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NEWS
THE COMPLETE COMPUTING WEEKLY
45p AUG 18 - AUG 24 Vol 1 No 24



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Print values of four new models

THE FIFTH SPECTRUM
The new games and graphics language

IBM ALL-ROUNDER
T/Maker: the new disk-based office

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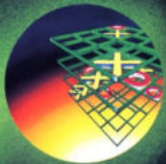
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August 18-August 24, 1983 Volume 1 No 24



PULL-OUT
Micropaedia Commodore 64: Part 1

First of three parts: the machine, the system, the languages, the software — the works.

REGULARS

Monitor 2
Commodore corrects error-riddled manual, *page 2*; Electron software hard to find, *page 3*; US video games and a new Tandy, *page 4*; London marathon halfway house, *page 5*; Systems-builders go for brokers, *page 6*; Software buyers' watchdog, *page 7*; and Logica launches Xenix 3.0, *page 8*.

PCN Charts 10
Follow the fortunes of your favourite games and micro

Random Access 12
Read all about the garden gnome syndrome!

Routine Inquiries 16
Max Phillips talks readers through their problems

Microwaves 18
A fiver for each one printed — take a tip from fellow-readers

PCN Binder 44
Keep your back-numbers in good order

PCN ProgramCards 56
In this week's cut-out-and-keep batch: Meteor Shower ends for Oric owners; Starship, a three-card trick for the Vic 20; and Surround, the light-cycle duel from *Tron*, brought to life on your BBC 'B'.

Readout 67
Choose the best books

Clubnet 69
Nationwide guide to the micro clubs

Databasics 73
Hardware — the lastest prices, latest specs

Billboard 81
Buy, sell or swop secondhand goods

Quit/Datelines 88
PCN's way-out page . . .

Cover photo by Theo Bergström

PCN SPECIALS



Videotex and you 20
Will home computer users get hooked on the new communications technology? Jessica Long looks into the future.

Interrupt your Dragon 23
In the third of his four-part excursion into the Dragon's machine code, Brian Cadge demonstrates the use of the interrupt.

PCN PRO-TEST: SOFTWARE

IBM management 27
John King puts the T/Maker III in charge of his IBM PC and watches it perform a variety of office routines.

Spectrum's Fifth dimension 31
Ted Ball plays with Fifth, an extension to Spectrum Basic which allows you to program fast-moving graphics.



PCN PRO-TEST: PERIPHERALS

Daisy chain 34
Ian Scales measures the price/performance gap of a quartet of daisywheel printers.

Spectrum tracer 41
Trevor Jones tracks down the RD digital tracer, a package designed to let you transfer an outline from paper to screen.

PCN PRO-TEST: HARDWARE

Lowdown on the Laser 42
The Laser 200 from Hong Kong is, at just £70, the cheapest colour micro on the UK market. Max Phillips sees how it shines.



GAMEPLAY

Sandra Grandison pits her wits against games for the Oric. 50

Mike Gerrard watches Charlie the Chef at work in Cookie and a chicken-and-egg situation down on Egg Farm — for the Spectrum. 52

Bobby Rao dodges the enemy fleet in Sea Lord (BBC), while Mike Gerrard averts a Lusitanic disaster at sea (Dragon 32). 53

Can biker Peter Worlock cross The Island on his Commodore 64? Can Dolores Fairman find the Xadomian Artifact, aided only by her Spectrum? 54

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CBM's disk slips a bit

By Sandra Grandison

The 80,000 or so people who have bought Commodore's Vic 1541 single disk drive shouldn't blame themselves if they can't follow the manual. It's more likely to be the documentation that's at fault.

Commodore is quick to admit there are blunders in the manual. One example is the Mailing List Read and Write Program on page 36. It simply doesn't work.

Mr Louis Marteau, who recently bought a drive, said: 'This program gave me a great deal of trouble.

'First of all, it was easy to see that the final 'A' had been left off of 'DATA' in line 80, but I was still getting an error response.

'When I contacted the Commodore Information Centre, I was told that the program was indeed faulty.

```
5  A(1)=12:A(2)=15:A(3)=20:A(4)=20:A(5)=12:A(6)=2:A(7)=9:A(8)=10
10 OPEN1,8,15:OPEN2,8,3:"0 Mailing List,1,""+CHR$(104):GOSUB900
20 PRINT#1,"p"CHR$(3)CHR$(1)CHR$(65)CHR$(11):INPUT#2,X
30 INPUT"Read, Write, or End" ;I$:IF I$="r"THEN GOSUB2:CLOSE1:END
40 IF I$="w"THEN200
50 PRINT INPUT"Record #";R:IF R<0OR R>XTHEN50
60 IFR<2THEN30
70 R1=R-R2*0:IFR1>256THEN R2=INT(R1/256):R1=R1-256*R2
80 RESTORE:DATA1,FIRST NAME,14,LAST NAME,30,ADDRESS1,51,ADDRESS2
90 DATA72,CITY,85,STATE,88,ZIP,90,PHONE,#
100 FORI=1TOR:READA,AS:PRINT#1,"p"CHR$(3)CHR$(R1)CHR$(R2)CHR$(A):GOSUB900
110 ONA/50GOTO50:INPUT#2,Z$:PRINTAS,Z$:NEXT:GOTO50
200 PRINT:INPUT"Record #";R:IF R<0OR R>5000THEN200
210 IFR<2THEN30
215 IFR>XTHENR=X+1:PRINT PRINT"Record#";R
220 R1=R-R2*0:IFR1>256THEN R2=INT(R1/256):R1=R1-256*R2
230 RESTORE:FORI=1TOR:READA,AS:PRINT#1,"p"CHR$(3)CHR$(R1)CHR$(R2)CHR$(A)
240 PRINTAS,:INPUT#2,IFLEN(Z$)>0 AS(THEN Z$=LEFT$(Z$,AS(1))
245 PRINT#2,Z$:NEXT X=R:PRINT#1,"p"CHR$(3)CHR$(1)CHR$(0)
250 PRINT#2,X:GOTO300
900 INPUT#1,A,B$,C,D:IFA<>20THENRETURN
910 IFA<>50THENPRINTA,B$,C,D:STOP:RETURN
920 IF I$="r"THENPRINT85
930 RETURN
```

One faulty entry — the revised version is about three times as long.

In fact, it contained so many faults they could not be dictated over the phone.

Commodore itself said there were so many things wrong with the program that it virtually had to be rewritten. But the company's speed in accepting the existence of errors is not matched by any rush to put them right. It has taken more than a year to correct the faults.

But Commodore has great faith in its consumers.

'Users can work out the corrections for themselves,' said a spokesman from Commodore. But he added helpfully: 'If they can't, they can get a corrected version of the program from our Information Centre.'

Commodore has no plans to send a corrected version of the manual to users of the thousands of £225 drives it has sold.

So, if you aren't sure about an entry in the manual, treat it with caution and check with Commodore.

Rival rodents

The next stage in the mouse race has been triggered off with a new hand-held device called PC Mouse, which has just made it to Britain.

This new gadget is made by a Californian company called Mouse Systems Corp, and is primarily pitched at the IBM PC user. And what makes it different from other mice is that you don't have to make any changes to the PC software, as it's ready to run with all popular programs such as VisiCalc and Wordstar.

The PC Mouse works by translating movement over a desk-top pad into movement of the screen cursor. And the company says pointing to a given screen character in this way is much faster than using the keyboard.

Click-buttons on the PC Mouse can be used to replace sequences of keyboard strokes. You get a total of nine sequences of 15 keystrokes.

At £341.55 the PC Mouse comes with a pad, interface box, power supply, RS232 cable and interfacing software; it is available from Data Design Techniques, 96 34774.

Schools get portamicros

Any educational establishment with £46,000 on hand may like to look at Computalab.

This consists of a building resembling a large portacabin which comes complete with 12 BBC Model Bs plus colour monitors, software and furniture for a class of 24.

The micros are networked, and extra electronic teaching aids are provided, while the teaching station has centralised facilities plus the master computer. The teacher can operate his or her computer by itself or along with some or all of the other workstations.

Wiring is located under the floor to ensure that people don't get tangled up in masses of leads, and the Acorn Econet system allows you to use a shared file server, printer, VCR and Teletext.

Two large overhead colour monitors are available for demonstration purposes, and the entire package should only take three days to erect, according to Tony Ibotson, spokesman for manufacturer Elliott-Medway (tel: 0296 668271).



A computer lesson progresses inside a Computalab teaching station.

Larger Lynx on the loose

Camputers' 96K Lynx, which made its debut at the London Computer Fair, is now starting to appear in the shops.

Laskys has been first off the mark with the new Lynx — its 50 Micropoint stores took their first stocks last week. The Spectrum chain was due to follow suit this week, and at the end of the month the Midlands distributor Discos will be shipping the system to its dealers.

The 96K Lynx will set you back £299. If you already have a 48K model you can upgrade it for £89.95 and get the additional 4K ROM into the bargain.

The new Lynx has 37.5K of RAM directly available to Basic in high resolution colour, with 24K more for machine code or as a data store.

BBC tracer

Tracer input devices are catching on — *PCN* has the RD Digital Tracer for the Spectrum in the peripherals section this week, and now a similar device for users of the BBC micro has been introduced.

Watford Electronics has launched the Beebplotter. This tracer device allows you to transfer graphics from paper to the screen, and then to disk or tape. You manipulate a mechanical arm to trace the outlines of graphics from books, maps, graphs or your own imagination. Text may be included with graphics output from the keyboard, and enclosed shapes may be filled with colour.

The Beebplotter comes with a perspex base and applications software. It costs £69 (plus £3 P&P).

The Beebplotter will be Pro-Tested in *PCN* issue 26. If you can't wait that long, Watford Electronics can be contacted on (0923) 40588.

XL's low cost

By Geof Wheelwright

If you hold off buying an Atari computer for one month, you should be able to get one of its new XL series micros for the same price you'd currently pay for Atari's 400 or 800 machines.

According to a major London Atari dealer, the 16K 600XL machine with full-travel keyboard will sell for £159 — the current price of the Atari 400 — while the 64K Atari 800XL will go for £229, the price you'd pay now for an existing old-style 48K Atari 800.

The 600XL has advantages over the old 400 machines in having a full-travel keyboard, rather than the flat ZX81-style keypad of the 400, and in being expandable to 64K (the 400 is not officially expandable beyond 16K).

Meanwhile, the 800XL will have an extra 16K over the existing 800 and the capacity to use Atari's XL Expander to run 80 column video, a hard disk controller, a speech recognition unit and other goodies.

The dealer suggested that the introduction of the new machines (the 600XL in September and the 800XL in October) will not cause a massive drop in the price of the existing machines, because Atari already has plans for most of its stock of older machines. He suggested that Atari will try and give them to schools and computer camps — as well as offering some as competition prizes for magazines and newspapers.

Atari declined to comment.

Electron shock

Although Acorn's Electron micro appears to be in the running for the title of 'hit machine of '83' there is a major disappointment in store for those who counted on it providing a cheap vehicle for the large library of BBC micro software.

The problem is that the Electron does not have the BBC's text mode 7. Mode 7 is the BBC's Teletext mode and its various features have made it a popular mode for running the BBC Micro's games programs.

This means that much of the BBC software is incompatible with the Electron in its raw state — you will have to wait till the various companies get round to 'moving it over' to run on the Electron, unless you are capable of digging about with program listings and doing the job yourself.

This is particularly important, because the Electron is likely to be used mostly as a games machine until Acorn starts offering the promised expansion features.

To make the Electron cheap meant leaving out all the interfacing components which came with the BBC. Instead, it has an edge connector and Acorn's word on a goodies package to take it up to BBC level.

The first will be a box allowing further ROM applications programs to be plugged in.

The missing Mode 7 (another cost-cutting feature) offered the BBC micro programmer a wide range of colours, a flashing facility, block graphics characters, and double height characters for title pages and menus.

It also had the added bonus of using up only 1K of RAM, leaving more for the program itself.

See next week's *PCN* for a full Pro-Test of the Acorn Electron.

● The BBC's Ceefax telesoftware service, for which Acorn is supplying the adaptors, is thought to be in its final trials — three months late.



Some early software for the Electron — but very little from the BBC micro.

Fortune won't cost fortune as price falls

In an attempt to get business executives to look at multi-user systems, IBR Microcomputers has cut the price of the Fortune 32:16 systems by about 35 per cent.

The cost of a 5Mb system capable of supporting five users has come down from £5,995 to £3,995; a 10Mb system is now £5,995 and a 20Mb configuration £7,495. The Fortune was the first commercially available machine to run Unix.

IBR has also released single-user Fortune 32:16s which it calls Infomates. The largest of these, with 20Mb of hard disk storage, costs £5,950.

IBR's general manager Phil Blatchford admits that the earlier prices of the multi-user systems were too high to attract orders in the volumes that some 16-bit standalone machines have managed. 'People need to be pushed into looking at something new,' he said. 'A very large price reduction with maintained quality and support is the best way to get anybody to change their buying habits.'

Health joins chain gang

Health workers will be the next beneficiaries of Acorn's special relationship with British institutions.

Following its success with the BBC, Acorn is developing a system to be sold by British Telecom for the health services. Called Chain (Community Health Advanced Information Network), it is due to be launched next spring. It will give nurses, doctors and other health workers the chance to use central computer systems directly. It will cost about £1,000.

Digital Research's Lisa-like launch

A super-cheap cut-down version of the Lisa software appears to be on the way from Digital Research, to run on an ordinary floppy-disk-based CP/M system.

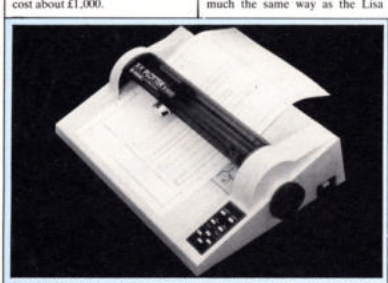
Digital Research is keeping a low profile about the VIP package, along with its rumoured launch of Monarch, a set of applications to run in the VIP environment. But Paul Bailey, who heads the UK office, says the company expects to make an announcement late this month.

It seems clear that VIP will act in much the same way as the Lisa software and the VisiOn package — announced by VisiCorp last year though not yet being shipped. Both these packages sit between the user and the operating system to give a friendly user interface.

'VIP is not a VisiOn product,' Mr Bailey insists. But the package does appear to use the same concepts as its larger rivals to make software easy to approach — files and programs presented graphically on the screen as little symbols — icons — and a mouse pointer used to select the icon you wish to use.

With both the Lisa software and VisiOn, users will be able to stack up several files on the screen, displayed as overlapping documents. But VIP is to be a much smaller package, fitting on to a floppy disk-based system with as little as 64K of RAM, so it will probably only display one or two documents at a time.

Hardware manufacturers will take out licences for the VIP software, rather than it being sold directly as an end-user product, and Commodore is reported to be planning to sell VIP as a $50 cartridge.



PAINTING IN OILS — Or in water, whichever takes your fancy; the BMC X-Y Plotter B-1000 takes water or oil-based felt pens of four colours. The plotter will run off a range of micros with Centronics or RS232C interfaces, and you can drive it from a program in any language, the manufacturer says, or from a word processor. It takes up just over one square foot of desk space, and the plotting area is 10in by 15in. The price of the unit starts at £740, and it is available from Encotel Systems in Croydon, (01)-686 9687.

Basic by air

Tuning into 747 kHz at 18.10 on a Sunday you might pick up what sounds like double Dutch — in fact it's the Dutch broadcasting organisation NOS putting out software.

NOS has just published a 70-page handbook to explain its broadcasts, which transmit programs written in a code called Basicode. The handbook is half in English, and the broadcasts also have an English element. You can pick them up in most parts of the UK, although reception is variable.

The programme to listen for is called Hobbyscoop (pronounced Hobbyscope) and you can expect a fair mix of software — scientific, games, utilities, and special items such as home energy management. Last Sunday's broadcast concentrated on the Oric 1.

Basicode is described as a kind of Esperanto; it was devised at NOS to include common denominators of several Basic dialects to be applicable directly to several machines, including the Apple II and BBC micros. It can't be run on Sinclair systems, but NOS's book covers a total of 17 different systems.

The software is transmitted at 1,200 baud, usually in a five-minute slot at the end of Hobbyscoop, which runs for 35 minutes.

The book explaining Basicode comes with a tape containing translation programs for a number of micros plus about 20 programs of general interest. The package costs about £7, and to order it you can contact NOS, Hobbyscoop, PO Box 1200, 1200 BE Hilversum, The Netherlands.

VIEW FROM AMERICA



Disk video games marry megabytes

By Chris Rowley

The Hollywood coup of the year must be ex-Disney animator Don Bluth's comeback from the financial disaster of his film The Secret of Nimh. Bluth is the man behind the hottest video game to be seen in years, perhaps the hottest ever. I refer, of course, to Dragon's Lair, the first animated film game to issue from the marriage of laser disk megabytes to inexpensive RAM.

Dragon's Lair has sold about 8,000 units in the past month, which will be about five per cent of the anticipated sales of all arcade units for 1983. Since Dragon's Lair costs $4,000 this sales surge shows not only the attraction of the game but the desperation of arcade owners who have seen their business roughly halved in the past year.

Dragon's Lair consists of 22 minutes of colour animation, basically an interactive cartoon, in which you either guide Dirk the Daring past assorted dangers to rescue the beautiful princess from the dragon, or you watch her die a horrible death. Spectacular animation and sound effects have already ensured hit status for the game.

Naturally, Hollywood is in a considerable ferment as a result. Dozens of small companies have sprung up to fight for a place in what everyone can see will be a very hot market.

It is expected that arcade owners will simply replace disks and decals — not the whole game booth — and that the new disks will cost $1,000; this will certainly be competitive with current arcade video games. In September the Third Annual Video Disk Conference will be held here in New York and, as you might expect, starting your video disk business and video disk games are high on the agenda.

Of course, at this stage in the game only the Lisa home users will have the cash to take home one of these babies, but there are other exciting developments here that will vastly expand the scope for all sorts of games that people like to play, many of which involve people making money rather than spending it.

