FOR T=1 TO 8:READ A:REM READ DATA AGA
  IN
100 ? A+2*2.5
110 NEXT T
120 REM ACTUAL DATA FOLLOWS
200 DATA 1,2,4,3,10
210 DATA 4,8,2
```

```
10 REM DEMO PROGRAM 2 - RND SETCOLOR AND
  SOUND
20 COLOUR=INT(RND(0)*15):REM SELECT A RA
  NDOM COLOUR AND PUT IT IN A VARIABLE
30 BRIGHT=INT(RND(0)*15):REM SELECT A RA
  NDOM BRIGHTNESS
40 TONE=INT(RND(0)*255):REM SELECT A RA
  NDOM NOTE
50 DISTORT=INT(RND(0)*15):REM SELECT A R
  ANDOM DISTORTION
60 SOUND 0,TONE,DISTORT,0:REM SET OFF TH
  E SOUND
70 SETCOLOR 2,COLOUR,BRIGHT:REM CHANGE I
  HE COLOUR IN REGISTER 2(BACKGROUND)
80 GOTO 20:REM KEEP GOING ROUND AND ROUN
  D
```

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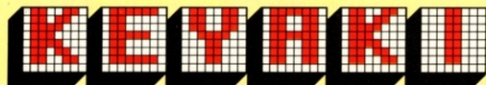
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Rainbow riches

Dragon owners wanting smarter text displays should consider this package, says Mike Gerrard.

While blazing the trail with Dragon games, Microdeal is not perfecting more serious applications and the American import is an attempt to overcome one of the machine's more serious shortcomings: the unattractive text display with no lower-case and no easy way of combining text with high-resolution graphics.

Features

Rainbow Writer offers you 124 different text layouts, from 64 x 24 to 16 x 8, and also these with a 224-character set which includes lower-case, a complete Greek, lower-case alphabet, card suits and various games graphics such as lunar landers, tanks and so on. You can delete up to 99 characters at the end of each set, or redefine everything for resaving by using the character generator programs that are part of the package.

Presentation

It wouldn't do Microdeal any harm to look again at the way it's presenting its more expensive software: this cassette and 16-page booklet come with a chunk of styrofoam inside a wrap-around, thin card cover. To get at the cassette you must either cut the Sellofoam on the cover, leaving it to flap about on the shelves, or continually push the styrofoam in and out, which makes the cover very dog-eared indeed. Most companies use the more sensible and robust plastic wallets.

It would also do no harm to actually list the programs as they occur on the cassette, there being several programs on each side, in both Basic and machine code. The introduction tells you that if you want to see what *Rainbow Writer* can do then you should load the DEMO program. What it doesn't say is that this is the third program on side two.

In use

The tape starts with a preloader which you use to allocate the main program to the upper reaches of your machine's memory, whether the 32 or 64, with the additional 10K option suggesting the software had Tandy origins. You also state here whether you would like to offset any of the characters at the end of the set provided, though if you want to offset a series in the middle you'll simply have to redefine them as blanks.

The two main programs are referred to as RW64 and RW42. The former gives you its option of 64 or 50 characters per line, the latter 42 or 32, and with both you can have double-width characters if using PMODE4; the programs being effective in all PMODEs. RW64 uses 4.5K of memory, which can be reduced slightly (four bytes for each character you offset). RW42 uses



4.9K, less six bytes per character offset.

Apart from the initial confusion, and an error on page five of the booklet which gets high density and low density the wrong way round under the DNH/DNL command, the instructions are clearly set out and the use of *Rainbow Writer* is easy to grasp. This is partly because the software doesn't do very much other than give you that range of text screens and characters, but it's not a criticism, because the applications are many and entirely up to the individual user.

That enhanced display is certainly a joy to work with. Among the 11 additional Basic commands you can use are automatic underlining, superscripts and subscripts (eg 32² or H₂O), and scroll protection of any number of lines at top and bottom of the screen. Switching from one of the high density screens to the Dragon's normal display (you can skip back and forth once *Rainbow Writer* is loaded) makes it look even more horrendously clumsy, like the script from a child's first reader.

Anyone writing programs for children to use would probably welcome the extremely large characters that can be used, perhaps for alphabet, spelling or maths drill. Video title screens are another possible use that springs to mind, remembering that this is high-res and can be combined with graphics.

There is one major drawback though, which may put many people off, and that is the slow speed at which the Dragon operates with *Rainbow Writer* loaded. I ran three sample routines to try to gauge the alteration in speed, two repetitive mathematical tasks and a straightforward printing loop. The first two took 16.6 and 48.8 seconds respectively on the Dragon 32, but with RW42 loaded this increased to 178.7 and 422.3 seconds. With RW64 loaded they took 212.0 and 483.5 seconds, which is quite a slow-down, though asking the machine to print "COUNTING" 3,000 times was even worse. Taking 35.8 seconds ordinarily, this rose to 586.4 with RW64 and 623.3 seconds with RW42. *Rainbow Writer* is definitely for those occasions where presentation matters more than performance.

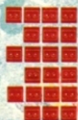
The method of entering the additional commands is also rather lengthy, although they can be used in both immediate and deferred mode. Taking as an example the command H, which prints the Help screen showing the present status of all commands, you must type PRINT CHR\$(27) "H" — not forgetting the full stop inside the quotation marks. The longest additional command is only four digits but nevertheless programs are going to be very memory consuming if you're switching from one mode to another, changing character sets or doing a lot of underlining.

Verdict

The individual programmer should be able to spot whether *Rainbow Writer* is something they need or not, and while it might seem on the expensive side it does also include two Basic graphics generator programs, accompanying RW64 and RW42, which would cost several pounds by themselves. It comes with a table of the various new PRINT screen locations that you'll need, and Microdeal allows its use in commercial software programs subject to one or two minor conditions. Pots of gold at the end of the *Rainbow Writer*? It's up to you.

RATING

Features
Documentation
Performance
Usability
Reliability
Overall value



Name *Rainbow Writer* Application Text enhancer System Dragon 32 and 64 Price £19.95 on cassette, £21.95 on disk. Publisher Microdeal, 41 Truro Road, St Austell, Cornwall PL25 5JE. Language Machine code, some Basic. Other Versions None. Outlets Mail order, most dealers.

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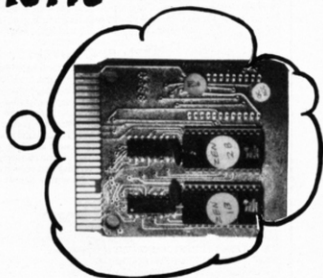
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Zen enlightenment

John Fairbairn studies Zen and the art of an editor/assembler/monitor for the Genie, TRS-80 and Lynx.



A certain Zen masters' proverb holds that a frog in a well thinks the outside world consists of nothing but a circle of blue light.

I risk being accused of being a myopic, ignorant frog, but I think the Zen editor/assembler/monitor can have no rivals as the best program available for the Colour Genie. It is very good and can serve as an example as to how assemblers could be written for other micros.

The Genie has in fact been sold principally as a machine for serious programmers and any Genie owner of that ilk will certainly want something like Zen.

It has been available on tape for some time, but a cartridge version and a disk version were issued over the Christmas holiday. I tested the cartridge and, for comparison, the latest version of the tape.

Features

As the program is being upgraded all the time it should come as no surprise that the cartridge has a couple of new commands, but the very substantial core is the same in both versions. In fact, this program started life as a bare-bones assembler written by John Hawthorne (one of the original Z80 gurus) and was eventually incorporated into Zen packages for other micros.

