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birthday issue
COMPUTER

50p March 10, 1984 No 52

NEWS

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52 MICRO TESTS

122 PROGRAMS

18 PULL-OUT VOLUMES

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Check to see if your favourite game is leading the rest.

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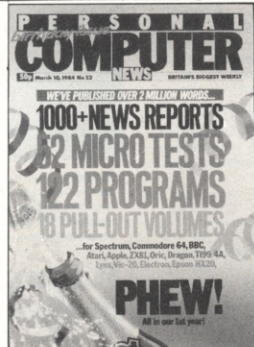
The Japanese are finally coming — bearing the MSX banner. Ian Scales and Igor Thomas investigate.



MENU

March 10, 1984

No 52



Cover by Brian Robson/Meiklejohn

One year old

Corks are popping at PCN to celebrate our first birthday — a couple of million words since we put No 1 on the news-stands. Being a forward-looking magazine we're not dwelling on the past, instead we'll thank you all for sticking with us and hope you'll stay for the next 2,600 pages — Ed

MICROPAEDIA

Pull out and keep

From quill to Queme

The final part of PCN's complete guide to printers looks at ink-jet technology, offers some advice on printer-related reading matter, and looks into a dot-matrix.

Competition

Five Epson RX80s to be won 16

The final instalment gives you the chance to win one of these superb dot matrix printers. The RX80 is a versatile and reliable machine.



SPECIALS

Adventure in words 24

A while back we asked: Is the text adventure being killed by its graphical counterpart? Mike Gerrard replies with a resounding 'No!'.



PRO-TEST SOFTWARE



64: Micro of note 35

Bring out the music in your micro with two packages for the Commodore 64.

Play as you learn 37

Despite the claims for micros in education, software has left much to be desired. We round up another batch of the new 'teaching games' to see if standards have improved.

PRO-TEST PERIPHERALS

Oric plug-in power 50

A new 'intelligent' cable allows your Oric to communicate with a variety of peripherals.

David Janda looks at the performance.



GAMEPLAY

Dragon 56

Action and strategy in this round-up of the new games for the Welsh micro.

BBC 59

Lobsteroids can damage your health, or you can do the same to a bunch of snakes.

PROGRAMS

Vic 20 64

UFO: a space game with a twist — you are the alien.

BBC 71

Morse Code: turn your Model B into a morse generator.

Commodore 64 72

Gary the Guitar: you become this heroic musical instrument.

Psion gears up for QL support

Sinclair software specialist Psion is gearing up to make sure that if Sinclair ever delivers a QL there will be plenty to run on it.

With up to 30 full-time staff it will make the QLUB (QL Users' Bureau) a substantial undertaking. It anticipates a flood of enquiries once the QL starts to find its way into your hands. Psion, the company that produced Vu-Calc, Vu-File, and notable educational games, is also responsible for the applications programs bundled with the new Sinclair micro.

QL owners can join the QLUB for £35 a year. Membership entitles you to phone up for instant hot-line help on specific problems and it offers free software updates and periodic information sheets. It has been set up by Sinclair and Psion jointly.

To help speed the handling of inquiries, Psion is installing its own

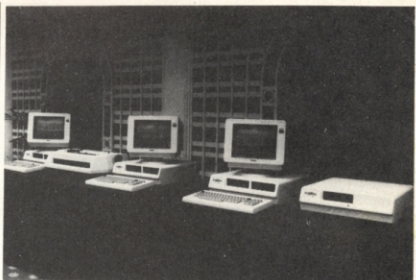
computer to act as a database for the staff — the company is expecting calls to number about 1,200 a day. This sort of facility can also develop into a database system which QLUB members can access.

The four Psion applications packages which come with the QL may soon be available on a large plug-in ROM cartridge which slots into the machine's left-hand side expansion port.

Undoubtedly such ROM cartridges would be expensive to produce at the moment, but an expected decline in the cost of ROMs and a large consumer demand should allow economies of scale that would make cartridges both affordable and worthwhile. By putting the packages on cartridge, the amount of available memory rockets from about 32K to somewhere close to 90K because the packages no longer sit in RAM.

family records and using them in the mysterious ways of the genealogist. At the product's launch the system was demonstrated with data from the Royal Family.

Bel Tech (07462 5420) is a sister company to Bridgenorth Engineering, a manufacturer of tractors and water pumps among other items. The genealogy of software companies will make an interesting study one of these days.



PC-LINK — Three Krypton micros hanging on a line. Transtec, the Irish micro manufacturer, has brought out its own networking system called Transnet. Apart from linking together the company's own Krypton micros you can also attach IBM PCs. Transtec hopes to add DEC, ACT and Apple links and claims an unparalleled range of mini and mainframe links.

TUG bugged by cash row

The Tangerine Users Group (TUG) is in a state of suspended animation as a legal storm threatens to break over it.

On one side is Colin Nowell, an ex-director of the TUG, and on the other is Bob Green, who originally ran the group and is now in charge of the Oric Users Group. In the middle are group members, who have paid subscriptions for services that may now be suspended.

The dispute revolves around the dating of the TUG at the time of Mr Nowell's appointment.

Weston-super-Mare printing firm Alpharprint says that the TUG owes it about £1,800, but in order to recover the debt it needs to establish whether Mr Nowell or Mr Green is responsible. Until recently the Oric group owed it a similar sum but Alpharprint says that half of this sum has been paid. But it will do no more work for either until it is paid in full.

Another creditor, Fleet Printed Circuits, told PCN that it is owed £400 by the TUG.

Mr Nowell is bitter about the affair and Mr Green describes it as a 'domestic dispute'. None of the wrangling will improve the position of group members and in the case of both groups they look increasingly likely to be left out in the cold.

Software branches out

Budding genealogists can watch their family trees bud with a program developed by Bel Tech.

The West Midlands company's Genealogy program gives you a dedicated form of database system that offers you a means of keeping

IBM hacks 20 per cent off PC price

IBM has slashed the prices of the two members of its PC family that have made it into the UK, the PC itself and the hard disk XT.

The PC comes down by 20 per cent, which puts it at £1,914, well below its main rival the Sirius and almost nudging the Apricot. The larger XT, with a price cut of about seven per cent, will now cost £3,958.

Characteristically cagey, IBM UK offered little to explain the price changes but a spokesman commented: 'We've always said that we wanted to be a low cost producer.' This is subtly different from being a low cost supplier.

The spokesman added that production lines in Greenock were now in full swing, but he did not respond to suggestions that IBM was clearing the decks to introduce new products — the PCjr, for example, or the new Portable PC.

IBM is still reluctant to say when these machines might appear in the UK.

Spirit racing game runs off the track

By John Lettice

Spirit Software's racing game has failed to materialise and the company has promised disappointed customers a full refund — but it plans to go ahead with production of the game.

The company has been advertising a Formula 1 racing game complete with a steering wheel instead of a joystick for £8.95, but in the last week PCN has received a considerable number of complaints from people who have sent money and received nothing.

Spirit is run by Simon Stevens. Its telephone number is 01-803 6074, but at the time of writing this had only led to an answering machine. A number of PCN readers have left messages on this machine and these have not been answered.

The game itself was said to be based on the Silverstone Grand Prix course, and to have been designed with the help of Silverstone's Jim Russell Racing Drivers' School.

Spirit also operated from an accommodation agency, a place where someone answers the phone

Status Report

for you and you collect messages every now and again. This particular agency also took messages for Boom Software, Golden Challenge Software and Silicon Tricks.

It's possible that these four companies have more in common than just an accommodation address. Silicon Tricks used the same telephone number as Spirit does — the exchange is West Kensington.

The address in Kensington, West London, where cheques to Spirit were sent, is also apparently an accommodation address. PCN spoke to someone at this address who claimed that mail for Spirit was still being collected.

At this point in the investigation Mr Stevens resurfaced, claiming

that there had been a misunderstanding, and that customers would be offered their money back. At the time of going to press Mr Stevens said he was writing to the people owed money explaining that production delays would mean the goods wouldn't arrive for another two weeks, and that refunds would be available on demand.

PCN will not be carrying advertisements from Spirit until we are sure that these refunds have been made.

But all this is only the tip of the iceberg. Setting up a software company is childishly simple, and the pages of computer magazines are full of advertisements from companies that are little more than a programmer and an answering machine. Many of these are legitimate, but some are not, and it is frankly impossible for the magazines publishing the advertisements to tell whether or not a company is about to disappear.

Modems off-line

By Ralph Bancroft

The Minor Miracles WS2000 could be all you ever wanted from a modem. It operates at 300/300 baud full duplex, 1200/75 full duplex and 1200/1200 half duplex. It recognises European and American protocols. And it costs just £99.95 plus VAT. You can add an auto-dial/auto-answer plug-in board for £39.

There is just one problem. It is illegal.

Minor Miracles has run into the problem that affects any other manufacturer making equipment designed to hook on to the telephone system — it has to be officially approved first.

Approval used to come from British Telecom itself with the inevitable result that manufacturers seeking approval faced delays and expenses.

All this changed as the Government removed restrictions in the telephone network and handed over the approval procedure to a new body — British Approvals Board for Telecommunications (BABT).

BABT has gone about its task with great gusto and determination. In most of last year it had only approved just one extension telephone.

To be fair, things have improved. Last month it approved some 16 different pieces of equipment.

But this has left modem and computer manufacturers far from happy. They still complain of long delays and the high cost of the procedure.

Part of the problem lies with the Government which insists that BABT should be self-financing.



The Minor Miracles modem — naughty but nice.

The other part is the extremely complex and stringent standards of design and manufacture demanded.

It is not just the design of the hardware that BABT investigates. The board carries out a full inspection of the factory where the product is to be made checks quality control procedures and can insist on changes.

Where the modem is connected to a micro, the board insists on approving the whole set up.

In the case of Torax, the company wanted to include a modem board in its new 68000 machine. Its existing machine already has an approved modem and, with the only differences between the two machines being the second processor board and the external package, you might have thought there would be no difficulties. No such luck. The whole machine has to go through the complete procedure.

The financial consequences to both companies and micro users are potentially extensive. The

basic approval fees start at £5,000; add to this the cost of making changes to the design of the modem, micro and software you soon see why some companies charge £200-300 for even a simple modem.

ACT with the Sirius and Apricot, LSI with the Octopus and GRID with the Compass are just three companies who have announced plans to introduce modems and must now go through the BABT hoops. Minor Miracles has sought to avoid the problems of compliance with the board's requirements by calling in the board at the design stage to provide consultancy and advice.

This has been expensive but it should ensure that the modem will secure approval 'in eight to ten weeks' says the company.

Within that time BABT itself is coming up for approval. The Government has commissioned an independent report into the board's sanctioning procedures.

Watch this space for further developments.

QL takes another step back

Sinclair Research will not ship its first QL computer to a customer until the end of March.

The company had promised to deliver the first machine by the end of February, but a Sinclair spokesman now says that development problems have put off the initial delivery date by a month. The spokesman maintained, however, that the 'target' delivery dates promised in letters sent out two weeks ago.

Those target dates allowed Sinclair up to four months from the date of ordering to get the machines to customers. On orders placed in late January, for example, customers were told they would receive their QLs 'no later than the end of May'.

Sinclair would not comment on speculation that the delays have been caused by difficulties with the QL's multi-tasking operating system — and would say only that it expects to have overcome development difficulties and have the machine in full production by the month's end.

■ Sinclair has agreed in principle that those who have ordered QL's by cheque will receive a free gift as compensation for lost interest. What the gift will be remains to be seen.

■ If anybody offers you a Sinclair Microdrive order form be sure that you don't pay for it. The Microdrives are available in any quantity by mail order from Sinclair, said a spokesman. Sinclair is concerned that unused forms are being bought and sold by people who don't realise that Microdrives can be obtained without the order forms.

Kaypro's A4

The first of the IBM-compatible book-size micros looks likely to come from Kaypro, one of the most prominent portable micro makers.

A number of companies are known to be working on A4-sized machines that will run IBM software with its machine, built by Mitsui in Japan. The company, represented in the UK by CK Computers of Plymouth, has given no details of price or performance, but it announced in the US last week that it would be selling the micro this summer.

The Kaypro model will be roughly the same size as a Tandy Model 100 but with a bigger screen (80 by 16) and a bigger memory, perhaps as much as 256K.

Again in imitation of Tandy, the company will be supplying bundled business applications software — a word processor and a spreadsheet will be included in the price. The degree of IBM compatibility is expected to take in Lotus 1-2-3 and the Microsoft Flight Simulator.

COMMENT COMMENT

Fast talking micro

By Piers Letcher

Recent developments in speech synthesis suggest the micro business is finally getting to grips with a technology that has proved elusive until now.

The development of speech synthesizers and recognisers has been slow, and even now most synthesizers sound more or less like Daleks. Voice recognition lags even further behind with most systems, prices running into hundreds of thousands of pounds.

The latest improvement in speech synthesis is to allow full text-to-speech conversion. Until now synthesizers have had to be programmed with a set of allophones (syllables plus emphasis), or had a very limited vocabulary — a few hundred words at the

most. But with text-to-speech conversion you can type in what you want said, and the synthesizer tries to say it. Changing spelling where necessary refines the results; 'hellow' sounds better than 'hello'.

This text-to-speech facility is now available for the BBC (in fact any micro with RS232 or RS423 port), with an American unit, the Votrax (0272 710103), which costs about £275. Commodore has plans to bring out a text-to-speech converter cartridge for Magic Voice, its speech unit (Issue 50), allowing you the same facilities as the Votrax. Although text-to-speech is still expensive it represents a significant improvement on more primitive methods, and the price should drop as competition arrives.

New developments are being

made in the speech recognition field too. One company, Orion Data (0273 672994), has brought out a speech recognition unit for the Spectrum, Micro Command, costing just £50. It appears to be good value at one ten thousandth of the cost of some systems.

Speech for micros is still in its infancy, but is growing up fast. Within the next few years it will be available on most machines. Whether people want to speak to their micros, and to have them speak back, is another question.

■ PCN will be Pro-Testing both the Votrex Type 'n' Talk and Orion's Micro Command in a forthcoming issue.

The Commodore Magic Voice, as noted, was reviewed a fortnight ago in Issue 50.

VIEW FROM JAPAN



Disk debate as diameters diminish

By Serge Powell

Although the dust has yet to settle on the great VHS/Beta video battle it looks as though Japanese electronics giants are already mobilising for the great storage drive contest.

With feints to the flanks from manufacturers in Hong Kong, Korea and Taiwan, the main thrust from Japan is in the new format 3in or 3½in floppies, with the production of 5¼in drives simply a battle for manufacturing efficiency and economies of scale. This 5¼in business could turn out to be no more than a sideshow.

With the rewards at stake in the microfloppy arena, not to mention the profits from sourcing drives for US distributors to put to market, the players in the new format game are playing hardball.

At present the most promising talent is Sony, with a 3½in model that packs a punch of 1Mb. IBM, Apple, Hewlett-Packard and NEC are all opting for the Sony format, and it looks like Sony may regain some of the face it lost over Beta. But the Hitachi/Panasonic group hasn't fully unfurled its standard yet.

The Japanese scene is alive with rumours of a 3in 1Mb drive, up from the 250K and 500K offered at present. But in the meanwhile you can watch the prices of 5¼in drives drift steadily downwards—OEM prices (for system builders) are now approaching the £60 mark compared to £350 last year.

If someone could just combine the capacity of the microfloppy with the pricing of the 5¼in model and couple the result to a decent RAM board we could all stop saving for a hard disk.

At the same time there are other peripherals to catch the eye. I came across one at the local Bit Inn, an NEC retail outlet that you might almost call a shop — in the way that you might almost call an embalmer a brewer and bottler.

It is called the PO-10 and in some ways it is a hangover from a bygone era, when people believed — sensibly enough — that it might be more economical and reliable to get data into a computer through a mechanism that gave rise to the term Optical Character Recognition. In other words, you train the machine to recognise printed or typed characters and all that you do to enter data is put a sheet of paper in front of its scanner.

The PO-10 on show in the Bit Inn costs just over £2,000, and for another £60 you can add a utility that permits it to read documents in our language and create CP/M files. The PO-10 isn't limited to typescript: it can also handle hand printed characters — perhaps you would expect this for £2,000, but believe me, the price is a remarkable reduction on some of the units that have preceded it, mainly in the mainframe arena.

It is hard to say exactly why it has taken so long for OCR techniques to percolate down to micro users in anything like a worthwhile form. The method dates back to computing's equivalent of the last Ice Age, and as you'll have noticed, where a method exists there is usually a research department or two trying to smarten it up.

OCR has frustrated many attempts to spruce it up, but the greatest drawback has probably been the price factor. Large mainframe users — the banks are good examples — find that the current techniques are adequate in certain applications, but that price restricts their use elsewhere. This is changing.

Besides, the price is bound to continue falling — unless OCR equipment starts a counter-trend by growing bigger, slower and more expensive. The type of device that is on the way is easily imagined — a reasonably priced OCR reader that will take in a variety of type styles and sizes and put the documents into files that can be edited and manipulated by word processors.

When these OCR machines are coupled up to the kind of laser disk filing system that is also just around the corner (perhaps by then OCR devices will be able to read round corners into the bargain) the prospects for office automation are considerable. In the first place, you may not need an office. I for one will welcome it.

ACT gears for second stage

With twice the turnover and bumper profits last year, ACT is raising a further £17.2m to finance its plans for new products.

As reported in PCN (issue 46), ACT intends to introduce a hard disk option for the Apricot as well as a modem and is working on a new machine that will be compatible with both the Apricot and the Sirius but cost less than either.

In addition to these products the company revealed that it is also planning to launch another new machine. It will be a multi-user system that will take over where the Sirius leaves off.

In the wake of the company's results John Leftwich, ACT's marketing manager, was less than forthcoming on the details of the new machines. 'One will be manufactured by us and the other will be distributed by us,' he said. 'There are gaps in the business market and we intend to take advantage of them.'

More immediately, Mr Leftwich

says that negotiations to buy the manufacturing rights for the Sirius from troubled Victor Technologies have reached 'a delicate stage'. ACT has joined forces with Hong Kong based Swire Pacific to make a combined bid. They are the only bidders in the field.

Interestingly, ACT will be paying for the manufacturing rights out of existing resources rather than seeking additional capital financing.

It generally has a policy of maintaining high cash reserves as a buffer against the costs of sustaining its rate of expansion.

ACT is remarkably confident about its prospects, even to the extent of saying that next year's doubled turnover forecast excludes any sales of the Sirius because of the uncertainty over their future supply.

In its annual report the company says that this assumption is made, in the interests of financial prudence, not because the directors expect an interruption in supplies.

Bunch of five

Zenith's Z100 micro has become a multi-user machine.

To put the Z100 at the centre of a party line you'll need Z29 workstations, price £595 each, MBOS/5 multi-user operating software and about £8,000 in all for a three-user system. The arrangement can support as many as five users.

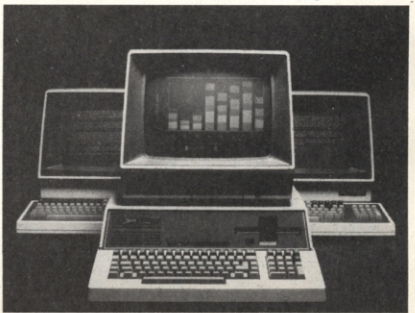
The Z100 behaves in much the same way as a larger computer in a time-sharing environment. It activates each screen in turn for a specific period, normally 200 milliseconds, keeping active users in memory and shunting the rest out to disk.

The individual workstations are

capable of a degree of multi-tasking with foreground/background modes, in which two processes can be controlled at the same time on one unit.

With multi-user systems Zenith (045229451) is giving away business and office applications software. Other software developed under MBOS for other systems will transfer to the Zenith systems without changes, the company says.

In the US Zenith has launched a range of five personal computers which are reported to be IBM compatible. Three of the new systems are desktop machines, but the other two are portable.



All for one — the Zenith Z100 multi-user system.

Hard luck story

UK micro makers who complain of the unfair advantage enjoyed by foreign manufacturers get one in the eye from a large regional store last week.