First of all, there is the dramatic fall in modem prices. For Commodore 64 and Vic 20 owners and the Atari folk there is the $150, 300 baud Autoprint. Then from Anchor Automation comes the revolutionary Volksmodem, which will retail for $70. The Volksmodem comes in just one type but has six different cable varieties for connection to different computer formats.

And then there is Texas Instruments' TCM-3101, which is a 1,200 baud CMOS modem on a chip which TI will be building into its new computer line. Other new modems are dropping below $500, even below $300 in discount deals. But the reality of mass access to modem communications in the US might give pause for thought, even shudders, to anyone blessed with memory and imagination. Especially if they happen to have an inkling of what goes on in the near anarchy of US computer/telephone relationships.

Second, there is the appearance of the affordable hard disk. For the serious user who wants to run large programs, very big databases, 'my-company-on-a-disk' with instant access to everything, there are now hard disks offering up to 10Mb of storage for as little as $1,500. For just $1,000 you can add a 5Mb system to your Apple II from Digital Equipment (not *the* DEC) of Alabama.

Then there is the Kaypro 10, which offers a 10M hard disk, with bundled software thrown in, in a system selling for $2,795. Naturally, all these inexpensive hard disk systems have brought out a rash of new streaming tape systems for back-up purposes, and these machines are down to $700 and less. And there are new devices like the incredible Disctron D-1100, which offers four thin-film disks and mini-Winchester heads that gives 111.5Mb of formatted storage for just $1,795 in manufacturer quantities.

Who needs 111.5Mb of storage anyway? Answer — all those who want to play the new wave of fully interactive colour animated video games, since video and megabytes are going to be the most natural marriage since words met processing.

Today's Tandy

Maintaining Tandy's recent record of roughly one new machine a week, the TRS80 Model 12 has started to appear in the shops.

Hot on the heels of the Model 100 and the Model 4, the Model 12 is a business machine in the sub-IBM PC class. With 80K of RAM, one or two built-in 1.25Mb disk drives, and an 82-key detachable keyboard, it will set you back at least £2,399.

Where the Model 4 is compatible with Model III software, the Model 12 will run Model II programs. It is Z80-based and runs TRSDOS 4.2. Basic is included in the package, and you can add Cobol, Fortran, Compiler Basic or assembler.

Visually it is unspectacular: a white casing around a green phosphor screen, with 24 lines of 80 characters.

Tandy is promising expansion features. The first is a 12Mb hard disk option — you can stack up four of these to run 48Mb off a Model 12. To help make sense of this capacity there is also a Model 16 upgrade kit, which will open the way for you to build the main memory up to 512K.

There is also a six-slot card cage for such optional extras as the high resolution graphics board.

The Model 12 with two disk drives costs £2,999. The first hard disk, if you want to add one, will cost another £2,999, and further hard disks are £2,299.

Tandy is in Walsall on (0922) 648181.

Free bites

If the Pacman still hasn't got you, Atari is out to catch you with the offer of a Pacman cartridge free with its 2600 Video Computer System. The system and cartridge will be combined in a pack due in shops about now, and it's worth noting that the price of the 2600 has come down in the process. The new price, £69.99, is a reduction of £20 — Pacman for the Atari costs £29.99.



Atari's Video Computer System now packs its own Pacman.

BBC counts

Business software for the BBC micro doesn't normally get much attention but HCCS is aiming to change that by offering a suite of accounting systems for BBC machines with disks.

The complete package will cost about £1,500. The software modules separately will set you back about £69, and there are six of them covering Invoicing and Sales Ledger, Purchase and Nominal Ledger, Payroll, Stock Control, and Order Processing.

HCCS is on 0767 317300.

DEC Pro prints on Epson

Owners of the DEC Professional should soon be able to link an Epson printer to their micro using a £143.75 interface card from Midlectron.

Midlectron claims it is the first time a DEC Professional can be used with a non-DEC printer, and the card will be available direct or through Epson dealers next week.

A DEC spokeswoman said that deliveries of the Professional were going according to schedule. She added: 'As far as we know, the Professional can't be used with any other non-DEC printer apart from the Epson. Our machine requires an 8-bit printer, whereas most printers are 7-bit.'

The Professional has an RS232 interface as standard with a second one available as an option — also optional are an RS422 or IEEE interface.

The new facility will be available direct from Midlectron or its dealers. The company can be reached in Belper on 077 382 6811.

16-bits and PCs race

By Ralph Bancroft

The London Computer Marathon, which is being judged by *PCN* and *Which Computer*, claimed its first victims when two privately entered IBM PCs hit problems and one of them had to be withdrawn.

The Marathon began on August 10 and was due to finish yesterday. Eleven machines began the race with the prospect of running a test program non-stop for a week, and it wasn't long before the pace began to tell on one or two of the runners.

But the biggest failure so far in the Marathon was the mains supply at the World Trade Centre. The start of the marathon had to be delayed by over five hours because of a power failure. The micros have been subjected to a rigorous test program that requires them to load 1,500 records from disk, carry out a sort routine and write the revised data on to a second disk.



And on the starting grid, Spartex's Roy Galloway with the ill-fated PC.

The program was devised by Richard King, *PCN*'s features editor. Each company was responsible for implementing the program in Basic on the machines that it entered.

At the end of the Marathon, the programs will be checked by Richard and the other judge, Colin Barker, editor of *Which Computer*, to make sure that the software was implemented consistently.

The IBM machines were entered by Spartex Micro, an IBM dealer. It stepped in when IBM decided not to enter a 'works' machine.

The first of the Spartex micros stopped shortly after the start because, says the company, a microswitch in one of the disk drives failed.



John Lamb with the latest Comart Communicator, a stayer that could come from behind.

The second machine came to a halt on Friday with a 'disk full' error message, and was restarted with a new disk.

The PC from Spartex has suffered since the start of the marathon (August 10) from a suspected program bug. It stopped every time it completed two passes of the test program.

Two other machines have also experienced problems so far in the seven-day test. One of the Wang Professional entries crashed at the start because of a faulty mains supply. The supply was quickly changed and the micro restarted.

One of the LSI machines went down on Thursday with a disk read error but was also soon restarted with a replacement disk.

At the half-way stage, the two Wang machines were well out in the lead. The LSI machines, which like the Samurais have 8in disks, were in a clear second place in terms of passes completed but scoring one black mark for the stoppage. The two Samurai micros entered by Micro Networks, which is sponsoring the Marathon, were next, having completed less than a quarter of the passes managed by the Wangs.



And they're off! Richard King (left), *PCN*'s features editor and Marathon judge, gets the race under way and the scrutineers run to start the systems.

Machine	Passes	Failures
Wang (11)	596	nil
Wang (10)	592	nil
LSI (1)	488	nil
LSI (2)	486	one
Samurai (6)	138	nil
Samurai (7)	138	nil
IBM (3)	61	see text
Olivetti (8)	70	nil
Olivetti (9)	70	nil
Comart (5)	40	nil
IBM (4)		withdrawn due to faulty drive

The table shows the number of passes made of the test program by the half way stage. The main purpose of the marathon is to test the reliability of the machines and this is reflected in the number of times each one stopped, shown in the second column.



Micro Networks' David Rayner arms the Samurai.



Iain Turner and the M-Four from LSI ready for the off.

MICRO MARATHON

***PCN* reports on the action . . .**



Martyn Longdon of Wang primes the early front-runner.

Timings recorded by independent scrutineers show that the remaining Spartex PC was fifth slowest of the six machines entered.

It was not far behind the two Olivettis, processing smoothly but displaying none of the advantages of their much vaunted 'bit power'.

Bringing up the rear was the single Comart Communicator, a long way off the pace.

The marathon is due to finish at Wednesday lunchtime and a full report and results will appear in next week's issue, following final checks to confirm the scores.



Olivetti's M20 psyched itself up at the back of the grid.

Crispin Thomas

Micros go for brokers

Insurance brokers should find themselves well catered for with the launch last week of a complete insurance system from Loxton Computers and a specially written software package for the Olivetti M20 from Mount Stuart Computer Services.

Loxton, a dealer for LSI computers, has based its system on the LSI M4 micro, and the £8,000 price tag gives you a printer, Wordstar/Mailmerge word processing system and five days' training from Loxton. The micro uses a 10Mb Winchester as well as an 8in floppy port and has 61 programmable keys with functions labelled in English.

Marketing manager Chris Roffey said: 'Most of the other things on the market are modified accounting packages. This will do brokers' accounts, keep track of and process all his forthcoming debit notes, and will print out renewals automatically whenever they are due, up to one month in advance.'

Meanwhile, a cheaper system, Olibroker, has been originated by insurance broker David de Laroque, managing director of Mount Stuart Computer Services, Cardiff. This program is aimed at small firms of insurance brokers and costs £2,300 with nominal ledger — £2,013 without. It runs on the Olivetti M20 which itself costs £2,750, setting you back £5,000-odd before you buy the printer.

On hard disk, it handles the accounting side of a brokers' business, prints cheques and will do word processing.

Olivetti has introduced interface boards so its electronic typewriters can be turned into printers when linked with the Olivetti M20. Alternatively, Mr de Laroque says a 1471 dot matrix printer is sufficient.

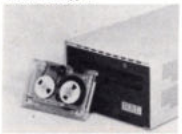
Loxton is on Snodland (0634) 243000 and Mount Stuart is on Cardiff (0222) 33736.

Winstream has it taped

Apple users with plenty of data to back up could be interested in Winstream 20, a streaming tape backup device with 20Mb capacity.

Stuart Hamilton, marketing manager of the maker, HAL Computers, said: 'If you're running a system, you don't have to worry about backing up to a floppy disk. You can copy all or part of your Winchester on to the tape, and it will also enable you to copy from one Winchester to another.'

Winstream 20: back-up for 20Mb of data from an Apple.



The product will be sold direct from the company for £2,070 and can be used on systems running the HAL Capricorn or Apple Profile disk drives, or for other systems using the right interface card.

The tape drive works at 30ins per second and all data is verified by a read-after-write check as it is written to the tape.

HAL is on Farnborough (0252) 517175.

CBM disk plan

Commodore has decided to get into disk drive production to reduce its reliance on 'third party' component manufacturers.

The company has formed a partnership with Mitsumi of Japan to launch a disk drive development and manufacturing venture.

The new company will start making 5¼in disk drives for the Commodore product range, and Commodore hopes it will be churning out 50,000 drives per month by next June.

Eventually Commodore hopes to utilise the developing vertical recording technology, and the new company will be heavily involved in its research and development. Vertical recording involves putting the magnetic impulses, which are conventionally laid 'end-to-end' along the recording surface, downwards into the magnetic coating. This means you can pack much higher densities onto the disk.

All this is a way up the track yet, but Commodore hopes the super density drives will be on the market by Christmas 1984.

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Software appeal

Unsatisfied users who buy faulty software can now air their grievances with the Guild of Software Houses (GOSH).

The organisation has been formed by a group of software houses which are members of the Computer Traders Association (CTA) (*PCN, Issue 22*). Nick Alexander, chairman of the group, said, 'We felt an organisation that worked along with the CTA would be a good thing. If somebody buys a cassette that doesn't work or has some kind of other problem they, now have someone to turn to — an organisation that has a bit of clout.'

GOSH has been set up by a number of leading software houses including Bug-Byte, New Generation, Quicksilva, Salamander, Silversoft, Softek and Virgin Games. All its members have pledged their support to a customers' charter.

The Guild's charter promises:

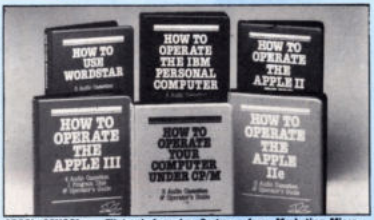
- Guarantee of a high standard of quality and reliability for its products. Faulty or defective merchandise will be replaced free of charge and despatched promptly.
- Deliveries will not exceed 28 days.
- Action on complaints about any products will normally be taken within five working days of receipt.
- Members do not advertise that products are available when they are not.

'GOSH will give consumers some sort of arbitration,' said Douglas Bern of Silvercroft. 'And if people see the Guild's logo on products then it gives some sign of approval.'

This type of set-up could be a major step towards regulating the software industry's conduct in some way. Not only will individual customers benefit from GOSH, there's a dealer charter for the trade as well. And a code of conduct for software producers themselves, covering the poaching of programs and programmers.

Any software house found to be in breach of the charter or the code of conduct will be fined or thrown out.

GOSH as a body will act to back up its guarantees, but its charter suggests that dissatisfied customers should use it as a second line of attack. If you have a complaint you should still tell the supplier first, and only later contact the Guild if the supplier doesn't come up with the goods. Its address is 71 Park Lane, Tottenham, London N17 0HG.



SPOOL SCHOOL — Fliptrack Learning Systems, from Marketing Micro Software, Ipswich, are an alternative to operating manuals and have been designed for first-time users of the CP/M operating system, the IBM PC, Apple II, Apple III, Visicalc and Wordstar/Mailmerge. They come in packs of three or four cassettes and let you learn by doing instead of reading. They can be bought direct from the company or from Apple or IBM dealers. Prices are £89.95 for the Apple III version, £45.95 for the Apple II, CP/M, Wordstar and IBM versions, and £62 for Visicalc or Wordstar/Mailmerge versions.

Big plans

The scope of business software has been extended to include businesses that are still only a gleam in the entrepreneur's eye.

Ashton-Tate, the company that has built its own business up successfully on dBase II, has produced Strategist for people trying to measure the potential of new products and services.

You can run Strategist on 8 or 16-bit systems using CP/M, CP/M-86, or MSDOS. It costs £250, for which you get a built-in suite of business models to simulate the development of your scheme. Strategist's output comes in the form of 44 graphs and three reports.

The reports deal with finance and marketing, depreciation and tax, and profitability. You can use the results extracted from the software as input to dBase II to customise reports, consolidations, and comparisons of strategies.

Ashton-Tate is on 0908 568866.

PERSONAL COMPUTER NEWS

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Xenix 3 binds mice

Mice, multiple users and Microsoft applications are among the features supported by an operating system launched last week by Logica.

The system is Xenix Version 3.0. Xenix is a commercial implementation of Unix System III, and Logica sees it primarily as a means of smoothing the upgrade path from a single to a multi-user system.

It represents one way at least of moving your system up from MSDOS — or PCDOS, in the case of IBM PC owners. According to Logica Xenix 3.0 will read from or write to MSDOS files and to the user it is 'identical in operation' to the interface used under MSDOS — hence Microsoft utilities and applications will run unchanged under Xenix 3.0.

But why should you go for Xenix when Unix is the word on everybody's lips? Logica's Gordon Kirk says that Xenix shields you from many of the complexities of Unix. 'Features such as the visual shell and mouse interface protect the user from the inner complexity, while the repackaging of the operating system gives access to all the tools he needs for application development,' he says.

Logica has already ported Xenix 3.0 to a number of MSDOS systems but its plans for future implementations show something of the way that a micro of modest scale could be built up into a multi-user system. It says that plans are well under way to apply Xenix 3.0 to the ACT Apricot. A spokesman pointed out that a hard disk system is not essential to run the OS.

The software comes in three parts: a time-sharing system holds the kernel and standard utilities; the software development system comprises compilers, a linker, C libraries and utilities; and the text processing system contains text formatters, macro packages, and less commonly used utilities.

Xenix 3.0 also includes networking capabilities designed to make it possible to link systems via serial lines.

The time-sharing element will probably cost about £600, and a full system might be £1,000. Logica will be supplying the first copies of the operating system to micro manufacturers in the next two weeks.



Gordon Kirk of Logica: sheltering users from the complexities of Unix.

Micro boom — it's a serious business

The personal computer is coming of age, as users move from games machines towards serious systems.

According to a survey carried out by Mintel the ultra-cheap micro's day isn't over yet, but the trend is towards more sophisticated machines. At the same time it expects that you'll shift from buying from stores like WH Smith in favour of shops that offer more expert advice.

Mintel predicts that sales of personal computers will reach 1¼ million this year, netting more than £200 million for the manufacturers. It goes on to say that in time the emphasis will move to peripherals, particularly disk drives, and software. It forecasts that Christmas 1983 will be followed by a software boom in January and February 1984 'as the owners of new machines expand their horizons'.

A feature of the report is the table which lists the retailers' shares of the micro business; it shows WH Smith well in the lead with 18 per cent and Boots, currently planning a blitz on micros (*PCN, Issue 25*), with a lot of ground to make up from its two per cent. The volume of goods being bought by mail order is dropping steadily.

The preponderance of home computers among sales of micros in this country leads the Economist Intelligence Unit (EIU), in another new report, to put the UK at the top of the European users' league. But in West Germany last year sales of units valued between £3,000 and £10,000 amounted to 16,000, compared to 10,800 in the UK.

The popularity of micros in the UK, it says, could have a great deal to do with the success of Sinclair in particular.



WARM AND HUSKY — DVW Microelectronics has repackaged its Husky portable to make it suitable for anyone using a micro in what it describes as 'flammable or explosive atmospheres'. The new model is known as the Husky IS (Intrinsically Safe). The Z80-based machine with 128 character LCD will sell from £2,099 for a 16K version to £3,144 for the 144K version. DVW is on Coventry (0203) 668181.

Fifth column for Spectrum

Spectrum users who have a burning desire to write fast action games but haven't the time to learn machine code can now look at Fifth.

Fifth is written in machine code and is an extension to Basic. It aims to provide you with useful graphics commands for moving characters and larger blocks around the screen with both smoothness and speed. You can therefore create your own space invader or Pacman in one of many colours, with the added boost of sound.

Running on the 48K Spectrum, Fifth needs only a small amount of learning if you already know Basic. The package costs £9.95 and will be available mid-September from Computer Rentals on 01-247 9004.

For a full review of Fifth see page 31, this issue.

Add-ons less

Two companies have slashed add-on prices. Data Efficiency has cut monitors and X-Data has dropped printer prices.