Laurie Shields, a hobbyist from Chesterfield with a penchant for serious work, got permission to rework Hawthorne's original for the Video Genie/TRS-80 and over a couple of years has added so much for the Genie (and the Lynx) that he reckons the guru would find it hard to spot any of his original code.

The cartridge, a robust plastic casing containing a single board with two chips, sits snugly in the expansion socket at the back of the Genie. Once installed it is always available from the keyboard through a CALL C000 from Basic.

Zen can be used with Basic—a program of about 4K would be possible—but it is really intended for use on its own, for assembler source files gobble up memory.

Memory available for this when using the cartridge is from 5B4EH to BEFFH. With the tape it is either 624EH or 724EH to BEFFH, according to whether or not



you sacrifice high resolution graphics.

There are over 40 commands, mostly single letters with Zen prompting for addresses or file names when necessary. They are easy to remember—one reading of the small but clear instruction booklet is all you would need.

The commands could conveniently be split into three groups: Editor, Assembler, Monitor. Because of one very useful non-standard instruction, **LOAD**, which loads assembled code direct into memory, you can edit, assemble and debug programs without a cassette in sight, all at great speed.

In use

Programs are loaded from the keyboard, from system tapes or from source file tapes. Source files and object files can be saved, and in both cases they can be verified (a delightful feature). But one thing I found that may be due to my cassette player was I had to turn up the volume to re-load or verify a tape I had just saved.

I should add that I found both cartridge and tape versions crash-proof and bug-free. I had in programs of up to 10K and I was overjoyed to see Zen avoided the dreaded problem that made me throw away my Tandy EDTASM for my Video Genie. Then, the symbol table for labels would fill up very quickly and, once full, that was the end of your program. With Zen you just increase the space allocation for the table and continue.

It sorts all the symbols, though only on the first letter, and a cross-reference of all symbols and their occurrences can be

printed, on screen or hard copy.

The Genie screen width is only 40 columns and if you include longish comments in your source code the screen display can look peculiar.

All operations are very fast. To a large extent this is due to the way the editor has been written—line numbering is done automatically by the machine and is readjusted automatically whenever you add, insert or delete. Multiple files can also be merged end to end because of this format, so you can, for example, have a library tape of common routines and just tag it on the end of your current program.

The editor, though, is not adequate for a cheap word processor.

The monitor is adequate but limited. The memory fill and display sections are very good, giving hex and ASCII output, but the debugging portion is limited to jump and breakpoint. A single-stepping routine and a disassembler may appear in later versions but for the time being they have been excluded to save space—and with the big programs I saw the sense in that. But for smaller ones I couldn't resist loading in my own single-stepper and with that I felt ready to take on the world.

Verdict

With Laurie Shields' Zen I have certainly seen the light beyond the end of my well.

Zen is only available from Laurie Shields. Both tape and cartridge assume a 32K Genie. Write to Laurie Shields for information on disk versions or versions for TRS-80 and Lynx.

RATINGS (1/5)

Features	5
Documentation	4
Performance	5
Usability	4
Reliability	5
Overall value	4

Name Zen Application Editor/Assembler/Monitor **System** Colour Genie (32K) **Price** £22.50 (cassette), £37.50 (cartridge) **Publisher** Laurie Shields, 151 Longedge Lane, Wingerworth, Chesterfield S42 6 PR **Other versions** TRS-80, Lynx **Outlets** Mail order

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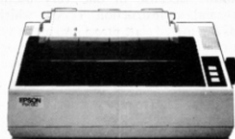
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COMMODORE 64

Bonny balloon

Name Crazy Balloon System **Com-**
modore 64 Price £7.95 **Publisher**
Software Products **Format** Cassette
Language Machine Code **Other ver-**
sions None **Outlet** Retail.

A program that has you guiding a little balloon through a prickly maze makes a welcome change.

Objective

This one-time extremely popular pub arcade game seems to have met the fate reserved for most of them and gone to meet its maker.

However, it has now reappeared for the Commodore 64, and remains fairly faithful to the original.

You must guide a balloon, using the joystick, through a prickly maze. Bumping into the side of the maze causes you to lose one of your seven lives, and it's back to the beginning for another go.

There are many levels of play in this unusual game, and completing one merely takes you onto another, harder level.

In play

The first screen follows a pretty display of little bobbing balloons and shows a fairly ordinary maze, not too difficult to manoeuvre around.

At the top of the screen is the spot you're aiming for, with a numerical counter in it, and all the time you spend avoiding collision with the walls decreases the value of the counter.

When you finally make it,

that value is added to your score.

About the only hazard on the first screen is one small prickly ball that wafts slowly across your path as you near home. But patience and a steady hand should see you through.

The second screen is a lot more difficult. This time, not only is the distance between the walls significantly less but you must also contend with an extremely large object that floats about the screen, generally getting in the way.

There is also a glowing square on the screen, which serves no purpose other than tempting you to satisfy your curiosity about what happens if you hit it. Don't bother: you'll only lose a life.

Subsequent screens feature ever more hazards, including a magnet that attracts your balloon. This is set extremely close to the walls, and is a constant source of worry.

Some pathways require you to go through at an angle, and some, on later levels, appear to be virtually impassable.

Verdict

It certainly makes a change from Pac Invaders. The graphics are nicely done, and though there isn't too much in the way of sound, the original pub game wasn't too musical either. A very enjoyably unusual game.

Pete Gerrard

RATING

Lasting appeal

Playability

Use of machine

Overall value



Peril for paras

Name Supacatchtroopa System
Commodore 64 Price £7.50 **Publisher**
Abrasco. The Grange Barn,
Pikes End, Eastcote Middle
Cassette **Language** Machine Code
Other versions Catchtroopa Outlets
Mail Order/Retail.

This is the game for someone who wants to rescue people instead of destroying them. It is based on the Vic 20 game Catchtrooper but goes much further.

Objectives

You are the only hope for a number of foolish paratroopers whose landing zone is in shark-infested waters. What's more, pterodactyls appear on a marauding flight pattern, and grab the paras out of your boat and up to their doom.

First impressions

The cassette is packed in a padded box, colourfully illustrated, and loading proved to be no problem.

In play

This solo game, offers five levels of difficulty, giving sufficient range to maintain interest. You progress through the levels of difficulty automatically.

You lose one of your six lives for each man eaten by sharks, or taken by pterodactyls. Each man saved gains points. The use of colour is very good and sprites are liberally involved to provide fast action. There is a clever use of sound to add to the enjoyment.

The helicopter flies over dropping paras, in twos and

threes, and making a realistic engine noise. The paras weave from side to side, which requires swift work on your part with the joystick, as if you get your rowing boat under a para and catch him, you score.