The same problem that frustrates users — non-availability of launched and advertised UK products — has forced the Gamekeeper, Birmingham's biggest computer store, to stop selling hardware and confine itself to software and add-ons.

Director Tony Noble says the company's four shops have found it impossible to obtain adequate supplies of hardware from UK companies, and the Gamekeeper has therefore taken the drastic step of pulling out of the market. 'We've had 324 Electrons on order since September, and several hundred Spectrums,' he said. The shops have actually received only six Elec-

trons, and Spectrums have also been scarce. Mr Noble says he got 5,000 calls about the Electron in response to one advertisement, and reckons he could sell 500 Spectrums a week. As it is, Sinclair hasn't supplied the Gamekeeper with any this year.

The only machine the shop has been able to get hold of in anything like sufficient quantity is the Commodore 64 — 'but you can't live on the Commodore 64 alone,' says Mr Noble. He claims the Gamekeeper isn't the only shop to be thinking this way, and is highly critical of the way the UK industry operates. He feels the endemic shortages encourage fraudsters to take advantage of customers, and that the disorganised nature of the market will generate a big retail crash soon, with serious repercussions for users.

The Gamekeeper is now trying to

set up an association of retailers and wholesalers to combat this by formulating a professional code of conduct that would help protect both customers and suppliers, and would cut out the pirates.

The move away from selling hardware is liable to hit one machine particularly hard. The Gamekeeper was one of the major stockists of the Spectravideo MSX-like machines (Issue 49), but not only does the shop no longer stock them — the matter is also in the hands of the Gamekeeper's solicitors. Mr Noble won't comment on what legal action is being taken.

Meanwhile, the stable door is slamming shut as Spectravideo gears up for the launch of the 728. This is a full MSX (where have we heard that one before?) version of the 328, and is to be launched in the US in the very near future.

HMS Minstrel

London-based HM Systems has launched a pair of micros covering the range from 8-bit to 32-bit processors.

The 8/16-bit smaller machine, the Minstrel, uses a Z80 and an 8086; the larger model, called the Minstrel 68K, includes a 68000 processor.

The basic Minstrel can become a multi-user system with the addition of further processor boards — it isn't quite an orchestra but up to seven screens can hang off the main processor complex.

A system with a 5Mb hard disk, dual processor, and the Turbosdos operating system, costs £5,000. Extra processor boards cost £465 for the Z80 and £1,000 for the 8086.

The Minstrel 68K runs Unix or Idris, Whitesmith's implementation of the popular operating system. In its minimum configuration it costs £6,497. Range of Rodime hard disks can be added, giving 10Mb to 40Mb capacity.

HM Systems is on 01-328 8737.

PERIPHERALS

The new releases

Printers Dyncer is the name of a range of daisywheel printers from X-Data. The DW16 prints at 16 characters a second on 10, 12 or 15 pitch on paper up to 12in wide and comes with either serial or Centronics interface at a price of £329. The DW20 and DW36 can handle paper 13.2in wide. Contact (0753) 72331 for further details. Meanwhile, if you want to own a Qume, try ISG Data Sales on (0734) 884666 and ask about the Letterpro 20 which, as the name suggests, prints at 20 cps. There is a choice of interfaces and it uses Qume's range of over 100 typefaces, all for £695. Having bought a printer you may get fed up with the untidy piles of paper flowing all over the place. If so, and you have £135 to spare, you might be interested in Inmac's printer stand. Adjustable brackets securely hold the prin-

ter and a basket at the rear of the stand catches your continuous stationery. The paper feed basket is a £29 optional extra as are the four castors at a price of £7.50. More details on (09285) 67551.

Printer interface P & P Micro Distributors (0706 212321) are importing the Grappler CD, an intelligent interface onto which to hook your Commodore 64 dot matrix printers. It handles high-resolution and block graphics as well as special characters. It comes complete with cables and its own serial ports at a price of £105 plus VAT.

Hard Disk: Compass Computer has a major advantage to its 11Mb add-in hard disk for the DEC Rainbow — it comes with a 12 months on-site warranty from DEC field service. It also features an additional 64K RAM board with the option of an additional 256K RAM. Contact (0892) 31812 for prices.

Memory Expansion HX-20 specialist Kuma Computers (07357 4335) is claiming exclusive distribution rights for a 16K RAM expansion that fits inside the case of the portable and costs £95.

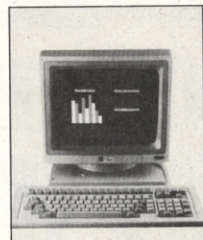
Monitor Philips is applying its knowledge of TVs to the task of producing monitors for home computers. The V7001 has a 12in green phosphor screen and a loudspeaker and costs £69.95.

Terminal The Esprit 6310 is a dumb terminal at a not so dumb price of £589 from CPU Peripherals. Its major plus point is the ability to pretend to be a Televideo 925/910+, ADDS Regent 25/

Viewpoint or Lear Siegler ADM3A. It has tilt and swivel, 14in non-glare display and low profile sculptured DIN standard keyboard with 22 non-volatile programmable keys.

Computer Camera Reflex has become UK agents for the VFR 2000 computer camera. It connects to a wide range of PCs including the IBM PC and captures screen images on 35mm film or instant 35mm slide film. It costs £1,980, and Reflex is on (0734) 884611.

Keyboard Extron has brought out a pad with 25 keys for the BBC micro, with all the numerical and arithmetic operators together with nine commonly used shifted characters all of which can be operated with a single keystroke. It costs £50 and Extron is on (02216) 2936.

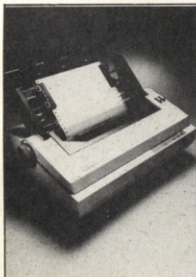


Esprit 6310 from CPU.

Image Plotter Reckie Technology (01-892 2877) is a new company which is launching what it calls the image plotter. At £50 it provides an easy way to reproduce diagrams and drawings.



Philips 12in monitor from TV technology.



Qume LetterPro, via ISG Data Sales.

PRODUCTS FOR COMMODORE

SPEED UP ANY BASIC PROGRAM WITH OUR COMPILERS

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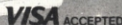
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PCN charts

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)

ANT ATTACK
FROM THE
QUICKSILVA



These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets from February 10 to February 17. The games chart is updated every other 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 CKC CKC Computers CBM Commodore Dragon Data DEC Digital Equipment EP Epson ICL ICL IBM IBM|NCR NCR MD Midelectron OR Oric SI Sinclair Wang Wang.

Machines: SP Sinclair Spectrum AC Acorn BBC 64 Commodore 64 V20 Commodore Vic 20 B1 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	(2)	Manic Miner	S/W Projects/Bug Byte	*		*							£7.95
▼2	(1)	Hunchback	Ocean	*		*				*			£6.90
▲3	(9)	3D Ant Attack	Quicksilva	*									£6.95
▲4	(7)	Chequered Flag	Psion	*									£6.95
▼5	(4)	Stonkers	Imagine	*									£7.95
▲6	(8)	Flight	Psion	*									£6.90
▲7	(10)	Mr Wimpy	Ocean	*									£8.00
▼8	(5)	Space Shuttle	Microdeal	*	*	*				*	*		£6.50
▲9	(11)	Alchemist	Imagine	*									£6.95
▲10	(—)	Scuba Dive	Durell/Martech	*		*				*			£7.95
▲11	(12)	Fighter Pilot	Digital Fantasia	*									£5.50
▲12	(13)	Lunar Jetman	Ultimate	*									£6.95
▼13	(6)	Death Chase	Micromega	*									£5.95
▲14	(22)	Pool	CDS	*									£5.50
▲15	(18)	Jet Pac	Ultimate	*			*						£14.95
▲16	(25)	Valhalla	Legend	*									£5.50
▼17	(3)	Atic Atac	Ultimate	*									£7.95
▲18	(—)	Falcon Patrol	Virgin	*			*						£5.95
▲19	(28)	Twin Kingdom Valley	Bug Byte	*		*	*						£6.50
▲20	(—)	Rommels Revenge	Crystal	*									£14.95
▲21	(—)	Hobbit	Melbourne House	*	*	*							£6.95
▲22	(—)	Crazy Kong	Interceptor	*		*							£5.95
▼23	(16)	Rev Of Mutant Camels	Llamosoft	*		*							£6.95
▲24	(—)	Skull	Games Machine	*									£9.95
▲25	(—)	Doomsday Castle	Fantasy Software	*									£6.50
▲26	(—)	International Soccer	Commodore	*		*							£9.95
▲27	(29)	Snooker	Visions	*	*	*	*						£8.95
▲28	(—)	The Snowman	BugByte	*									£6.95
▲29	(30)	Hovver Bover	Llamosoft	*		*							£7.50
▲30	(—)	Wheele	Microsphere	*									£5.95

Sinclair Microdrive an allergic reaction?

In March 1983 I bought a 48K Spectrum at W H Smith. With Microdrives coming soon I thought this was a good buy.

Now I find myself with my Spectrum, still no Microdrives, and no idea when I will see them in the shops. No disks are at least accepted or supported by Sinclair. Then the QL appeared, but again no disks (Sir Clive is probably allergic). Has Sinclair ever used a computer for anything other than mathematics?

I would like you, or Sinclair Research, to explain how to use a database of 1000 seconds of 1000 bytes (or any combination) on Microdrives (ghosts), or how it is possible to use a hard disk without saving or duplicating?

I am sure that the happy few who got Microdrives agree with me that at £5 each they are not a storage medium.

I am frustrated.

D Koehler,

L'Hayles Roses, France

The QL's halo is knocked off centre

I have just read the shiny silver brochure for the new Sinclair QL, and two reviews of the same, and it seems to me people are over enthusiastic about it.

Issue 47 of PCN states: 'Sir Clive's approach to the market is unconventional and brilliant.' The March '84 issue of *Practical Computing* claims that the £399 QL is competition for the £4,000+ IBM. Who wrote these reviews? Sinclair?

The much vaunted Microdrives seem to be a step back from IAS 5¼in floppies, the cartridges being tape, serial access, about 1/3 the storage capacity, and twice the cost of disks; thus the cost of storage on Microdrive cartridges is about six times the cost of storage on disk.

Also, unless you meticulously housekeep the cartridges, programs will get scattered all across them, making the average access time near to 7 seconds (serial access). This is slower than most (if not all) 5¼in disk drives. Neither can I believe that these tape cartridges will last as long or be as reliable as disks. I can see no advantage that Microdrives offer over disk drives.

Even though I have only seen pictures of the QL, the keyboard does not look to have reached the same quality as such keyboards found on the Apple IIe or 380Z computers. The placing of almost all non-alphanumeric keys on the QL is different to the placing of the same keys on other standard qwerty keyboards that I have used, this lack of standardisation is perhaps not wholly attributable to Sinclair, but nevertheless is an annoyance to an accomplished typist.



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

And so my last criticism of the QL-standards. The 'unconventional approach' mentioned earlier means that Sinclair Research has come up with a computer which has:

- non-standard keyboard layout,
- non-standard operating system (ODOS)
- non-standard language (Super-Basic)
- non-standard mass storage system (Microdrives).

Surely what users really want, and need, is standardisation, and any company of any worth should be working towards that goal?

PCN £10 Star Letter



The QL is not the wonder machine, but it is a good machine that will sell well. A new market will open up which, along with the more affluent Spectrum users, will buy the QL, and sales figures for computers like the BBC will probably be untouched.

A Smith
Huddersfield, West Yorkshire

Weakness might be revealed on longer use and disk drives might be preferable — they are in the pipeline — but on first look we found the kit most impressive. As ever, we reserve final judgement until PCN's Pro-Test, but few can deny Sinclair's very clever approach. —Ed.

Advertisers get a sound telling off

I am writing to air my view on so-called 'advertising'. I never cease to be amazed by the way firms that sell software can so blatantly abuse the system of advertising a product; if the advert does not

contain a wildly exaggerated narrative it contains an artistic and eye-catching display which, in my mind, can only be there to deceive the potential consumer.

How is it that these adverts can escape the scrutiny of the advertising standards people? It seems to me that a little honesty would do no harm here.

One firm that strikes me as having the right idea is IJK Software which, as well as giving an outlandish artist's impression to catch the eye of the reader, also includes a picture of the actual screen display.

I mean, when did you last see a bog-eyed jumping jack leap out of the TV screen at you?

So let us see some standards. I will make it easier for us, the poor consumer.

J Webster,
Easenhall, Warks.

What we got wrong on the Memotech

Many thanks for the very informative article explaining the operation of the VDP in the MTX range of micros (Issues 46 and 47), however I must point out a couple of errors:

When data is being read from VRAM the data is read from port 1 (not as stated from port 2). Also the VDP requires a short amount of time to read the appropriate byte after the address has been set up, thus the programmer must allow such a delay, which is easily accomplished thus:

```
OUT (2), LSB ; address
OUT (2), MSB ; set up
PUSH HL ; delay
POP HL ; delay
IN A (1)
```

The accumulator now holds the appropriate data.

In listing 2 the stack pointer is loaded from the system stack (&FA96) which is all well and good providing one does not wish to return to Basic from the routine. However, if a return to Basic is required, SP should be loaded from

ASTASK (&FD6D), and assuming the stack is kept balanced, a correct return to Basic is achieved.

When testing sprite coincidence it is bit 5 not 6 of the status register which must be tested thus the instruction is:

```
BIT 5,A
```

An undocumented command which the Memotech micro has could prove extremely useful. This is the INP command which acts in a very similar manner to the Z80's IN instruction and takes the form:

```
LET variable = INP(port)
```

Thus there are facilities to read ports via Basic without having to revert to the dreaded machine code.

J Mullins
Microcell Computer Systems

Keith Hook agrees that INP is particularly important. Other available but undocumented commands are USER: FK: FRE. USER jumps to a specified user routine through address FA 89 in the system variable list at the back of the manual. —Ed.

Thoroughly fed up with unreliable Oric

I ordered a 16K Oric-1 in October 1982 as a Christmas (1982 not 1983) present for my wife and small children. A 48K version complete with bugs in ROM arrived in March 1983.

I have had constant problems and difficulties when loading programs from cassette, even with programs I have saved on my own cassette recorder. Because of this problem, added to the fact that educational and utility software of the Spectrum/BBC standard and quality has become only sparsely available, my wife goes nowhere near the machine and my children consider it a toy.

I have waited eagerly for the 'full range of peripherals' to make life bearable. Only the printer/plotter made it to the market place.

I have weakened on several occasions to the point of considering other machines only to be dissuaded by other Oric-1 users.

Now your columns tell me that Oric-1 is out of production. This heralds the death knell of the machine, for what little support was around will tail off to nothing.

When one looks back at the Oric-1 advertisements that appeared in your magazine one wonders if there is a case under the Trades Description Act ('A fully expandable system for home, education and small business use').

One really does wonder. My loyalty is exhausted, I'm throwing in the towel. Anyone want to buy an Oric-1 cheap?

E Bond,
Blackburn, Lancs.

Don't do anything rash, Mr Bond. You will be able to upgrade to the Atmos, which is really a de-bugged and revamped Oric-1. —Ed.

Rockwell's CPU is a boon for buffs

B Tailor's letter (Routine Inquiries, Issue 48) prompted answers regarding Rockwell's new R65C02 CPU, to which I'd like to add.

For the last six months I have used this chip in a Microtan 65 computer. Although Rockwell does not quote a minimum speed, I found that with the clock running at 750kHz, no problems showed up.

Far from being useless, the BIT control instructions can and do tend to shorten programs and in the case of 'Markers' (ie SET, do this, if RESET, do that) 8 Markers can be contained in one ZP memory location.

I did make a half-hearted attempt to find out if any of the instructions were in the old 6502 but could find none.

Of course, there will be problems when upgrading, as you point out. Luckily I had my own disassembler so I was able to upgrade to cover the new instructions. Regarding assemblers, I find it easier and faster to write in machine code anyway. Machine code is not a black art! Well in the case of the 6065 series it isn't. That is a story which was probably put about by firmware writers so you had to buy their black boxes.

Back to the 65C, I discovered it turns the computer into a rather

clever programmable controller which will handle up to 64 I/O lines. Mind you, you will have to have a compiler to write the programs for you, as they can get rather mind-boggling. I use a corrupt form of Boolean algebra as input, not being up to relay logic at the moment.

R Hodgson,
Dursley, Glos.

I suspect there's no minimum speed, the internal registers/RAM being static, it should be possible to single step the CPU with the clock input. The problem is more with the maximum speed most 6502s are run at up to 4MHz. Due to second source manufacture of 6502s, the design of the micro instruction ROM can change. ST2 (store zero) works on a 6502 in PCN's office, yet is not documented. —Ed.

Atari software is well worth the cost

In reply to Mr B C Heath (Issue 50), bemoaning the dearth (?) and expense of Atari software, I can only say that he doesn't know how lucky he is.

I, too, have recently bought an Atari. Now, at last, I have some real games to play. Sure they're expensive, but nothing that is any good ever came cheap. Better to have four good games at £30 than a mindless, soon forgotten pile at £5.95 featuring rabid bananas and

witless aliens.

I suspect the reason most independent software houses shy away from Atari is because the existing software is a very hard act to follow. S D Wood,
London NW6

Copy protection is counter-productive

I have purchased numerous items of software, most of which have not been copy protected and which I have made at least two back-up copies of to protect my investment.

The original distribution copy is locked away, hopefully never to see the light of day again. This policy has saved me many problems and kept my programs running and computers operational.

In the last two years software distributors have decided to copy protect their software, but are not prepared to make sure that the customer is not stuck with a useless copy of the software package — duplicate copies are not even made on the reverse side of the cassette or a duplicate disk supplied. This has meant that I have had to use that original copy as my working copy with all the hazards this entails, or to try and defeat the copy protection scheme and possibly lose the original copy by corrupting it.

In most instances you do not discover that the software is copy protected until you try to make a

back-up copy, by which time it is too late to decide not to purchase the software.

I feel that computer magazines should publish this information in their reviews and that advertisers should stipulate that the programs advertised are copy protected, then the customer can decide whether to purchase the protected software or not.

I do not purchase software which is copy protected if I am aware of this at the time of purchase, and if I am caught out by a software distributor copy protecting software and cannot get a refund I will not purchase this company's software again.

If all computer owners were to take this attitude, perhaps software distributors would rethink their attitude towards their customers and provide adequate back-up facilities at nominal cost. W J Whitehouse,
Saundersfoot, Dyfed

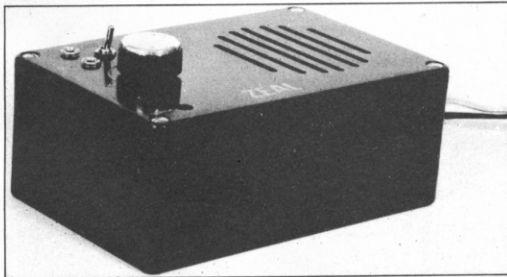
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The long tale of Dragon graphics

Q How can I switch from graphics to text mode in machine code on the Dragon 32? *N Dyson, Irchester, Northants.*

A Thereby hangs a tale... to switch screen modes on the Dragon you have to set up the VDG (Video Display Generator) and SAM (Synchronous Address Multiplexer) chips by loading the relevant control registers with the appropriate values.

The whole thing is more than a little complicated and for a full explanation you'll have to get a reference book, such as the detailed 'Inside The Dragon' by D Smeed and I Somerville, published by Addison Wesley, (ISBN 0-201-14523-5).

In fact, most books on the Dragon which have sections on machine code programming, or which deal in detail with graphics, should explain how to set up the chips.

The three SAM 'mode control' register bits (VO to V2) can be accessed via the three pairs of addresses at FFC0/1, FFC2/3 and FFC4/5. These six addresses give access to the many (up to 14) possible screen modes of the Dragon. The table below shows the combinations needed to get them.

One way to 'set' one of the V registers is to POKE the even numbered address of the pair with 255, and do the same to the odd address to clear the register.

The letters G, A and S refer to Graphics, Alphanumeric or

Semigraphics types of screen-handling.

R and C refer to whether each bit specifies a pixel (R), or whether a pair of bits is used (C). This obviously relates to the number of colours you can have ie the colour set of the mode.

You may also have to set up some other SAM registers which run in pairs from FFC6 to FFD3. These are used to indicate the top-left-hand address of the block of RAM to be displayed.