You can pick up the Kaga 12in green monitor for £114, a 12in RGB medium resolution monitor at £285 and high resolution and super-high resolution colour monitors at £350 and £435 respectively.

The monochrome monitors feature a non-glare tube as standard. The colour monitors connect to the Apple II or IIe by a separate interface card, and to other micros by a cable. These monitors are available from Data Efficiency on Hemel Hempstead (0442) 60155.

X-Data, on Slough (0753) 72331, has knocked down the price of the Microline family of dot matrix printers. Cuts of between seven and 16 per cent have been made and you can now buy a Microline 82A for £345, a reduction of £70.

Games galore

Texas Instruments users who are feeling neglected can look forward to three new games from Thorn EMI next month.

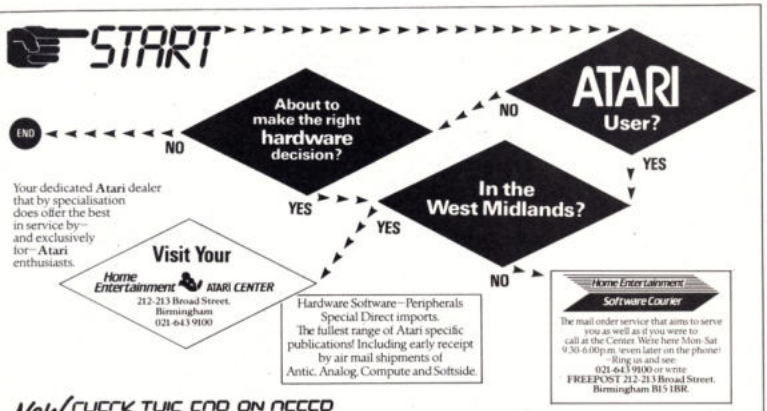
In Computer War you can practise saving the planet from nuclear obliteration — Vic 20 and Atari 400/800 owners will also be able to develop this useful talent, but for the TI99/4A there will also be River Rescue and Submarine Commander.

Due out for the Atari 400 and 800 machines this week is Major League Hockey,a game that needs 16K of RAM and joysticks to run. For the Vic 20 there is a Medieval Joust, which is not a reference to the system's marketing battle with the Dragon. Thorn EMI is on 01-836 2444.

The author of Quicksilva's highly successful Mined-Out has set up his own company; the first product is called Splat. It is for the 48K Spectrum and looks like an adventure game with a difference, and the company, Incentive Software, is offering £500 for the highest Splat score registered by January 14 next year. Incentive Software is on Reading (0734) 591678.

Another new company, Mogul Software, will release its first games next month. Called Crash, Shark, and Seeder, they are arcade games for the 48K Spectrum and the Commodore 64. Mogul is on 01-437 3156.

For the Oric, ZX81, and Spectrum, Vortex Software has produced Serpents Tomb. For the 48K Spectrum only it has Android Two, a successor to Android One. What price The Return of the Android next? Vortex is on 061-973 9580.



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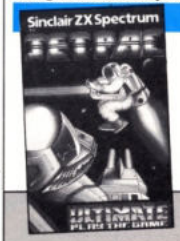


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PCN Charts

You've followed the micro charts — now here's the games top 30 compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets in the two weeks up to July 28 and, like the micro charts, do not take account of mail order sales.

The micro charts this week show the number of machines sold in the two-week period ending two weeks before publication date, so they tell the story in the high street



GAMES Top Thirty





			GAME TITLE	PUBLISHER	MACHINE	PRICE
►	1	(1)	Jet-Pac	Ultimate	Spectrum	£5.50
▲	2	(6)	Ah Diddums	Imagine	Spectrum	£5.50
▼	3	(2)	Penetrator	Melbourne House	Spectrum	£6.95
▲	4	(8)	Arcadia	Imagine	Spectrum	£5.50
►	5	(5)	Transylvanian Tower	Shepherd	Spectrum	£6.50
▲	6	(—)	Terror-dactyl 4D	Melbourne House	Spectrum	£5.95
▲	7	(—)	Trans AM	Ultimate	Spectrum	£5.50
▲	8	(10)	SS Enterprise	Silversoft	Spectrum	£6.00
►	9	(9)	Killer Gorilla	Micropower	BBC	£7.99
▲	10	(21)	Psst	Ultimate	Spectrum	£5.50
►	11	(11)	The Hobbit	Melbourne House	Spectrum	£14.95
►	12	(12)	Flight Simulation	Psion	Spectrum	£5.95
▲	13	(—)	Horace and the Spiders	Psion	Spectrum	£5.95
▼	14	(7)	The King	Microdeal	Dragon 32	£8.00
▲	15	(26)	Krazy Kong	Interceptor	Vic 20	£6.00
▲	16	(24)	Zenon 1	IJK	Oric	£5.50
▲	17	(27)	Horace Goes Skiing	Psion	Spectrum	£5.95
▲	18	(—)	Cookie	Ultimate	Spectrum	£5.50
▲	19	(—)	3D Tanx	DKTronics	Spectrum	£5.50
▼	20	(13)	Zaxxon	Datasoft	Atari	£29.90
▼	21	(15)	Timegate	Quicksilva	Spectrum	£6.95
▲	22	(23)	3D Combat Zone	Artic	Spectrum	£4.95
▼	23	(3)	Gridrunner	Llamasoft	Vic 20	£8.50
▲	24	(—)	Heathrow ATC	Hewson	Spectrum	£5.50
▲	25	(—)	Lazerzone	Llamasoft	Commodore 64	£8.50
▲	26	(—)	Chess	Psion	Spectrum	£5.95
▼	27	(18)	Miner 2049er	Big Five	Atari	£29.95
▲	28	(—)	Light Cycle	PSS	Spectrum	£5.95
▲	29	(—)	Attack of the Mutant Camels	Llamasoft	Commodore 64	£8.50
▲	30	(—)	Monsters in Hell	Softek	Spectrum	£6.95

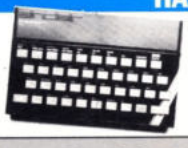
PCN Charts

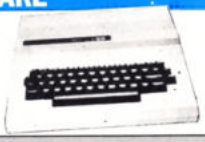
between June 14 and July 28.

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

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

HARDWARE





Top Twenty up to £1,000

▲	1	(2)	Spectrum	£99	(SI)
▲	2	(4)	Dragon 32	£175	(DR)
►	3	(3)	Vic 20	£150	(CO)
▼	4	(1)	BBC B	£399	(AC)
▲	5	(6)	Commodore 64	£299	(CO)
▼	6	(5)	Atari 800	£300	(AT)
▲	7	(11)	Newbrain A	£228	(GR)
►	8	(8)	Oric 1	£99	(OR)
▼	9	(7)	ZX81	£40	(SI)
▲	10	(13)	Lynx 48	£225	(CA)
▼	11	(9)	Atari 400	£150	(AT)
▼	12	(10)	TI99/A	£150	(TI)
▼	13	(12)	Colour Genie	£168	(LO)
▲	14	(15)	Tandy Colour	£240	(TA)
▲	15	(16)	Sharpe PC1500	£169	(SH)
▲	16	(17)	Apple 11e	£969	(AP)
▼	17	(14)	Epson HX20	£472	(EP)
▲	18	(19)	Sharpe MZ80A	£549	(SH)
▲	19	(—)	Aquarius	£99	(MA)
▼	20	(18)	Jupiter Ace	£90	(JU)

Top Ten over £1,000

►	1	(1)	Sirius 1	£2,754	(ACT)
►	2	(2)	IBM PC	£2,392	(IBM)
▲	3	(4)	DEC Rainbow	£2,714	(DEC)
▼	4	(3)	Commodore 8096	£1,374	(CO)
▲	5	(7)	Apple III	£2,780	(AP)
▲	6	(8)	Olivetti M20	£2,754	(OL)
▼	7	(6)	HP86A	£1,541	(HP)
▼	8	(5)	Osborne 1	£1,581	(OS)
▲	9	(—)	Televideo TS800	£2,220	(MI)
▲	10	(—)	Tandy TRS80 III	£1,299	(TA)

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Diagnosed! Garden gnome syndrome

After owning my first micro — a BBC — for some three months, I fear that I am developing the 'garden gnome' syndrome in that I have become convinced that it has a personality of its own.

After all, we show such emotions to our micros. Who among us can honestly say that they have never typed into the keyboard a rude word after the 25th error message has been displayed when trying to run your simple ten-line program?

Painstaking research to encourage a similar response from my micro has recently produced an unexpected result. I quickly abandoned such mundane, repetitive processes as forcing the machine to count backwards from 27,000,000 in steps of 0.01 — far from getting bored, it seemed to thrive on such trivia.

I almost abandoned my search when suddenly two events occurred which gave me further hope: I read a letter in a magazine from someone complaining that his machine, although otherwise faultless, was unable to spell its own name correctly on first being switched on. *Aha!* So they do have 'human' failings.

A few days later, after being trapped in the underground caverns of Acornsoft's Sphinx Adventure and repeatedly rubbing the lamp in the hope of summoning a genie, for the want of something better, I typed 'rub carrot', to which the machine replied 'You must be joking!' I was quite delighted with this response until I realised that it must be pre-programmed.

I felt, however, that I was nearing my goal of a true, machine-emotion response and, yesterday, I achieved it. My micro produced a completely human and unexpected reply.

I was drinking a cup of coffee and 'doodling' with the keyboard when I typed in:

AUTO 10,0.5

which asks the machine to automatically produce line numbers for a program in the unlikely steps of 0.5 instead of the usual 10.

Fed up with my aimless tinkering, its temper finally snapped and it replied with the single word:

Silly

Utterly crushed, I replied with 'Sorry' and switched off.

D N Gilpin,
Horsforth, Leeds

PS. This response appears to command AUTO 10,n for all values of n between 0 and 1, where the decimal point is preceded by a zero. I have not been able to elicit this reply by any other means other than PRINT "Silly" etc.

See also Pal2000, page 88 — Ed.

Errors in the Vic manuals

As a fellow 64 owner I wholeheartedly agree with Peter Chadwick's criticism of the 64 Users Guide *(Issue 21)*. However, if he thinks that is bad there are further surprises in store.

The Vic 1541 disk drive manual could not be less understandable or more confusing. Can manuals get worse?

Alas, there is yet more to come. The new Vic 1520 Plotter/Printer (very similar to the Oric MCP40 reviewed in PCN issue 21) contained no manual on receipt. Eventually a photocopied 'manual' was received. It was possible to understand the information in the manual once the gobbledegook had been transformed into correct written English. For example, 'Section 2: Preparating to use your Plotter Printer' and '6. Maintenance: We hope you don't have problems but just in come . . .' These are just two of literally dozens of errors.

It is possible to program the function keys with Simons' Basic, but other methods of programming these keys would appear to be one of Commodore's best-kept secrets. Simons' Basic is a worthwhile addition to the machine supplied with an excellent manual.

An ideal way of finding out more about the 64 is to join the National and/or Local Independent Commodore Products Users Group, which offer a wide interchange of information for Commodore users.

In spite of various restraints the 64 shows great potential, if only Commodore can get its whole act together.

N L J Silburn,
Henley-on-Thames, Oxon

Two messages for 64 users

A couple of weeks ago you published a letter of mine complaining in particular about the poor operating manual supplied with the Commodore 64, and giving examples of incomprehensible instructions.

A number of your readers have written to me with advice on dealing with the specific problems, and this has proved extremely helpful. I would like to express a 'thank you' both to them and to you.

The two messages which have come across loud and clear are that nobody expects to be able to program from the manual supplied with the machine: in order to use a Commodore 64 once you have purchased it, you need the further expense of purchasing the Programmer's Reference Guide. The second point is that several people have recommended membership of the Independent Commodore Product Users Group, and this I will certainly be joining.

The point remains that first-class computing equipment is spoiled by a bad operating manual, and the usefulness of a good range of equipment is spoiled by the difficulty of transferring software from one machine to the next.

Peter Chadwick,
Oldham, Lancs

How dare Commodore cut its prices!

Having read your article (*Sord cuts, PCN Issue 21*), I would like to congratulate the manufacturers of the Sord M5, not for reducing the price (all manufacturers are having to do this), but for allowing a concession of a free Basic-G language package to all original purchasers.

I have been a keen Commodore fan since the beginning. I bought one of the first Vic 20s and then upgraded to one of the first 64s. Needless to say both were purchased at the full original price. This means that in total I have paid approximately £200 for the privilege of being an avid Commodore fan.

I do understand that a manufacturer needs to recover the development costs for a machine, but surely this has already been achieved by Commodore sales of the Vic and 64 in the US.

Please do not assume that I am complaining solely about Commodore. All manufacturers seem as bad as far as price is concerned.

It is worth pointing out, however, that the original buyers provide the solid support for a manufacturer and if we continue to be badly treated then that support crumbles.

If Commodore and other manufacturers were to be seen to be looking after their true supporters in the way that Sord is then they can surely look forward to continued support.

Come on, Commodore, it isn't too late yet.

B Rushby,
Great Sutton, South Wirral.

I am a recent CBM 64 owner (April this year). I have followed, with ever-increasing anger, your reports concerning the proposed price reduction of Commodore from £345 to £229.

I can accept price fluctuations when retail outlets decide to promote a computer, presumably at some reduction in profit margin to themselves, but when the manufacturer decides to reduce the price, not

by £10 or £20, but by a massive £116, I find this totally unacceptable. I can accept that new technology may reduce the cost of manufacture. But by a staggering £116? It makes one wonder just what the profit margins are to computer manufacturers.

I have written to the managing director of Commodore (UK) Ltd and asked for a refund of £116. I wonder if I will be lucky?

I regret now that I hadn't waited four months, or better still, purchased a different make of computer altogether.

Any chance of more 64 programs in the near future?

Thank you for an excellent magazine and, despite *your* increase, it still represents good value for money.

A J Brown,
Devizes, Wilts

Where the chain falls short

The influx of home micros into the large retail chains will, I am reliably informed by various magazines, result in much lower prices for both hardware and software. However, it would seem to be a case of swings and roundabouts. What one may gain on price one must lose on service.

At the moment I have the use of my father's office computer, an Apple II, at weekends and occasionally on weekdays in the holiday. However, I am hoping to purchase a computer of my own in the £100-£250 price range.

In furtherance of this aim I recently went to a local chain store in Hammersmith to look at the Commodore 64, a computer which I had heard praised but knew little about.

I was greeted by a very polite, friendly young man who answered my questions about price etc very happily. But when asked about graphics I was greeted with the reply, 'Er, Yes. I think it has high resolution graphics. Er, I'll go and get you the manual.' (This turned out to be a rather uninformative document, although I did discover it had sprites.)

But the manual apart, this kind of service cannot be good for the shop or for Commodore or, especially, for the newcomer to computing who, faced with a dealer who seems to understand no more than him, is likely to decide that computers are above him and that his or her hard-earned cash would be better spent of a video system or hi-fi.

J White,
London W4.

Clean up your listings

I am a newcomer to the hobby of home computing but I would like to say that I have found your magazine both interesting and informative. I have recorded the ProgramCards you published for the game Ten Pin Bowling for the Spectrum and I am now going to record the Fruit Machine game.

I have found your software reviews very interesting and I am sure they will be helpful in building up a software library.

One thing I must ask, however.

Why do you (and other magazines as well, come to that), publish program listings in what I can only call pseudo-television-script. Your ProgramCards are generally quite good, but other listings — *eg*, the listing on page 14 of issue No 20 — are, to me, quite difficult to read.

Surely it is better to publish them in a form in which they can be easily read, while still retaining the uniform spacing 32 characters to the line — in the case of the Spectrum.

I have recently ordered a one-year subscription to your magazine, and I do hope that before my subscription runs out pseudo-television-script will be confined to the place where it belongs — the television screen.

J N Sharp
Godalming, Surrey.

We are setting rules to make sure all PCN's listings are easy to read, but there's little we can do about 'psuedo-television-script' for that's how it's printed and, to avoid introducing errors by typesetting the list, that's the way we use it. The 81's silver paper isn't a great help but we'll keep these programs as clear as possible — Ed.

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ROUTINE INQUIRIES

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All set to receive teletext

Q I don't own a computer yet but hope to buy one (probably a BBC micro) before the end of the year. Before that, I'm going to replace an old black and white TV with a colour one. In part 2 of the BBC Micropaedia it was suggested that the Newark Video Centre could supply Grundig sets, presumably with a modification, so that they could be used as monitors.

Obviously, I'd prefer to buy a set locally. Could my local TV repair man undertake the modification? I intend going the whole way and buying a set able to receive teletext. With this and the monitor modification, could I download programs from Ceefax without the need for expensive adaptors?

A J McDade,
Guernsey, Channel Islands

A Sophisticated TVs that do it all cause a lot of confusion but they are about to become standard issue. Many TV dealers are able to offer monitor adaptions to certain sets . . . talk to your local suppliers and see what they come up with. Better still, many sets are produced with monitor input (and usually teletext as well). These include models by Grundig, Normende and Panasonic, all of which have been used at one time or another around *PCN*'s hectic office.

The only traps with getting one of these sets is having the wrong sort of input and not having the relevant cables. The TVs will either be RGB input or composite video. Check which your micro produces.

Be careful of composite video outputs — some colour micros produce only a black and white (or nearly so!) composite video output.

Get those two matched up and then all you need to do is get a cable to join them.

Composite video is usually a standard cable — you may have one on your hi-fi. RGB leads are more complex and the shop which makes the cable up will need a diagram of the computer's output, which will be in the manual.