If you miss you have a second chance, because you put a net over the gunwales. You must act pretty quickly to beat the sharks to the para. The sharks have a remarkable turn of speed, especially at the higher levels of difficulty. If you achieve a new high score, the machine responds with a rendering of *Michael, Row the Boat Ashore*. The high-resolution graphics are very well done indeed.

One criticism is that the higher levels of difficulty only offer more of the same, only faster, rather than a variety of scenes.

Verdict

The game offers excellent high-speed joystick response, and realistic graphics.

The animation is very smooth indeed, however, it is repetitious, and does not offer enough variety for lasting appeal. It would have been improved by the addition of new marauders in place of the pterodactyls, in the later stages, preferably with different behaviour patterns.

More the sort of game to show off the capabilities of your machine, than to play for months.

Barry Miles

RATING

Lasting appeal

Playability

Use of machine

Overall value



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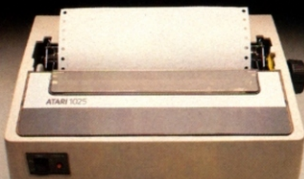
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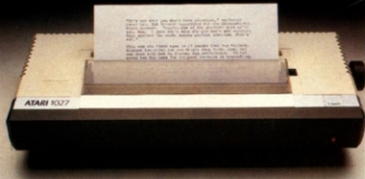
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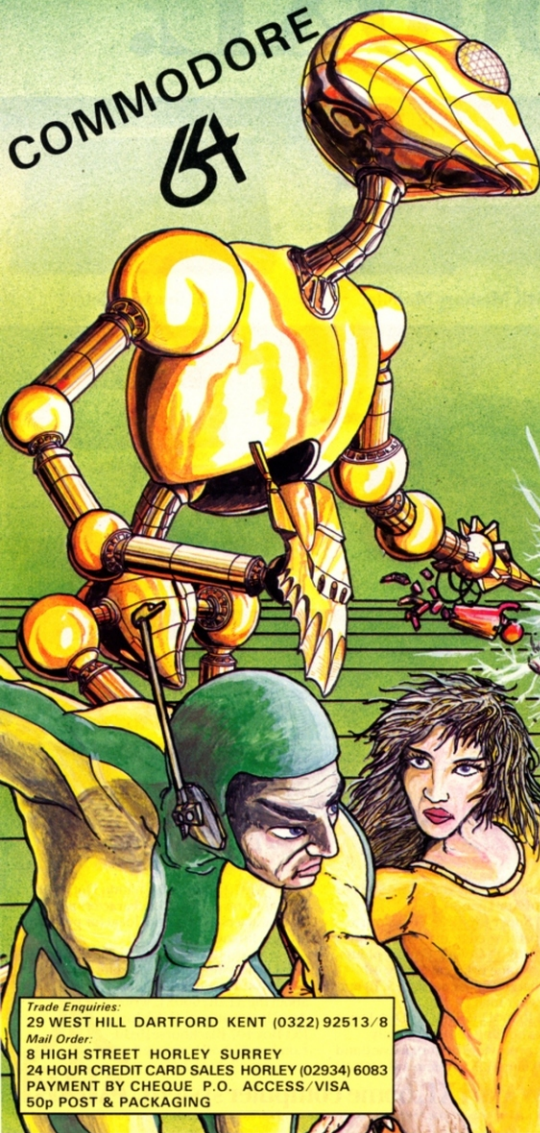
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Simple programs for small children? Read what Daphne Sullivan and Mike Gerrard have to say.

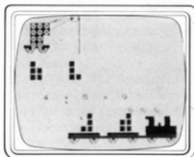
School for Spectrum

Adding & Subtracting

Three programs are included on this cassette to provide practice in addition and subtraction of numbers up to 20 for pre-school and primary children. To make the task more fun, the sums are presented in both picture and standard numerical form.

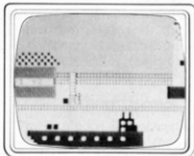
These programs teach or test a child who is learning the basic concepts of addition and subtraction, by both completing computer-set sums and by setting their own questions.

The first program displays a number of blocks at the bottom of the screen. An engine pulling two trucks enters and halts in the centre of the screen. Some



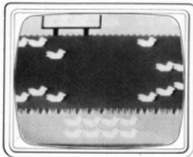
blocks are loaded onto each truck, and when the player has correctly counted them and has pressed the relevant number, the written form of the sum is displayed. As soon as the correct solution to this sum has been typed in, the train chugs off the screen, leaving behind the written sum together and the remaining unused blocks.

In the second of the programs, a boat laden with blocks appears. In a similar procedure, blocks are unloaded onto the quayside in order to illustrate a subtraction sum.



The final program *Ducks* provides practice in both addition and subtraction. A group of ducks sit on the bank of the river. The player is required to count how many leave the bank to take a swim or, alternatively, how many return.

Although this program is great fun for those already confident and competent in manipulating numbers, it is misleading to the uncertain. In each of the programs, the written sum does not corre-



pond to the picture displayed, eg in the *Ducks* program the written sum may be $2 + 3 = 5$ but the screen display shows two ducks in the water and 7 more ducks on the bank. Another point worth noting is that none of the programs include the concept of zero.

The graphics are imaginative and attractive and fun to watch, but for any real benefit to be gained, parental help is a must.

Letters and numbers

Although this program does not profess to be educational, it is concerned with helping children, aged 2 years and over, in the skill of identifying numbers 1-9 and the alphabet letters.

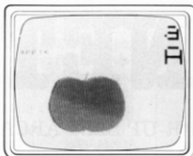
The purpose of the program is to identify correctly the letter or number randomly selected by the computer and to press the corresponding key.

Each correctly identified letter (both upper and lower case are displayed) or number is rewarded by a picture which either shows an article with the same initial letter or with the relevant number of items. Some pictures are accompanied by an appropriate tune/sound, eg when the xylophone appears (for 'x') each key on it lights up as its note on the so-fa scale is heard. If a wrong key is pressed the letter remains until correctly identified.

For parents who want to leave a child alone to complete the task, the player's success rate is recorded and displayed in the form of a percentage after each letter or number.

In spite of the imaginative graphics, this program falls short of either teaching or

reinforcing any educational skills. Presumably the program aims to assist children in the acquisition of the pre-reading



skills of recognition and matching. But since the letters and numbers displayed do not resemble their keyboard equivalent, matching is almost impossible.

Quick thinking

The *Daily Mirror* has entered the software market with *Mirrorsoft*, and has done so with some style.

Mirrorsoft's aim is said to be 'computing for the family', with the purpose of the two games on this tape, *Sum Vaders* and *Robot Tables*, being to teach addition, subtraction and multiplication by using simplified arcade-style games.

The packaging is handsome, a large sturdy wallet including screen shots on front and back and comprehensive instructions both here and as options when the programs are loaded.

Both games can be played by one or two people. They are designed so that even the youngest players can safely be left to cope alone by disabling the Break key and including only the simplest of error-trapped instructions to follow. The graphics might not satisfy the arcade addicts, but they're smoothly done and should appeal to their audience.

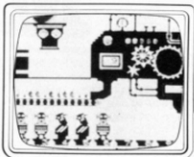
Sum Vaders tests addition or subtraction and offers five skill levels; the easiest deals only with numbers up to 9, the hardest up to 99. A space ship slides across the top of the screen and a robot starts to descend. There is a number on both the ship and the robot. The player must add or subtract the two numbers and type the answer before the robot reaches the ground. Only one chance is permitted as a wrong answer jams the keys. Right

answers score points, but if five robots manage to land then that's the end of the game and the total score is given. There is also a high score record.

If you're proving to be good at the game the space ship flies lower and lower demanding quicker responses.

Robot Tables is naturally enough a test of the multiplication tables. The five skill levels range from two times tables only through to 6, 7, 8, 9 and 12 times tables at the hardest level. The setting is a robot factory, with the raw material for a robot appearing on a conveyor belt at the top left of the screen. Each piece of material has a number on it, and you must say if that number is the next one in sequence for the table being tested, which is shown on the side of one of the machines. Only two keys are needed for this game, 1 if you accept the number and SPACE if not.

If you correctly spot the wrong numbers this raw material disappears in one of several ways, and if you're correct with the right numbers then a perfect robot pops out at the end of the sequence of conveyor belts, mincers and machines. You're aiming to get ten good robots in a row at the foot of the screen.



but if you get a wrong answer then the robot produced is of distinctly inferior quality. The game sounds easy enough, but it is a good test of your knowledge of the multiplication tables. There isn't much time in which to enter your answer.

This is an enjoyable package of two games, good value for money, and a welcome attempt to bring a little learning into the mass software market.

Adding & Subtracting (£5.25) Widgit Software, 48 Durham Rd, London N2 9DT.

Letters and Numbers (£5.50) Jim Jams Software, The Radlett, Plealey, Sharnbury, Sharnbury SY5 0XF.

Quick Thinking (£6.95) Mirrorsoft, Holborn Circus, London EC1P 1DQ.

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1983 GOLDEN JOYSTICK AWARDS

Vic 20

Boris on Synlac

Name Quadrant System
Unexpanded Vic 20 Price £5.99
Publisher Romik Software, 272
Argyll Avenue, Slough, Berkshire
Format Cassette **Language** Machine