As a simple example one of the 14 possible colour graphics modes (64x64 cells) can be set up in Basic with a few POKES: POKE # HFFC1,1 POKE # HFFC2,0 POKE # HFFC4,0 POKE # HFF22, &H90

The first three POKES set up SAM, the last configures the VDG chip (bits 3-7 of FF22 control this).

To set up the two-colour PMODE4 graphics screen (with 256x192 pixels), you would use:

POKE # HFF22, PEEK (65314) AND7+240+V POKE # HFFC5,1 POKE # HFFC3,1 POKE # HFFC0,0 where V is 0 or 1 for the desired colour set.

It's far from easy to work out how to use each screen using these methods, but you can get some interesting effects. To translate Basic POKES into machine code is easy. You need only load one of the registers with the value you need, then use the assembler mnemonic ST to get that value stored at the required address. For example, to get 0 into address FFC2, you might use:

LDA 0 STA FFC2

To answer your question; to get back to text mode in Basic (apart from CLS or PRINT), you could write:

POKE 65472,1 POKE 65474,1 POKE 65476,1

In machine code this would be:
LDA #1 STA FFC0
LDA #1 STA FFC2
LDA #1 STA FFC4

Sending games to software houses

Q I am writing games for the Spectrum (so far I have sold two). I would like to make them compatible with most popular joysticks, but so far can handle only Kempston. Can you tell me what signals they (especially Interface 2) deliver on which input port?

Could you also tell me which software houses you would recommend? One I know makes replicas of another's cassettes, while another operates with falsified sales figures to cheat the programmer, and a third needs three to six weeks to say 'no'. Is it right to offer a program to more than one software house at the same time, and finally, in your PCN charts, if you can't give the number of sales, why not give a percentage figure?

B Barts, Wasterkingen, Switzerland.

A Rather than messing around with hearsay technical specifications, your best approach is to contact the companies concerned. As they'll have a vested interest in getting their joysticks compatible with as many games as possible, they should be perfectly happy to give you most of the information you require.

For Sinclair, contact Software Development, Sinclair Research, Stanhope Road, Camberley, Surrey GU15 3PS.

Surprise, surprise, we can't recommend a specific software house. If your programs are any good, you'll get the best deal from the established software houses, and which you know publish good games. Really the only advice we can give you here is to be very careful about the people you deal with and check out adverts before putting anything in the post.

There's no law against sending programs to more than one

company at a time, but make sure you tell the companies to whom you send them that they must contact you before they do anything with them. Obviously you can't sell the same program to more than one company, but there is a distinction.

Finally, the charts. We don't include mail order sales in the PCN charts, so if we were to include numbers sold or percentage market shares it would imply the charts had a statistical validity which they do not have. They are an accurate league table of what's selling best in shops nationwide.

Stopping the Oric's Auto-RUN isn't easy

Q I find there's virtually no software for my Oric 16K can I get an upgrade to 48K?

Also, how can I change the shape of the cursor and how can I prevent a program from Auto-RUNning once it's loaded? *Adam Durham, Wakefield, West Yorks.*

A Oric Products International (0990 27641) doesn't offer an upgrade path RAM-wise, but you might be able to swing an upgrade to a 48K Atmos. After all, it's only a question of swapping a couple of chips on your circuit board and putting it in a new case.


No, you can't change the shape of the cursor, this is fixed in ROM and cannot be altered by the user.

Preventing programs saved with the 'A' option from Auto-RUNning is not easy. When a program saved as Auto is loaded, address #63 will contain a non-zero value. What you would have to do is to write a short machine code program using the interrupt facility of the 6502. The routine would constantly load #63 with zero.

The Atmos comes with a cassette containing a program which stops a program from Auto-RUNning if any load errors are found. This is to eliminate the possibility of a system crash if an attempt is made to RUN a corrupted program. This implies that it is possible to reset the contents of #63 after a program has loaded, but you'll have to contact Oric for details you would need to write your own program.

MODE(s)	V2 (Register pairs)	V1	V0
	FFC5/FFC4	FFC3/FFC2	FFC1/FFC0
G6R/C	set	set	clear
G3R	set	clear	set
G3C	set	clear	clear
G2R	clear	set	set
G2C	clear	set	clear
G1C/R	clear	set	set
A1/E,S4,S6	clear	clear	clear

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Put zoom in your Spectrum programs

The following routine for the ZX Spectrum produces a short 'zooming' noise which may be useful in programs.

```
When the routine has been loaded CALL IT WITH RANDOMISE USR 31200
10 REM 'ZOOM'
20 CLEAR 31299
30 FOR F=31200 TO 31225
40 READ A:POKE F,A
50 NEXT F
60 DATA 6,5,197,33,0,5,17,10,
0,229,205,181,3,225,
17,16,0,267,237,82,32,
240,193,16,233,201
70 POKE 32101,1
80 REM DEMO
90 RANDOMISE USR 31200
A Lonsdale,
Chester-le-Street.
```

Nifty routine for Spectrum printing

There are numerous occasions when printing on the bottom of the Spectrum screen is required.

Of course, the `PRINT £0` statement can be used for this purpose, but it is rather unwieldy and cannot be easily incorporated into loops.

The following routine will overcome these disadvantages. It does so by reclaiming the bottom two lines of the screen from the operating system in line 10. No report codes must be displayed after this `POKE` including `Scroll?` or a crash will result. In order to prevent the OK report code from being displayed at the end of the program, line 50 is used as a delay and line 60 resets the computer for normal use.

```
10 POKE 23659,0
20 FOR A=0 TO 23
30 PRINT TAB A;A
40 NEXT A
```

Commodore 64 frozen display

When listing a program on the Commodore 64, you can slow down the display by pressing the `CTRL` key. The following short program adds the facility to freeze the display by pressing the `SHIFT` of `SHIFT LOCK` keys. Run the program and then type `NEW` (`RETURN`) load your program and type `LIST` (`RETURN`). Pressing the `SHIFT` key will now freeze the listing.

```
10 REM PAUSE ROUTINE
20 FOR I=49152 TO 49161:READ A:
POKE I,A:NEXT
30 DATA 72,173,141,2,208,251,
104,76,26,167
40 POKE 774,0:POKE 775,192:END
```

Brian Rutherford, Coventry, Warks.

```
50 BEEP 10,10
60 POKE 23659,2
J M Lewis,
Llanelli, Dyfed.
```

Break into Spectrum line input

In a previous issue of *PCN Microwaves* there was an example of how to break out of an `INPUT` AS statement. It is also possible to break out of an `INPUT LINE` AS eg

```
10 INPUT "THIS IS A LINE INPUT.":LINE AS
20 GOTO 10
```

To break out of this, just press `CAPS SHIFT` and 6.

D A Hall,
Newport, Gwent.

Run a 64 program with three keys

Most Commodore 64 users know that pressing a letter then shift with `RUN/STOP` runs a program.

There is a three key version of this routine which can be more useful.

If you press down the shift key with the number 4 and then 2, this also runs the program and if you press down the `SHIFT` 4 and 2 keys simultaneously this will load in the next program on

tape. There may be a few other variations with these keys that you can find with a little experimenting.

Gareth Wyn Jones,
Bagil, Clwyd.

Spectrum program stop string along

An alternative way to stop a program on the Spectrum that is waiting for a string input is to press `EDIT` and (`CAPS SHIFT` and 1): both the string quotes will disappear, then just enter `STOP`.
M Terry,
Middlesbrough, Cleveland.

A strange Spectrum scrolling quirk

While I was playing around with inputs from my Spectrum keyboard, I discovered a strange quirk. Type in this short program:

```
10 PAUSE 0
20 PRINT INKEYS;IN 31
30 GOTO 10
RUN
```

Next hold down `CAPS SHIFT`+9 (Graphics mode) and let it repeat for the whole screen. The usual `Scroll?` changes to `RUN` when the above keys are held down. Press `ENTER` and all the Spectrum keywords go

scrolling up the screen, some whole, some with their ends missing. After about two screens full it stops with `K INVALID COLOUR`. Can anyone explain this?

G Williams,
Hazlemere, Bucks.

Spectrum programs hidden conveniently

`POKE 23607,70` turns the complete character set into a lot of not very useful spaces. This could be used to hide the program from prying eyes, and does not affect the user defined graphics, so if the program does not contain text then nothing will affect the program when run.

If the program does use text then the line before a print statement should be `POKE 23607,60` and the line after, `POKE 23607,70`.

Also, if the program has its own custom made character set and you want to list the program after you have broken into it, but you cannot read the characters, try `POKE 23606,0:POKE 23607,60`. After this has been typed in and entered, you should be able to list the program in the Sinclair character set that all Spectrum users know and love.

Paul Hargreaves,
Brentford, Middx.

Compare two methods to fill BBC squares

Filling a square on the BBC is very ugly, as the quickest way in Basic is (or was until now) to draw two triangles next to each other and fill them in with `PLOT` 85.

This takes quite a long routine. If, instead, you define a graphics window around the place where you want the square and then clear the graphics screen, it is possible to produce the square quicker and more neatly. Here are examples of both methods.

```
10 MODE 1
20 GCOLO,2
30 MOVE 150,300
40 MOVE 1100,300
50 PLOT 85,150,700
60 PLOT 85,1100,700
```

```
10 MOVE 0,130
20 VDU24,150;300;1100;700;
30 VDU 16
```

D Abensour,
Potters Bar, Herts.

Spectrum print format effects

The ZX Spectrum does not have print formats but the function command can be used to give the same effect. In the example below, the first function is used to print a column of figures so that the decimal points line up. The second function rounds the figures to two decimal places.

```
10 DEF FN Y(Z)=(LEN STR$ INT ABS Z)+<Z<10)
20 DEF FN W(X)=(INT(X*100+.5))/100
30 FOR A=1 TO 5:READ B
40 PRINT AT 2#A,16-FNY(B):FNW(B):NEXT A
50 DATA 95.376,-100.8952,3.1416,51926.7,12.961832
```

Sean Smyth, Tunbridge Wils.

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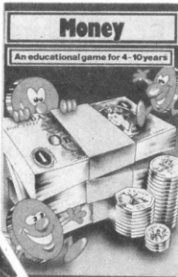
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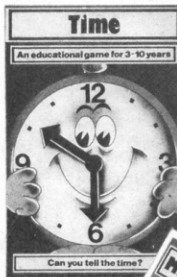
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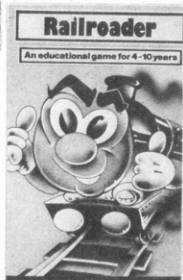
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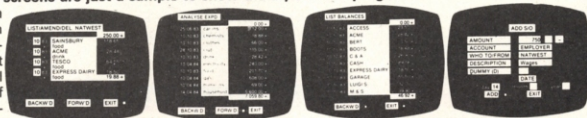
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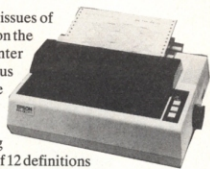
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HERE ARE THE FINAL TERMS AND DEFINITIONS:

TERM

Self-test Routine 9.

Print ribbon 10.

Parallel interface 11.

Daisywheel 12.

DEFINITION

A plastic cartridge containing the ink-soaked fabric which, when struck by the print head, causes characters to appear on the paper.


Also known as Centronics.

Printer paper that consists of connected sheets with perforated edges.

An instruction to the printer that causes it to advance the paper by one page

And here's your entry form. Fill in the correct term AS PRINTED IN PCN in the space opposite the corresponding definition. Then fill in your name, address and current machine owned and send the form to us at the address given below.





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Wren goes cheap

The £1,000 mark is an important psychological barrier. Arguably, the transportable Wren is the first business micro to break that barrier. For your £1,000 you get all the hardware including screen and twin disk drives, CPM/M, BBC Basic, bundled software and a built-in modem. You only need add a printer for a system that's ready to go.

Of course, you only get what you pay for. In the case of the Wren there are some limitations that have to be taken into account. The disk drives have a capacity of only 200K, puny by today's standards. The built-in screen is monochrome, so you miss out on the glorious technicolour of Prestel that the machine was purpose-built to work with.

The bundled software is, inevitably, from Perfect with all its non-anglicised imperfections. And, while you do get a Prestel program, there is no software enabling the user to exploit the micro-to-micro communications capability.

Still, at £1,000 the Wren is well worth a detailed look if price is the important consideration.

Presentation

The Wren sent for review did not come in any kind of box. It was one of three pre-production machines so some of the criticisms listed here may have been dealt with in the production versions by the time you read this.

With the machine you should get a large shoulder/hand bag that holds the Wren, disks and cables, and documentation. Certainly, these would be essential if you wanted to exploit the machine's transportability. The micro is advertised as a portable, but weighing in arm-wrenchingly at around 20lbs it is more in the category of Osborne-like transportability than the compact lightweights now available.

Documentation

The documentation was a loose bound folder of photocopied typescript that was definitely pre-production. It is, compared to some manuals, well-written. But to the inexperienced user with no knowledge of CPM some of the sections might be as readable as Dostoyevsky. Much will depend on how well it is laid out and illustrated.

For the Perfect Software you get the usual Perfect manuals complete with the misleading pages that suggest the software has been customised to deal with English, as opposed to American, ways of handling dates and addresses.

Construction

At first sight the Wren is robust if ugly looking. Hardly the small, light, streamlined picture conjured up by its name. The case is a combination of sheet metal and the more familiar injection-moulded plastic.

Ralph Bancroft on a sub-£1,000 luggable.

A conventional micro configuration except the Wren is very compact. Points are collected for the restful amber screen but deducted for the flimsy feel of the keyboard.



The unusual constructional feature is the sliding monitor/disk drive unit. When not in use, it slides forward to cover the keyboard and reveal the sturdy carrying handle at the rear.

At first sight this appears to be an absurd arrangement. When you carry the Wren around its monitor screen is facing the floor and you might put it down on an uneven surface or sharp object that could damage or scratch the screen. Wren Computers said it was redesigning a screen cover that would be firmly secured to the case when the Wren is in transit. Unfortunately, one was not provided with the review machine.

A plus point for this arrangement is that the Wren can be easily up-ended on a desk when it is not being used thereby releasing the space otherwise taken up by the Wren's large footprint (or should that be claw-print?).

In practice, the monitor unit was very loose with a tendency to wobble when moved and the sliding action was far from smooth. The only way to get it to slide fully forward was to upend it and let gravity do the work.

This wasn't the only tacky feature as the keyboard left much to be desired. There was a distinct lack of travel in the keys and the whole keyboard bent if a key was pressed too hard, as the board carrying the keyboard was screwed to the outer casing rather than supported from behind in the usual arrangement.

The layout of the keyboard is standard qwerty with the addition of a vertical line of

five function keys on the left and five cursor control keys on the right. Two nice features are the LED in the caps lock key and the special * and # keys for use with Prestel. These latter keys should only be used with Prestel as they generate different keyboard codes than the usual * and # keys.

The Wren is not the most ergonomically designed machine and I found it a pain to have to crouch to see the whole screen properly. The monitor needs to be moved forward and/or the casing redesigned to allow you to see the screen at a normal viewing angle.

In use

To get the Wren up and running you first plug the power lead into a socket hidden in a compartment on the top of the monitor unit. Also beneath the grill are the on/off switch and controls for brightness and contrast for the screen display. An additional bonus is that the compartment is big enough, just, to stow the power lead with its bulky mains plug when the Wren is in transit.

On powering up the Wren it is immediately obvious that someone has given careful thought to what is described nowadays as the man-machine interface. Instead of the usual few lines of copyright notice and version number appearing at the top of an otherwise empty and far from user-friendly screen a large Wren logo appears with a message prompting you to insert the systems disk into drive A. After you insert the disk and wrestle with disk



Muscles are needed, though the Wren is not as tendon-stretching as some 'portables'. The Wren at roost (below) with socket-protecting flap raised.

drive door (it's the worse design I've come across) the screen clears and a copyright message flashes by as a menu is loaded.

This is undoubtedly the feature of the Wren I liked most. The menu software and executive desktop software was written by Quante Software, a small CPM software house better known, perhaps, for its high quality Micromega Spectrum games software and early learning software published under the Longmans label.

The menu appears on screen as a series of overlapping file folders, each file covering a different function. To select a file you simply move a large cursor from file to file using either the space bar or cursor keys and then hit Return when you have found the one you want. A message appears at the bottom of the screen telling you which disk to insert in which drive and



what to do next.

The Executive Desktop suite of programs are nice, neat and not worth having unless they come free. Frankly, if you want to use their features you would probably find good, old manual technology more efficient than the swapping around and loading of disks involved with the Wren.

Executive Desktop might be a more apt description for this software. It has a number of features that you could always find an excuse for using. It has 'Time Management' (a diary), 'Addresses' (a card index), 'Deskfile' (a note book and simple forms like expenses), 'Filing system' (an index), 'Calculator' (a pocket calculator) and 'Typewriter' (a typewriter).

The software gives a full Prestel terminal emulation and generates the Prestel graphics and codes within the software rather than using a proprietary chip set. Apart from the ability to look at Prestel pages, save them on disk and/or print out you also get a software downloader (very useful when Micronet gets round to launching the much delayed Business Micronet and starts providing downloadable CPM software) and an off-line message editor. If you have tried to send messages via Prestel you will know why this facility is such a godsend.

However, Prestel looks none too impressive on the Wren's tiny amber screen as some of the colours almost disappear. Regular Prestel users will therefore need to invest in a colour monitor to plug into the Wren. Alternatively, Prism says it will be offering an add-on modulator so you can plug the Wren into your TV.

Although Perfect Writer is a powerful and complex word processing package that is great if you want split screen editing of two documents and automatic placing of footnotes it is user-violent when it comes to learning to use it.

Perfect Calc is a competent spreadsheet. I don't use spreadsheets, but those who do assure me that Perfect Calc is fine.

Perfect Filer is the program I take great exception to. Apart from being a somewhat pretentious database system it has the fundamental disadvantage of being written for the American market. Perfect has told all and sundry that it will be anglicised for the UK market. Unfortunately, they only got as far as rewriting the manuals. Thus, the date fields use the American (month/date/year) format and the address template (essential for generating address labels) has two digit fields for 'state' and a 'zip code' field not large enough to handle UK post codes.

A Wren spokesman assured me the program will be anglicised 'after the first 200' but I remain a hardened sceptic.

The irritating faults of the Wren are not related to the software. Mention has already been made of the bouncing

keyboard and disk drive doors but the drives themselves give rise to concern. On the review machine, the top drive had a nasty habit of corrupting disks or simply refusing to read them. This last fault could be cured, but only by asking the Wren to attempt to re-read the disk several times until it eventually found the data that was undoubtedly there.

Apart from this curable fault, the drives ran hot and any disk left in a machine for more than an hour was liable to come out with a warped jacket. Over a period of time this could also lead to unreadable disks. Regular backing up of disks is to be firmly advised. Investment in a large fan may not come amiss either.

Verdict

The Wren has an impressive pedigree. Designed by Transam (designers of the Tuscan — remember that?), manufactured by Thorn-EMI and distributed by Prism Microproducts via its Prism Business Systems subsidiary, it has all the hallmarks of a machine that should sell.

The limitations and foibles of the hardware and software are not insurmountable if Prism/Wren puts its mind to it.

The only class of machines that Wren could claim to belong to is the far from crowded communicating micro market. The Tiger is in suspended animation following the collapse of Harrison Industrial Developments and the Torch (like the Tiger) is a desktop machine that nobody except a would-be hernia victim would claim to be a portable (it is also more expensive).

The real test is whether I would be prepared to buy one myself. I must admit, in the end, I'm tempted. Given correction of the design faults and larger capacity disk drives I would be tempted even more. After that the only drawback is the lack of an electronic mail package to allow full micro to micro communication. Then all it would require would be a ray of inspiration at Torch to convert its excellent Mail Plus program to run on the Wren and I would be reaching for a cheque book.