You'll probably find a teletext facility on a set with a monitor input. Unfortunately, it won't let you download programs. The teletext adaptor (if and when it gets uploaded into the shops) allows the micro to 'listen' to the teletext signal. This information can then be channelled through the machine onto the screen. A teletext set can pick up a teletext signal but there's no simple way the micro can get at it.

```
10 REM Peeker for Oric 1
20 REM Oric Basic, Aug '82, Max
21 GOTO 110:REM DO'P SUBS
22 REM
25 REM PRINT L AS HEX
30 H$=HEX$(PEEK(L),2):H$=LEFT$("0000",4-LEN(H$))+H$:PRINT H$;" ";:R
ETURN
40 REM PRINT PEEK(D+L) AS HEX
50 H$=HEX$(PEEK(D+L),2):H$=LEFT$("00",2-LEN(H$))+H$:PRINT H$
;" ";:RETURN
100 REM COMMANDS
110 PRINT:PRINT"Dump Edit Go Quit ";
120 INPUT A$:IF A$="" THEN 110
130 C$=LEFT$(A$,1):IF C$<"a" AND C$>"`" THEN C$=CHR$(ASC(C$)-32)
140 IF LEN(A$)>1 THEN L=VAL(MID$(A$,2))
150 IF C$="D" THEN GOSUB200
160 IF C$="E" THEN GOSUB300
170 IF C$="G" THEN GOSUB400
180 IF C$<>"Q" THENGOTO 110
190 PRINT "BYE !":END
195 REM DUMP
200 PRINT:FOR L=L TO L+15*8 STEP 8
210 GOSUB 20
220 FOR D=0 TO 7:GOSUB 50:NEXT
230 FOR D=0 TO 7
240 X=PEEK(D+L):IF X<128 THEN X=X-128
250 IF X<32 OR X>126 THEN X=46
260 PRINT CHR$(X);
270 NEXT:PRINT:NEXT
280 RETURN
290 REM EDIT
300 PRINT:PRINT"Enter new data.  Enter S to leave    unchanged ";
310 PRINT"Enter . to finish"
320 PRINT
330 GOSUB 50:D=0:GOSUB 50
340 INPUT A$:IF A$="." THEN 110
350 IF A$<>"S" THEN X=VAL(A$):POKE L,X
360 L=L+1
370 GOTO 330
390 REM GO
400 CALL L:RETURN
```

Figure 1 — a helpful introduction to machine code for Oric fans.

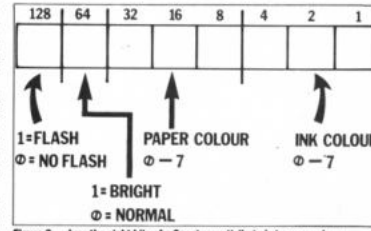


Figure 3 — how the eight bits of a Spectrum attribute byte are made up.

Monitoring the Oric

Q How do I get a machine code program to run on the Oric 1? I've got G P Stephenson's book on 6502 machine code and entered a program to fetch two numbers from different addresses, add them and store the result.

To enter the program, I typed in the machine code monitor in Vince Apps' The Oric 1 program book. However, I can't get the monitor to run the program and display a result. Can you advise?

Eugen Steiger,
Richmond-on-Thames, Surrey

A I'm afraid Mr Apps is being a bit hopeful when he describes an inefficient 26 line program to POKE numbers into sequential memory locations as a 'machine code monitor'. It seems to be 'written for budding programmers' to put them off, and apparently by a budding programmer.

At the very least, you need a program that will let you enter data into memory and look at it afterwards. You also need to be able to run your machine code . . . actually execute it. The simplest way in Basic is to CALL it at its start address. All your programs should end in an RTS (*#60*) so that the Oric returns to Basic at the end of the program.

If you are going to learn machine code on the Oric, you need a real monitor . . . that's one actually written in machine code. A package such as Orion from AWA Software is a good bet because it includes a full and standard 6502 assembler as well as all the usual tools.

But just as a quickie, we can probably get away with a Basic 'peeker' to show your addition example. Figure 1 is the sort of ten-minute lash-up that Mr Apps should have included in his book. Commands are entered as a single letter plus an optional address followed by Return. There are Q for quit, D *address* for dump memory in hex and ASCII, E *address* for edit memory and G *address* to actually run the machine code.'

Let's put the machine code at *#400*, an undersize (32 byte) but safe hole in the Oric's memory map. The program will look a bit like this:

```
0400 CLD
0401 CLC
0402 LDA $40C
0405 ADC $40D
0408 STA $40E
040B RTS
040C BRK
040D BRK
040E BRK
```

This adds *#40C* and *#40D* together and puts the result in *#40E*. The machine code looks like D8,18,AD,0C,04,6D,0D, 04,8D,0E,04,60,00,00,00. Enter this from location *#400* onwards. Store two numbers in *#40C* and *#40D* and use G to call the program. What no result?

The program doesn't print a result. It just puts it into location *#40E*. Use dump to have a look at it. With any luck, you've got your answer!

Confuser defined?

Q I own a 16K Spectrum and am confused by user defined graphics. I have found out that SCREENS will not work with UDGs but that ATTR must be used instead.

Could you please explain ATTR and the codes used with it?

Lee Overy,
Mold, Wales

```
1000 REM UDG SCREEN$
1010 REM
1020 REM set x & y & GOSUB here
1030 REM returns a$=char OR ""
1035 REM UDG A=32, UDG B=33 etc
1040 REM
1050 LET a$=SCREEN$ (x,y): LET c
harsl=PEEK 23606: LET charsh=PEE
K 23607
1060 IF a$="" THEN POKE 23606,PE
EK (23675): POKE 23607,PEEK (236
76)-1: LET a$=SCREEN$ (x,y): POK
E 23606,charsl: POKE 23607,chars
h
1070 RETURN
```

Figure 2 — this provides a modified SCREEN$ for the Spectrum.

A This whole area is a bit tricky to start with, but is worth getting to grips with. Starting from the very beginning, the Spectrum uses two areas of memory to 'remember' what's on the display.

The first is the 'display file' from locations 16384 to 22528. This is used as a 'bit-mapped' display — it stores graphic patterns and the *shapes* of any characters printed on the screen.

Hot on its heels is the 'attributes' area from locations 22528 to 23296. This stores the colour information associated with each character block on the screen . . . the INK and PAPER colours and whether the character is BRIGHT or FLASHing.

SCREEN$ looks at the display file and ATTR looks at the attributes. As you know, SCREEN$ returns a string containing the character at a particular position on the screen. Remember that the display file does not contain character codes — just the dot patterns that form each character.

So SCREEN$ works by comparing the dots in a particular character block with the character shapes stored in the Spectrum's ROM. If it finds a character it can identify, it returns it in a string. Unfortunately, SCREEN$ only looks in the ROM. User defined graphics are in RAM. So normally, SCREEN$ can't read them.

But it isn't right to suggest that it can't be done. A crude fix involves altering the CHARS system variable that tells the Spectrum where the character set is. The subroutine listing (figure 2) provides a modified SCREEN$ that checks the ROM characters followed by the UDGs. Any UDG found will return a string starting with CHR$ 32 for graphic A, CHR$ 33 for graphic B and so on. Crude but effective.

This is a bit slow. The dodge most people adopt is not to use SCREEN$ at all but to go for ATTR instead. This returns an attribute byte corresponding to a particular character block on the screen. It will tell you the INK and PAPER colours and the BRIGHT and FLASH settings for that character.

So the technique is to check for your space invader or whatever by looking for perhaps a green flashing character rather than using SCREEN$. The codes returned by ATTR are described in detail on page 88 and page 173 of the manual. Because it involves using individual bits of a byte, you would be advised to read the whole of appendix E before progressing.

The eight bits of an attribute byte are made up as shown in figure 3. So it contains the INK colour plus 8* the PAPER colour plus 64 if the character is BRIGHT, plus 128 if the character is flashing.

Try a few examples to convince yourself you can do it. A flashing red character on a green background would be 128 (flashing) + 2 (red INK) + 32 (8* green PAPER). So ATTR would return 162.

Try another? Suppose ATTR returned a value of 220. Describe the character. This is easiest if you write out the binary column headings:

128 64 32 16 8 4 2 1

and 'fit' the binary number underneath it. 200 in binary is

128	64	32	16	8	4	2	1
1	1	0	1	1	1	0	0

So the character is flashing, bright with green INK on magenta PAPER. Yuk! There are other ways of interpreting the bytes returned by ATTR. Have a little fun working out various ways.

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Explosions on the Oric can be made more dramatic with a little screen flicker. This can be done like this:

```
10 EXPLODE
20 POKE # BB80,24
30 WAIT 5
40 POKE # BB80,26
```

Try this in HIRES; the two POKEs should be 28 and 30.

J B Laverick,
Norton, Cleveland

```
0300- AD 30 C0 88 D0 04 C6 01
0308- F0 08 CA D0 F6 A6 00 4C
0310- 00 03 60 A2 00 BA 18 E9
0318- 01 D0 FC 0D 30 C0 E8 E0
0320- 64 D0 F2 88 D0 ED A0 A0
0328- 32 AD 30 C0 BE 00 E0 CA
0330- D0 FD 88 D0 F4 60 A0 10
0338- A2 E0 B6 18 E9 01 D0 FC
0340- 0D 30 C0 E8 E0 50 D0 F2
0348- 0B D0 ED 60 00 00
```

More sound for the Apple.

Wizz bang buzz on Apple

This machine code program provides four sound routines for the Apple II. From Basic, you can use them as follows:

Tone POKE 0,note: POKE 1,duration: CALL 768

Wizz POKE 788, note: POKE 800, type: CALL 787

Bang POKE 808, Dur: CALL 807

Buzz POKE 823, dur: POKE 825, type: CALL 822

The routine is given as a hex dump. To enter it directly, call the Apple's monitor with CALL-151. Then enter each line starting with 300: AD 30 CO 88 DO 04 . . . and so on. You can save the routine to disk with BSAVE SOUND, A$300,L$4C and use BLOAD to reload it.

Alternatively, by converting the bytes to decimal and storing them in a DATA line, you could use a FOR . . NEXT loop within a program to POKE them into place.

M Bowyer,
Southgate, London N14

```
5 REM DOUBLE HEIGHT ON THE 64
6 REM
7 REM CREATE CHARACTER SET
8 REM
10 POKE 52,48:POKE 56,48:CLR
20 POKE 56334,PEEK(56334) AND 254
30 POKE 1,PEEK(1) AND 251
40 FOR G=0 TO 255
50 POKE 12288+G*2,PEEK(53248+G)
60 POKE 12289+G*2,PEEK(53248+G)
70 NEXT G
80 POKE 1,PEEK(1) OR 4
90 POKE 56334,PEEK(56334) OR 1
200 REM
210 REM DEMO ROUTINE
220 REM
225 PRINT "□"
230 FOR G=0 TO 31
240 POKE 1024+G,G*2:POKE 55296+G,1
250 POKE 1064+G,G*2+1:POKE 55336+G,1
260 NEXT G
270 POKE 53272,(PEEK(53272) AND 240)+12
280 GET A$:IF A$="" THEN 280
300 POKE 53272,21
```

This program gives the 64 double-height characters.

Increase your 64's stature

The Basic program above allows double height characters

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to be used on the Commodore 64. After running this routine, use POKE 53272,(PEEK (53272) AND 240)+12 to access the characters. Use RUN/STOP, RESTORE or POKE 53272,21 to put things back to normal.

Each double height character is formed by putting one character on top of another. For example, a large A is formed by a B on top of a C. The second program will print out all the double height characters.

You can change the 53248 in lines 50 and 60 to alter the available double height characters. A value of 55296 gives lower case and 53760 produces double height graphics.

Martin Lightfoot,
Wersley, Manchester M28

Thinking INK for Spectrum

The Spectrum's INK and PAPER commands do not affect the whole screen until you clear it with CLS. Unfortunately, this erases your drawings.

This machine code routine affects the attribute change without ruining your picture.

The Basic loader puts the code directly below the UDGs. After an INK or PAPER, call the routine with RANDOMIZE USR 65339 (32571 for a 16K Spectrum — remember to alter the CLEAR statement in line 10). The assembly code is:

ld a, (23695)	jr jr z, DIS
ld d,a	ld b,32
ld hl,22528	ld (hl),d
ld c,22	inc hl
ld a,(23672)	djnz,DIS
ld e,a	dec c
ld a,(23672)	jr nz,DIS
cp e	

D J Fazackerley,
Cardiff, Wales

```
 5 REM instant INK & PAPER
10 CLEAR (65339-1)
20 FOR n=65339 TO 65339+25
30 READ r: POKE n,r: NEXT n
40 DATA 58,143,92,87,33,0,88
50 DATA 14,22,58,120,92,95,58
60 DATA 120,92,187,40,-6,5,32
70 DATA 114,35,16,-4,13,32,-19
80 DATA 201
90 REM RANDOMIZE USR 65339
100 REM 32571 on 16K machine
```

This program gives you more artistic scope on the Spectrum.

Spectrum enabled by table

Decoding the values returned by the Spectrum's ATTR function can be a little tiring. Just for development purposes, the table below should make it easy to look up which values will be returned by ATTR.

To use the table, select the row and columns for the correct INK and PAPER colours. Then pick B=0 or 1 for BRIGHT being on or off and F=0 or 1 for the FLASH attribute.

David R Parker,
Hemel Hempstead, Herts

INK		BLACK		BLUE		RED		MAGENTA		GREEN		CYAN		YELLOW		WHITE	
		0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7
PAPER		F=0	F=1	F=0	F=1	F=0	F=1	F=0	F=1	F=0	F=1	F=0	F=1	F=0	F=1	F=0	F=1
BLACK	0	B=0	000	128	001	129	002	130	003	131	004	132	005	133	006	134	007	135
	0	B=1	064	192	065	193	066	194	067	195	068	196	069	197	070	198	071	199
BLUE	1	B=0	008	136	009	137	010	138	011	139	012	140	013	141	014	142	015	143
	1	B=1	072	200	073	201	074	202	075	203	076	204	077	205	078	206	079	207
RED	2	B=0	016	144	017	145	018	146	019	147	020	148	021	149	022	150	023	151
	2	B=1	080	208	081	209	082	210	083	211	084	212	085	213	086	214	087	215
MAGENTA	3	B=0	024	152	025	153	026	154	027	155	028	156	029	157	030	158	031	159
	3	B=1	088	216	089	217	090	218	091	219	092	220	093	221	094	222	095	223
GREEN	4	B=0	032	160	033	161	034	162	035	163	036	164	037	165	038	166	039	167
	4	B=1	096	224	097	225	098	226	099	227	100	228	101	229	102	230	103	231
CYAN	5	B=0	040	168	041	169	042	170	043	171	044	172	045	173	046	174	047	175
	5	B=1	104	232	105	233	106	234	107	235	108	236	109	237	110	238	111	239
YELLOW	6	B=0	048	176	049	177	050	178	051	179	052	180	053	181	054	182	055	183
	6	B=1	112	240	113	241	114	242	115	243	116	244	117	245	118	246	119	247
WHITE	7	B=0	056	184	057	185	058	186	059	187	060	188	061	189	062	190	063	191
	7	B=1	120	248	121	249	122	250	123	251	124	252	125	253	126	254	127	255

Decoding values returned by ATTR is easier with the above table.

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Jessica Long hooks-up to a number of databases to see what the future holds for micros and videotex.

Videotex on view

Videotex is still something of an unknown quantity. Most people will tell you it is something to do with television, but its workings remain a mystery.

But think of a home computer, an Apple, Commodore, Sirius or Sinclair and there's a sigh of familiarity. Just a keyboard, screen and memory — pop in the right software and, Hey presto, instant entertainment.

The two technologies live side by side in the United Kingdom. Videotex is geared more to the business market (even though many domestic users receive Prestel or Ceefax or Oracle) while personal computers are very much consumer commodities. What the future holds for both is the elimination of the gap between consumer TV (Prestel), home computing and business computing.

But it is important to see how these two technologies fit together.

Videotex is a communications medium, combining three ingredients: telephone, TV and computer. These work together to transmit and display information to the user, who controls what is seen on the screen with a hand-held keypad or keyboard.

Basically, videotex systems use TV equipment to display computer-based information, which is brought to the screen via a telephone line or broadcasting channel. Probably the best known form of videotex is Prestel.

GPO pioneers

This service is also the oldest form of videotex. It was pioneered by the Post Office, now British Telecom, and the result was the world's first nationwide public fact supplying service.

Domestic users can access Prestel on the TV by just pressing a few buttons on the keypad. Each videotex terminal, or TV set, is connected to a computer database through the telephone line. The terminal will automatically call the computer when the user presses the 'phone' button on the keypad and the telephone number directory held in the terminal's own memory ensures that logging onto the chosen computer is automatic.

This means that connection is made quickly and the user is then free to select the information required from a list of options, or menu, which is flashed up onto the screen. There are 200,000 pages of information in Prestel, and the user is able to select any one of these pages using the keypad. No technical knowledge is needed, and the system provides helpful comments as part of the menu routine.

Although Prestel is one domestic application of videotex it's mainly used by private companies who need information systems tailored to their own requirements. Videotex terminals can be connected to three types of systems. Prestel is a public system but a second type of system, known as PLAK (public look alike), provides a more economical fact-finding alternative to the public service.

Super-videotex is the third option. It grew up out of a need by companies to have a tailor-made private information service. The difference between this system and the other two is that it can be integrated with other information and communication services the company may already have. Because it is not a dedicated videotex system it can function as an electronic office system.

Videotex has five basic functions: information, networking, education, entertainment and finally, but most important for the future, local processing: the convergence of videotex with personal computing. This will be the beginning of what is rather unappealingly called Human Interface Technology. Apart from sounding like a quote from George Orwell's *1984* this refers to systems already in use like Prestel, the foundation of the home information systems of the 1990s. In other words, the age of everyman's computing.

Home terminals

In their simplest form, home videotex systems will be stand alone personal computers with user friendly databases attached to them. These will in many respects resemble such viewdata systems as Prestel. They will be especially useful for users who want information not available on public viewdata systems, but who can't afford the facts and figures available on private systems.

When everyone has a home terminal, the need for a method of networking the equipment will be obvious. Users would be able to use this to plug into each other's systems and have access to a full range of computer-stored information.

The reason all this hasn't happened already is simple. Videotex was invented by the Post Office as a consumer telecommunications product and service. The system was successful, but its success was technology-orientated and not driven by consumer requirements.