Code Other versions None **Outlet**
Mail order, retail.

As Boris 'The Galactic Hero' it is your job to patrol the four quadrants of the planet Synlac, and ward off aliens great and small. As a part time job you jump over craters, avoid the track bombs, and do everything else expected of a Galactic Megastar. In short, save the universe as we know it. And on an unexpanded Vic.

Objectives

The four quadrants of the planet are the four difficulty levels in the game, and Boris must destroy everything in sight on each, while avoiding all the other hazards flung his way.

You always start at level 1 and progress purely by annihilating everything that moves, in the form of little aliens that fly about above you, and tracker bombs that zoom down the screen homing in on you.

Presumably, if you ever make it to the fourth level, the world is saved, and you go back to level 1 again. Some of us didn't make that far...

In play

Although describing itself as a three-dimensional game, this appears to be so in name only.

With a choice of either joy-

stick or borrowing a friendly octopus and using the keyboard, the game doesn't really have that much to it, though you do need to keep your wits about you.

Boris can only run along the bottom of the screen, and the rest of the display is taken up by aliens of fairly traditional appearance flapping about the sky, and a mountainous terrain displayed constantly in the background.

The foreground is just a little path along which Boris has to run, and the Synlac county council seems to have learnt a few lessons from Earth since the path is littered with giant craters that break a leg and lose a life if ever you fall into them.

And that is basically that. The game continues on its merry way with you destroying all the aliens as they fly about, and attempting to avoid jumping into the craters as they come along with increasing regularity.

The other levels don't appear to change much, and something is bound to wipe you out in the end.

Verdict

Since this is written for the unexpanded Vic 20, all limitations must be taken into consideration, and in light of the fact that it fits into a paltry 3.5K of memory, this is quite a fun little number from Romik.

Pete Gerrard

RATING

Lasting appeal

Playability

Use of machine

Overall value



Space-age mechanic

Name Jetpac System Expanded (8/16K) Vic 20 **Price** £5.50 **Publisher** Ultimate Play the Game, The Green, Ashby de la Zouch, Leics.
Format Cassette **Language** Machine
Code Other versions Spectrum
Outlet Mail order, retail.

Jetpac, which first appeared for the Spectrum, has been translated to work on the expanded Vic 20. Considering the excellence of Ultimate's products for the Spectrum, how well does this new version cope with the translation?

It should have stayed on the Spectrum.

Objectives

The Acme Instellar Transport Company currently delivers spaceship kits to various planets throughout the known universe. You, its chief test pilot, have to follow after them, assembling the rockets and then blasting off to the next planet.

As an added bonus, various treasures appear on the screen from time to time. Since this in an all expenses paid trip you might as well do what any self-respecting test pilot would do, namely grab the treasures and fiddle the expenses.

Just to make life a little awkward for you, a variety of meanies are doing their best to prevent you leaving the planet surface. However, you are equipped with a Quad Photon Laser Phaser to destroy them with.

In play

If I'd never seen the Spectrum version of this game, I think I'd

like it. But the graphical displays of that computer and the Vic 20 are light years apart, and since this game is a little short on plot it depends a great deal for success on the effectiveness of the graphics.

Treated in its own right, the screen display shows platforms, on two of which rest parts of the rocket, while the main fuel stage to the device is lying conveniently on the ground.

Using your fuel pack (or joystick), you must move about the screen collecting the two stages of the rocket.

The aliens are a mean bunch, and appear with almost frightening rapidity, but it's fairly easy to blast them all and collect the next item on your agenda—the six fuel pods that appear on the screen.

Having done all that, you then just return to the rocket and whisk away to the next planet, where the same thing happens all over again. The difference is the aliens are a different shape, but that apart, the game just goes on and on and...

Verdict

Jetpac does have some redeeming features—in particular the choice of keys if you haven't got a joystick is very good: it's virtually up to you. And high scores, two player options, and other little touches all show the Ultimate stamp.

However, this Vic offering is just an average shoot-em-up and blast-em-down game, that ultimately gets very boring indeed.

Pete Gerrard

RATING

Lasting appeal

Playability

Use of machine

Overall value



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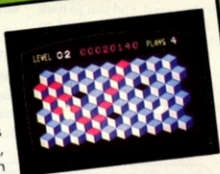
manner of treacherous traps and hidden perils - an epic test of your courage and cunning. Aztec Challenge features no less than seven totally different screens - here are just three of them - each of which presents a brand new challenge. We hope your joystick can stand up to it!



*

SLINKY

Slinky, the spring, was having fun hopping about when suddenly he came upon a pile of coloured blocks, so he thought he'd play around on them for a while. Much to his amazement he found that they changed colour when he landed on them. Wow! But unknown to him, the blocks belonged to the Wicked Wizard, who sent his friends along to tease our poor hero. Slinky is a real fun package with ninety-nine levels, amazing reward displays, and action replays. Where else could you meet such charming characters as Dusty the dust cloud, Marge the magnet, Ralph the random roindrop, and Lorenzo the chameleon hopper?



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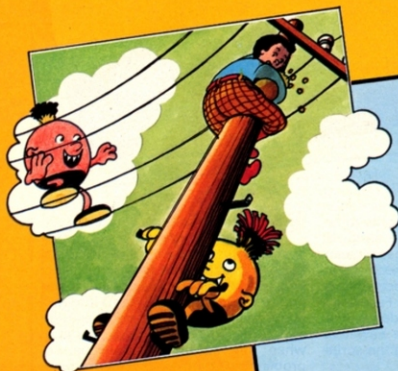
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Title: *Sprite Designer*
Machine: *Commodore 64*
Application: *Design*
Language: *CBM Basic*
Author: *N J Parmar*

Not many machines have hardware sprites, and those that do generally need to use POKES to get the sprites up and moving. N J Parmar of West Bromwich solves this problem with this sprite designer program.



The program allows the sprite to be designed on a grid. As the sprite is being made up, four sprites can be seen building up. They are in the form of non-expanded, x-expanded, y-expanded and xy-expanded. Full operating instructions are included within the program and they can be viewed at any time without disturbing the sprite currently being design.

After the sprite is finished it can be saved to tape. It can later be retrieved

from tape for alterations if necessary.

To include the sprites in your own program just use the display data routine and copy the data statements into your program. These data statements can be read and POKED into the appropriate registers for use. The program takes up about 13K of memory when run, so there should be no problems in fitting it into a 64K machine (even though there is not exactly 64K available).

PROGRAM NOTES

- 70 Sets the background, foreground and text colours. V=the beginning of the sprite chip. Turn off the sprites and set the screen to lower case.
- 72 Sets all sprite pointers to data block 13.
- 75 Disables the shift Commodore key.
- 80 Dims sprite grid (xy) and sprite data (sd).
- 90-170 Sets up the screen and asks if instructions are required.
- 200-330 Option choosing.
- 379 Start of sprite maker. (A1=0 is sprite maker and A1=1 is alter sprite).
- 380-550 Sets up the screen for the sprite maker.
- 560-565 Clears the sprite registers and values for xy.
- 570-690 Sets the cursor flashing.
- 730-750 Routine for cursor right.
- 790-810 Routine for cursor left.
- 900-910 Routine for cursor up.
- 960-1015 Routine for space.
- 1050-1090 Routine for delete.
- 1125-1270 Works out the cursor position on sprite grid and pokes in the bits.
- 1330-1610 Writes the data onto a sequential file.