SPECIFICATION

Price	£1,000
Processor	Z80B running at 6Mhz
ROM	8K with diagnostics
RAM	64K expandable to 256K 50 bytes CMOS RAM with battery back up
Monitor	Integral 7 in amber monochrome
Disk drives	Twin 5¼in single sided drives with 200K each
Text screen	80 by 24 Teletype TVI 910 emulation, 40 by 24 Prestel emulation
Graphics screen	512 by 256 pixels in eight colours or eight shades of grey
Keyboard	67 typewriter style keys, five function keys (shiftable) and five cursor control keys
Interfaces	RS232 serial 75-19200 baud Centronics compatible, parallel port, Left and right paddle controls, Winchester hard disc, RGB, Inbuilt auto-dial modem 1200/75 baud full duplex, 1200/1200 baud half duplex CPM Plus
Operating system	BBC Basic Z80 version
Languages	Executive Desktop (Time management, Addresses, Deskfile Filing System, Calculator and Typewriter), Perfect Writer, Perfect Calc Perfect Filer, Prestel terminal emulator, CPM and disk utilities
Software Included	Prism Business Systems, Prism House, 18-29 Mora Street, London EC1V 8BT Tel: 01-253 2277
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Samurai Standard

Japanese MSX is going to raise standards say Igor Thomas and Ian Scales.

The Japanese are very good at producing electronic consumer products. During the 1970s the various corporate giants (Hitachi, Sharp, Sony etc) managed to dominate the markets for TVs, hi-fi equipment, video recorders, cameras — you name it they made it.

It's hardly surprising that these Japanese companies represent something of a recurring nightmare for the diverse mass of UK and US-based computer manufacturers currently squabbling over the home market — a traditional Japanese stamping ground.

Until recently conventional wisdom said that the Japanese would never make an impact on the micro market because they lacked the necessary software expertise. This opinion has almost become an article of faith. Unlike VCRs, TVs and other consumer-electronic categories which use software created by a separate industry, the relationship between hardware and software in the computer industry, it was argued, was so entangled and essential that Japanese companies couldn't just produce hardware (like they do for VCRs or stereos) — they had to produce software to go with it.

This theory had a lot going for it. Good applications software relies on good documentation and an understanding of indigenous business practices. Basically you have to be English-speaking to create software for English-speakers. So while Japanese companies could dominate their domestic market (you have to be Japanese-speaking to create software for Japanese-speakers), it was assumed they'd be a long time before dominating the world computer hardware market.

PCN PRO-FILE HARDWARE

This limitation is even more apparent in the overwhelming 'cultural-specific' games/education area of computing. You can't get much of a handle on what UK

games-enthusiasts are likely to consider an exciting game from the inside of a different culture and a different language on the other side of the world. Consider the subtleties of nuance and language necessary to create the proper difficulty level in an adventure game, for instance.

But what would happen if a clutch of the largest Japanese electronics giants got

23 ▶

MINIMUM MSX HARDWARE SPECIFICATION

CPU	Z80A or equivalent, bankable 4-window memory control circuitry
MEMORY	RAM: 8K minimum ROM: 32K Basic language
DISPLAY	Text: 32 columns, 24 lines Graphics: 256 by 192 pixels Colour: 16 (8 colours, 2 intensities)
CASSETTE	1200 & 2400 baud FSK formats, motor controlled (default is 1200)
SOUND	3 music channels, 8 octaves each
KEYBOARD	72 keys, JIS standard, software scanned matrix, English & Japanese characters, graphics
CARTRIDGE CONNECTOR	Bankable Z80 I/O type design, built-in power protection during insertion/removal, multi-way plug/socket construction.
EXPANSION CONNECTOR	Bankable Z80 I/O type design, edge-connector construction.

Note that these are only the minimum requirements; most manufacturers will offer many other features as standard, such as joystick and printer facilities.

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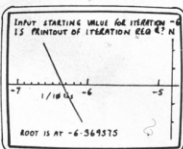
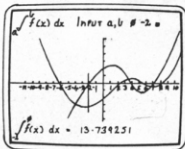
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PCN PRO-FILE HARDWARE

21 together and shared a 'standard'? In other words, all the computers that they produced would be completely compatible in terms of peripherals, software, languages and so on. This way the manufacturers could collectively provide a lucrative market for applications software writers and peripherals manufacturers here and in the US.

Surprise, surprise. Although it's early days yet, the big Japanese consumer manufacturers seem poised to group around such a common software/hardware standard, the better to carve out a niche in the lucrative home computer market. The standard in question is called MSX — Microsoft Extended Basic.

'Software houses should gear up for MSX'

If you already have a grasp of Basic programming, operating an MSX machine will be a very simple exercise for you. Should you already have some proficiency in any of the many Microsoft Basic dialects (Apple, Dragon, IBM, Tandy 100, etc), using an MSX machine may even be more fun than work. Lastly, if you really want to think about a career in programming, either Z80 machine code or MSX Basic will provide you with impeccable credentials for employment well into the end of the decade.

Newcomers to Basic language programming, and Z80 machine code may find an MSX machine more economical in the long run than any of the current low-priced micros simply because so many different expansions and cartridges can be plugged into it. Apart from interchanging all MSX plug-ins with all MSX micros, those of you who buy software books and programs will have a far longer-lived collection if they are written for an MSX machine.

Initially developed to use conventional cassette recorders as the long-term storage medium, MSX Basic is in fact designed to operate with a soon-to-be announced disk operating system known as (guess what!) MSX-DOS. When this becomes available, the MSX standard will promptly move up into commercial and business planes. At the moment numerous third parties are tinkering with implementing CP/M on MSX micros, but this will more than likely not be officially sanctioned by Microsoft, and the international value of MSX-CP/M will probably not be as great as that of MSX-DOS.

Undoubtedly, MSX-DOS systems will become commonplace in the commercial business world within a few months of MSX-DOS's release. There is every likelihood that MSX-DOS will bear a remarkable resemblance to MS-DOS, and MS-DOS users will slip into MSX-DOS without a hitch. Any software factories worth their silicon would do well to gear up for MSX as soon as possible, or pay the profitability consequences.

Within the terms of the Microsoft MSX license rigid hardware specifications to which an MSX manufacturer must adhere.

These include: a Z80 type microprocessor chip, a three-voice sound chip, a full-colour display, a standard keyboard layout, two MSX connectors for software and hardware expansion plug-ins, at least 8K of RAM memory (with the ability to expand up to 1,024K) and a 32K Basic language ROM.

All this provides wonderful potential for the software marketplace, and even though MSX machines are only at the drawing-board stage in Britain, a number of UK firms are looking more than slantly-eyed already.

English-language applications software is being produced in Japan now, although no official export plans have been confirmed by either Microsoft or any of its licensees. Any far-seeing British manufacturers (software and hardware) will reap great benefits in being ready when the Japanese invasion begins to make its presence felt later this year.

Having looked at a number of Japanese MSX machines, and even with the numerous variations currently in production, there certainly is still some room for good old-fashioned British innovation. Serious plans are afoot for a British MSX micro although, with the incredibly low prices which Japanese firms can sell machines at, competition will be tough.

The Yamaha YISS03 currently represents a classic example of the new MSX standard, of which much has already and

will continue to be said. Over the coming weeks almost all the popular micro journals will be trumpeting more and more about MSX micros, even though none of the machines are currently available outside of Japan.

Standing behind all the furore is the proud parent, Microsoft, which has finally given birth to MSX in a big way. Maybe the MSX standard is not everything to everyone, but you can't argue with the sheer volume of units which will be in use by the end of this year alone.

The MSX concept is a commercially viable proposition, and deserves a good crack at the whip. Hopefully the as-yet anonymous UK developer(s) of an MSX machine will avoid cloning from the Japanese and show the world something Britain can be proud of.



The first full implementation of the MSX standard is soon due in the UK courtesy of Yamaha, traditionally associated with motorcycles. But you won't see blue smoke issuing from this Yamaha which owes much to the company's other product line — musical instruments. This home computer can come with a full synthesiser and keyboard. Igor Thomas plays the Yamaha YISS03 in next week's Hardware section.

MSX BASIC KEYWORDS

ABS	IF/GOTO/ELSE	PLAY
ASC	IF/THEN	POINT
ATN	IF/THEN/ELSE	POKE
AUTO	INKEY#	POS
BASE	INPUT	PRESET
BEEP	INPUT £	PRINT
BIN#	INPUT#	PRINT £
BLOAD	INSTR	PRINT USING
BSAVE	INT	PSET
CALL	INTERVAL ON/OFF/STOP	PUT SPRITE
CDBL	KEY	READ
CHR#	KEY LIST	REM
CINT	KEY ON/OFF	RENUM
CIRCLE	KEY ON/OFF/STOP	RESTORE
CLEAR	LEFT#	RESUME
CLOAD	LEN	RIGHT#
CLOAD?	LET	RND
CLOSE	LINE	RUN
CLS	LINE INPUT	SAVE
COLOR	LIST	SCREEN
CONT	LLIST	SGN
COS	LOAD	SIN
CSAVE	LOCATE	SOUND ON/OFF
CSNG	LOG	SPACE#
CSRLIN	LPOS	SPC
DATA	LPRINT	SPRITE ON/OFF/STOP
DEF FN	LPRINT USING	SPRITE#
DEF USR	MAXFILES	SDR
DEFDBL	MERGE	STEP
DEFINT	MID#	STICK
DEFSGN	MOD#	STOP
DEFSTR	MOTOR ON/OFF	STOP ON/OFF/STOP
DELETE	NEW	STR#
DIM	OCT#	STRIG
DRAW	ON ERROR GOTO	STRIG ON/OFF/STOP
END	ON INTERVAL GOSUB	STRING#
EOF	ON KEY GOSUB	SWAP
ERASE	ON SPRITE GOSUB	TAB
ERL	ON STOP GOSUB	TAN
ERR	ON STRIG GOSUB	TIME
ERROR	ON GOSUB	TROFF
EXP	ON/GOTO	TRON
FIX	OPEN	USR
FOR/NEXT	FOR INPUT/OUTPUT/APPEND	VAL
FRE:	AS CAS: /CRT: /GRP: /LPT:	VARPTR
FRE#	OUT	VDP
GOSUB/RETURN	PAD	VPEEK
GOTO	PAINT	VPOKE
HEX#	PDL	WAIT
IF/GOTO	PEEK	WIDTH

Mike Gerrard continues the argument of text-only adventures versus adventures with graphics.

Text-only wins



A few weeks ago (PCN issue 44), John Lettice asked if the new breed of graphics adventures was killing off the traditional text-only quest. If the latter weren't quite ready for burial just yet, he suggested, they were at least in the Intensive Care Unit with little hope of recovery.

I don't want to make a simple biased statement for the opposite view, but while it's true that the new graphics adventures are holding centre-stage at the moment, I believe that the text adventure could be on the verge of, and I choose the words carefully, a quantum leap, thanks in part to some of the techniques developed in getting the likes of *The Hobbit* and *Valhalla* to the screen.

In talking of those two adventures in particular, John Lettice praised the way they made use of a type of artificial intelligence in the programs so that characters like Thor and Thorin are able to act independently of the player. While I too admire this technique it is of course nothing to do specifically with the graphics elements, but could be used equally to enhance text-only programs.

To some extent this is already being done in the *Dungeons and Dragons* style of game, where the character set up at the beginning has an influence on the likely outcome of certain events, and although this is nothing in comparison to the characters wandering round at will in *The Hobbit*, or the fact that the snake in *Valhalla* may decide to drink the wine, to the bewilderment of all concerned, I'm sure this is one way in which text-only adventures will develop, unhindered by the additional problems facing games with graphics.

Those graphics pages are great consumers of two items that most adventures can little spare: memory and time. Waiting for the picture to be drawn is all very well the first time, but no matter how impressive it may be, do you really want to sit and watch a particular location being drawn for the fiftieth time when you're aching to pass through en route to somewhere else? And is a picture really worth a thousand words? Well, it needs to be in terms of the memory it consumes, but for me a few dozen well-chosen words are worth any of the pictures in recent graphics adventures.

Take *The Hobbit*, for example, which

opens with 'You are in a comfortable tunnel like hall. To the east there is the round green door.' Apart from the fact that it should have a hyphen in tunnel-like, the description is mundane in the extreme and could have come out of a Janet and John

book: 'Here is Bilbo. See Bilbo read the map.' Further on: 'You are in a hidden path with a trolls footprints,' which is as unatmospheric as you can get, and should read the trolls' footprints in any case.

Without the pictures the text could draw much more on the words from the original book... Tolkien, after all, was a better writer than any programmer could hope to be, and with more room to concentrate on the text you could avoid silly responses, as happens when 'You are at the Great River. What now?' If you reply 'Swim River,' the program answers 'I do not see the river here.'

Let me say that I am a great fan of graphics adventures, but much as I enjoy playing *Valhalla* I can't see it becoming an all-time classic, partly because its locations and descriptions are even sketchier than those in *The Hobbit*: 'You are in the mountains in Asgard,' 'You are in an icy waste in hell,' and 'You are in Hel's hall, which is in hell' being typical examples. How could anyone prefer adventures to develop in this way, after the descriptive traditions established in the original mainframe Adventure:

'You are in a splendid chamber in an east-west canyon. The walls are frozen rivers of orange stone and a carved pillar rises to the ceiling 30 feet above. The floor is formed from smooth marble slabs, and is slightly worn in the centre. There is a little bird here, singing merrily.' Or 'You are in

the Hall of the Mountain Kings, a huge room decorated with majestic statues. The east wall is covered by trophies and the mounted heads of elves and monsters, with a carved granite throne standing beneath them. The hall is hung about with the tattered remains of rich tapestries and has large doorways on all sides. A huge green snake hisses fiercely at you.'

And if anyone who has had their head stuck in *The Hobbit* for the last six months complains that it's unfair to compare something written on a mainframe with an adventure squeezed into the humble Spectrum, I'm quoting from the excellent Spectrum version from Level 9, which has squeezed the original into Sir Clive's little black box and added some locations to the final game.

Not everyone has the imagination and descriptive powers to conjure up the haunting atmosphere suggested in the above locations, but you don't need the Nobel Prize for Literature to use words effectively. Level 9's latest text-only game, *Lords of Time*, is a clever Dr Who-style adventure where you can travel through time in a grandfather clock and wind up (if you'll forgive the pun, which is also an unusable clue) in any of nine different time zones, each with its own adventure.

When you de-clock you may find yourself on a flat rocky plain which stretches for miles. It is covered by fine grey dust. The night air is cold. Luminous walkways travel east and west, or perhaps 'you are on a beach in a small bay surrounded by overhanging cliffs. Breakers roll in from the sea to the north, rocking the Viking longship drawn up on the sand north of you.' Even those simple

descriptions couldn't be conveyed fully on any micro, no matter how good its graphics capabilities.

Text and tasks are the two vital factors in an adventure, and it will be intriguing to see the software produced using *The Quill*, the recent adventure-generating program from Gilsoft. People with imagination but insufficient programming ability will now be able to write their own

adventures, and one of the first to use the generator, Denis Through the Drinking Glass, shows how important the text is. Attempts at caricaturing Denis and Maggie on the cassette cover are disappointing, but the amusing rhymes in the text enable you to conjure up your own real picture of goings-on in Number Ten. Graphics would



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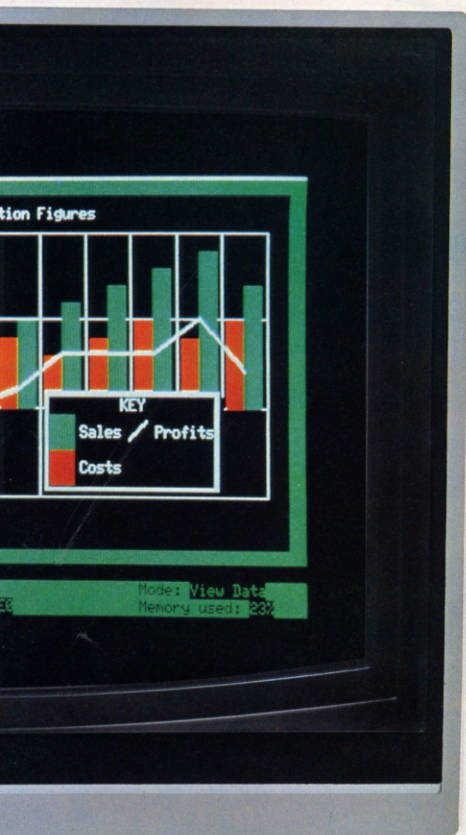
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32-bit processor architecture, 128K RAM, and QDOS combine to give the QL the performance of a mini-computer for the price of a micro.

Exclusive: new QDOS operating system

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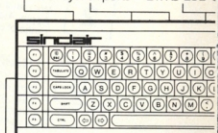
QDOS is a single-user, multi-tasking, time-sliced system using Sinclair's new SuperBASIC as a command language.

One of its most significant features is its very powerful multi-tasking capability – the ability to run several programs individually and simultaneously. It can also display the results simultaneously in different portions of the screen. These are features not normally available on computers costing less than £7,000.

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QL ROM Cartridge slot

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New professional keyboard

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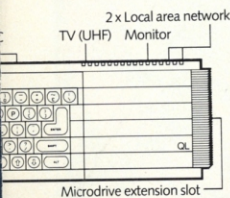
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The new Sinclair SuperBASIC combines the familiarity of BASIC with a number of major developments which allow the QL's full power to be exploited.

Unlike conventional BASIC, its procedure facility allows code to be written in clearly-defined blocks; extensibility allows new procedures to be added which will work in exactly the same way as the command procedures built into the ROM, and its constant execution speed means that SuperBASIC does not get slower as programs get larger.



Two 100K microdrives built in

The Microdrives for the Sinclair QL are identical in principle to the popular and proven ZX Microdrives, but give increased capacity (at least 100K bytes each) and a faster data-transfer rate. Typical access speed is 3.5 seconds, and loading is at up to 15K bytes per second. The Sinclair QL has two built-in Microdrives. If required, a further six units can be connected.

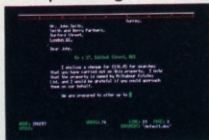
Four blank cartridges are supplied with the machine.



Included – superb professional software

The suite of four programs is written by Psion specially for the QL and incorporates many major developments. All programs use full colour, and data is transportable from one to another. (For example, figures can be transferred from spreadsheet to graphics for an instant visual presentation.)

Word-processing



Certain to set a new standard of excellence, QL Quill uses the power of the QL to show on the screen exactly what you key in, and to print out exactly what you see on the screen.

A beginner can be using QL Quill for word-processing within minutes.

QL Quill brings you all the facilities of a very advanced word-processing package.

Spreadsheet



QL Abacus makes simultaneous calculations and 'what if' model-construction easier than they've ever been. Sample applications are provided, including budget-planning and cash-flow analysis. QL Abacus allows you to refer to rows, columns and cells by names, not just letters and numbers. Function keys can be assigned to change a variable and carry out a complete 'what if' calculation with a single key-stroke.

Business graphics



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only spoil a game like this, not enhance it. The managing director of a very successful software house said that he too thought the days of the text-only adventure were numbered, and what the public wanted was graphics quests galore.

It's hard to argue with someone who has a first-class track record of spotting the kind of software people want, but in a way this kind of thinking has always gone on. The invention of photography, for instance, was said to signal the death of painting, TV, the end of both films and radio, and every new invention heralds the end of books.

Conversely, television has been described as radio with pictures, and the same could be said of graphics adventures: they're just text adventures with a few pictures stuck on, but because the pictures are what's new they're getting all the attention at the moment. Just as for many people the goggle-box will never replace

the magic of listening to a good radio programme, where you use your mind to create pictures of the people and places, so graphics adventures won't replace text-only adventures.

A classic example of this was the radio comedy program, *The Goon Show*. An attempt to transfer the show to television with puppets was doomed to failure because no-one, however talented, could create puppets to match the unique pictures everyone held of what Eccles and Bluebottle looked like.

Another advantage that John Lettice saw in the latest graphics adventures was that no two games are ever played the same way. This is true, in a different way, of text-only adventures, as people would hardly play them for months on end otherwise, but in any case, do people stop reading books because the pages never change? *The Hobbit* is a book that people read over and over again without deman-

ding a different outcome.

There's no doubt that graphics adventures are what's happening at the moment, and both Melbourne House and Legend are working on follow-ups that promise to be bigger and better. A software collection will be the poorer without the best of these, but the text-only type aren't going to disappear, they're going to improve dramatically.