But this was not the end of the story. British industry recognised a good thing



when it saw it, and the idea of the public service took a back seat while private manufacturers took the technology and adapted it for business use.

This was both the strength and the weakness of videotex. Its strength was that the business market saw how videotex was more than just a consumer product, and could also be integrated with concurrent technologies and developed with them to form part of a network of communications.

The business market changed the initial idea of relying on the telephone network, which is expensive, and used local area networks to link the videotex terminals. This was cheaper and it also meant that by sharing facilities and sending data off in batches, or packets, communications networks could be better than they had ever been before.

Local area networks have been around a long time, and they will have an influence on the home market because the costs of electronic products are falling.

A 'Home Bus Standards Association' has recently been established, and three of its members are Matsushita, Sony and Texas Instruments. Philips is also climbing onto the bandwagon with the recently published proposal for a Digital Domestic Bus aimed at defining interconnect standards for TVs, VCRs, videodisks and stereo audio equipment.

Already people are plugging personal computers into television for entertainment, so the next question has to be, how long before we can use the full potential of the technology now at our fingertips?

The answer depends on how quickly videotex enters the home. This issue hinges on other consumer telecommunication concepts.

The problem is that individually, the services may appear of dubious financial attraction to the manufacturers that will make all this possible. In aggregate, using common equipment and transmission services, they begin to look very interesting.

Manufacturers who are at present producing modems and networking facilities could perhaps have the answer to our problem of linking the various domestic services. It may not be long before personal computer users are 'on-line' to other users tapping data bases and public information networks.

British Telecom has already created a vision of the future, at Milton Keynes, where they have used fibre-optic technology (pulses of light carrying information at high speed down fibres of glass) to provide a small number of new homes with exceptional entertainment facilities, including pay-TV and Prestel.

Fibre-optics may be the way of the future, how to get there we should look at technology today. The business market was the first to tap videotex and the idea of the multi-tasking terminal, so perhaps the technological answer lies in industry.



The videotex handsets of the future will be highly user-friendly, uniting telephone, TV and micro in a multi-tasking terminal. Users will have access to a number of commercial database services, along with mail, banking, shopping, business and other facilities.

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Three programs by Brian Cadge show how to use the Dragon's interrupt to enhance its capability.

Learn to interrupt

What exactly is an interrupt? The 6809 cpu at the heart of the Dragon 32 (actually a 6809E — an improved version) has several interrupt pin connections. The 'Fast interrupt' and 'Non maskable interrupt' are both used in connection with the expansion socket. The 'Interrupt request' line (known as IRQ) is the one you can use. When a signal is on this pin, the processor jumps to a special program called an interrupt routine. In the Dragon 32 the IRQ pin is connected to the PIAs (interface adaptors), which produces an IRQ 50 times a second.

The obvious use for this is in timing. The only built-in use is for the TIMER function (this is why the value returned is in 50ths of a second) and also for timing in the PLAY command.

The address in memory to which cpu goes for an IRQ is held in locations 269/270; this normally points to the above ROM routine. But by changing it to point at RAM with your own routine in it, the IRQ is at your disposal. The important thing to remember is to send the processor to the ROM routine afterwards, otherwise the timer stops and the PLAY command plays for ever.

Now to some uses of the IRQ. I should stress that these are only three examples of useful routines; the possibilities are endless, especially as part of a game program (regular joystick check, for example).

The Dragon's keyboard lacks an auto-repeat facility. The first listing gives this feature. When a key is pressed, if it is held down for more than one second the key will autorepeat until released. This not only has the obvious advantages in normal typing, but also gives a *real* INKEY$ function.

To enter the program, type in the Basic listing and RUN it. The program checks for errors in the data statements and stops if any are present. All the programs are listed in Basic data statements and also in the assembly language source code so that you can examine how they work.

The initialisation routine, in all cases, adjusts loc. 269/270 to point to the routine starting at @INT and the last instruction executed is a jump to 40253 — the ROM IRQ routine.

The Dragon 32 uses locations 65280 and 65282 in its I/O map for the keyboard. When a keyboard scan is called, it stores the results of the scan in locations 337 to 345. If the result is the same as what is already there then it knows that the key hasn't been released. A zero value is then returned, hence no autorepeat. This routine detects whether a key has been pressed. If it has, it starts to count to 50 — one second. If the key is still pressed the repeat sequence begins. This checks that the key is still pressed and if it is it resets locations 337 to 345 in line 150, so that the

KEYBOARD AUTOREPEAT (Basic loader program)

```
20 CLEAR200,32599
30 FOR I=1 TO 84:READ A$:Z=VAL("&H"+A$):POKE 32599+I,Z:CS=CS+Z:NEXT
40 DATA 8E,7F,65,8F,1D,D7,7F,AB,7F,7F,AA,39,7D,7F,AB,26,1F,B6,FF
50 DATA 0,8A,C0,81,FF,26,5,7F,AA,20,2F,7C,7F,AA,B6,7F,AA,81,32
60 DATA 25,25,B6,FF,B7,7F,AB,20,1E,7F,FF,2,B6,FF,0,8A,C0,81,FF,26
70 DATA 5,7F,7F,AB,20,D,8E,1,51,B6,FF,5F,A7,85,5C,C1,8,23,F9,7E
80 DATA 9D,3D,12,12
90 IF CS<>9768 THEN PRINT"DATA ERROR":END
100 EXEC 32600:PRINT"AUTOREPEAT INITIALISED"
```

KEYBOARD AUTOREPEAT (Disassembled listing)

```
7F58                    20      PRT
7F58                    25 *KEYBOARD AUTOREPERT
7F58 8E7F65             30 @INIT LDX #@INT    GET START OF ROUTINE
7F5B BF0180             30      STX 269       STORE IN IRQ VECTOR
7F5E 7F7FAB             30      CLR @REPT     CLEAR REPT FLAG
7F61 7F7FAA             30      CLR @COUNT    CLEAR COUNTER
7F64 39                 30      RTS           RETURN TO BASIC
7F65 7D7FAB             40 @INT TST @REPT     REPEATING SEQUENCE IN PROGRESS
7F68 261F               40      BNE @GO       IF SO JUMP TO IT
7F6A B6FF00             50 @TEST LDA 65280    GET KEYBOARD ROWS
7F6D 8AC0               50      ORA #128+64   NO REPERT ON ENTER ETC.
7F6F 81FF               60      CMPA #255     ANY KEY PRESSED
7F71 2605               60      BNE @PRESS    IF SO GOTO PRESS
7F73 7F7FAA             70      CLR @COUNT    CLEAR TIME COUNTER
7F76 202F               80      BRA @END      JUMP TO END
7F78 7C7FAA             90 @PRESS INC @COUNT  INCREMENT COUNTER
7F7B B67FAA             100     LDA @COUNT    CHECK COUNTER
7F7E 8132               100     CMPA #50      IS IT 1 SECOND
7F80 2525               100     BLO @END      IF LESS THEN JUMP TO END
7F82 8EFF               110     LDX #255
7F84 7F7FAB             110     STX @REPT     SET REPEAT FLAG
7F87 201E               110     BRA @END      JUMP TO END
7F89 7FFF02             120 @GO CLR 65282     CLEAR COLUMN REG
7F8C B6FF00             120     LDA 65280     GET KEYS ROW
7F8F 8AC0               120     ORA #128+64   NO REPERT ON ENTER ETC.
7F91 81FF               130     CMPA #255     ANY KEY PRESSED
7F93 2605               130     BNE @DEC      IF SO GOTO DEC
7F95 7F7FAB             140     CLR @REPT     CLEAR REPT FLAG
7F98 2000               140     BRA @END      GOTO END
7F9A 8E0151             150 @DEC LDX #337     START OF KEYS STORE
7F9D 86FF               150     LDA #255
7F9F 5F                 150     CLRB
7FA0 A785               150 @RESET STA B,X    RESET LOCATIONS
7FA2 5C                 150     INCB
7FA3 C188               150     CMPB #8       FINISHED
7FA5 23F9               150     BLS @RESET    IF NOT THEN LOOP AGAIN
7FA7 7E9D3D             160 @END JMP 40253    JUMP TO ROM IRQ ROUTINE
7FAA 12                 170 @COUNT NOP
7FAB 12                 180 @REPT NOP
7FAC                    190     END @INIT
```

FLASHING CHARACTERS (Basic loader program)

```
20 CLEAR200,32599
30 FOR I=1 TO 78:READ A$:Z=VAL("&H"+A$):POKE 32599+I,Z:CS=CS+Z:NEXT
40 DATA 8D,88,27,5D,26,7,8E,9D,3D,8F,1,D,39,CA,40,F7,7F,9D,8E,7F
50 DATA 71,8F,1,D,39,7A,1,46,26,1E,B6,1,47,B7,1,46,8E,4,0,A6
60 DATA 80,1F,89,81,7F,9D,27,F,80,40,81,7F,9D,27,9,8C,6,0,25,EB
70 DATA 7E,9D,3D,C8,40,E7,1F,20,F2,12
80 IF CS<>6748 THEN PRINT"DATA ERROR":END
90 DEF USR=32600
100 POKE 327,25
```

FLASHING CHARACTERS (Disassembled listing)

```
7F58                    20      PRT
7F58                    25 *FLASHING CHARACTERS
7F58 8D8827             30 @START JSR 35623   GET USR VALUE IN B
7F5B 5D                 40      TSTB          IS IT ZERO
7F5C 2607               40      BNE @BEGIN    IF NOT GOTO BEGIN
7F5E 8E9D3D             50      LDX #40253    ROM IRQ ROUTINE
7F61 BF0180             50      STX 269       RESET VECTOR
7F64 39                 50      RTS           RETURN TO BASIC
7F65 CA40               60 @BEGIN ORB #64     GET ASCII CODE
7F67 F77F90             60      STB @STORE    SAVE CODE IN MEM
7F6A 8E7F71             70      LDX #@FLASH   START OF ROUTINE
7F6D BF0180             70      STX 269       SET IRQ VECTOR
7F70 39                 80      RTS           RETURN TO BASIC
7F71 7A0146             90 @FLASH DEC 326     DECREMENT COUNTER
7F74 261E               90      BNE @RET      IF NOT ZERO RETURN
7F76 B60147             90      LDA 327
7F79 970146             90      STA 326       RESET COUNTER
7F7C 8E0400             90      LDX #1024     START OF SCREEN MEM
7F7F A680               100 @LOOP LDA ,X+     GET CHRS
7F81 1F89               100     TFR A,B       LET B=A
7F83 817F90             110     CMPA @STORE   IS IT RIGHT CHAR
7F86 2708               110     BEQ @CHANGE   IF SO GOTO CHANGE
7F88 8040               120     EORA #64      INVERT CHAR
7F8A 817F90             120     CMPA @STORE   CHECK AGAIN
7F8D 2700               120     BEQ @CHANGE   IF SO GOTO CHANGE
7F8F 8C2600             130 @CMP CMPX #1536   END OF SCREEN
7F92 25EB               130     BLO @LOOP     IF NOT THEN LOOP
7F94 7E9D3D             140 @RET JMP 40253    JUMP TO ROM IRQ
7F97 C040               150 @CHANGE EORB #64  INVERT CHAR
7F99 E71F               150     STB -1,X      STORE ON SCREEN
7F9B 20F2               150     BRA @CMP      GO BACK INTO MAIN LOOP
7F9D 12                 160 @STORE NOP
7F9E                    170     END @START
```

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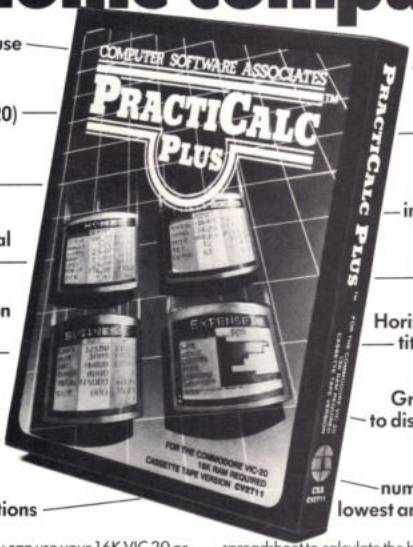
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Dragon thinks the key has been released and so autorepeats.

It is possible to control which keys repeat by the instruction ORA in lines 50 and 120. As it stands, all keys, including shifted characters, will autorepeat except ENTER, CLEAR, and BREAK which could cause havoc if repeated. Also the SHIFT key on its own must not cause repeat to start. It is necessary to clear the column select register — loc. 65282 in line 120 to achieve a constant repeat.

You may have noticed that all the routines listed are relatively short. This is important as the interrupt must not overrun its allowed time or the machine slows to a halt.

The second example is used to flash characters automatically. Typing: X = USR0(n) where 'n' is the ASCII code of the character to be flashed, will start any of these characters on the screen to flash until another user call is made. IF 'n' is zero all flashing stops and the routine is not executed until another user call is made. The effect can be very useful especially in menu or title displays. Graphics characters (codes above 128) can also be flashed — the colour will alternate.

The way in which the routine works is very simple. Lines 30 to 80 handle the USR command and disable or enable the flash routine as required, and the character to be flashed is stored in @STORE.

The main routine searches the screen for the character and inverts any found. The rate at which the characters flash is controlled by loc. 327. A value of 50 causes them to change once a second, 25 twice a second and so on. Values less than 10 aren't recommended as the Dragon begins to slow down. Note that the ROM call in line 30 to loc. 35623 returns the value in the USR brackets into the 'D' register. This routine needs to be called in any USR call which requires a value. Also note that although USR0(n) works, if you wish to use 1 to 9 you must use the correct syntax which is not in the manual — *eg*, X = USR#1(n).

The final example program is the usual use for interrupt routines on any micro, that is to give an on-screen digital clock. When you enter the hours, minutes and seconds you must enter two digits, *ie*, if the time were 7 minutes past 3, you would enter 03, 07, 00 to the three prompts. During any cassette input/output, *eg*, saving or loading a program, timing is critical so the IRQ is disabled, consequently the clock stops until the cassette has stopped. Theoretically, the clock should be accurate to 1/50th second. In practice the IRQ is not that accurate and so the clock gains or loses a second or two every hour. The effect will depend on the particular version of your Dragon.

A final word on interrupts. The ROM routine can be disabled by typing:
POKE 65283, PEEK(65283) AND 254
and enabled by:
POKE 65283, PEEK(65283) OR 1
This stops the timer and so allows you to cheat at timed games providing they have no PLAY commands.

As mentioned earlier, the FIRQ is used for the cartridge. Typing:
POKE 65315, PEEK(65315) AND 254
allows you to insert a cartridge without it auto executing. However, it is *not* recommended to insert a cartridge with the power on.

NEXT WEEK Machine code screen dump routines



DIGITAL CLOCK (Basic loader program)

```
20 CLEAR200,32599
30 FOR I=1 TO 67:READ A$:Z=VAL("&H"+A$):POKE 32599+I,Z:CS=CS+Z:NEXT
40 DATA 8E,7F,5F,8F,1,D,39,7A,7F,F7,26,22,86,32,B7,7F,F7,8E,7F,FF
50 DATA 6C,84,A6,84,81,A,25,12,6F,84,30,1F,6C,84,A6,84,81,6,25,6
60 DATA 6F,84,30,1E,20,E6,8E,7F,F8,10,8E,4,0,A6,80,8B,30,A7,A0,8C,7F,FF,
23,F5,7E,9D,3D
70 IF CS<>7445 THEN PRINT"DATA ERROR":END
80 PRINT"ENTER HRS":GOSUB 200
90 POKE 32760,A:POKE 32761,B
100 POKE 32762,10
110 PRINT"ENTER MINUTES":GOSUB 200
120 POKE 32763,A:POKE 32764,B
130 POKE 32765,255
140 PRINT"ENTER SECONDS":GOSUB 200
150 POKE 32766,A:POKE 32767,B
160 EXEC 32600
170 END
200 INPUT X$
210 IF LEN(X$)<>2 THEN 200
220 A=VAL(LEFT$(X$,1)):B=VAL(MID$(X$,2,1))
230 RETURN
```

DIGITAL CLOCK (Disassembled program)

```
7F50                    20      PRT
7F50                    25 *DIGITAL CLOCK
7F50 8E7F5F             30 @INIT LDX #@INT      GET START OF ROUTINE
7F53 BF0180             30      STX 269         STORE IN IRQ VECTOR
7F56 39                 30      RTS             RETURN TO BASIC
7F57 7A7FF7             40 @INT DEC 32759       DECREMENT 1/50TH COUNTER
7F62 2622               40      BNE @DIS        IF NOT ZERO DONT CHANGE TIME
7F64 8632               50      LDA #50         RESET COUNTER
7F66 B77FF7             50      STA 32759
7F69 8E7FFF             60      LDX #32767      GET ADDRESS OF SECONDS
7F6C 6C84               70 @TIME INC ,X         INCREMENT IT
7F6E A684               70      LDA ,X
7F70 810A               70      CMPA #10        IS IT TEN
7F72 2512               80      BLO @DIS        IF LOWER GOTO DISPLAY
7F74 6F84               90      CLR ,X          RESET TO ZERO
7F76 301F               90      LEAX -1,X       GOTO NEXT DIGIT
7F78 6C84               90      INC ,X
7F7A A684               90      LDA ,X
7F7C 8106               100     CMPA #6         IS IT SIX
7F7E 2506               110     BLO @DIS        IF LOWER GOTO DISPLAY
7F80 6F84               120     CLR ,X
7F82 301E               120     LEAX -2,X
7F84 20E6               120     BRA @TIME       DO AGAIN
7F86 8E7FF8             130 @DIS LDX #32760     START OF DIGITS
7F89 108E0400           140     LDY #1024       START OF SCREEN
7F8D A680               150 @PRT LDA ,X+        GET NUMBER
7F8F 8030               160     ADDA #48        ADJUST TO ASCII
7F91 A7A0               170     STA ,Y+         DISPLAY ON SCREEN
7F93 8C7FFF             180     CMPX #32767     FINISHED
7F96 23F5               190     BLS @PRT        IF NOT GOTO PRT
7F98 7E9D3D             200     JMP 40253       JUMP TO ROM IRQ ROUTINE
7F9B                    210     END
```

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*Operating system 1.0+

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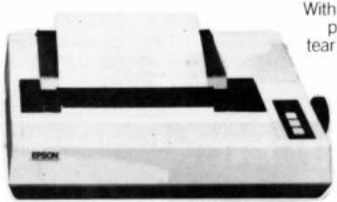
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T/Maker III doesn't wake you up with a piping hot spreadsheet, but John King finds it's an all-rounder.