```

10 REM *****
20 REM **      NITIN J. PARMAR      **
30 REM **      SPRITE DESIGNER      **
40 REM **      1983                  **
50 REM *****
60 _
70 POKE 53280,6:POKE 53281,6:POKE 646,5:V=53248:POKE V+21,0:POKE V+32,6
72 FOR X=0 TO 7:POKE 2048+X,13:NEXT X
75 PRINT CHR$(8)
80 DIM A$(24,21),SD(62)
90 PRINT CHR$(147)
95 PRINT "N.J. PARMAR'S SPRITE DESIGNER (C) 1983"
100 PRINT "*****"
110 PRINT "*****"
120 PRINT "*****"
130 PRINT "*****DO YOU REQUIRE INSTRUCTIONS?"
140 PRINT "*****"
150 GET A$:IF A$="Y" THEN 10070
160 IF A$="N" THEN 200
170 GOTO 150
200 PRINT CHR$(147):POKE 646,12:POKE V+21,0:POKE V+33,6:POKE V+32,6
210 PRINT "*****"
220 PRINT "*****"
230 PRINT "*****"
240 PRINT TAB(9);"*****1 TO CREATE SPRITE"
250 PRINT TAB(9);"*****2 TO WRITE DATA ONTO TAPE"
260 PRINT TAB(9);"*****3 TO READ DATA FROM TAPE"
270 PRINT TAB(9);"*****4 TO ALTER SPRITE"
280 PRINT TAB(9);"*****5 TO DISPLAY SPRITE"
290 PRINT TAB(9);"*****6 TO DISPLAY DATA"
295 PRINT TAB(9);"*****7 TO DISPLAY INSTRUCTIONS"
296 PRINT TAB(9);"*****8 TO EXIT FROM PROGRAM"
300 GET A$:IF A$="" THEN 300
310 A=ASC(A$):IF A<133 OR A>140 THEN 300
320 A=A-132
330 ON A GOTO 379,1620,1710,10070,1330,9000,6000,10700
379 A=0
380 POKE V+33,11:PRINT CHR$(147):POKE V+21,0:POKE 646,12
390 FOR X=65 TO 88:PRINT CHR$(X+128):NEXT X
400 PRINT CHR$(19);" "
410 FOR X=1 TO 21:IF X=9 THEN PRINT "0"RIGHT$(STR$(X),1):GOTO 430
420 PRINT RIGHT$(STR$(X),2)
430 NEXT PRINT:PRINT
440 FOR T=0 TO 2
450 FOR X=0 TO 1 STEP -1
460 PRINT MID$(STR$(X),2,1):NEXT NEXT

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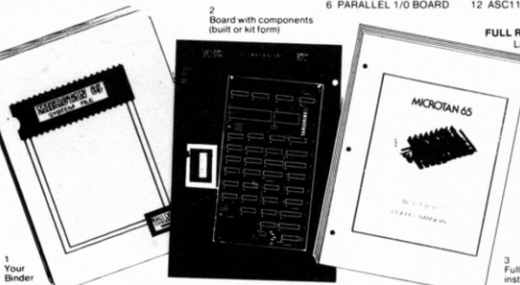
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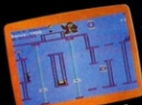
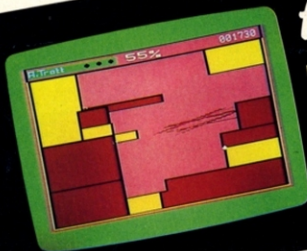
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DATA BASICS

PCN Databasics is presented in three-week cycles. This week it's the turn of software packages, next week hardware, and two weeks from now, peripherals. We can't fit all software packages in, so we've compiled a selection, giving best sellers from 100 publishers and distributors.

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

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

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

APPLICATION Each software package is listed alphabetically by its application.

PRICE includes VAT.

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

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

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

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

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

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

COMMENTS — any other points of interest.

SOFTWARE

	Price £/val	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied	Mail order avail.	Hardware Required	Publisher/ Distributor	Comments		
						Cassette	Disk	Cartridge	Disk drive	Joystick	Other	
BUSINESS												
Databases	£132.25	Apple II		DB Master	48K	●	●	●				M5 Available on hard disk. Allows 1K records over 100 fields. Report generation, etc.
	£96.60	Apple III	●	PFS: File	48K	●	●	●				P6 Also for Apple II (£135.70). Used in tandem with PFS (£96.60).
	£217.35	Apple IIE		VisiTrend + VisiPlot	64K	●	●	●				R6 Also for CP/M. Graphic representation of data. Compatible with VisiCalc.
	£10.30	BBC Model B		Filter	16K	●						M7 Allows searching, sorting, saving & recovery of data.
	£295.00	CP/M	●	InfoStar	48K	●	●	●				M10 Also on IBM PC, MS-DOS. Integrates with WordStar and Calcstar.
	£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 applications package information.
	£1,840	CP/M	●	MDBS II	64K	●						T2 Also on CP/M-86, MS-DOS, Turbo DOS, Unix and Xenix. Mainframe-like facilities.
	£29.32	Newbrain		Database 40/5	30K	●		●				E2 Also on the Memotech.
	£99.95	Commodore 64		Magpie	64K		●	●	●	●		A3 User-programmable database manager.
	£39.95	Commodore 64	●	Home Filewriter	64K	●	●	●				D7 Also for Atari. Database design system.
	£68.42	Newbrain		Invoice & Credit Program	32K	●		●				E2 The invoice program allows you to put in your own information and design invoice.
	£29.32	Newbrain		Database 40/S	32K	●		●				E2 Information gatherer, stores large quantity of information & can be interrogated at will.
	£684.25	Sirius, IBM PC, MS DOS	●	Tomorrow's Office	128K	●	●	●	●			S11 Complete applications generator.
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. PCN issue 1.
Management	£569.25	Commodore 8000		The Administrator	96K	●	●	●	●			S11 Complete applications generator. No programming required.
Financial Planning	£44.85	Commodore Pet		Basicalc	16K	●		●				S5 Also on Hytec & ICL PC. 96K version available. Helps decide on financial strategy.
	£345.00	CP/M		Bottom-Line Strategist	48K	●	●	●				P4 A business/project forecasting program. Allows user to test business assumptions.
	£281.75	CP/M	●	Master Planner	64K	●	●	●				C5 Also on MS-DOS & CP/M 86. Needs 80 column printer. Upgrade of a spreadsheet.
	£343.85	CP/M		Minimodel Financial Modelling	48K	●	●	●	●			M5 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.
	£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.
	£178.25	CP/M		T-Maker	48K	●	●	●				X1 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.