Consider the memory soon to be available on the Sinclair QL, and on machines likely to follow that, and think what could be achieved by using that memory for text alone, yet incorporating the artificial intelligence elements of the graphics adventures.

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



'The IBM Personal Computer Handbook' edited by Dzintar Dravnieks, published by Prism Press (in association with PC User) at £11.95 (paperback, 240 pages).

It's hard to see who will buy this weighty tome. The 455 pages are divided into two sections; the first ten chapters introduce the world of computers to the newcomer, while the latter half is dedicated to indices which the PC user will find invaluable.

These include lists of software, peripherals (fancy a 1Kx1K colour graphics controller card, or a voice recognition board?), suppliers and

distributors, periodicals and user groups.

So, while the first section is a good introduction to the machine for those thinking about buying a PC or who've just got into using one, the second part would be of most use to a more experienced user.

The detailed opening chapters (each with its own glossary) include a brief history of computing, using software, how and where to buy the hardware and an introduction to the machine. Other topics are the major uses of personal computers; principles of database management, word processing, spreadsheets, telecommunications and even games. There is a useful section on computerising your business and a fairly comprehensive list of relevant software (with a brief description of each product) at the end of each chapter.

The English edition has a 41-page supplement giving details of British and European sources of PC software, but lacks such information as where to get peripherals and such novelties as bumper stickers

reading 'IBM PC's Eat Apples'. Or how about an 'Anchor Pad' which secures your PC to your desk with 600 pounds of 'grip strength'.

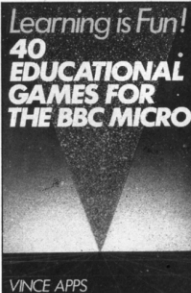
Overall, it's a handy book for the first-time user and would serve those wishing to learn more about the general principles behind the micro boom; but those who subscribe to one of more of the many micro magazines and who know the basics will find it largely redundant. **BS**

'40 Educational Games for the BBC Micro' by Vince Apps, published by Granada at £5.95 (paperback, 203 pages).

£5.95 for 40 programs must be a bargain when one cassette game costs as much, and these have the added extra of mixing entertainment with education.

Some old familiars crop up—Hangman, Noughts and Crosses and so on, while maths, geography, grammar, music, weights and measures are dealt with in a light-hearted way.

This book is not for the newcomer, but for someone who knows the BBC and wants



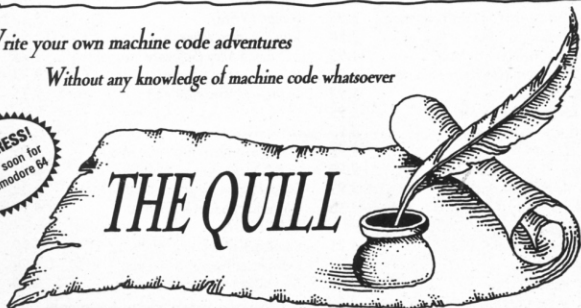
to test its capability in handling programs. Each of the 40 programs follows the same format: a brief introduction, how to play and some programming hints followed by the listing itself. However it's a pity the hints do not accompany each program, even though they are only on how to change data. In this book you have to think things out and as your programming skills increase you can change the listings to make tasks more difficult. **SG**

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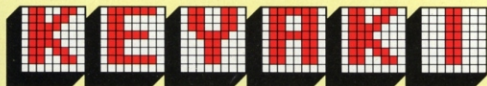
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A MICRO OF A NOTE

Pete Gerrard plays Commodore keyboards.

With the sound capabilities of the Commodore 64 as they are, and with Quicksilva being one of the top software suppliers for home computers, what better than to see a marriage between the two producing a synthesiser for the Commodore 64 called Ultisynth 64.

Objectives

Quicksilva prefers to call the program a music processor rather than a synthesiser, and in fairness the program is closer to the former, since it possesses few of the capabilities of a true, dedicated synthesiser. But what a food processor does for food, Ultisynth does for music. Even the musically incompetent should find themselves capable of producing excellent sounds and rhythms within a couple of minutes at the keyboard.

In use

Ultisynth presents you with a seven option menu. Two options are for the loading and saving of tunes, background rhythms, or any piece of music that happens to be in the machine at the time.

Like a good word processor, Ultisynth won't automatically save everything onto tape: instead it asks you which sections of the music you wish to store. Every note entered has an associated number, and in total, Ultisynth is capable of storing over 7,000 notes.

When in record mode, it is possible to

enter music a note at a time. You won't hear it being played in this mode, but you can set up pre-defined rhythms by moving notes up and down the screen, deciding what key or octave to play them in, and also for how long they are to be played.

These compositions can be stored as one of the two user-defined background rhythms, of which there are eight, accessible by either voice 2 or voice 3 of the three available on the 64.

Voice 1 is used for the actual playing, and upon entering keyboard mode this voice does the talking. The keyboard is treated as a piano keyboard, with notes being played by simply pressing keys. All of the features associated with each voice can be easily altered, such as the shape of the envelope, the level of filtering, pulse widths and so on. Such advanced features as ring modulation and synchronisation are also adequately coped with.

Other musical effects such as glissando (the sweeping of notes) are included. But the highlight of the Ultisynth package is the Pretab feature, which gives control of the filter cutoff frequency and resonance, pulse width, and the frequency of voice 1 in real time, by altering a pre-defined table of values.

Verdict

By the time you've got two background rhythms going in synchronisation with voice 1 playing the leading melody, you're

well on your way to joining Mike Oldfield at the keyboards.

A couple of minor complaints prevent this program from receiving an A1 rating. As you merrily plough through the manual, following the instructions and altering everything, you rapidly find yourself in chaos, and there is no way of resetting everything back to normal, short of re-loading the program.

Finally, altering the tempo of the voices is a rather hit and miss affair, since the method used to control this is not the easiest to master.

Despite that, a triumph for Quicksilva which anyone remotely interested in music should consider.

Ultisynth gets my approval because it's easy to use, offers good control, works with all three voices and allows you to save your music to tape.

RATING (5)**Lasting appeal****Usability****Use of machine****Overall value**

Name Ultisynth 64 **System** Commodore 64 **Price** £14.95 **Publisher** Quicksilva Ltd, Palmerston Park House, 13 Palmerston Road, Southampton SO1 1LL (0703-26515) **Format** Cassette **Language** Machine code **Other versions** None **Outlet** Mail order/Retail

Romik Software's early synthesiser for the Vic 20 was well-received. Now this has been upgraded to run on the Commodore 64, but has it been worth the wait?

Objectives

Some music programs set out to be simply programs that play music, but right from the start Multisynth has its heart set on being a true synthesiser, since in use it is very similar to using a dedicated machine.

Of course, you can use it to play music, but it is as an impersonation of a synthesiser that it will stand or fall.

In use

Multisynth has a number of different screen displays, with the principal one being of the keyboard used to play the music. Unlike some other programs, Multisynth uses almost the whole of the keyboard for playing notes, and in feel it is very similar to playing an electric organ with two keyboards: deep notes at the back, and higher up the octave at the front.

This can be misleading, since sharps and flats are played by individual keys, rather than pressing the shift key and another key,

consequently some keys on the keyboard do not produce any sounds when pressed, but are just left there to make up the numbers.

This is apart from two of them, which can easily be pressed by mistake, and instead of playing a note the 'A' and 'S' keys will send you up and down the octaves with many a dire consequence.

One nice point about this display is that a little blob lights up on the key that you're pressing to show you where you are on the keyboard.

To leave this display and move onto the first menu screen, you press the left arrow key, and then feel faint at the sight of a million and one options open to you.

These are not quite as frightening as they seem, since they are used mainly for voice 1, to set up the shape of the envelope, the pulse widths, and so on. However, pressing another key takes you onto the master control panel, and if you didn't faint before, you will when you see this, since there are at least two million and two options to this one.

But, hang on, there aren't — half the options shown here work on the previous menu, but weren't displayed on the screen

due to lack of space. This is confusing and misleading, and causes many a strange note to be played.

Verdict

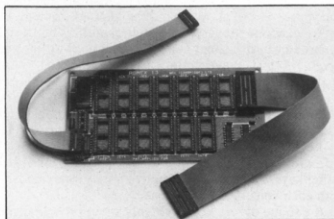
It doesn't appear to be possible to have all three voices playing at once, and at first the package presents itself as a very confusing one if you want to do anything other than just play a few notes.

The effects are all in there, somewhere, but finding them is the problem. The preliminary version of the manual that I had certainly needs some work done on it. But overall it was definitely worth the wait.

RATING (5)**Lasting appeal****Usability****Use of machine****Overall value**

Name Multisynth 64 **System** Commodore 64 **Price** £14.99 **Publisher** Romik Software, 272 Argyll Avenue, Slough SL1 4HE (0753-71535) **Format** Cassette **Language** Machine code **Other versions** Original version for Vic 20 **Outlets** Mail order/Retail

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Play and Learn

Colin Cohen on educational software for the Dragon, Spectrum, BBC and Commodore 64

IN PCN 48 I mentioned there were certain conventions observed by book publishers. One of the most obvious is that in the better class of production the publisher take a certain amount of care to ensure that the pages don't fall out. This is the nearest equivalent that I can think of to a series of programs that won't load.

Good Housekeeping

When I received the first series of *Good Housekeeping* software (it is available for the Spectrum as well as the Beeb) they would not load. Or rather, out of a whole series, only one program would load and the usual operating system fixes had no effect. All the programs had to be returned for replacement.

It would seem that all National Magazine's resources have been concentrated on protecting the tapes against copying — indeed you are even warned that attempts of copying may affect the tapes themselves.

My major complaint is that some of the programs start in Basic while others are in code. While it is not expected that a child should start the programs on their own it seems quite reasonable that they should be able to use them unsupervised subsequently. This is made difficult because some of them are loaded with CHAIN™ and others with *RUN. There is nothing on the tapes to indicate this and the parents' handbook is printed in a type small enough to make PCN's small ads look large.

Apart from this annoying idiosyncrasy the programs have common features. There is Nat Mag's own 'Mr T' who does a neat little dance if you get something right, and turns some fairly odd colours if you have a load error (there was only one on the replacement tapes). All the programs have a common title page and the block numbers count back to zero through the lengthy load. There are also common parent screens.

Number Games is a pre-school teaching aid. In the first stage the spots jump off a ladybird and then have to be counted back on again. A nice touch is the way the ladybird is animated and walks off the screen when the child gets it right. A later version requires the child to count the spots and then tap the appropriate number key — as opposed to the earlier version in which the learner counts the spots out loud and taps 'N' once for each spot.

Other programs on the tape draw large numbers of the child's choice on the screen and have a splendidly-animated elephant eating a number of buns.

The Money Box program seems to be a perfect example of what a micro is not good at. The graphics are simply not up to depicting the different coins on the screen and even the relative sizes are not clear. All its other failings relate to this. Alphabet Games draws groups of letters on the screen. You choose which group, depending on any problems the child may have. I have to say that I preferred the Chalksoft version (PCN 16) and the parent screen that came with the program was not the one described in the documentation. I do, however, feel that one is entitled to expect the BREAK key to be adequately trapped (it is not trapped at all and the program can't even be OLDED) just as ESC can be used to take one back to some form of menu (it is).

After all if one really needs to BREAK or ESCAPE this can always be done by a final option on the menu.

Our favourite was Mr T Tells The Time. We especially liked the way in which numbers fell off the dial if you try to put them in the wrong position on a good old-fashioned analogue clock. Unfortunately, the real problem with telling the time is the minutes

rather than hours and this is beyond the scope of the program. A good word can be said for one aspect the documentation — all the programs come with suggestions for further related activities.

Wiley/Sulis

The second batch of programs comes from academic publishers John Wiley who have a very good reputation in the higher education market and are marketing software produced for them by Sulis of Bath. I admit that my very high expectations were sadly disappointed. Having cut my way through the adhesive tape that implied at least a short, sharp sentence in the Tower if I even thought of copying the programs, I was rewarded by two of the three loading without error, while the third could be loaded with *OPT2.0, though I had to use my back-up recorder for them all.

While the lengthy load goes on the screen displays another copyright warning — it's a pity as much effort did not go into on-screen documentation. For instance, ESCAPE is trapped, but while BREAK is not, the program can be OLDED.

There are all the usual options of difficulty in Wordpower and several diffe-

rent ways of playing each game. In one way or another you have to match opposites, similes, collectives, adjectives, nouns and synonyms. The graphics are totally without imagination, the sound bored me and al but half of the program consists of DATA statements.

It's also irritating to have 'The right answer is . . . displayed every time you enter the correct word.

Besieged is for the dedicated anagrammer — the best one can say is that the anagrams are often very difficult indeed; I suspect too difficult for most secondary children. Up to ten letters may be shown, but as few as four are sometimes needed.

WordSpits invites the child to match the second half of a word with the first. It is probably the best of the bunch, though like the other two it has boring sound and graphics. None of them do anything that could not be done better by a book of the same price or cheaper.

Verdict

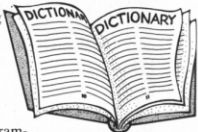
All six programs were grossly over-packaged. Of the programs in this review only one of the cassettes could be removed from its box without resorting to a screwdriver each time I wanted to use it.

It seems to me that no-one would spend about £10 on a book that taught as little as these programs. In particular, book publishers have long since given up binding books in this price range as expensively as the average program. The inevitable conclusion is that too much of the final price relates to the packaging and not enough to the contents. More effort needed.

PCN

Name Mr T's Number Games, Mr T's Money Box, Mr T Tells The Time System BBC, Spectrum, Commodore 64 Price £12.95 each Publisher Ebury Software, National Magazine House, 72 Broadwick Street, London W1V 2BP Outlets Mail order/Retail

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**PCN PRO-TEST
PERIPHERALS**

David Janda tests a cable that will make life easier for Oric owners

A cable has come to the rescue of Oric users. Called the Hybrid, this clever bit of kit gives the Oric and Atmos disk drive power, cures known bugs in the Oric's notorious ROM and improves its Basic.

At £100 it does what the Atmos sets out to do, and adds a little extra.

Made by Kent-based ITL, it contains miniaturised component mounting in a tiny, almost flat box at the micro's end of the cable. This is no bigger than the average connector, but contains the disk interface and Basic enhancements.

Small it certainly is, but it will make major improvements to the life of the Oric user.

The Hybrid comes with a manual, a master disk containing the Oric

DOS, utility programs and demos. It can be bought with the Byte Drive 500 (Pro-tested Issue 41) and programs are available to transfer cassette software to disk, and to run Oric-1 programs on the Atmos and vice-versa.

Though tested here with the Byte Drive, the Hybrid is compatible with all 5in drives, as well as most 5.25in units. We found no problems with 40- and 80-track drives.

Features

The Hybrid is a small piece of ceramic substrate about 1½in sq. Components are layered on it: Integrated Circuits (ICs) without their casings on the top level. The hybrid is baked and a protective resin applied to it before it is housed in a connector casing.

Many chips can be fitted onto a hybrid, and the choice of ICs used is not limited and includes both RAM and ROM, operating systems and languages.

The Hybrid used for the Oric contains a dedicated Uncommitted Logic Array (ULA) which controls the Oric's memory map and allows the freeing of the 16K RAM where the Basic normally sits. This ULA takes care of the floppy disk controller and a ROM that contains a program to pull in the first part of the operating system from the disk.

The master disk supplied with the Hybrid contains the operating system,

together with the Basic enhancements and patches. The OS is completely input/output (I/O) independent, and far better than the Oric's I/O, giving faster screen output.

Both random access and sequential storage are catered for by the OS, and sequential files can be appended, allowing additions to be made later. The files are accessed by letter ('R' for random, 'I' for input etc), and by channel number, of which there are three. More than three channels can be used with the high resolution area, but only two for random access files.

The features of the OS are accessed from Basic, though since the OS has been written to allow its 'high level' features to be accessed at low level, the machine code programmer is catered for.

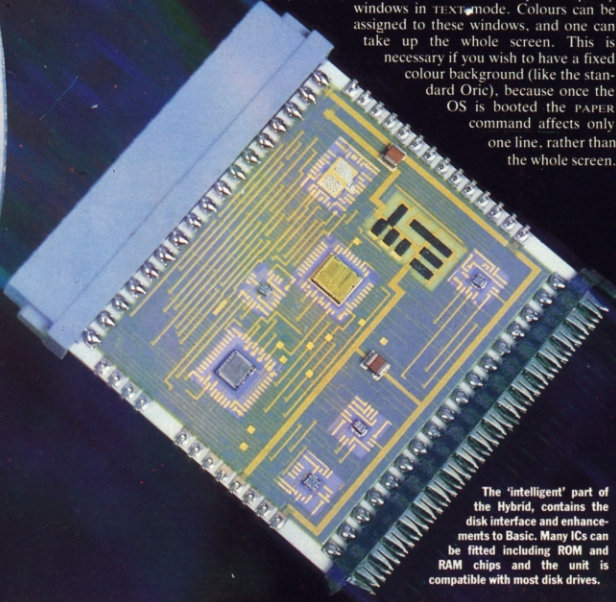
Besides being able to save Basic programs, it is also possible to store machine code, memory dumps, random and sequential text files, ASCII, Basic and Command files.

The ability to set up a command file, called a DO file, is one of the OS's most important features. It allows screen input to be made into a sequential file, so the computer takes keyboard input from a file rather than from you.

The extensions to Basic offer useful commands. A 'print at' function has been implemented as VTAB and HTAB. The new WINDOW command allows you to specify windows in TEXT mode. Colours can be assigned to these windows, and one can take up the whole screen. This is

necessary if you wish to have a fixed colour background (like the standard Oric), because once the

OS is booted the PAPER command affects only one line, rather than the whole screen. 53 ►



The 'intelligent' part of the Hybrid, contains the disk interface and enhancements to Basic. Many ICs can be fitted including ROM and RAM chips and the unit is compatible with most disk drives.

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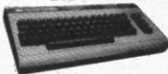


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PCN 7/3

450 AN ON ERROR COMMAND allows errors to be trapped, and the type of error can be discovered from the sys codes. It is a particularly secure command, and with it it's possible to trap so tightly that a hard reset is needed.

PCN PRO-TEST SOFTWARE

The nasty (known) bugs in Oric Basic have been fixed, namely the problems with the IF . . THEN . . ELSE construct, TAB, PLAY, FILL and so on. On top of that, the

implementation of the escape codes has been changed and it's now possible to use them within programs or strings. A nice effect of this is that using line feeds within program listings results in neat looking listings.

Other changes include fully working field separators (',' and ';'), allowing you to format text and numbers much more neatly using tabulated output. RESTORE now has a line and statement parameter, and TRON allows single-stepping through programs or parts of programs. INPUT will not produce the question mark if there is a string prompt, and CALL allows parameters to be passed.

The enhanced Basic is a welcome addition, and surprisingly, the operating system, together with buffers, enhancements and patches takes up only 9K of RAM.

In use

Once set up, the boot ROM in the Hybrid sets the disk spinning and the operating system and Basic enhancements are loaded. When you format a disk you specify a Basic program to be the boot program, and every time the system boots up, this program is loaded and run too.

This feature is very handy as it makes it possible to set up the Oric with function keys etc, as part of the start-up process.

File handling is simple, and there are three channels for data exchange to and from the drives. Only two of the three channels are available for random access and I would have liked to have seen three, to ease disk sorts. Also, the internal disk buffer is only 510 bytes long and while this is fine for most applications, I would have preferred it selectable.

The user interface is excellent. Typing DIR displays one of the most informative directories you could hope for. The disk type (40 or 80) is displayed together with the number of sectors free. Entries have a three-letter file type to their left and file-names can be up to 30 characters long.