T/Maker: multifunction management on IBM

T/Maker III doesn't make the tea for two. It is a word processing, data processing and file management single program package aimed at the beginner and the seasoned user.

It is made by the T/Maker Company in Virginia, and is marketed by Lifeboat Associates. There are other products coming through soon, and it will be interesting to see if the company comes up with a Visiclone spreadsheet. The concepts used here are closer to Micromodeller.

The set-up used here was an IBM PC — two disk drives are essential, with a minimum of 300K. There are a few idiosyncracies in this variant, but they are quite well covered by the bright yellow addendum sheet.

Features

As stated the T/Maker has a variety of uses: the manual splits into six main sections. It begins with word processing then moves on to the electronic spreadsheet, list processing, graphs, data transfer and general file management. The middle four are the group referred to elsewhere in the manual as 'data processing'.

The power and flexibility regularly pushed by the blurb is attained by the availability of using all these options on the same bundle of data at, to all intents and purposes, the same time.

The intro to the manual says that these six types of use are really only variations in suitably sticking together some of the 36 or so key command words. Sadly there is no quick reference guide to what these mere three dozen keywords are, but it's easy to track them down through the manual (and you can learn quite a bit at the same time.)

A more detailed look at these seems to show some gaps, but these are later filled by other commands.

The following commands are explained in detail in each relevant part of the manual.

WP: EDIT ALIGN PRINT
Spreadsheet: COMPUTE CLEAN COMBINE
List: ARRANGE FIND REPLACE DROP KEEP MATCH SORT TALLY
Graph: BAR
Data Transfer: LOAD UNLOAD
File Management: CLIP CREATE DATA DELETE DO FILES GET INFO
Others: INSERT LIST MERGE NOTABS RENAME RESET SAVE STOP TABS WAIT (GOTO)

Almost any spreadsheet or word-processor routine will use many of the file management and data transfer codes. There is no limit on mixing these keywords.

Presentation

The packet came from Lifeboat in a big cardboard box which eventually revealed two diskettes, one big manual and one heavy card quick reference booklet. Both these were in glossy black with a series of spectrum stripes across the cover. On the latter, the page tags and the colour patches went by the same order on each page — rather a neat trick. One petty point: if this had a backrest to lean on while getting to know the package it would score an extra bonus mark.

The software for the IBM comes as two diskettes, one for immediate use and a second with demo files and a customisation program. Unlike Lotus 123 and several other programs of this class, it is possible to copy the system disk (although it did need a call to Lifeboat to get it right.)

30 ▶



The Printer's Prompt

The Print command brings the "Printer's Prompt" to the screen.

NEXT PAGE 1 (YES.SCREEN.NO.GO.QUIT)?

One of the following answers should be given:

Answer	Result
Y	Prints the page on paper.
S	Prints the page on the screen. The printing may be stopped temporarily (and re-started) by touching the spacebar.
N	Skips the page. The Printer's Prompt appears for the next page.
G	Pre-answers all following Printer's Prompts with *y*.
Q	Terminates printing session.

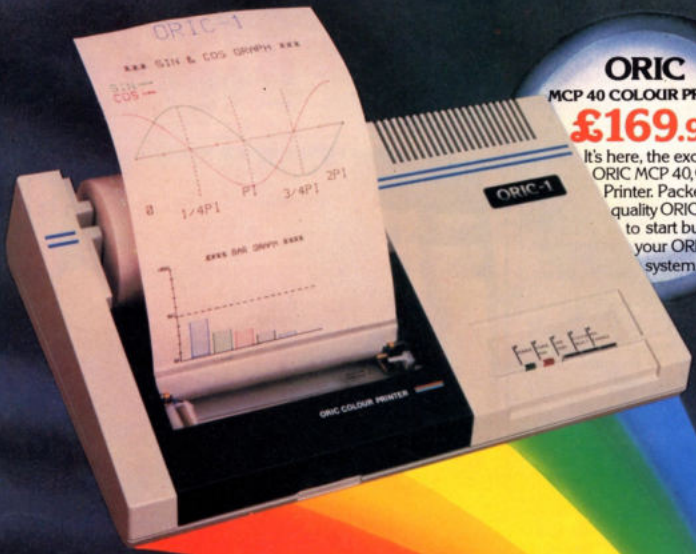
Design Commands

Design Commands carry out a number of editing functions. They are inscribed into the file but are not printed.

Design Commands always begin with a period in position one. Keywords in Design Commands (e.g., ***single***) may be abbreviated to their first three letters (***sin***).

A sample of the documentation.

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◀ 27

Getting started

This is quite straightforward, although there was the problem in getting a back up copy of the system disk. Once aboard the tea-trolley, the training course and the demonstration showed the basic habits necessary for using the main parts of the system.

The manual contained, among its nearly 300 pages, a back-up chat show on the tutorial. This could have been aimed a little higher, but is presumably targeted at the first-timer with some brains rather than at the hardened user/reviewer.

The manual is helpful, but there are both underlaps and overlaps between it and the 14-page quick reference booklet. I often find an even smaller A4 folded card cribsheet is useful but there is none in the package.

The demo is easy to get at but the first screen is a worrysome sight. The bottom three lines begin with:

1/1 WHAT NEXT? wait find III wait 56/22 wait /1 clean etc etc

This apparent gobbledygook occurs on every screen. During the first few pages you go from panic to irritation to ignore — not the best way to begin.

There are also typographical errors in the demo, and there is no excuse for these in a professionally prepared package.

The demo also has an irritating habit of hiccuping — *ie* scrolling a page two or even three times before holding. There is presumably a reason — perhaps something to do with embedded command words.

Lastly the demo doesn't tell you on the screen how to exit, let alone how to get at the main system program. The manual seems to want you to go all the way back to the PCDOS prompt A> (which it refers to throughout as A:). It may be that they want to give you a break while you make the T — but it's very tiresome the first couple of times until you have worked past it.

In use

The word processor was the first piece to be checked out. This is not, like more and more of this type, a menu-driven operation. But it is easy to use. This review was all written on T-Maker with no great difficulty. One minus point is the lack of a word count.

The screen formats are reasonable and can be called up at any time. Whether or not they are adequate for everyone is always a matter of opinion; but they could certainly be improved. For instance, it is always useful to have some idea of the number of lines or words done so far without going through a sequence of button-belting.

Similarly I find, admittedly after prolonged exposure to menu driven programs, that this is not so quick to use. One of the more tiresome points of this T/Maker III is the need to write so many of the commands out in full.

The method for putting in comment lines is to preface them with the characters . . . Hi Jack or at least . . . Hi (both tedious and kitsch).

The Electronic Spreadsheet is a different beast altogether. A major point is that it needs a very different type of analysis of the available input and of the desired output to get the required result than is used on a Visicione. The structure used here is NOT the 'text/value/formula related cell' common to so many others.

The method used is based on simple mathematical chains written, like ordinary sums, either horizontally or vertically. This is not to say that the version here is at all difficult to use, merely that you have to think rather more than the manual might imply. It is, however, not so easy to make changes to a file as might be thought likely in a 1982 generation number-cruncher.

The list processing facility contains several features that are new to me — particularly the command MATCH. This is a great help in producing exception reports and suchlike. There is one apparent weakness in that the sort is assumed to apply to the whole of the specified column or columns as opposed to a selected block within such a set of data.

The graphics section is quite limited in comparison with other graphics extensions to spreadsheet packages. This one only allows a variety of bar charts. However the depth and complexity of most data can become radically easier to understand when limited by such a constraint — that is to say management find it quicker to look at a well designed picture than at 27 pages of printout

Verdict

For an office-user there are a number of concepts which appear at first glance to be very specialised, rather far from ordinary day-to-day needs and probably of doubtful value. Actually it ain't that bad. T/Maker can do a lot of number-crunching and data manipulation without a disproportionate effort on the part of the user.

The word processor is pretty good, in fact it is so easy to learn that it is the best part of the package. It almost, but not quite, merits full marks for value. In comparison with other WP programs it does have some limitations but these are not that drastic for humdrum clever-typing. The list processor is a useful and worthwhile facility.

Spreadsheet is much more a matter of getting used to it. The graph is, within its stated limits, quite useful. The underlying file management and data transfer routines are by implication perfectly satisfactory.

It will be interesting to see whether the manufacturer comes out with an improved version (which should be well worth getting) or whether the next step is a series of related programs.

In the latter case they will be improving the tea-set without improving the tea!

RATING

Features	■■■■■
Documentation	■■■■■
Performance	■■■■■
User interface	■■■■■
Reliability	■■■■■
Overall value	■■■■■

Name T/Maker III **Applications** General office routines including wp, spreadsheet, bar charts. **Price** £155 **Publisher** T/Maker Company, PO Box 6430, Falls Church, VA22046 **System** IBM PC **Format** Disk **Other versions** CPM80/CPM86/MSDOS **Outlets** Lifeboat Associates, PO Box 125, London WC2. 01-836 9028.

Arcade games programming in Spectrum Basic? Ted Ball enters the Fifth dimension . . .

Change up to Fifth

You can write arcade style games in Basic but unless the game is very simple it is likely to be too slow to be worth playing. The usual solution is to write the game in machine code or a faster high-level language like Forth.

Fifth is an extension to Spectrum Basic that provides commands specifically designed for graphics and games programming. It makes it easier for you to write the programs and gives you moving graphics at a speed that is otherwise impossible without machine code.

Features

The most important and most useful part of Fifth is the facilities it provides for moving graphics. It allows you to create moving objects on the screen. Once the objects have been created they will continue to move without needing any further program instructions.

The objects are created in groups or types by the command OBJECT (name), (number), where (name) is a string used to name the group and (number) is the number of objects in the group. You also have the commands USE and ALL to specify whether to move one only or all of the objects in a group and PRINT and COLOUR to specify the character used to represent the objects in a group and the colour they are shown in. VECTOR and SPEED set the direction and speed of movement, and MOVE sets the initial position. The only limit to the number of groups and the number of objects in each group is the amount of memory available.

The objects are moved by Fifth independently of Basic by using the interrupt system of the Z80 microprocessor in the Spectrum. Interrupts are normally used only by machine code programmers working at the hardware level. When you are using a high level programming language you usually don't need to know anything about interrupts. However, in Fifth two objects colliding, or an object going off the edge of the screen, are treated in a similar way.

In order to detect collisions or objects going off the screen you use the commands INTERACT (line-number) and LIMIT (line-number), which give the line number of a 'service routine' which is called when the appropriate condition occurs. A service routine is similar to a subroutine but the call to the service routine can occur at any point in the program. Within these routines you have special commands INTPARAM and LMTPARAM that tell you which objects have collided or which object has gone off the screen.

As well as the commands for moving graphics there are a number of functions that allow you to obtain current information about the object's position, speed, direction, etc.

There are also two separate commands that are useful for moving graphics: GET, which stores a rectangle from the screen into a string variable, and PUT, which restores a previously saved rectangle to the screen. These can be used for moving graphics because a rectangle does not have to be put back in the place from which it was taken.

There is a limitation in Spectrum Basic which prevents you from changing colours over the whole screen at once. Fifth includes commands to overcome this limitation. TEMPS is used to define colours, without changing anything on the screen. FILL changes all the colours on the screen, and REPLACE changes one specified colour into another.

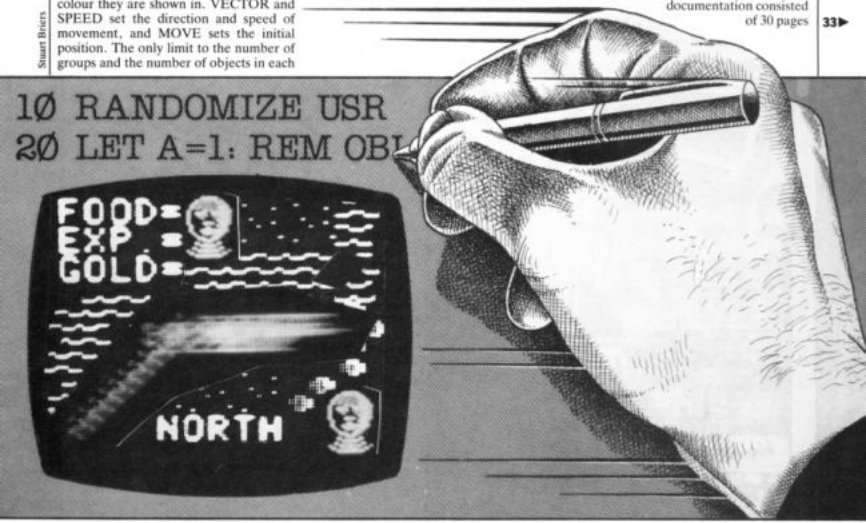
Fifth also has a command LARGE which allows you to print large characters on the screen. The characters can be any size from the normal character size up to 32 columns wide by 22 rows high.

Sound effects are an important part of games, but in Spectrum Basic all you can get is simple beeps. Fifth includes a SOUND command that allows you to produce more varied sound effects by rapidly changing the pitch.

Presentation

The advance copy provided for review was recorded on an ordinary cassette. The documentation consisted of 30 pages 33►

Stuart Briers



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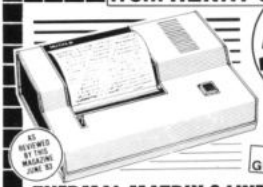
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photocopied from a typed original. However, Computer Rentals does package its programs properly and the production version should have a clearly labelled cassette and a printed instruction booklet.

Getting started

There is a lot to learn before you can use Fifth properly, and although the information is all given in the instructions, it is not laid out very well and much of the detail is not explained clearly.

The instructions go through the commands one at a time describing what they do and giving some short example programs. This format is useful to give you an idea of what can be done with Fifth, but it is difficult to find the details you need when you come to write programs for yourself. Important details that apply to a number of commands are explained under the first command that uses them and are not mentioned in the explanation of later commands. For example, details of the format for the parameters needed in the Fifth commands are given under SOUND but it is not clear that this format applies to all commands that require parameters and not just to the SOUND command.

The instructions really need to be rewritten to make them useful for reference, with an index and a separate section giving precise details of the overall syntax of Fifth and the syntax for the individual commands.

In use

When you write a program with Fifth you have to mix its commands with Basic. A Fifth command goes into a REM statement with parameters usually being passed by single letter numeric variables. For example, to set up 10 space invader figures you would start with something like:

```
100 LET a=10: REM OBJECT invader, a
```

There are some minor inconsistencies in the syntax but these are fairly easy to remember. The most important inconsistencies are that the LARGE command is not followed by its parameters. Instead it takes its parameters from the variables x,y,t,w and a$. You can use a string variable to hold the name of an object type in most commands but not in the OBJECT command itself. You can write:

```
100 LET a=10: REM OBJECT invader,a
110 LET a$="invader": REM ALL a$
```

but not:

```
100 LET a=10: LET a$="invader: REM
    OBJECT a$,a
```

There are also some inconsistencies in whether you can use a space or a comma between the object name and the next parameter. In some cases you may use either but in other cases only a comma is allowed.

The limited syntax for parameters in Fifth commands does mean that you need to include quite a lot of supplementary Basic in order to use it. As well as having to use LET statements to pass a constant parameter to a Fifth command, calculations have to be carried out in ordinary Basic and the result passed to Fifth command in a single letter variable. With only 26 variable names available you may need to re-use some of the names in a large program. This could cause problems unless you are very careful to keep track of the variable names and where they are used.

However, the ease with which you can produce smooth moving graphics and have several objects moving rapidly on the screen at once makes these limitations less important.

Reliability

Fifth has extensive error checking. There is one important difference from Spectrum Basic, in that Fifth does not check the syntax when you type in a line. Thus, if you have made a mistake you will not find out until the program is run and Fifth tries to execute the invalid command.

The only case I found where it will accept and execute an invalid command was with PRINT. The form for a Fifth PRINT command is:

```
REM PRINT (name),(character)
```

So the command:

```
REM PRINT invader, a
```

would cause all 'invader' objects to be printed as the letter 'a'. However, anything following the character is ignored and no error message is given. For example, you might try:

```
LET a$="x": PRINT invader, a$
```

to set the invader objects to the letter 'x', but it would actually set them to the letter 'a'.

The only other bug I could find was the effect it has on the LLIST and LPRINT commands. If you try to LLIST a program after it has run, the first line does not come out on the printer, and if you include LPRINT statements the first line of output does not appear on the printer.

Verdict

Fifth provides an excellent set of commands for programming arcade type games and makes it easy for you to write fast moving games in Basic. The few bugs are very minor and are unlikely to cause you any problems. The documentation does contain all the information you need to write programs in Fifth, but it is badly laid out and really needs to be rewritten to separate the reference and explanatory parts.

Fifth is a very useful extension to Spectrum Basic and I recommend it highly.