	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied	Cartridge	Mail order avail.	Hardware Required	Other	Publisher/ Distributor	Comments
	£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.
Integrated Software	£569.25	IBM PC	●	Context MBA	256K	●	●	●	●	●	B2	Integrated spreadsheet modelling, graphics, WP, database & communications.
	£908.50	MS DOS	●	Silicon Office	256K	●	●	●	●	●	F1	Also on Sirius & Victor. Comprises word processor database management system.
Payroll	£431.25	Apple II	●	Payroll	48K	●	●	●	●	●	C1	Supports weekly, monthly & per monthly. Up to 350 employees per disk.
	£287.50	Apple II	●	Tabs Payroll	48K	●	●	●	●	●	T3	Also on CP/M & MS-DOS (64K). Up to 2000 employees, nine pay schemes.
	£80.50	Apple II	●	Statutory Sick Pay (SSP)	48K	●	●	●	●	●	H1	Also on Spectrum. Does all SSP calculations.
	£977.50	CP/M	●	Powerday	48K	●	●	●	●	●	O2	Also on MP/M and MS-DOS. Integrates with Omicrons nominal ledger. Handles SSP
Project Management	£747.00	IBM PC	●	Microton	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
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.
	£339.25	Apple II	●	Sales Ledger	48K	●	●	●	●	●	H1	Supports 700 & accounts. Direct posting, credit control & 100 analyses.
	£325	DEC Rainbow 100	●	Sales Ledger System	64K	●	●	●	●	●	D2	Also on DEC Mate II. Invoicing & monthly statement generating system.
	£287.50	CP/M	●	Sales Ledger	64K	●	●	●	●	●	S2	Also on CP/M 86 and MS DOS. Flexible ledger system.
Spreadsheets	£188.60	Apple II	●	VisiCalc	48K	●	●	●	●	●	R1	Also on Apple III, Commodore & IBM PC, etc. The classic spreadsheet.
	£44.85	CP/M	●	Plannercalc	48K	●	●	●	●	●	C5	Needs 80 column screen. Entry level system for spreadsheet planning.
	£212.75	CP/M	●	Super Calculator	48K	●	●	●	●	●	E1	Spreadsheet calculator.
	£396.75	CP/M	●	Micro-Plan	64K	●	●	●	●	●	B1	Also on MP/M. Spreadsheet financial planner.
Word Processing	£92.00	Apple II	●	Piewriter	48K	●	●	●	●	●	M5	Needs 80 column card. Allows entry, editing & print formatting of any text type.
	£17.25	BBC Model B	●	Wordsworth	32K	●	●	●	●	●	I7	Disk version £19.50; cheap word processing package. PCN Issue 33.
	£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 accounting. PCN Issue 10.
	£89.00	Commodore 64	●	Paperclip	64K	●	●	●	●	●	K5	Also Commodore 8000. Compatible with WordPro & SpellPro. PCN Issue 6.
	£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
	£316.25	CP/M	●	Spellbinder	48K	●	●	●	●	●	E1	Also on Oasis. Word processing & office management system.
	£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.
	£40.25	Newbrain	●	Word Processor 40/12	32K	●	●	●	●	●	E2	Automatic word wrap, editing, saving paragraphs, deleting.
	£45.42	Sharp MZ804	●	Wordpro	48K	●	●	●	●	●	K1	Also on MZ80B + K. Available on disk (£91.94). One of few WP packages for Sharp.
	£40.25	Memotech	●	Propan 32 (4)	30K	●	●	●	●	●	E2	Also for New brain — word processor.
	£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.
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.
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. PCN Issue 20.
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.
	£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.
Mathematics	£37.89	Apple II	●	Bumble Plot	48K	●	●	●	●	●	P4	A set of five programs for developing graphics and maths skills. For children 8 to 13.
	£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.

	Price inc vat	Machine/Operating System	Other versions	Title	Memory required	Media Supplied	Hardware Required	Publisher/Distributor	Comments
	£5.95	BBC Model B	●	Sequences	32K	●	●	C9	Also on Vic-20. Demonstrates number patterns.
	£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.
	£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.
	£5.25	Spectrum		Adding and Subtracting	16K	●	●	W2	For children aged 3-7. Three animated programs with full graphics.
	£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.
Physics	£14.38	Research Machines 380Z	●	Lenses	31K	●	●	H4	Also on Apple II. Illustrates formation of images by lenses using ray diagrams.
	£3.00	Sharp MZ80A	●	Physics 1 and 2	20K	●	●	D6	Also MZ80K. 0' level electricity and motion.
	£28.75	CP/M	●	Touch'n'Go	48K	●	●	C6	Also on MS-DOS. Typing tutor for mastering numeric pad & Qwerty keyboard.
Typing	£31.05	IBM PC		Typing Tutor	64K	●	●	I3	Presents exercises for learning touch typing or for improving existing skills.
Various	£29.84	Apple II	●	Face Hanger	48K	●	●	P4	Also on IBM PC. Designed for children to learn computer keyboard by building up face.
	£37.89	Apple II		Gertrude's Secret	48K	●	●	P4	An educational game to teach logical thinking & planning. For children aged 6-9.
	£9.80	Atari 400	●	Jigsaw Puzzles	16K	●	●	T4	Also on Atari 800. Has 16 puzzles and optional difficulty.
	£9.95	BBC Model B		Tree of Knowledge	32K	●	●	A9	Interactive program teaching categorisation. Simplified information retrieval.
	£4.95	Sharp MZ80K	●	Master Builder	48K	●	●	S8	Also on MZ80A. Repair a wall using random blocks. Teaches spacing.
	£9.20	Sharp MZ80A	●	Morse Tutor	48K	●	●	K3	Also on MZ80K. Used to teach morse code by sight and sound. At seven levels.
	£322.00	UCSD-P	●	Classroom Monitor	64K	●	●	K4	Also on Apple II. Provides demonstration facilities & monitors student's progress.

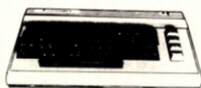
GAMES

Arcade	£5.50	Spectrum		Zip Zap	48K	●	●	I6	Concerns a non-stop robot which avoids aliens. PCN issue 27.
	£7.50	Spectrum		Halls of the Thing	48K	●	●	C11	Pretty straightforward — you avoid and kill monsters.
	£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'.
	£4.00	Spectrum		Fozbee & the Hunny Suckers	48K	●	●	A10	ArCADE game in 100 per cent machine code.
	£5.95	Oric 1		Killer Caverns	16K	●	●	V1	'Involves running off with pieces of a ladder, hidden in the caverns'.
	£7.95	BBC Model B		Microbe	32K	●	●	V1	Fast action game, written in machine code. PCN issue 39.
	£5.95	Spectrum		Quetzalcoatl	48K	●	●	V1	Fast action game of strategy and skill involving small plane.
	£6.95	Commodore 64		Falcon Patrol	48K	●	●	V1	3-D maze game set on the high seas'.
	£5.50	Commodore Vic-20		Wacky Waiters	3.5K	●	●	I6	'Walter serving drinks in hotel. Has to hop from lift to lift'.
	£9.99	Commodore Vic-20		Hopper	3K	●	●	R2	A version of Frogger' — PCN issue 15.
	£5.95	Spectrum		Horace goes Ski-ing	16K	●	●	S10	'Sequel to Hungry Horace. Has to fetch skis and ski down slope'. PCN issue 1
	£24.95	Commodore Vic-20		Chop Lifter	8K	●	●	A3	Also on Commodore 64. PCN issue 10.
	£19.95	Apple II		Lunar Lander	16K	●	●	S12	Reviewed in PCN week ending April 22.
	£9.95	Dragon 32		Dragon Trek	32K	●	●	S7	'A version of Star Trek with ten levels of difficulty'. PCN issue 9.
	£5.95	Spectrum		Android Run	16K	●	●	A6	'Control android to shoot walls, kill mutants & reach central complex'.
	£7.50	Atari 400		Space Attack	16K	●	●	A11	Consists of a battle in a black hole.
	£5.50	Spectrum		Schizoids	16K	●	●	I6	'Space bull dozer nudges shapes into black hole'.
	£7.99	BBC Model B		Swoop	32K	●	●	M7	'Written in machine code with full colour and high resolution graphics'.
	£7.50	BBC Model B		Model B Invaders	32K	●	●	I4	A Space Invaders game with high resolution and colour graphics.
	£7.95	Dragon 32		Wizard War	32K	●	●	S7	Reviewed in PCN week ending April 8.
	£7.95	BBC Model B		3-D Deep Space	32K	●	●	P10	You're in a starship defending the stargate to your galaxy. PCN issue 33.
	£7.50	Atari 400		Intruder Alert	16K	●	●	A11	Locate your ship and escape with Dreadstar's plans.
	£7.50	Atari 400		The Rings of the Empire	16K	●	●	A11	Involves battle stations protected by rings of energy.
	£7.50	Atari 400		Crazitack	16K	●	●	A11	The Crazies are attacking you. Also on Atari 800 and 800.
	£7.95	BBC Model B		Hunchback	32K	●	●	S15	Little man runs along walls avoiding obstacles.