Verdict

The Hybrid is well designed, useful, and improves the Oric out of all recognition. The piece of hardware, coupled with ITL's policy of continuous upgrading of the disk software, at no cost to the user (just take your disk to your dealer and you get the latest version of the master), makes it exceptional value for money. I got a great kick using the Oric with a disk drive. PCN

SPECIFICATION

Product Price	Hybrid cable. £99.42 inc VAT for Hybrid cable + master disk and manual. £299 inc VAT for package including Byte Drive 500, power supply, Hybrid cable, master disk, manual and connectors.
Machine Manufacturer	Oric 1 or Atmos. ITL Kathmill, The Old Courthouse, New Road, Chatham, Kent ME4 4QL (0634) 815464.
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TABLE 1 — DOS COMMANDS

FORMAT ""(D0,D1,D2,D3)	Initialises a blank disk for use. A formatted disk will boot DOS.
DIR (D0,D1,D2,D3)	Displays the contents of a disk. Sectors free, 40/80 track drive also displayed.
SAVE ""(,P)	Saves a Basic program to disk. 'P' specifies that program can only be RUN, for protection.
LOAD ""	Loads a Basic program from disk.
RUN ""	Loads and runs specified Basic program.
MSAVE ""(,A,E)	Saves machine code file to a binary file.
MLOAD ""(,A,E)	Loads a binary file.
MRUN ""(,A,E)	Loads and runs a machine code program.
RENAME "old" TO "new"	All types of file to new if file name doesn't already exist.
ERASE ""	Deletes file from directory and frees sectors.
PROTECT ""	Locks a file and directory shows filename in inverse.
FREE ""	Releases a protected file.
VERIFY ""	Verifies any file on disk.
FIND ""	Finds a file on disk.

Brackets denotes an option, "" presence of a file.

TABLE 2 — TEXT FILE COMMANDS

OPEN "mode", (No.), ""	Opens a specified sequential file for reading or writing to in "O", "I", or "A" mode.
OPEN "R", (No.), "" , L	Opens a specified random access file for reading from or writing to.
CLOSE (No.)	Close a file and channel after use.
CLOSE	Closes all files after use.
INPUT (No.)	Enables data to be read from specified channel number.
WRITE (No.)	Enables the writing of information to specified channel number.
LINE INPUT	Inputs an entire line into a string variable.
GET	Will get any specified record in random access file.
PUT	Put data into specified record in random access file.
CREATE ""	Converts a Basic file into a sequential text file.
DO ""	Creates keyboard input from a sequential text file, instead of from the user.
TYPE ""	Displays contents of text file without load or run.
EOF	Detects end of file in text file.

TABLE 3 — ADDITIONAL BASIC COMMANDS

VTAB (n)	Sets verticle tab to n.
HTAB (n)	Sets horizontal tab to n.
WINDOW l,w,t,b	Sets text window to line, width, top, bottom.
INVERSE n	Changes the foreground and background colours to opposite numbers.
NORMAL	Reverts back to normal colour conditions.
ON ERROR and ON ERROR RESUME	Avoids the halting of a program when an error occurs.
LWIDTH n	Sets the width of the printer.
SYS	Function which returns system variables.
SWAP v1, v2	Exchanges the values of two variables.
LINE INPUT	Inputs entire line up to 240 characters in a string.
CAPS	Set capitals.
PR:	Vectors all DOS and Basic output.
IN:	Vectors all DOS and Basic input.
DEF KEYS (n)=""	Defines function key with string which will be evaluated.
RESET	Clear all buffers.
USA	Sets Htz for US.
UKMD	Sets Htz for UK.
HOME	Homes cursor, doesn't clear screen.
PON	Printer on.
POFF	Printer off.
DRIVE	Sets drive.

Note: Tables are not complete.

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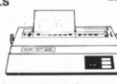


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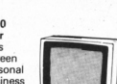
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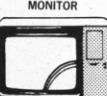
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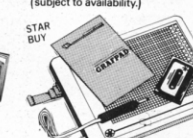
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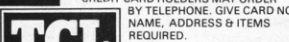
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WILLY'S REVENGE



For the prudish this might have been titled 'The Caterpillar Strikes Back.'

The tables are turned in this energetic game, and Willy feasts on creatures from other games to make up for being cut up in the past.

All you have to do is whizz him around the screen, gobbling up the characters as you go. Bumping into other bits of his body — don't try any swift turns — or colliding with the screen edge loses a life. You get another chance, but by this time you've grown an inch or two.

There are eight lives in all; by the end you'll have grown to an unmanageable length. You start about four inches long, but finally you've 18 inches to manoeuvre.

The other characters vary in size too: the smaller they are, the higher the points. With some practice, I chomped quite a few of the 11 different meemies, but my score still fell way short of the high score chart.

The longer you survive on each life, the faster Willy moves, and the more points you'll gather.

Great fun, but you need a decent joystick to succeed.

SEA BATTLE



This relaxed and enjoyable game is a game for two, based on Battleships,

with the computer acting only as referee. You play on a 12x12 grid. The three A4 pages of instructions were daunting but clear.

The aim is to sink the enemy's aircraft carrier or reach his side of the board with your carrier. The 18-strong fleet is well armed and contains destroyers, frigates, cruisers, minelayers, a minesweeper and an aircraft carrier.

Moves seemed slow initially, but this tactical game calls for planning and strategy.

Battles are decided by the micro which bases its decision of the outcome on a variety of factors. Attacks aren't always sudden death affairs. Only one gun battery is deducted from the loser's ship, so unless you're down to the last gun — in which

Dragon fire



case you'll sink — you live to fight again.

I was a little disappointed that a joystick option wasn't offered (using a menu like Beyond's Up Periscope) as this would have made for a far comfier game. Another choice might've been the chance to take on the computer.

But these were my only niggles: it's a well presented, enjoyable game, but be prepared for a few late nights playing it.

AND ALL BECAUSE



If you've envied the man who delivers the chocolates to the lady's boudoir, leaving only his calling card and a trail of wet footprints across her carpet, you'll like this.

And All Because, is B&H's answer to the advert. The instructions tell you to expect mazes, skiing, jumping ravines, hang-gliding and parachuting to name but a few.

Some of the graphics let it down. For stage one you drive around in a pre-war style racing car in an attempt to get out of the maze of chocolates. By stage two, giant choccies fall into your path. Fortunately, these jumbo strawberry cremes don't land on you — they're at least twice the size of Action Man.

Stage three is the cross-country steeplechase, which gave me the most problems, it was certainly far tougher

Perhaps I had the rag and bone man's horse as a jumper — he certainly ran as if the cart was still attached.

A fun game but I'll leave you to discover the rest. It raised many a chuckle — and quite a few snarls — in my household.

ACE-HIGH mkII



Meanwhile, back at the airfield you get the chance to earn fame and glory in a World War II dogfight. As a Spitfire pilot, you battle it out with the Heinkels and Messerschmitts in the skies.

It's not the easiest game to play, but shooting down the fighters and bombers beats space invaders any day.

While the instructions are printed, the famous dit-dit-ditah used by the BBC World Service during the war adds a touch of nostalgia.

Both joystick and cursor controls are on offer and surprisingly, it's possible to get more kills using the keyboard for firing. The object is to shoot down as many planes as possible before your kite cop it.

Your view is from the Spitfire's cockpit, and while lightning reactions don't appear to be needed, you must be swift to catch a fighter in your sights.

Should you knock out ten or more Jerries on your first sortie and use up your quota of 16 rounds, your Spitfire is refuelled and rearmed. Then it's tally-ho and chocks away for a crack at Ace-dom (25 kills).

I didn't quite reach those dizzy heights, but after many flying hours, I'd bagged 20 planes and picked up my wings.

ELECTION FEVER



Election Fever takes you into 1986. The Government has reduced the 600 plus MPs to 49 (hear, hear). The major parties are now Red, Blue and Yellow, and there are three separate stages to the game. First the leadership elections, followed by the campaign and finally election day.

You are the person with the real power — the agent to the party leader — controlling the party funds. Up to three players can join in and the computer will make up the threesome if necessary.

A profile is offered on three potential leaders and each player must choose who will represent their party. Current news is displayed throughout the game, giving an idea of whose popularity needs boosting.

In the election run-up you pay out for research, media time and grooming. The computer will decide how much each party spends on entertaining and bribery. As the election approaches, the opinion polls are also printed (they appear unrealistically accurate).

For election night, a map is printed on screen and as the results trickle in, it fills up. The program is listable so you can adapt the names, profiles and newflashes as you wish.

Certainly more fun than the real thing.

Willy's Revenge (£7.95) Abacus Software UK, 21 Union Street, Ramsbottom, Nr Bury, Lancs. (0204) 383839

Sea Battle (£4.95) Oetistia, High Lee, Luddenden Foot, Halifax HX2 6LB

And all because (£6.95) B&H Software, 208 King Street, Cottingham, Hull (0482) 842373

Ace High Mk2 (£6.95) Tudor Williams, 15 Summerhill Road, Bilston, West Midlands WV14 8RD

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BBC B

Snakes & fences

Name **Snorter** System **BBC B** Price **£7.50** Publisher **Beebugsoft** Format **Cassette** Language **Machine Code** Other versions **Electron (soon)** Outlets **Retail**.

This original game requires you to destroy snakes in a number of mazes by an unusual method — you shunt sections of fence into them.

Objectives

There are five different mazes. A skill level of between one and ten must be selected, and you are given three lives.

Increasing numbers of snakes are introduced into each maze at regular intervals. To proceed to the next maze, it is necessary to destroy all the snakes. There is a fixed amount of energy available with which to do this — as you move around the maze, this energy decreases.

The aim is for you to position yourself (as the defender) behind sections of fencing and attack the snakes with it. Each time you shove a piece of a fence into a snake, you kill it.

On the other hand, if the head of one of the snakes touches you, a life is lost.

In play

The game makes excellent use of the BBC's graphics facilities. The mazes are well-defined and movement around them is achieved by very responsive reactions to the keys. An area is

preserved in the centre of each maze in which the current score, the remaining energy, and the number of lives lost is displayed.

Annoyingly, despite the otherwise excellent graphics, the snakes are depicted as little more than a string of asterisks.

There are lengths of fencing scattered throughout each maze. These can be separated by the simple act of pushing the defender against one. Different bits can be joined together by shunting them into one another.

A combination of skill and strategy is required for success. It is not simply a matter of chasing the snakes around — in this way you merely use up all the available energy.

There is a slight problem during the loading process — if you do not answer the question regarding the use of sound effects soon enough, part of the program appears to get lost. No problems, however, during actual play.

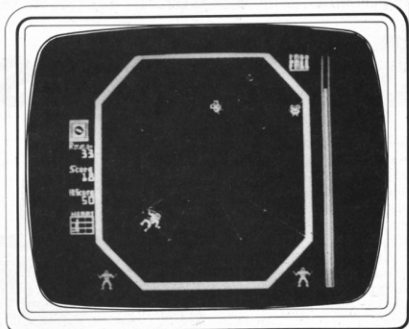
Verdict

This really was enjoyable to play. Without the constraint of a limited amount of energy, it might have been just another chase and destroy game. As it is, a genuine element of strategy is required in order to play well. The sound effects were a little too much, but there is provision to turn them off.

Russell Jones

RATINGS (5)

Lasting appeal	★★★★
Playability	★★★★
Use of machine	★★★★
Overall value	★★★★



Acrobatic astronaut

Name **Free Fall** System **BBC Price** £9.95 Publisher **Acornsoft**. 4a Market Hill, Cambridge CB2 3NJ Format **Cassette** Other versions **Electron** Outlets **Retail**.

If you can keep six balls in the air while simultaneously playing the piano, this is the game for you. There are just too many keys to operate in Free Fall. It is a pity, because the basic idea is a good one.

Objectives

A neatly-drawn little astronaut floats about inside Deep Space Station Coriolis, under attack from four different sorts of lobster-like creatures. You have to manipulate its arms and legs to kick and punch these creatures into oblivion. The game should feel like a mugger's night out.

In play

Unfortunately, to keep things in proportion, whoever wrote the graphics to this game wrote in the most flimsy little movements of arms and legs to represent kicks and punches. Instead of delivering a round-house kick to the delicate parts, the astronaut barely twitches a toe. Sometimes this seems to be effective, sometimes not. It's hardly the sort of thing to keep the crowds on the edges of their seats.

As if to make up for this lack of graphic violence, in what is after all an extremely violent idea, the sound effects are deafening. And there is no way of dimming down the sound, short of putting a telephone

directory over the speaker.

You have three rockets on the astronaut's suit which control movement, but firing them nearly ruptures the eardrums. The one really satisfying noise in this game comes when you drive the astronaut at full thrust into one of the walls of the space station. The result is a concussed astronaut and a loud, reverberating 'boing'.

That sound occurs frequently during play. The keys which activate the left and right rockets are both right next to the keys which cause the left and right arms to punch. So that what inevitably happens is that, having manoeuvred the astronaut with care through the curved space of the station right to the point where you are about to cripple a lobsteroid, the right finger hits the wrong key and your man ends up comatose, bouncing off the space station wall.

Another point of difficulty is that some of the lobsteroids, waspoids, batoids and other oids appearing in the space station can paralyze your astronaut. You find this out when your controls go dead, which they do from time to time.

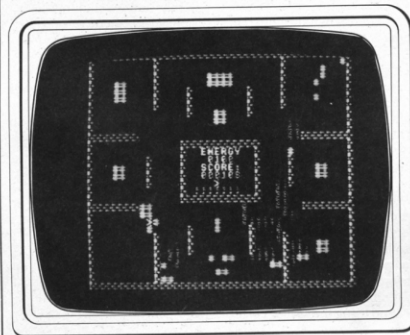
Verdict

I wasn't sure that this wasn't simply a marvellous way Acornsoft had dreamed up of disguising bugs in its program. A major plus point, though, is the very full instruction booklet that comes with Free Fall. In fact it's almost a great game.

Tony Harrington

RATING (5)

Lasting Appeal	★★★★
Playability	★★★★
Use of Machine	★★★★
Overall value	★★★★



A Spectrum was all Mike Gerrard needed to see the solar system — and with no lifeline either.

Spectrums in space

There must be more space games for the Spectrum than there are stars in the sky, though you'd need stars in your eyes to get any pleasure out of some of the software on offer. In concentrating on so many variations of a single theme the inevitable result is a lot of dross, so do any of this recent batch of software stand out from the crowd?

Not **Starclash** from Micromega, which is a disappointment coming after their earlier 3-D attempts with **Haunted Hedges**, **Luna Crabs** and **Death Chase**. The cover gives the impression that this too is 3-D, showing a fighter zooming over the Earth's surface, but this is merely a shot of the title screen, the game itself being an invaders variation that I remember playing in the arcades at least three years ago.

In this, four separate waves of aliens come down the screen at you, different shapes moving in different ways, from a straightforward downward progression to green bow-ties that move up, down and around. You have three lives, and if you let a single ship reach the bottom of the screen then the entire wave starts afresh. After four waves there's a mothership, which has two reactor cores that flash alternately, and you must hit the live one to polish it off and start all over again. It's compatible with a Kempston joystick, but there are hundreds of better games around.

One of them is **Fireflash**, the best version of a missile command type of game that I've seen. The graphics of the base you're defending are very detailed, full of little buildings and towers, and you move your missiles along underground passages to the chosen launching pads. In addition to the nine skill levels, author Kevin Flynn has written into the program a routine enabling you to alter any of seven **POKE** values affecting the speed of certain aspects of the game.

The pre-set values and the range of possible alternatives are given on the cassette insert, and the game itself is fast-moving, colourful and reason-



ably noisy. An ability to understand what you're doing with six fingers simultaneously is an advantage.

From the same company comes **Munnery's Mergatroids**, which should be marginally easier as here you only need five fingers to enable you, as the instructions succinctly put it, to 'blast every alien you see!' This is an attempt at 3-D, with the waves of aliens moving towards your sights in the centre of the screen as you attempt to pass through seven zones of them.

The main problem is that the aliens are simple geometric shapes like diamonds and triangles, and because these are transparent it's impossible to pick out what you're firing at and what you're trying to avoid as they come thick and fast towards you, overlapping each other.

The fact that your own missiles are also transparent diamond shapes doesn't help matters, and the game was a case of over-kill, I thought.

Cosmos has you as 'the pilot of an advanced defender class starship. You protect convoys of sub-light speed cargo vessels from hostile attack and natural dangers.' The convoy is in the centre of an area of space made up of a 3 x 3 grid. You can only see one of these grids at a time through your viewscreen, but can scroll quickly enough around them.

You're watching out for the asteroid showers which float across as well as 18 alien ships

that will try to destroy your convoy. Guiding your lasers by the sight in centre-screen, you must decide whether to stay close to the convoy, when you only see dangers at the last minute, or whether to roam around the grid in search of enemies and risk leaving your convoy open to obliteration.

I found control of this difficult as there's quite a delay between firing your lasers, which come in from the corners of the screen, and the shot exploding when they converge in your sights, by which time the target has zipped away. You have to keep firing continually, and try to predict the movements of your enemies, which is not easy.

The game is fast-moving but the graphics are ordinary and again it gets submerged beneath the mass of good material available for the Spectrum.

At one time a machine code game meant automatic interest, but now they're ten a penny, so you have to produce something different.

An attempt at that is promised by **Space Island**, a graphics adventure from Terminal Software, who have previously produced some good material for the Commodore machines. I wasn't impressed by this Spectrum effort, though, which is very similar to another they've published at the same time, **Vampire Village**. In both you're shown a map on the screen and you must move your character around using the cursor control keys.

In this space story, where you're attempting to find the cause of dangerous time distortions, your character is simply a cross while the map is filled with black dots, representing interesting features. As you arrive at a dot you're shown some text, which may perhaps tell you that there's a rifle or a boat there. Pressing the space key will get you a list of the 19 commands at your disposal, though unfortunately not for long enough to enable you to note them all down or even read them and consider which to use.

You enter the first letter of your chosen command in inverse video and the game responds (or not), the dot disappears and you go on your way to the next one. As you visit the various dots the game does start to build up like a conventional adventure, with problems to solve, but each time you die there's a lengthy wait while a new game is generated and the only time distortion I noticed was that after playing the game for ten minutes it seemed like two hours must have passed.

If you want a game where you spend half your time with a finger on the cursor key while you watch a cross move slowly over a simple map then this is definitely the one for you.

This only serves to raise the question again of how much of a games software industry the home computer market can support. All the signs are that a good thing is being spread much too thinly.

Only one outstanding game in this crop, then, so if you're looking round for something to buy make sure you makes your choice *before* you pays your money.

Mike Gerrard

Starclash (cassette £6.95, any machine), Micromega, 230 Lavender Hill, London SW11
Fireflash and **Munnery's Mergatroids** (£5.95 each), Abacus, 716 Langley Road, Treboeth, Swansea SA5 9EL.
Cosmos (£5.95), Abxex Electronics, 20 Ashley Court, Great Northway, Hendon, London NW4.
Space Island (£6.95, 48K), Terminal Software, 28 Church Lane, Prestwich, Manchester M25 5AJ.

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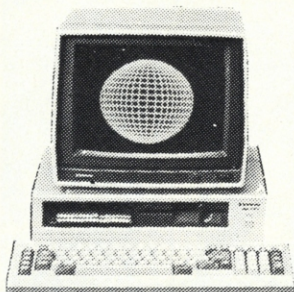
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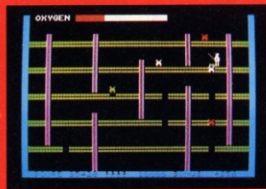


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SPACE PANIC — £7.95

How long can you survive in the multi-storey building filled with alien bugs. This machine-code programme accurately simulates the arcade game where you climb ladders and dig holes to catch the aliens then fill them in again once they are caught. The red ones must fall through one floor, the green ones, two floors and white ones, three floors. Red aliens who have time to dig themselves out get rather cross and become green. PANIC!! Joy stick or keyboard control.



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Title: UFO

Machine: Vic 20 Unexpanded

Language: CBM Basic

Application: Game

Author: Christopher Hillary

UFO is a game for the unexpanded Vic 20 from Christopher Hillary of Bradford in Yorkshire.

You take the part of the commander of a UFO; your mission is to land it. Preventing you from doing this are a number (50) of randomly placed stars. To remove them from your path you

have 45 missiles. Fortunately you can zap more than one star per shot, but your fire power is still rather limited.

This simple game is surprisingly difficult and quite a challenge to complete. It makes good use of sound and colour and you won't have to spend a week typing it in as it's fairly short.