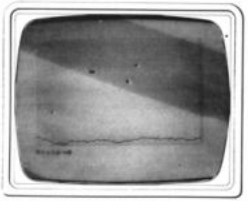
RATING

Features	■■■■■
Documentation	■■■■■
Performance	■■■■■
User interface	■■■■■
Reliability	■■■■■
Overall value	■■■■■

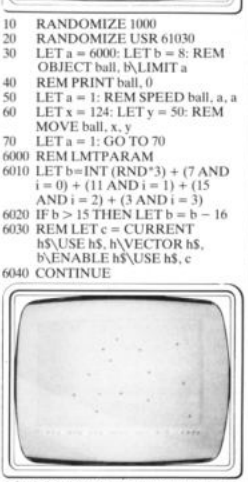
Name Fifth **Application** Games programming language System 48K ZX Spectrum **Price** £9.95 **Publisher** Computer Rentals Ltd, 140 Whitechapel Road, London E1, 01-247 9004 **Format** Cassette **Language** Machine code **Outlets** Mail order and High Street stores from mid-September.



```
10  RANDOMIZE 1000
20  RANDOMIZE USR 61030
30  FOR a = 0 TO 255
40  PLOT a, 0
50  DRAW OVER 1; 255 - 2*3, 175
60  NEXT a
70  FOR a = 0 TO 175
80  PLOT 0, a
90  DRAW OVER 1; 255, 175 - 2*a
100 NEXT a
110 PAUSE 50
120 PRINT PAPER RND*7; INK 9
130 REM FILL
140 GO TO 110
```



```
10   RANDOMIZE 1000
20   RANDOMIZE USR 61030
30   LET a = 6000: LET b = 8: REM
     OBJECT ball, b\LIMIT a
40   REM PRINT ball, 0
50   LET a = 1: REM SPEED ball, a, a
60   LET x = 124: LET y = 50: REM
     MOVE ball, x, y
70   LET a = 1: GO TO 70
6000 REM LMTPARAM
6010 LET b=INT (RND*3) + (7 AND
     i = 0) + (11 AND i = 1) + (15
     AND i = 2) + (3 AND i = 3)
6020 IF b > 15 THEN LET b = b - 16
6030 REM LET c = CURRENT
     h$\USE h$, h\VECTOR h$,
     b\ENABLE h$\USE h$, c
6040 CONTINUE
```



Sample of the kind of games programming possible with Fifth.

If you're in a spin over printers, Ian Scales will straighten you out with the lowdown on daisywheels.

Wheels revealed

Daisywheel printers are designed to copy the output of good-quality typewriters. This is especially important in business correspondence where dot-matrix output, though readable, has yet to achieve the acceptance of the typewriter. People are used to typewriter-style text while its dot-matrix counterparts are more commonly associated with electricity bills and bank statements.

Whatever the reasons, daisywheel printers are still an important segment of the computer peripherals market, and they're likely to be with us for some years yet.

Far from fading out, there have been a couple of notable daisywheel printer releases over the past couple of months which have broken new price/performance ground. Manufacturers, it seems, are tailoring the products to be more price-compatible with the computers they serve. After all, who wants to buy a computer for a few hundred pounds and then have to spend more than twice as much on a printer to go with it.

There are now a number of high-quality daisywheel printers around £500, four of which have recently featured in *PCN* Peripherals Pro-Tests. Here we round up the Juki, Smith Corona, Triumph Adler and Brother HR 15 printers and compare their features side by side.

Mechanics

A daisywheel printer stamps a fully-formed character shape through a ribbon and onto paper in the same manner as a typewriter. Instead of using individual print arms, however, all the characters are on a single wheel made up of small print arms radiating from the hub — giving it the appearance (if you have enough imagination) of a daisy.

The printer continually rotates the wheel back or forth. When the required letter arrives at the 12 o'clock position it is quickly struck through to the paper by a small hammer mechanism. The entire assembly (hammer and wheel) moves across the length of the paper as opposed to the carriage moving as in a conventional typewriter.

In many ways, the cost involved in manufacturing a daisywheel printer as opposed to a dot matrix, reflects the disadvantages of trying to merge an old concept with a new technology. Not only does a daisywheel printer tend to cost more because of its reliance on a multiplicity of precise mechanical components, but it is also slow and inherently inflexible.

Unlike alternative methods of getting marks on paper you are generally limited to a set number of characters. To change character sets you have to change daisywheels. It also means that you can't generate graphics or easily change typestyles or sizes within a page. All this means little if you want a printer to turn out letters and high-quality documents. But it's definitely worth bearing in mind if you can see yourself wanting to branch out to other applications.

Most daisywheels communicate with their host computers through a Centronics parallel interface. If your computer's I/O limits you to, say, an RS 232 serial interface it is worth bearing in mind that having to switch interfaces on either the printer or the computer is likely to cost extra.

Speed

The thing to consider is the volume of text you are likely to want to put through in a day, or, perhaps more importantly, how quickly you require each document to be printed.

The less costly daisywheel printers achieve their economy at the expense of speed — they are very slow. For applications which

Triumph Adler TRD 170S

The Triumph Adler TRD 170S comes at the top of this round-up price-wise. A few months ago a £723 plus VAT daisywheel was a pretty good buy, but now there are other similar-featured printers on the market.

The TRD is rated at 16 cps. It has the bonus of a wide range of daisywheels available and a wide range of pitches which can be chosen by the user.

The ribbons are available in fabric, carbon or multistrike carbon. As an added bonus the ribbon carrier has a lever to set the amount of ribbon transport to suit the pitch of the wheel being used.

Paper loading is easy and accurate and there is little noise generated by the printer and its fan.

On the minus side the control codes offered are sparse and there is a tendency for the first character on the line in 'double-strike' mode to be off-centre.

Product Triumph Adler TRD 170S daisywheel printer **Price** £725 plus VAT **Interfaces** choice of Centronics, Qume parallel, RS232 and Diablox emulation **Extras** Optional tractor £125 plus VAT, mechanical sheet feed £595 plus VAT **Distributor** Triumph Adler (01) 250 1717.

Brother HR15

The Brother HR-15 is a very solid, 'ownable' sort of printer. At £540 plus VAT it offers a bumper package of features in exchange for a very slow speed of 11 cps.

To compensate for this it has a 2K buffer (expandable to 5K) and an automatic 'copy' function so you can leave it to churn out multiple copies while you use the computer to do something else.

It has a full range of control functions available through a full set of dip switches (easily accessible at the rear of the machine) and a comprehensive range of control codes.

Printing features include proportional spacing, auto-underline, shadow or red print. Parallel Centronics and RS 232 interfaces are both standard and the printer is very quiet.

There is also a wide range of wheels in 10,12 or 15 pitch. The ribbon and wheels are very easy to change. The HR 15 has the added bonus of a sheet feeder at the relatively low price of £220 plus VAT.

Product Brother HR 15 daisywheel printer **Price** £540 plus VAT, Tractor feed £80 plus VAT **Interfaces** RS232 and Centronics parallel. **Distribution** Thame Systems (084) 4215471.

Smith Corona TP1

The Smith Corona TP1 is a 'no frills' model costing £485 plus VAT. It comes with either Centronics or RS 232 interfaces and the idea of 'either/or' is continued in pitch choice. You must specify whether you want a 10 or 12 pitch model. Friction feed comes as standard and there is a friction operated tractor upgrade available.

Cost-cutting exercises include the elimination of dip switches. There is a single switch to set the printer into 'top of form' mode or 'normal' mode. Line spacing is set with a lever, like a typewriter.

Changing the ribbon and print wheels are simple exercises and the manual is clear and concise.

This printer is only capable of 12cps but it is not bi-directional or logic seeking and because the print-head transport uses a rack and pinion system it is very noisy. The ribbons and wheels, however, are cheap: at £2 and £7.50 respectively.

Product Smith Corona TP1 daisywheel printer **Interface** Centronics or RS232 Speed 12 cps **Price** £485 plus VAT **Contact** Smith Corona (01) 965 7766.

Juki 6100

The Juki represents the major price breakthrough with its retail price of £399 plus VAT. On price/performance considerations it would appear to be the best buy in the round-up.

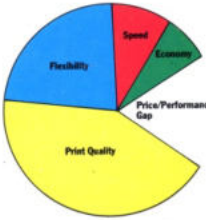
With a print speed of 17 cps it operates in 10, 12 or 15 pitch modes, with an added proportional spacing option.

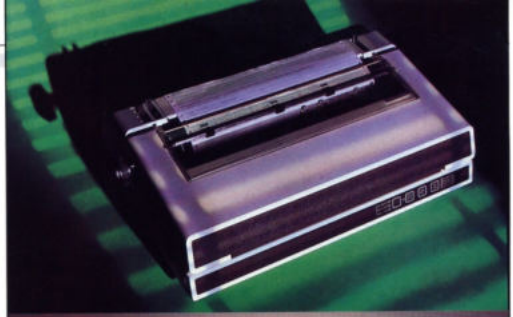
There is a useful 2K buffer which enables you to down load about 2 pages of text and use the computer for something else.

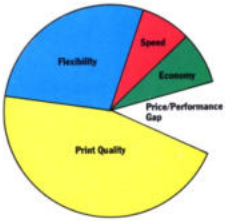
The ribbon is an IBM type and can be a bit mucky to install, although for economy it uses top, middle and bottom in turn. There is a wide range of control options available, both from a 10 dip switch panel and a comprehensive number of control codes.

On the minus side however, the manual is a little confusing in places and the mechanism produces a rather irritating whining noise. Juki as a company is a newcomer to the UK market. It would therefore be wise to seek assurances on spare parts availability.

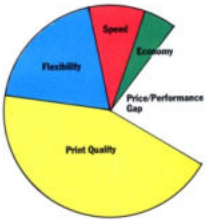
Product Juki 6100 daisywheel printer **Interface** Centronics parallel **Price** £399 plus VAT **Manufacturer** Juki **Contact** Microperipherals (0256) 54057.


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require a large volume of output but have a long lead-time — you know what you want to print and when you need it by (form letters for instance) — you only require to be well organised. Here a sheet feeder can pay dividends.

If you want to produce one-off letters in a reasonably short space of time it can be a remarkably irritating procedure, especially if you want to work on the computer to do something else.

In this situation a spooler can be a valuable aid. The spooler acts like a large buffer. The computer quickly down-loads the contents to the spooler which then feeds the text to the printer as it needs it. This enables you to get back on the computer again while your text is printing out. The trend in computer products generally is for the cost of micro-circuitry to fall dramatically in relation to the more static cost of mechanically-based components.

Spoolers have therefore become viable for a slow daisywheel, especially as the alternative method of getting your computer to spend less time looking after the printer is to buy a faster printer — costing at present two to three times as much.

The ease with which you can feed in the paper (assuming you aren't going to buy a mechanical sheet feeder) has a direct bearing on its speed. It's also important that it feeds in straight first time. If feeding in a sheet usually involves a manual realignment because the press-button 'top of form' function feeds it in crookedly then there's not much point having one in the first place. The same applies to the ease with which you can replace the ribbon and daisywheels.

Noise is another thing to watch out for. Daisywheel printers vary considerably from brand to brand in the racket they make. Sound can be generated from the drive method of the printing mechanism in addition to the expected tap-tapping from the daisywheel itself. As these printers are so slow it's worth remembering that you are likely to have to put up with extended periods of (hopefully) background noise.

Flexibility

The printer's flexibility is another important criteria. First make sure you can get a full range of daisywheels. It is useful to have a varying number of pitch options. The pitch relates to the number of characters per line. By combining different-sized characters and pitches it is remarkable the different textual effects you can create. A normal range of pitches could offer you 10, 12 and 15 (characters per inch).

Have a good look at the manual. The way the printer is controlled to set such things as page length, pause between pages and so on is normally set up by a set of 'dip switches'. These are a row of small on/off switches — configuring the switches to combinations of on or off enables you to permanently set the printer to work the way you require it. The directions for setting the dip switches should be clearly explained in the user manual.

A second level of control commands is usually available to set such features as underlining, shadow or bold printing. The commands to set these features into the text often have to be sent down from the computer as 'control characters'. Make sure the printer has all the features you are likely to require.

Last but not least, pay special attention to the level of support offered from the dealer. Can it be fixed quickly if it breaks down? Printers are as prone to a good old fashioned breakdown as any mechanical device.

Questions you should ask

It's always useful to have the questions ready to fire at the dealer before you get your printer home and discover them for yourself.

Compatibility If the interface isn't the same as the one on the computer get an assurance on how much money a change involves. The same applies to your word processing package: will it work without an endless amount of fiddling about with control codes?

Speed Try and determine the 'real' speed of the printer. If the machine can run in bi-directional mode, this increases the speed considerably; as does logic seeking where the printer doesn't waste its time tracking over white space at the end of a short line of text.

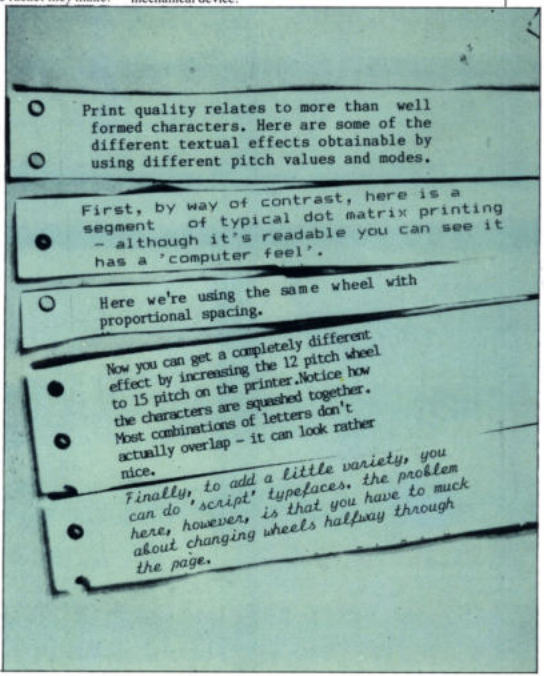
Cost If you are likely to need a sheet feeder, get an assurance on price and availability. Consumables are also an important factor. Do a calculation on ribbon life and cost and print wheel cost and include it in the equation — all this can add up. If you don't regard yourself as a business, remember about VAT.

Noise Remember you have to live with it.

Carriage width If you're likely to need wide output make sure the carriage is wide enough. If you don't, don't pay for features you won't use.

Flexibility Ask to see the range of print wheels. Remember you will probably want different sizes as well as styles.

Documentation This is more important than it sounds. There is nothing more frustrating than a manual that doesn't make any sense. Have a good pore through it in the showroom.



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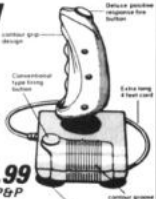
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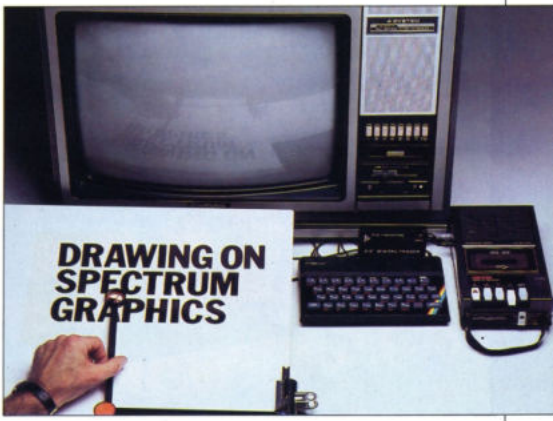
Evaluation form
Authors Name
Address
Computer
Game Name
Cassette enclosed YES NO

PCN 18 8

The RD Digital tracer opens doors to graphics tracing with Spectrum. Trevor Jones reports.

Screen tracer

Product RD digital tracer **Host computer** 48K Spectrum **Price** £55 incl. VAT **Contact** RD Laboratories Ltd, 20 Court Road Estate, Cwmbran, Gwent NP44 3A8, Cwmbran (06333) 74333. Telex 437240.



Until the technology of the man-machine-interface catches up with what is depicted in science fiction, we will be limited to the more usual input devices for communicating with computers.

When executing tasks that are not numeric or textual the limitations of the standard keyboard soon become apparent. The problem worsens when you try to enter freehand sketches or graphics into the micro. Most people make life a little easier by using some form of joystick or graphics tablet.

An inexpensive alternative method is to use a digitiser to measure the position of a tracing head and turn this information into a discreet digital value which can be manipulated by the micro. The RD digital tracer is such a device. It can be used for graphics creation, or Computer Aided Design if you prefer.

The RD digitiser consists of a base and two pivoted arms which move the two potentiometers that are used to sense the position of the tracing head. The potentiometers are connected to the electronic interface which is housed in an empty cassette case covered in black plastic tape. The unit plugs into the back of the Spectrum and is input/output mapped, therefore data acquisition is fast.

There are four other programs provided which can be merged with the main draw routine. Scale is the first of these. This program allows you to translate your shape left, right, up or down. The shape can also be scaled up or down as well as perform multicombinational operations, such as move left, increase size and invert.

The retrace routine allows you to trace an outline, save it and alter it later. The x,y coordinates can also be used by the user in his programs. These coordinates are a representation of the pattern traced out on the screen.

User defined graphics may be created, used and displayed simultaneously as other traced shapes on the screen, although the graphics facility would be used before tracing.

Features

The background and foreground colour can be changed to any one of seven colours. Circles, semicircles, rectangles, straight lines, right angles and single points can be plotted easily by using the various control codes. Outlines of intricate shapes, such as maps, can be drawn and shaded in with two different types of patterns; you can also colour in the shapes that you have drawn.

Text can be incorporated onto the graphics display in one of three modes:—normal, inverse, or flashing.

Presentation

The tracer arrives in a container that bears more than passing resemblance to a shoe box. It was certainly robust enough to protect the unit, even if it was a little bland in colour.

The user manual is a 24 page affair which details how to connect up the system, and the various facilities offered. The manual did not pose any great difficulty in terms of understanding how to use the system.

An installation template and a tracing sheet was also provided.

Getting started

The digitiser is easy to use; all that has to be done is to push the 22 way adaptor onto the back of the Spectrum expansion port. Connections for the rest of the system are just as easy. Once the television and the cassette recorder are plugged in and you have loaded the control program, you can start to explore the potential of the digitiser.

In use

It's almost child's play to draw circles and rectangles using this system. All you have to do is specify the position of the start coordinate and the end coordinate, then your required shape will be drawn for you by pressing the appropriate control keys. To paint or shade in the areas drawn is just as easy, and the background colour can be changed without halting the program and reloading it.