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FX100 (Friction & pin feed) Dot matrix	£545.95
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	Price inc. vat	Machine/ Operating System	Other versions	Title	Memory required	Media Supplied	Cartridge	Mat order avail.	Hardware Required	Publisher/ Distributor	Comments
	£24.99	Commodore Vic-20		River Rescue	8K		●			T4	Needs joystick. 'Captain boat through treacherous rivers to rescue explorers'.
	£7.50	Commodore 64	●	Gridrunner	64K	●		●		L2	Also on Atari and Vic-20.
	£7.50	Commodore 64		Hover Bover	16K	●		●	●	L2	Man mowing the lawn is chased by his neighbour. PCN issue 27.
	£5.95	Commodore 64	●	Horace and the Spiders	68K	●		●		M8	Also on Spectrum and Dragon 32.
	£7.95	Dragon 32		Wizard War	32K	●	●			S7	Needs joystick. 'Magical combat for two to nine players; interactive duel'.
	£6.95	Spectrum		Luna Crabs	16K	●				M14	Convincing 3-D graphics PCN issue 33.
	£5.95	Spectrum		Manic Miner	18K	●		●		B3	Guide miner Willie through 20 crazy caverns.
	£5.50	Spectrum		Lunar Jet Man	48K	●		●		U1	Sequel to Jetpac — enhanced version.
	£5.95	Spectrum	●	Jetpac	16K	●		●		U1	Spaceman collecting pods and rockets. PCN issue 14.
	£5.95	Spectrum		Kong	48K	●		●		O3	Kong's got the girl — you go to her rescue.
	£6.95	Spectrum		3-D Ant Attack	48K	●		●		Q1	Girls rescue boys (or vice versa) in a maze filled with aggressive ants.
	£5.50	Spectrum		Chukkie Egg	48K	●		●		A5	Also runs on BBC B. Try walking on the eggs.
	£6.95	Spectrum		Penetrator	48K	●		●		M8	Joystick optional.
	£5.50	Spectrum		Zzoom	48K	●		●		I6	3-D fighter game. PCN issue 27.
	£7.50	BBC Model B		Atlantis	32K	●		●		I4	'Guide submarine through caverns & destroy enemy'.
	£9.99	Commodore Vic-20		Annihilator			●		●	R2	'Based on Defender'.
Adventure	£6.95	Dragon 32		Death Cruise	32K	●	●	●		V1	'Adventure game set on the high seas'.
	£9.95	BBC Model B		Sphinx	16K	●		●		W1	A classic adventure, moving through caves avoiding hazards to collect treasure.
	£8.00	Dragon 32		Mansion Adventure	32K	●		●		M12	'Wind your way through an old mansion picking up clues to find the diamond.'
	£35.00	IBM PC		Adventure in Serema	64K	●				I3	Needs colour graphics adaptor and direct drive colour monitor for use.
	£6.90	Oric-1	●	Zodiac	16K	●				A5	'The thinking person's adventure game'.
	£12.07	Sharp MZ80A	●	Adventure	48K	●				K1	Also runs on Sharp MZ80B & MZ80K. 'An interactive adventure game'. PCN issue 12.
	£7.95	Sharp MZ80K	●	Nightmare Park	48K	●				S8	Also runs on MZ80A. Cross Nightmare Park.
	£4.00	Spectrum		The Last Jedi	48K	●		●		A10	Textual adventure with over 500 rooms.
	£4.00	Spectrum		Dragon	48K	●		●		A10	Mission to recover Sword of Roac.
	£4.00	Spectrum		Kane	48K	●		●		A10	Mission to kill the great Dragon Smang.
	£14.95	Spectrum		Valhalla	48K	●		●		L1	PCN issue 35.
	£14.95	Spectrum		The Hobbit	48K	●		●		M8	Object is to get treasure. For one player. Also for Commodore 64.
	£5.00	Spectrum	●	Orb	16K	●		●		I5	Also for Dragon 32 and Commodore Vic-20. Explore labyrinth and destroy Orb.
	£10.00	Spectrum	●	Pimania	48K	●		●		A7	Also runs on ZX81, BBC, Dragon 32. PCN issue 1.
	£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.
	£10.06	Tandy TRS-80 1	●	Mysterious Adventurer	16K	●		●		M6	Also runs on Tandy TRS-80 111, Genie I, II, Colour Genie and BBC B.
	£5.95	BBC Model B		Invisible Man	32K	●		●		C9	Also on Commodore Vic-20. 'Aim is to shoot man who keeps disappearing'.
Simulation	£5.95	Spectrum		Starship Enterprise	48K	●		●		S9	Based on the classic Star Trek. Includes arcade action.
	£5.50	Spectrum		Heathrow ATC	16K	●		●		H7	Air traffic control game.
	£7.95	Spectrum	●	Flight	48K	●		●	●	P9	Also available on ZX81.
	£14.95	Atari 400	●	Up Up Away	16K	●		●		S13	PCN week ending April 29th 1983. Also on Atari 800. Available on disk, also.
	£22.80	Atari 400	●	Jumbo Jet Pilot	16K	●			●	T4	Also Atari 800. Ten difficulty levels. PCN issue 32.
	£7.95	Spectrum	●	Flight Simulation	48K	●		●		S10	Also on ZX81. 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'.
Board Games	£4.00	Spectrum		Advance to Mayfair	48K	●		●		A10	Play against your Spectrum. Supports printer.
Sport	£33.35	IBM PC		Decathlon	64K	●	●		●	I3	Needs colour graphics adaptor and direct colour monitor.
	£29.99	Atari 400	●	Kick Back	8K	●		●	●	T4	Also available on Atari 800. Needs joystick to run.
	£19.55	Atari 400	●	Soccer	8K	●		●		T4	Also on Atari 800. Reviewed 11.3.83. Aerial view of field.
	£7.50	Atari 400		Giant Slalom	16K	●			●	A11	Guide the skier down a giant slalom course via gates.
	£7.95	Dragon 32		Golf	32K	●		●		S7	For one or two players. Full handicapping system.
	£3.75	Sinclair ZX81		Golf	16K	●		●	●	R3	Similar to other golf games in black & white.
	£8.50	BBC Model B		Billiards	32K	●		●		H3	Available on disk. 'A game for all ages'.
	£5.99	Commodore 64		Hustler	48K	●		●		B6	Simulation of mini-pool game. PCN issue 33.
	£7.95	Dragon 32		Grand Prix	32K	●		●	●	S7	Features eight Grand Prix tracks and ten levels of difficulty.