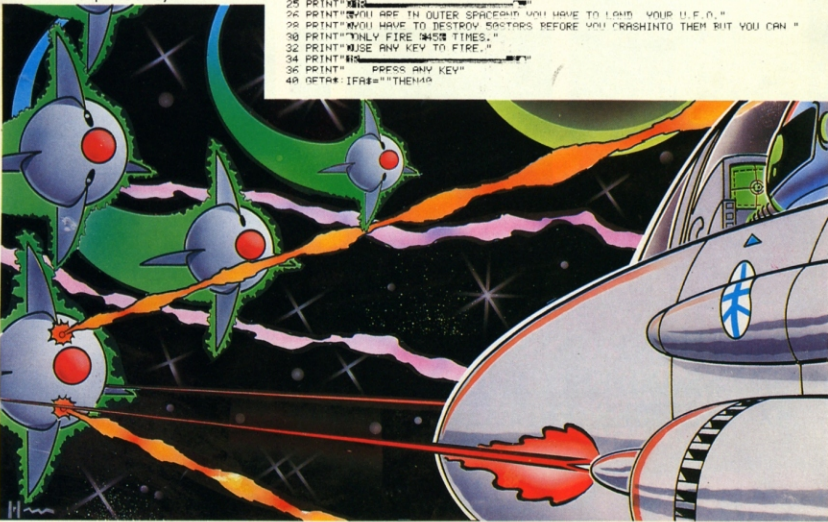
Program notes . . .

20-34 Prints out the instructions.

36-40 Waits for the player to press a key.

```

14 REM U.F.O.
11 REM BY C.HILLARY
12 DEM JAN/APR 1984
20 INK#36879:24
21 POKE36879:15
22 PRINT"##### U.F.O. #####"
24 PRINT"      KERRY C.HILLARY"
25 PRINT"#####"
26 PRINT"YOU ARE IN OUTER SPACE! YOU HAVE TO LAND YOUR U.F.O."
28 PRINT"YOU HAVE TO DESTROY 50 STARS BEFORE YOU CRASH INTO THEM BUT YOU CAN "
30 PRINT"ONLY FIRE 45 TIMES."
32 PRINT"USE ANY KEY TO FIRE."
34 PRINT"#####"
36 PRINT"      PRESS ANY KEY"
40 GET# :IF#=""THEN#
  
```



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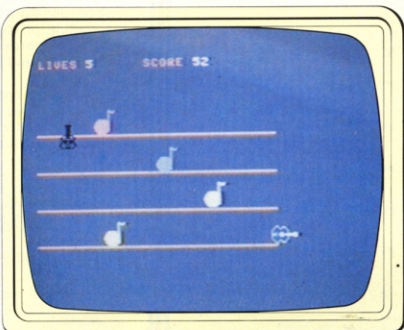
This program for the CBM 64 is from J Springall, of Clevedon in Avon, and takes you to a crazy world of music. You take the part of Gary the Guitar, the one in the top left hand corner of the screen, wearing the sunglasses.

Your aim is to try and reach your friend at the bottom right-hand corner of the screen. The drawback is that you have to get past the notes that are drifting along the staff (the lines drawn across the screen).

The only way past these notes is to jump over them, this is done by pressing the space bar or, if you're using a joystick, the fire button. Be careful how you go, since it

is possible to bump into the notes on the line above, as well as those in front. You can move forwards or backwards while you are in the air, so you can avoid the notes while you are in mid leap. One other thing to be careful of is the different speeds of the notes. The further you get down the screen, the harder it is.

Title: Gary The Guitar
Machine: Commodore 64
Language: Commodore Basic
Application: Game
Author: J Springall



Program notes . . .

- 1 Set up variables and pointer to the sprite registers (V). The last poke sets the volume of all voices to maximum.
- 2 Clear the screen and set the foreground and background colours: gosub and print the intro.
- 5 Gosub and print the playing screen.
- 6 Discard the first 15 bits of data.
- 10 Toggle sprites on/off.
- 20 Set up the sprite pointers.
- 30-33 Read sprite data. Put two of the sprites onto the screen.
- 50 Test the keyboard.
- 60-80 Check for keys to move Gary and move sprites as appropriate.
- 90-107 Jump and check position.
- 110-116 Move the other sprites on the screen.
- 120 Check for position and end if bumped.
- 300-330 Make the sound effects.

```

1 V=3248:F=20:K=1:O=238:S=183:Z=138:H=98:L=68:POKE54296,15
2 PRINT"7" POKE53281,111:POKE53288,11:GOSUB3800
5 GOSUB 500
6 FORN=0TO15:READO:NEXT
10 POKEV=21,252
20 POKE2842,13:POKE2843,192:POKE2844,191:POKE2845,191:POKE2846,191:POKE2847,191
30 FORN=0TO62:READO:POKE832+N,O:NEXT
31 FORN=0TO62:READO:POKE1222+N,O:NEXT
32 RESTORE:FORN=1TO142:READO:NEXT:FORN=0TO62:READO:POKE12224+N,O:NEXT
33 RESTORE
38 POKEV+41,0:POKEV+42,1:POKEV+43,4:POKEV+44,1
39 POKEV+6,250:POKEV+7,282
40 POKEV+4,F:POKEV+5,S+1
50 GET#
60 IF#="M"THENF=F+6:IFF238THENF=20:IFJ=3:IFS+1D235THENG0T0780
70 IFR#="R"ORF#>20THENF=F-6
80 IFR#="P"ORF#>80THENF=F+1
90 IFR#="L"ORF#>3:K=K+1:IFK=20THENP=2
100 IFR#>2:THENJ=J+3:K=K+1:IFK=40THENP=0:K=0
105 IFR#>2:ORP=1:ANDK<5THEN:POKE54277,190:POKE54278,248:POKE54279,17:FORI=1TO100:NEED:POKE54276,0
107:IFP=2:ORP=1:ANDK<5:THEN:POKE54278,0:POKE54277,0
110:POKEV+9,0:POKEV+9,183:O=0-3:IFO<3THENO=2+O
112:POKEV+10,2:POKEV+11,166:Z=Z+6:IFZ<3THENH=238
114:POKEV+12,H:POKEV+13,199:HH=0:IFH<3THENH=230
116:POKEV+14,L:POKEV+15,136:L=L-3:IFL<3THENL=230
120:IF#="R"(53278):IF1=2008:IF1=15209:IF#>500:IF#>60:THEN2000
300:POKE54277,9:POKE54276,17:FORI=1TO10:NEED:READO:READO
310:IFB=1THENPOKE54279,0:POKE54272,0:END
320:L=J+1:POKE54275,A:POKE54272,B:POKE54276,0
    
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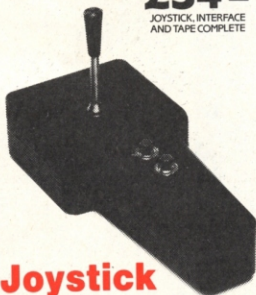
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Toshiba T1350	£1,495	M		○	○			9600	256	6	10,12	192	192	15	55×38	19.9	3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	T4	
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ZX Printer	£40	Electrical					1	N/A	N/A	9	10,32	30	32	4	14×4.6	N/A	1															S5	

MONITORS

These have been split into **colour** and **monochrome**.

Screen size is a diagonal measurement in inches. Nearly all monochrome monitors accept a **composite video** signal from the computer and most computers are equipped with composite video output. Colour monitors feature a wider range of **signal** systems than mono and it is important to match the output of your computer to the input of the monitor.

An **audio channel** will enable sound to be output from a speaker inside the monitor. **Mono tint** refers to the colour of the text on a mono monitor. Some monitors come with an **anti-glare filter** to relieve operator discomfort.

Band width refers to the frequency range of signals which the monitor can respond in MegaHertz. **Dot resolution** indicates the number of dots which can be displayed across the screen: the more dots, the sharper the picture.

Dimensions indicates the area the unit occupies on the desktop.

Make & Model	Price inc VAT	Screen size (in inches)	Signal					Dot resolution	Dimensions (cms)	Weight (kilog)	Distributor	
			Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear	32 bit 4 bit TTL					
Crofton C1401	£300	14		●				10	600	37×42	10	C4
HM 2713	£3,120	13		●				25	720	54×40	36	B1
HM 2719B	£2,553	19		●				25	960	50×49	46	B1
HM 2719C	£3,042	19		●				25	960	50×49	46	B1
HM 3619	£3,548	19		●				45	1280	50×44	48	B1
Kaga Vision II	£327.75	12		●		●		15	510	32×30.3	12.5	D6
Lion Cub 1431-TTL	£286	14		●				7	585	65×57.5	11.5	S6
Lion Cub 1436	£316	14		●	●			7	585	65×57.5	11.5	S6
Lion Cub 1445	£633	14		●	●			15	895	65×57.5	11.5	S6
Lion Cub 1449	£604	14		●	●			15	895	65×57.5	11.5	S6
Lion Cub 1451-TTL	£430	14		●				10	653	65×57.5	11.5	S6
Lion Cub 1455	£483	14		●				10	653	65×57.5	11.5	S6
Lion Cub 1459	£459	14		●				10	653	65×57.5	11.5	S6
Lion Cub 2031-TTL	£344	20		●				7	585	65×57.5	11.5	S6
Lion Cub 2051-TTL	£646	20		●				10	940	65×57.5	11.5	S6

COLOUR MONITORS

Make & Model	Price inc VAT	Screen size (in inches)	Signal					Dot resolution	Dimensions (cms)	Weight (kilog)	Distributor	
			Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear	32 bit 4 bit TTL					
Luxor Digital	£574	14			●	●	●	25	800	N/A	15.7	P1
Luxor Linear II	£643	14			●	●	●	25	800	N/A	15.7	P1
Microtech 14	£402	14		●				18	585	33.7×40.8	12.6	M6
TM 22	£329	6			●			5.5	N/A	22×34.5	4.1	J3
VM 14 PSN	£378	14			●			5.5	300	47×40	13.6	J3
Wolf Cub 1435-TTL	£358	14			●			7	653	65×57.5	11.5	S6
Wolf Cub 1456	£454	14			●			10	653	65×57.5	11.5	S6

Make & Model	Price inc VAT	Screen size	Composite video		Mono tint	Anti-glare filter	Band width (MHz)	Dot resolution	Dimensions (cms)	Weight (kilog)	Distributor
			Audio channel	Audio channel							
AVT DM 210G	£138	12	●		Green	●	12	750	30.8×29.6	9.5	L1
EG 100	£77	12	●		Green	●	8	700	37.5×29	8	L1
EG 101	£91	12	●		Green	●	12	700	37.5×29	8	L1
LEDM 091D	£99	9	●		B&W	●	12	750	22×24	5.4	L1
LEDM 0910	£121	9	●		Green	●	12	750	22×24	5.4	L1
Luxor 10	£212	10	●		Orange	●	22	625	N/A	8	P1
M9	£131	9	●		Green	●	15-22	650	22.4×25.7	5.7	P1
M12	£144	12	●		Green	●	15-22	800	29.3×30	9.3	P1
Novex	£114	12	●		Green	●	12	750	N/A	N/A	P1
N12 1003	£112	12	●		Green	●	24	800	23×26.5	7	P1
Prince	£126	12	●		Green	●	24	800	33×50	7	C4
PM 102	£126	9	●		Green	●	24	800	22×28	7	C4
Zenith ZVM121	£99	12	●	●	Green	●	15	N/A	29×29	6.5	P2
U300	£149	12	●	●	Green	●	18	N/A	34.8×36.8×29.2	7.7	R4

MONOCHROME MONITORS



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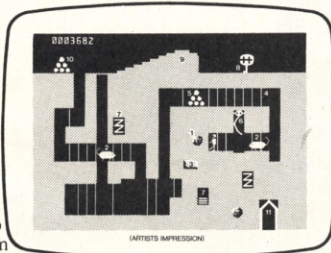
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In 1849 the Great American Gold rush started. Almost everyone who could, sold up everything and dashed to the west coast to look for this precious metal - including YOU!

You must dig for those nuggets (1) - But watch out for the giant rats (2) They burrow through the earth (3) to get into your tunnel. You can delay them for a while by knocking down a support (4) which causes a small cave-in (5) to block their way, but you can only destroy them by releasing a snake (6) from it's nest (7), when it heads straight for the surface, destroying everything in it's way.

All the time the Gremlin (8) is busy digging it's way through your waste earth pile (9) to reach the entrance to your mine. Once it does you have no



ACTUAL ZX-81 SCREEN DISPLAY.

escape!! - so you must stop it getting there by returning to the surface to replenish the main mound (9) with the smaller pile of earth which appears on the surface as you dig (10). The deeper you dig the more points you score -

but the further you have to go to replenish that mound! Once all nuggets have been collected, a cave opens (11) allowing you to pass through to the next stage - if you can reach it! This gives you more rats - but less snakes to destroy them with!!

- Skill levels
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Software Farm, 155 Whiteladies Road, Clifton, Bristol BS8 2RF. Tel: (0272) 731411 Telex 444742 AFMADV G

Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Securing	Sides and density	Connects to										Distributor
							IEEE	RS232	BBC	Apple II	St. Shugart	Nation	Gemini	Z80	Others		
8" DISK DRIVES																	
F 320	£2,300	2.4Mb	2	76	Soft	DS,DD										B5	
M 2894	£499	1.6Mb	1	77	Soft	DS,DD										A3	
M 2896	£493	1.6Mb	1	77	Soft	DS,DD										A3	
Megastor 11 DD	£1,133	2Mb	2	77	Soft	DS,DD										V1	
Megastor 11SD	£1,018	1Mb	2	77	Soft	DS,DD										V1	
Megastor 111	£1,121	2Mb	2	77	Soft	DS,DD										V1	
R.M. FDS-2	£3,789	1Mb	2	77	Soft	DS,SD										R3	
Tandy Model 11	£999	486K	1	77	Soft	DS,SD										T1	
Tandy Model 16	£949	1.2Mb	1	77	Soft	DS,DD										T1	
Tandy Model 16	£1,549	2.5Mb	2	77	Soft	DS,DD										T1	

MODEMS

A modem interfaces a computer and the telephone system so computers can communicate over long distances. It converts data to electrical pulses or sounds that can be sent down the line. A modem can be connected to the line directly or acoustically. A **D** in the connection column represents direct link, while **A** indicates acoustic. The acoustic coupler is like a female telephone handset with a speaker in the coupler opposing the phone's mouthpiece and a microphone opposing the earpiece. A **B** in this column indicates that both methods of attachment are available. **Baud** rate shows the speed with which the data is transmitted.

The modem must be connected to the computer through an interface. The **interface** column lists the main interfaces featured on each modem. **Asynchronous** means that data may be transferred at intervals as available or as needed. **Synchronous** data is transmitted at regular intervals. **Simplex** transfers data in one direction, while **Half duplex** can transmit/receive in either direction, but not simultaneously. **Full duplex** transmits and receives information in both directions at once. Some modems can originate a call or start a two-way conversation. **Answer** means they can respond to a call from another computer.

Make and Model	Price inc VAT	Connection	Data Rates (baud)	Interface	Capabilities							Distributor	
					Others	Asynchronous	Simplex	Synchronous	Half Duplex	Full Duplex	Originate		Answer
AD 123	£287.50	D	1200	RS232									A6
AJ 311	£320	B	300	RS232									A5
AJ 1234	£684	A	1200	RS232									A5
AM 211	£387	B	300	RS232									A5
Bermac 1200/1 Model A	£414	D	1800	RS232									B3
Bermac 1200/1 Model B	£460	D	1800	RS232									B3
Commodore 64 Modem	£99.95	D	1200	C-64 cartridge port									C2

DISTRIBUTORS

A1 Appropriate Technology, 01-625 5575 **A2** Advent Data Products, Melksham 706289 **A3** Alex Microcomputers Ltd, Reading 791579 **A4** Atan International (UK), Slough 33344 **A5** Anderson Jacobson Ltd, Slough 25172 **A6** Alpha Data Systems, 058 27 96136
B1 Bytech, Reading 61031 **B2** British Olivetti, 01-785 6666 **B3** Barron McCann, Biggleswade 316286 **B4** Bencom Sendata (UK), 01-940 1386 **B5** Baydel Ltd, Leatherhead 378811 **B6** BASF, 01-388 4200
C1 Conterics, 01-581 1011 **C2** Commodore Business Machines, Slough 79292 **C3** Calcomp Ltd, Bracknell 50211 **C4** Crofton Electronics, 01-891 1923 **C5** Canon (UK) Ltd, 01-680 7700 **C6** Cumana, Guildford 503121 **C7** CBL, Reading 792097
D1 Discom, Evesham 3591 **D2** Datacube Ltd, Northampton 22289 **D3** DNGS Ltd, 051-643 0316 **D4** DSI, Weston-super-Mare 415396 **D5** Data Systems Division, Bedford 223889 **D6** Data Efficiency, Hemel Hempstead 63561 **D7** Data Track Technology, New Milton 619650 **D8** Dacom Systems, Milton Keynes 676797
E1 Epson (UK), 01-900 0466 **E2** Eleomatic, 041-881 5825 **E3** Eicon, Barhill 81825 **E4** Environmental Equipments Northern Ltd, Northwich 625115
F1 Fastcol, Reading 791557
G1 Geveke Electronics, Woking 26331 **G2** Gemini Micros, Amersham 28321 **G3** G. C. McMichael, 02816 2797
H1 HAL Computers Ltd, Farnborough 51175 **H2** Haywood Electronic Assoc, Ltd 01-428 0111
I1 Informex Ltd, 01-318 4213 **I2** Intel Data Systems, Farnham 54770 **I3** ITT Business Systems, Brighton 507111 **I4** ITT Consumer Products, Basildon 3040 **I5** Intelligent Industries, Stratford-upon-Avon 298879

Make and Model	Price inc VAT	Type	Max Pens	Paper Size	Maximum Printing Speed in in/sec.	Interface (+ £1 extra cost)	Connects to										Distributor
							IEEE	RS232	BBC	Apple II	St. Shugart	Nation	Gemini	Z80	Others		
CCITT CAT	£228	A	300	RS232/V24													
CDSV22	£719	D	1200	RS232/V24													D8
DSL2123	£329	D	300/1200	RS232/V24													D8
Prism VTX 5000	£99.95	D	1200	Sinclair Spectrum													P3
Prism 1000	£69.95	D	1200	RS232													P3
Prism 2000	£84.94	D	1200	RS232													P3
Sendata 700 Series A	£253	A	300	RS232, 20ma	1												B4
Sendata 700 Series B	£224	A	300	RS232, 20ma	1												B4
Sendata 700 Series C	£309	A	600-1200	RS232, 20ma	1												B4
Sendata 700 Series E	£149	A	300-1200	RS232, 20ma	1												B4
Racal 126 L51	£782	D	2400	V24													R2
Racal MPS 3021	£295	D	300	V24													R2
Racal MPS 1222	£678	D	1200	V24													R2

PLOTTERS

Plotters use a pen to put graphics or characters on paper under the command of a computer. They are usually one of two types — flatbed or drum. A **flatbed** holds the paper flat while the pen draws on it in two dimensions. A **drum** plotter turns the paper vertically on a cylinder while the pen moves horizontally. Most plotters can change pens during operation so a variety of colours and line thicknesses are available. **Max pens** indicates the number of pens in operation or on standby. Dimensions of the paper to be used are listed under **paper size**. **Maximum plotting speed** measures the distance in millimetres per sec covered by the pen. **Interfaces** are included in the basic price or come at extra cost.

Make and Model	Price inc VAT	Type	Max Pens	Paper Size	Maximum Printing Speed in in/sec.	Interface (+ £1 extra cost)	Distributor
Calcomp 81	£3,392	Flat	8	A3	30cm	RS232 or IEEE	C3
Commodore 1520	£170	Drum	4	4 1/2"	52mm	Commodore Serial	C2
HP 7470A	£1,317	Drum	2	A4	38.1cm	RS232 (IEEE+)	H2
MT Pixy 3	£688.85	Flat	3	A4	200mm	Parallel (RS232 +)	M3
PD4	£585	Flat	1	A4	700mm	(IEEE+)	J2
RY-21	£747.50	Flat	1	A4	200mm	Centronics, (RS232+)	R5
RY-10MZ	£1,865	Flat	8	A3	400mm	Centronics, (RS232, IEEE+)	R5
Stroke 100	£662	Drum	1	A4	7.6cm	(RS232, Parallel+)	D6
TRS-80 Pen Plotter	£1,399	Flat	6	A4	6.8cm	RS232	T1
Watanabe WX 4635	£2,301	Flat	1	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4637	£2,862	Flat	2	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4638	£2,635	Flat	1	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4671	£1,129	Flat	1	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4675	£1,638	Flat	6	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4731	£1,761	Drum	4	A3	200mm	(Centronics, RS232, IEEE+)	E4

J1 Jones & Brother, 061-330 6531 **J2** J J Lloyd Instruments, Lookshath 4221 **J3** JVC, 01-450 2621
L1 Lowe Electronics, Matlock 4995
M1 Mitsui & Co Ltd, 01-600 1777 **M2** Modata, Tunbridge Wells 41555 **M3** Mannesmann Tally Ltd, Reading 788711 **M4** Micropute, Macdesfield 615384 **M5** Microware, 01-272 6237 **M6** Microtech Leeds, Leeds 679964 **M7** Micro Peripherals Ltd, Basinsgtoke 3232
N1 Newbury Data Recording, Newbury 48864
P1 Phoenix Technology, 01-737 3333 **P2** Pete & Pam Computers, Rossendale 227011 **P3** Prism Microproducts 01-253 2277
Q1 Qume (UK) Ltd, Reading 584466
R1 Rail Ltd, 01-636 6921 **R2** Riva Terminals, Woking 71001 **R3** Research Machines Ltd, Oxford 249866 **R4** Roland (UK) Ltd., 01-568 4578 **R5** Rikademi/Silicon Microsystems, 01-397 5111 **R6** Real Time Printers Ltd., 0276 681444
S1 Sinton Electronics, Reading 875464 **S2** Siron, 01-930 4214 **S3** Stotron, Coventry 613521 **S4** Ssysteme, Leeds 702211
S5 Sinclair Research, Camberley 665311 **S6** Silicon Engineering, Leicester 374917 **S7** Sharp Electronics, 061-205 2333
T1 T-ty Company, Walsall 645181 **T2** Triumph Adler, 01-250 1717 **T3** Trend Communications, 06285 24977 **T4** Toshiba Office Internat., Sunbury-on-Thames 65666 **T5** Torch Computers, 06284 75033
V1 Viasac, High Wycombe 448633
W1 Walters Microsystems Int Ltd, High Wycombe 445175
X1 X-Data Ltd, Slough 723331
Z1 Zygol Dynamics, Bicester 3361 **Z2** Zenith Data Systems, 0452 29451

Atari disk drive and/or memory upgrade wanted for Atari 400, cash waiting. Tel: Dave 021-478 1208 (Birmingham).

Z801 + 16K RAM, typewriter keyboard, hi-resolution module, joystick and software, including Forth. Excellent condition. Offers please. Tel: Dave on 021-443 191.

Atari 400, recorder, Star Raiders, Asteroids, Super-Breakout, Chess, Joysticks, Paddles, Manuals, Books. £300 + £30. Will accept £120. Tel: 093 287 2808 (Chertsey).
ITT 2000 and BBC B, bargain at £250. Tel: 09141 75371.

Atari 800 for sale, 9 months old, Basic etc. Program recorder and 60 games included. Zaxxon, Necromancer, Fort Apocalypse, Pooyan, more. £300. Rone £300. Tel: 01-203 4545.

Spectrum 48K plus software, exchange for Dragon or Vic 20 plus VHS cassette recorder, write: 34 Cavern Road, Torquay, Devon TQ1 1NS.

BBC (B) software: Arcade games: Udder, Scramble, D Kong, Checkman, Galaxians and many more. Eight for £10 or £1.80 each. For details, tel: Mike, King's Lynn (0553) 65156.

Dragon 32 + cassette, recorder Compuserve edit + cartridge, joysticks, software, 12 months of Dragon User, books etc, £200 one. Wirral, Merseyside. 051-652 8914.

Spectrum software for sale: ZX Trek, Timegate, Champions, Football Manager, Black Crystal, 3D Graphics. All £3. 11 Trafalgar Way, Billeray, Essex, CM12 0UT S. A. Rouse.

Vic software for sale. Only £2 Stamp, Digger Dan or super Simon. Tel Jim after 4 pm 041-336 4913.

Dragon 32 computer, joysticks, new keyboard, mags accept £180. Chess computer, 00 gauge railway system 1000's of stamps inc Gibcomm's, £220 the lot. Tel Bob 01-672 6383.

Sell Dragon 32 includes software, magazines, joysticks, Dragon User, sell for around £190 very good condition. All leads included. Tel (0742) 617919. After 5 pm (Pervez).

Massive Spectrum software sale: All originals at low prices up to 50% off. Large sale for catalogue B. Crossford, Ford, Farmhouse, Liton, Nr Bath.

ZX81 32K keyboard, repeat, inverse video printer, manual, leads several books, two games, £100 Tel Ashford (Middle) 57704.

48K Spectrum with ZX printer. Both in excellent condition and both under guarantee. Plus software. Bargain. £150. Tel Anthony 023-870981.

BBC B wanted. Must be in good condition and preferably in London area. Software not essential. Tel 01-571 1954 afternoon.

Wanted Tandy Atari 400 to hire, loan or swap, Wildcatter, Colocube, Shooting-gallery, Checkers, Roman Checkers, Backgammon, handyman, Football, popcorn. Tel Staines 58707 after 6 pm.

Microline 82A dot-matrix printer, 80 columns, 120 cps dual interfaces. Lightly used in excellent condition—offers over £200. Harding, 12 Belmont, Lansdown Road, Bath.

PCN Billboard

Spectrum microdrive order form. Offers. Also issue on 48K Spectrum plus some software £100 one. Plus Pacman carteridge (Atari 400) £12. Tel 01-586 9366.

Atari two cassettes plus instructions Learn Forth by Elcomp. £10 Tel 051-724 5563 evening.

Oliver! ET351 text editor for sale, including twin disc drive, plus quantity of discs etc. £1500 Tel 01-363 0356.

Atari VCS with 12 cartridges including Enduro, Donkey Kong, Star Raiders, 15 more others. £165. Will not split. Tel Maidenhead 32875.

Sharp PC-1500 pocket computer and case, boxed with manuals, assembly language details etc. £100. Tel 01-802 8487.

Vic 20 plus cassette unit, 3k super expander, programmers reference guide, magazines and software. £100 Tel Folkestone (0303) 77135.

ITT 2020 48K, OULME Sprint, 45 cps printer plus card, paddles, colour card, manuals w/p software and various games etc. excellent condition. £625 one. Tel 0376 23002.

For sale, ZX printer in excellent condition. Three months old. Boxed, complete with manual. £25. Tony, Tel Edenbridge (Kent) 864506. Buyer collects.

Atari VCS + 13 cartridges set of paddles 2 joysticks cost £300 + new set £200 or swap for CBM 64. Tel Marlow 75248 after 6 pm. Andre.

Seiko GP250X graphics printer plus BBC connecting cable and screen dump program only £195 one. Tel Rhooze 710663 after 6.30 pm.

ZX81 computer 16K RAM. Serviced by Sinclair 12 months guarantee. 133 programs on paper, 3 cassettes, 30 magazines including Sinclair User £75. Tel 051-677 8585.

Database Video game cartridges: Boxing, Four in a Row, Maze, Air Sea Battle, Bat and Ball, Shooting Gallery, Space Wars and Horses. £4 each. Tel 01-689 8420.

Zenith ZM121 green screen monitor, £65. Also Newbrain software technical manual. £25. Tel 01-302 9512 eves. only.

Spectrum back-up copier 16K/48K, easy to use even for beginners. £4. P. J. Monk, 2 Knights Close, Pembury, Tunbridge Wells, Kent. TN2 4EL.

Spectrum software for sale. Black Crystal £4, Microf Spreadsheets £4, Arcadia £2, Molor Maul £2, Tel Rugby 833116.

Will swap Atari software for Atari books etc. Send for list. Also swap Jumbo Jet Rom for other ROM. K. Brookes, 2 East St, Blackhall, Cleveland.

Lynx 48K manual, leads, disassembler, some games, Sinclair's red book. Good as new £150. Tel 061-973 2651 after 6 pm.

Wanted Serious or business software for Spectrum 48K. Write Peter Gill, Chemin de la Caroline 20, 1213 Petit-Lancy, Geneva, Switzerland. Tel Geneva 22/920255.

Swap Colour Genie software. More than 60 programs, Peter Heezen, Dorpsgr 199 3161CC Rhooen The Netherlands.

96K Lynx. One month old, guaranteed, plus Pac-Man, Monsternest types including all leads, two manuals. Excellent condition. £230 Tel 061-881 4018 after 5 pm.

Colocvision with Turbo, Zaxxon and Donkey Kong. Sell for £150 or swap for CBM1541 disc drive. Tel Burton 701042.

Ambur 2400 printer hardly used, spare paper and ribbon. Cost £100 sell for £65 one (inc p&p). Tel Abingdon (0235) 31218 after 6.30 pm.

Sell Oric Hobbit £8, Zorgons Revenge £5, Ocean Hunch-5 £5, Ian Sinclair's The Oric-14 50. Stafford (0785) 211445 Ian after 4 pm.

16K Spectrum DCP interface + leads, meters, six Spectrum books, Microdrive order form, in good condition. All £150 one 0234 216491 after 5 pm.

Oric software unused. Dinky Kong, Hopper, Ultra, Light Cycle, Xenon-1 and book. 60 programs for Oric-1 (PCN library). £5 each lot £28. Portefract 620585.

Tandy CGP 115 plotter/printer. Excellent condition with two extra paper-rolls. £115 one. Also Dragon Centronics printer cable £10. Tel N'pton (0604) 28379.

Dragon 32. Totally unused, new, tape recorder, joysticks, software worth £41 + books worth £23 + light pen. All only £225 one. Tel Northampton (0604) 28319. Evenings only 01-550 8806 after 6 pm.

Vic 20 plus cassette deck with Sargon chess, star battle and some cassette software plus programming book. Best offer over £100 secures. Farnham 725209.

International soccer (Commodore) plus defender (Atari) wanted. Good prices paid or swap for other CBM 64 software. After 6.30 pm ask for Ian. 0622 61917.

48K Atari 400 recorder. £180 of games (Defender, Miner, Donkey Kong, etc), magazines joysticks, basic. In boxes, 11 months guarantee. Offers? Tel 01-734 5802 (office hours) or 01-550 8806 after 6 pm.

Commodore 64 £185 or would like to swap Electron or Atari 600XL with cassette unit of Atari 800XL. Tel Southampton (0703) 437369.

Swap Spectrum software. Over 100 titles to choose from. Send your list for mine. Eddie Early 65 Anner Road, Dublin 8 Ireland.

Spectrum 48K for sale + CCR 800 tape recorder + carry case + Kempston interface + 2 joysticks + micro drive order form. £150 one. Tel 722 8745 David.

Sell Galactic Chase E11. Preppie £15. Star Trek 3.5, 47. 3D Caves of Death £10 All original. Tel Canvey Island 696601 (after 7 pm).

For sale: Zeta deluxe joystick for Vic-20. Atari 400/800 or VCS. One month old. Boxed. Excellent condition. Three year guarantee. Tel (0375) 678180 £7 one.

Lynx 48K. Immaculate condition — hardly used. Includes user magazines plus programs. Guaranteed. £135 Tel 0532 742450 after 6 pm.

Atari 400. Cassette unit, six cartridges, four cassettes, and three books, £200 or exchange for BBC. Tel James 0342 713610.

Wanted Up to £90 offered for 48K Spectrum in excellent working order (complete with manual etc). Tel Preston 724992 except Saturdays. Robert.

Commodore Pet 32K 3032, dual disc drive 3040, printer 3022 for sale. Also manuals, business games disks. Good condition. £400 Tel 0602 231265.

MZ80K 48K with built-in monitor plus recorder. Includes five languages, over 100 games. Calc, several manuals/books. £280 one. Tel Huddersfield (0484) 686499.

Lynx 488K. £125. Boxed, manual reads introductory + own games cassettes perfect for machine code and Basic learning Tel 074-788 206.

Atari VCS with Pac-Man, Combat, joysticks paddles, good condition £50 one. Also Defender £13 Air Sea Battle £10 Nightrider £10. Tel (0705) 476357 Tony.

Atari software, disks, cassettes and cartridges. Home filing manager, Bandits, Astro Chase, Preppie, Pac-Man. Tel 0606 76576 evenings or weekends. Howard.

Wanted Dragon users for pen-pals in the Southampton to Salisbury area for info exchange. Ashley R. Adamson 'St Elmo' Slab Lane, West Wellow, Romsey, Hants SO5 0BY.

Jupiter Ace 32K. Excellent condition still boxed, complete with manual plus adventure game. £100. Tel 01-958 7414 after 6 pm.

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
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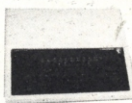


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The last laugh is on Laskys

You've probably seen the Lasky's advertising. 'Why did you spend Np on this magazine when you could have got free advice and a demonstration?' says one cheeky little two-page spread.

We dinosaurs in the micro press were a bit sceptical about

this at first, but the latest ad banishes all our doubts. This promises a Commodore 64 for £199, and a Commodore 'Vic 64' for £79.90. What can we say? We frankly admit that Laskys know more than we do — we'd never heard of that last one . . .

Ultimately not

More and more attention should be paid to the question of data corruption in transit.

Motorola Information Systems marketing manager Ray Wright unleashed a particularly souped-up time-division multiplexer on the world, with the words: 'We think it's the ultimate. That's why we call it Ultramax.'

Revolution in Leeds now

Red and black was a significant colour scheme in the days of the Spanish Civil War. Little wonder then, that Oric's new fighting Atmos is dressed up so smartly.

All of this could be an unhappy coincidence for Curry's, whose latest Micro-C shop in Leeds is similarly decorated in the red/black trim, right down to the last details of furniture and ceiling.

Poisonous humour

Hungry Horace is on the way down in the PCN Charts and you don't have to look far for the reason — yes, in issue 49 we printed its publishers as Poison.

Asbjorn Tobiassen from Kristiansand wins the PCN Gobbledgeok prize of £5 for being the first of several readers to spot it. This may be of little consolation to Psion/Melbourne House but we hope they see the joke.

SANTAX ERRORS

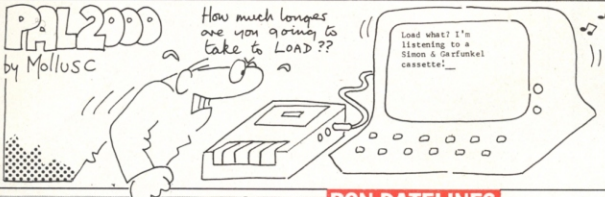
The program Minescape in issue 50 had a few untrapped errors in it. Line 1020 should be numbered 1045 and 1040 should read:

```
1040 UNTIL B=3 OR L=0
```

NEXT WEEK

- Full throttle** — PCN gives a road-test to Yamaha's musical MSX micro.
- Mac-Winners!** — Two Apple Macintosh systems are on the line in our latest competition.
- Atmospheric** — Pull-out this guide to the new Oric micro.
- Fair Game** — We run games software for the Dragon, Commodore 64, and Spectrum.
- Action...** — . . . in a fast-moving listing for the Spectrum.

Hungry Horace	Poison/Melbourne
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PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in

PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

UK EVENTS

Event	Dates	Venue	Organisers
Computer Trade Show	March 13-15	Wembley Conference Centre, Middlesex	Reed Exhibitions, 01-643 8040
Scottish Computer Conference	March 13-15	Holiday Inn, Glasgow	Quadrilect, 01-242 8697
Microcomputer Applications Workshop	March 26, 27	Computer Laboratory, Liverpool University	Ms C Bryson 051 709 6022
Microcomputer Networks Workshop	March 27, 28	Computer Laboratory, Liverpool University	Ms C Bryson 051 709 6002
Electron & BBC Micro User Show	March 29-April 1	New Horticultural Hall, Westminster, London	Susie Lipman 061-456 8383
Computer Aided Design	April 3-5	Met. Exhibition Hall	Reed Exhibitions, 01-643 8040
Artificial Intelligence Seminar	April 7-8	City University, London	Warm Boot Ltd, 01-368 7561
Sir Frederick Osborn School	April 8	Sir Frederick Osborn School, Welwyn Garden City	Alan Henderson, Welwyn Garden 23367/8
Computer Fair	April 10-12	Cardiff University	Reed Exhibitions, 01-643 8040
COMPEC WALES	April 12	Cavendish Conference Centre, 82 New Cavendish Street, London W1	A4 Publications Ltd., 088-385 2051

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Personal Computer Show	March 14-17	Sydney, Australia	ECL Ltd, 01-486 1951
International Business Equipment & Computer Show	March 13-17	Singapore	International Business Centre Co. Ltd., 8F Hosoi Building, 15-7, 5-chome Honmachi, Higashi-ku, Osaka, Japan
Videotex '84	April 16-18	Hyatt Regency, Chicago	Sally Summers, 0101 212 279 8890

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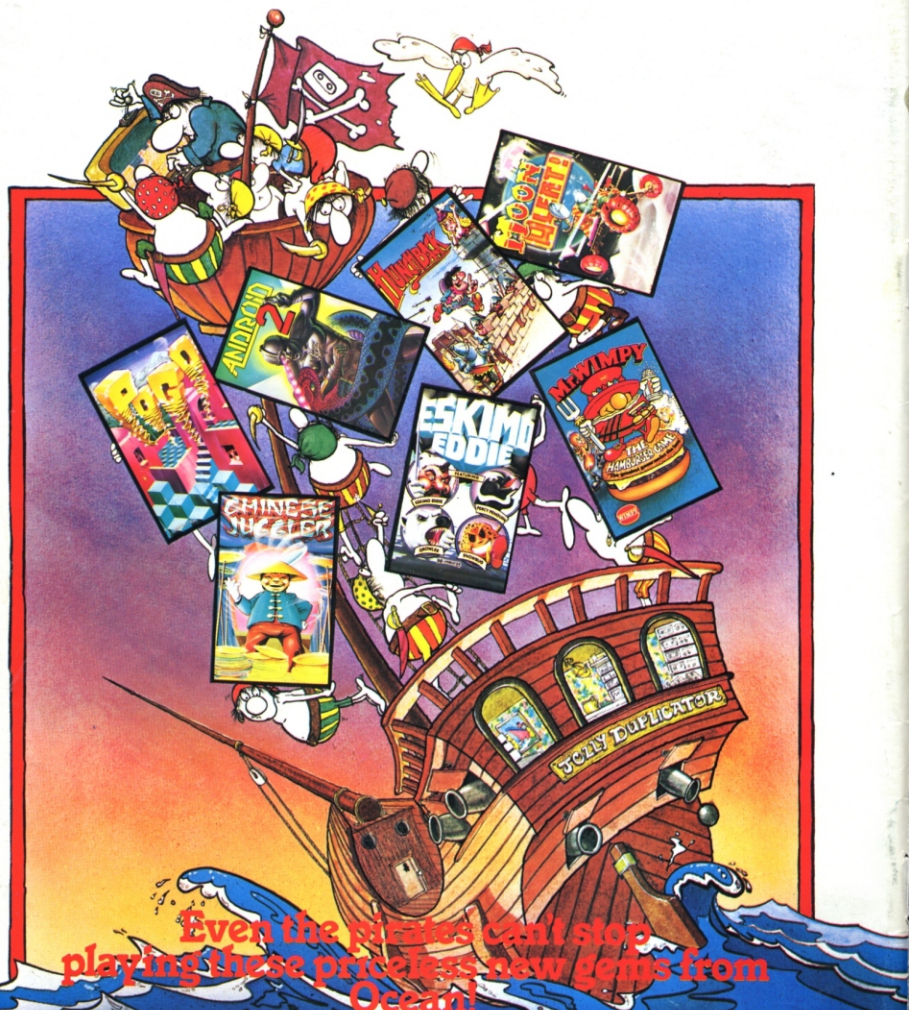
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