	Price inc. vat	Machine/ Operating System	Other versions	Title	Memory Required	Media Cassette	Supplied Disk	Cartridge	Mail order avail.	Hardware Required	Other	Publisher/ Distributor	Comments
Various	£14.99	Atari 400		British Heritage Jigsaw Puzzle	8K	●	●	●				T4	Also on Atari 800. 'Educational game with selective difficulty'.
	£15.95	Spectrum		Scrabble	48K	●	●	●				P9	Expensive but popular.
UTILITIES													
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.
	£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.
	£575	CP/M	●	Bisync AC-3780	64K	●	●	●				E1	Also on MP/M & CP/M86. Micro to mainframe comms through IBM terminal emulation.
	£117.30	IBM PC		IBM 3101 Emulation Program	64K	●	●	●				I3	Makes PC act as 3101 terminal provides 3270 emulations when connected to host.
	£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.
	£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.
	£41.40	IBM PC		Asynchronous Communications	64K	●	●	●				I3	Needs asynchronous comms adaptor. Makes PC act as asyncs comms terminal.
	£638.25	IBM PC		PC SNA 3270 Emulation	128K	●	●	●				I3	Needs SDLL adaptor card makes PC act as IBM 3270 terminal.
Database	£224.25	Apple II		Informex Database System	48K	●	●	●				I1	Database system which can be used to & update info on any type of record.
	£402.50	Apple II	●	Mailist	48K	●	●	●				A4	Also for IBM PC & Corvus Concept. Requires hard disk. A networking product.
	£166.75	CP/M		Supersort 116	64K	●	●	●				M10	A sort utility for handling various forms of data files. Mainframe-like additions.
Debugger	£258.75	CP/M	●	Animator	64K	●	●	●				M11	Also on Unix & MS100S. Interactive source level debugging tool for C/S-Cobol.
File Transfer	£132.25	CP/M		BSTAM	16K	●	●	●				X1	Needs common interface ports or modem access. Utility for transferring CP/M files.
Graphics	£34.50	Apple II	●	Graphic Utilities	48K	●	●	●				C1	Also for Apple IIE. Parameter driven machine code programs, high res graphics.
	£24.95	Atari		Constructor	48K	●	●	●				C8	Less experienced & new programmers can design animated sequences.
	£9.95	BBC Model A	●	Creative Graphics	16K	●	●	●				W1	Also for BBC model B.30 programs on cassette produce range of pictures & patterns.
	£24.95	BBC Model B		EDG Graphics Package	32K	●	●	●				S7	Computer aided design package. Reviewed 11.3.83.
	£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-compact 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).
	£253.00	CP/M	●	ProPascal	56K	●	●	●				E1	Also on CDOS. Needs two disk drives. Native code Pascal.
	£40.19	Sharp MZ80A	●	Forth	48K	●	●	●				K1	Also on MZ80K & Osborne. Allows implementation of Forth.
	£25	Spectrum		Hisoft Pascal	48K	●	●	●				H5	Reviewed in PCN week ending April 8. Pascal compiler and screen editor.
	£421.70	Any 8 or 16 bit machine		PL1	48K	●	●	●				D4	A compact implementation based on ANSI standard general purpose subset of PL1.
	£172.50	UCSD p-System		UCSD Pascal	48K	●	●	●				D4	Portable Pascal for systems development or commercial applications.
	£201.25	CP/M		Basic 80	48K	●	●	●				X1	Industry standard Basic.
	£235.70	CP/M		Basic Compiler	48K	●	●	●				X1	Companion to Basic 80. Allows programs to run faster.
	£121.90	CP/M	●	C Basic	64K	●	●	●				X1	Commercial Basic. Also on CP/M86 (£265.65).
	£213.00	Any Z80		X-Basic	48K	●	●	●				X1	Built-in matrix functions. Supports MP/M record locking. Graphics option.
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.
	£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	Multitasker, 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.

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	Price inc vat	Machine/ Operating System	Other versions	Title	Memory required	Cassette	Disk	Media Supplied	Card	Mail order avail	Disk drive required	Joystick	Other	Publisher/ Distributor	Comments
	£168.70	8080, Z80, 8086 and 8088 micros		CP/Net	64K	●	●	●	●					D4	A CP/M compatible O/S designed to access local & networked resources.
	£295.20	Motorola MC68000		CP/M 68K	64K	●	●	●	●					D4	Extends CP/M to Motorola MC68000 microprocessors. Single user, single tasking.
Program Generator	£228.85	Apple II	●	Quickcode	64K	●	●	●	●					P4	Also on IBM PC. Program generator for dBase II.
	£126.50	CP/M	●	Forms-2	64K	●	●	●	●					M11	Also for Unix & MS-DOS. Programming tool, for generating Cobol code.
	£379.50	CP/M	●	Last One	64K	●	●	●	●					S3	Also on MS-DOS and Apple DOS.
	£569.25	Commodore 8000		The Administrator	32K	●	●	●	●					S11	Applications generator. No programming involved.
	£684.25	IBM PC	●	Tomorrow's Office	128K	●	●	●	●					S11	Also on Sirius, Victor & MSDOS. Complete applications generator.
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.
	£18	Apple DOS		MUM	48K	●	●	●	●					H8	Macro Utilities Master is a business programming aid.
	£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.
Testing Tool	£95.82	CP-M 86	●	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 86. Control over man/hour expenditure by job or account number.
Utilities	£23.00	Apple II	●	Computech Utilities Disk II	48K	●	●	●	●					C1	Also on Apple IIe. Error checking, copying. Single disk copy. Label disk.
	£79.35	CP/M		Vista 80	64K	●	●	●	●					M13	Constructs a menu-driven system to your design.

HOME

Clubs and Sports	£78.00	Sharp MZ80A		Clubman	48K	●	●	●	●					S8	Golf handicapping and competition results system complying with 1983 regulations.
	£575.00	Apple II	●	Tabs Golf Package	48K	●	●	●	●					T3	Also on MS-DOS (64K). Maintains members handicaps including 1983 regulations.
	£28.18	Epson HX20	●	Horse Race Forecast	48K	●	●	●	●					K1	Also on Newbrain and Sharp. A punter's aid to betting.
	£28.69	Sharp MZ80A	●	Naxev	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.
	£9.95	Spectrum		Data Genie	48K	●	●	●	●					A3	User programmable home database.
	£28.75	Newbrain		Home Expenses 4/6	30K	●	●	●	●					E2	Also on the Memotech.
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).

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D1 Dataview, Colchester 869414 **D2** DEC, Basingstoke 59200 **D3** Dragon Data, Kenilworth 744700 **D4** Digital Research, Newbury 35304 **D5** Dipar Software, 0329 46756 **D6** Datcom Computer Services, 0207 508532 **D7** Dynatech, 0481 20155

E1 Encotel Systems, 01-686 9687 **E2** Estree Computer Centre, 01-953 6921

F1 Ferrari, 01-751 5791 **F2** Farmplan Computer Systems, Ross-on-Wye 64321

G1 Great Northern, Leeds 589980 **G2** Grafcom Systems, 01-385 9422

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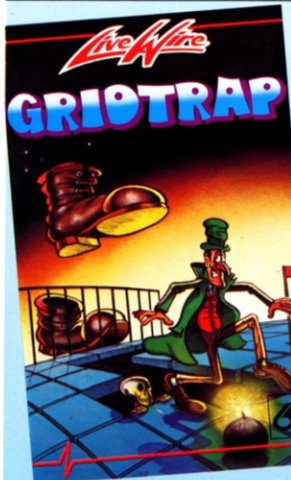
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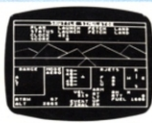
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