The documentation stated that this digital tracer was suitable for computer aided design. However, I was not too impressed at the quality of some of the lines. Some trial and error was called for while trying to determine the right speed at which to move the tracer's head to prevent wobbly lines.

In the scale mode you soon realise that you don't get something for nothing. When you magnify an object you tend to lose out on the object's definition, conversely if the screen's display is reduced to a suitable level you can draw intricate details with reasonable accuracy.

One point that I felt was missing is the ability to use a pencil or similar device in conjunction with the tracing head. This would have made such things as copying maps that much easier.

Creating unique graphics certainly proved useful as I was able to create my own circuit symbols and use them in the main draw program. It was not possible to merge all the programs to be used at once on a 16K Spectrum, but on a 48K machine this posed no problem as there was ample RAM for user application or further subroutines that would enhance the supplied software. When trying to merge the programs they did not always merge at the first or even the second attempt.

Verdict

This digitiser offers an inexpensive method of creating graphics directly on the screen.

Overall the system provides a very comprehensive set of functions which proved easy to use. It also operated satisfactorily apart from the slight problem while trying to merge certain programs. Apart from this the hardware and software features of the system along with ease of use makes it a worthwhile investment.



The Laser 200 is a bit like an old friend. If it looks familiar, it's because it is more or less the same machine as the Texet TX8000, Pro-Tested way back in *PCN* issue 1.

Despite all its promises and its imminent launch, the Texet disappeared almost as quietly as it arrived. Now the Hong Kong produced machine is back. One hopes that take two will see it in the shops.

We left the story where the Texet was the cheapest colour computer not quite on the UK market. Since then Sinclair, with its usual impeccable timing, has reduced the price of the Spectrum to £99.95. The Laser still offers an alternative because it has a seductive £70 price-tag, though only half its original 8K of memory.

Presentation

Nothing special here though the Laser does seem very complete for £70. You get a machine, power supply, cassette and TV lead, three manuals and a demo tape.

Documentation

A slight departure from the norm, the Laser comes with three manuals — a user's manual, a Basic reference manual and a booklet called 'Basic applications programs'. The user's manual is a six-page rag for setting the machine up. Newcomers will have to be confident and prepared to 'have a go' with this one. It's a reasonable suggestion to separate it from the Basic manual but the thing is so trivial you're likely to lose it.

The Basic reference manual is another example of the obscure art of Basic tutorial/reference writing. It's not as good as many — piling up endless vocab and not explaining what's going on. It's also deadly dull, especially compared to Steven Vickers' 'masterpiece' for the ZX81 and Spectrum.

But its biggest failing is that it's dreadfully short of technical stuff: memory maps, machine code information, pinouts and so on. And what little there is has errors in it. It may be a beginner's machine but you don't want to stay that way. After all, it's the professionals, in software and hardware, who carry a machine by producing the add-ons that make it a good beginner's buy.

The last 24-page booklet is a library of type-it-yourself programs like the ones you get with programmable calculators. It's great to see this idea come back though it's a shame the programs are all so deadly dull. All ridiculously short and mostly maths routines.

Construction

The Laser's white wedge shaped case is surprisingly well built for the money. People will be impressed by this, especially if they compare it to something like a 48K Spectrum. There's even a screw-on cover for the expansion connectors at the back of the machine.

Inside is less pretty. It's based on a Z80 at 3.58MHz with 4K RAM and a lot of glue. It isn't badly made or hastily kludged, but even a total layman will detect it is slightly messy. Anyway, it works well so who cares what's inside?

Keyboard

The Laser has a 45-key keyboard of the rubber pad variety and a good one of its kind. It's helped by the angle and spacing.

If you were a typist, you could moan about the lack of a second shift key, no space bar and an awful lot of stretched Control codes for editing. But, the machine is intended for small and inexperienced hands. The Sinclair ZX-Spectrum has proved the point in no mean way.

The cluttered look is caused by optional Basic keywords above and below each key. You can either type out common Basic commands yourself or get them typed for you, using CTRL and another key (for a top keyword) or CTRL and RETURN followed by CTRL and another key for the bottom set of keywords.

So you've got the option of working either way. Most people will start by typing words and then gradually adopt the keywords as they learn where they are.

The keywords are implemented at a late stage. They just trot out the relevant characters into the keyboard buffer. They are not single tokens/characters like the

Photographs by Naru

beams in at just £70

Max Phillips lights on the cheapest colour micro on sale in the UK.





Sinclair system. Side-effects include pressing one key to type a word and then having to press RUBOUT several times to erase it. You can even enter keywords in response to an INPUT statement!

INKEY$ lets you test for a key being held down. Different codes are returned for the CTRL and CTRL and RETURN combinations. So you could program your own programable keys..

Screen

The Laser plugs into a standard TV and also boasts a Composite video socket for a monitor. It's a good picture despite the price. The colours, though not unreasonable, are of the rancid Apple/Dragon variety rather than the bold, bright colours possible with machines like the BBC.

The only problem seems to be a good dose of 'snow' during fast access to the graphics screen. The problem occurs on many machines from machine code programs that don't time screen access carefully. No doubt professional software houses will find a way round it, but it shouldn't happen to the beginner writing in Basic.

Using the Laser has a sense of déjà-vu. The display is very similar to the 6847 powered screens of the Dragon and Tandy Colour Computer though the Laser has it reduced to the bare bones.

There are two formats. MODE (0) is a text screen and MODE (1) a 'high resolution' screen. MODE (0) provides 32 × 16 upper case only text on a green or muddy orange background. The only possible text attribute is inversed text — it can't be coloured or flashing.

The text screen supports 2 × 2 pixel characters in eight colours — nine if you count the black that annoyingly appears behind 'unlit' pixels. These can be simply typed in, but beyond that aren't easy to use.

There isn't a SET and RESET to control them so you must resort to POKE (which lets you get at all eight colours directly) or to PRINT@ CHR$ (which lets you at only the graphics in the colour set by the last COLOR statement). The codes and addresses used for these two are, of course, very different. Still, it provides something to get your teeth into.

MODE (1) is the rather hopefully titled 'High resolution' mode. 128 × 64? Well — it's higher resolution than the text screen but it is ridiculously out of date compared to everything from a Spectrum upwards. And it's only got four colours.

You can have one of two choices. A green background with green, yellow, blue or red; or a 'buff' background with buff, cyan, magenta or orange. Basic provides just SET and RESET to control the screen. The lack of serious graphics support (lines, circles and so on) won't do the beginner any favours.

The advantage of this system is that it uses a mere 2K of memory. So you can run



47►

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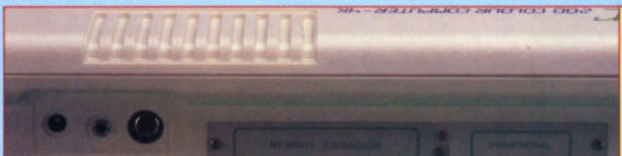
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BASIC KEYWORDS Functions SQR INT RND ABS SGN COS SIN EXP TAN LOG ATN LEN STR$ VAL ASC CHR$ MID$ LEFT$ RIGHT$ INKEY$ **Graphics** CLS SET RESET POINT COLOR SOUND MODE **Statements** DIM END GOTO GOSUB RETURN FOR . . TO . . . STEP NEXT REM IF . . . THEN . . . ELSE INPUT INPUT # PRINT PRINT TAB PRINT USING PRINT @ PRINT # LET DATA READ RESTORE PEEK POKE LPRINT LLIST INP OUT COPY USR AND OR NOT **Commands** LIST RUN NEW CONT VERIFY CLOAD CSAVE CRUN.



Top: The Laser has a Spectrum-style rubber keyboard. Basic keywords can be typed out in full or entered with a single keypress.

Left: Besides TV and monitor outputs, the Laser has two edge connectors for 16K or 64K RAMpacks and peripherals.

◀43

high-resolution programs on a standard machine provided they occupy a bit less than 2K. Like the Dragon, you can't write text on the graphics screen, unless you produce suitable machine code routines to do it for you. This will probably prove a bit hard on the unexpanded machine but there's hope that a 16K Laser will offer new possibilities for the experienced and ambitious.

Storage

Your usual cassette recorder is used for storage. A 600-baud system provided no serious problems. Strangely, the Laser has a stereo jack at the computer end of its lead and the more normal MIC and EAR jacks at the other. The lack of motor control using a connection to the tape recorder's REM socket is a disappointment. A lot of loading goes on in a 4K machine.

Cassette handling is well catered for with CLOAD, VERIFY, CSAVE and CRUN for programs and PRINT # and INPUT # for data files. Files are named and suitable on-screen prompts take the guesswork out of cassette use.

Laser has mentioned the inevitable disk though it does seem to be a fairly distant option. Even so, the Basic apparently has a route to allow for a disk to be added.

Expansion

Expansion is through two sockets, one labelled 'peripheral' and the other 'memory'. Minor things such as printer interfaces are optional extras that will push the price up.

The most important add-on is the 16K RAMpack. This is already available, is beautifully made and worked with no problem whatsoever. It's a crucial part of the Laser's success. If people buy it as standard then Laser programs will be much better and beginners will do better than the raw 4K deal they get for £70. Unfortunately, a Laser plus a RAMpack is ever so nearly a 16K Sinclair Spectrum.

So there's a chance that most users will stick with a 4K machine. Certainly the Vic 20 priced itself into this position, though it has the advantage of plug-in cartridges that come with extra memory. But the Vic is a lot older than the Laser and newcomers are going to find 4K a rapid disappointment.

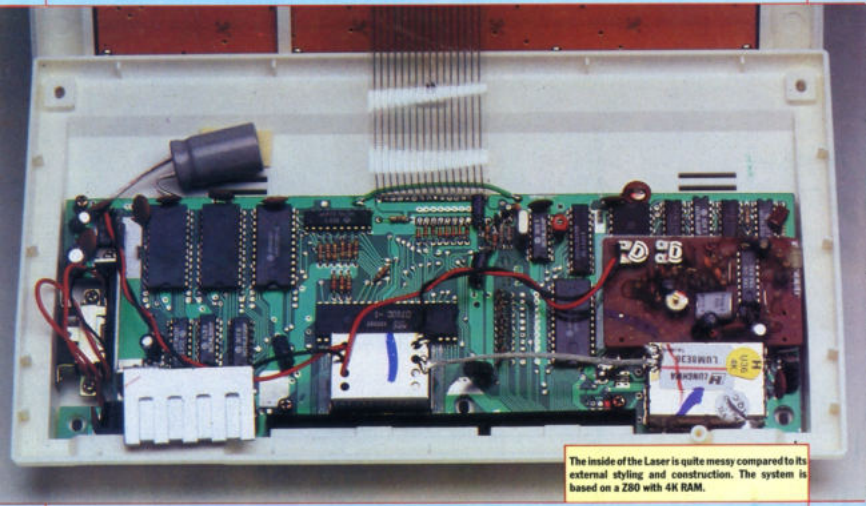
Other add-ons promised by Laser include a Centronics interface, joysticks, light pens, even one of those Tandy, Sharp, Oric printer/plotters. A 64K RAMpack is promised, but is probably a bit over the top for this type of machine. The other curious promises are Laser Forth and Laser Basic on cassette. What's wrong with the Basic it's got?

Basic

This is a standard 8K Microsoft Basic providing a familiar and stable environment for nearly every programmer in the business. It is neatly implemented, it's only serious drawback being the limited graphics support.

A full screen editor makes editing a treat. The nearest thing to this is probably the Pet-Vic editor. It allows you to move to

48▶



The inside of the Laser is quite messy compared to its external styling and construction. The system is based on a Z80 with 4K RAM.

any line on the screen, insert and delete characters and so on. It's a shame there is an 80-character limit on input lines and a clear-to-end-of-line would have been useful. There are 20 error messages although the two letter codes from the Texet are still in the ROM.

The only surprising extra is PRINT USING, a bit out of place in a home machine with a 32-column screen, but useful nonetheless. IF . . . THEN . . . ELSE is provided along with a COPY command to dump the screen to either a Seikosha GP100 or 100A printer. How ironic that these are typically configured as RS232 devices and Laser is planning a Centronics interface!

Sound is provided through a built-in squeaker and is a bit like a dying Stylophone. Basic has just SOUND *pitch, duration* to play notes. So it is easy to type in the odd melody but will be harder to provide a game soundtrack.

Basic runs merrily at a reasonable pace and Laser should be congratulated for choosing the Microsoft route. It may not be the best Basic in the world but it's a great one to learn with. You can go from the Laser to Apples, Pets, IBMs etc with the minimum of trouble. The only obvious bug is that a numeric INPUT can be answered with a null return and consequent errors.

Software

As usual with any new machine, it's the way the software crumbles that counts. Laser's UK distributor, Leisure-Zone, has teamed up with software house Abbex to produce an introductory cassette and a large range of Lasersoft titles.

The advantage of this is that the Laser has a software base and it therefore stands a chance. But there is a danger that Abbex's strong lead will be a deterrent to others. Even so, there are plenty of Z80 people knocking around to take up the challenge of a simple 4K machine.

Verdict

The Laser 200 is a colour ZX81. It will appeal to genuine penny scrapers or those who don't want to gamble too heavily on trying a new hobby. There will also be buyers who simply worry about Sinclair's bottom-line engineering.

It provides a reasonable introduction to computing though the manual doesn't make things easy.

But the long-term success of the machine does depend heavily on how the software houses and hardware sheds take to it. The Laser won't compete with the Spectrum at all until it has a tiny fraction of the Spectrum's vast low-cost quality software base. And of course, the Spectrum has the added attaction of networking and Microdrives to keep it ahead for years to come.

But, provided it gets into the shops (crossed fingers this time!), the Laser is a possibility.

Prices		*Available*
Laser 200 4K	£69.95	Now
16K RAM pack	£29.95	Now
64K RAM pack	£59.95	Nov
2 Joysticks	£19.95	Aug
Centronics interface	£19.95	Aug
Light pen	£19.95	?
4-colour plotter/printer	£149.95	Sept
Laser Basic	£5.95	Aug
Laser Forth	£5.95	Aug

Shortlist	
ZX81 + 16K Ram pack	£45
Laser 200 4K	£69.95
Sinclair ZX Spectrum 16K	£99.95
Oric 1 16K	£99.95

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Price £69.96 inc VAT
Processor Z80 3.58MHz
Ram memory 4-16K
Rom memory 16K
Text format 32 × 16, nine colours
Graphics screen 128 × 64, 4 colours
Keyboard 45 keys, single keyword entry
Storage Cassette, 600 baud
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The Oric on show

Whether you prefer a bit of zap-pow-blast action or the more thoughtful pleasures of adventuring or maze-running, there are quite a few games around on the Oric to keep you up late at nights.



XENON-1



This is a space invader type game with a difference. It has lots of colour and sound which will give you hours of entertainment.

Your mission is to blast your way through five levels of play and if you accomplish that, what more can I say? Being fleet commander in the Xenon Space Academy you should put on a pretty good show. I managed to fire through to level three, but after that there wasn't much hope for me.

There are ten skill options at which to play, and option zero which is the hardest will certainly give you a run for your money. I tried playing at its tremendous pace and got zapped within the first level.

CENTIPEDE



This is based on the arcade version. A fast moving centipede travels from the top of the screen downwards and you have to eliminate it before it gets you.

Not only do you have to cope with the centipede, but you have to blast through a field of mushrooms, nasty spiders, itchy fleas and mushroom laying bugs.

There are some good sound effects in this game. When you hit a centipede repeatedly it sounds as though you're firing a machine gun. And there are three levels of play.

My major moan about this game is the positioning of the Up key, which I found awkward. Apart from that, this is fairly good, mainstream stuff.

NIGHTRIDER



A drive in the country with a difference — that's how the publisher Cirosoft describes this Oric adventure. Your mission is to recover valuable stolen shares from ex-foundation members and staff who are now trying to legally take over. They must be stopped immediately. However, you are not able to kill them. Hard task eh!

On my first time round this adventure, I ran into the sinister Professor Stein along with his welcoming committee of three men with flame throwers. I had four options — quit, fight, run or ask for help. Being brave I decided to fight them off, but I was killed.

Second time around I beat the opposition. I then asked to see a map of my chances, my surroundings and my route. I headed north only to find yet another welcoming committee.

I asked for help and guess what? While trying to escape I drowned in my car crossing a river.

RED DEVILS



A very simple game. You have to manoeuvre into castles trying to escape an ever-increasing maze of red devils who spring up randomly. If you get surrounded by the little perishers you can always dive into an escape hole.

You'll get tired of this game. There's nothing that really taxes the brain.

INVADERS



Your standard arcade type action for the living room. Nothing original about this one. The usual multi-coloured invaders come at you dropping bombs, and you pick up bonus points if you hit the mothership. I'd have been amazed if this one hadn't turned up sooner or later on the Oric.

GRAIL



Here we go again on another adventure — this time in Quest of the Holy Grail. So, as you might expect, you take the part of a Knight of the Round Table, and you get the usual bunch of monsters to battle.

The mythical chalice lies hidden in the Castle Perilous. So with a strength of 250 I began to roam the five-floor castle. My quest was a bit of a letdown though.

On the first time round I got killed by a monster. The second time round I began to lose interest in the game as I seemed to be going around in circles. I wouldn't say this is an exceptional adventure — it's like so many others on the market. The only thing that changes is the story line.

3D MAZE/BREAKOUT



Now here's better value for money. Two classic games to test your mental agility and reflexes. If you like the challenge of getting out of mazes this is the package for you.

The maze is a square, in which each side can have from three to 20 rooms. You decide what size you want the maze to be. Then in 3D technology you're shown each step you take as you battle to escape. And if you want you can ask to see a map of where you are, but this loses you a few points.

Breakout is a standard version of its arcade namesake. You practice your wall demolition in this colourful game. If you like bashing down walls you can't go wrong with this one.

PSS 452 Stoney Stanton Road, Coventry — Centipede £4.95, Invaders £4.95.
IKJ Software Ltd 9 King Street, Blackpool, Lancs — 3D Maze £7.50, Xenon-1 £8.50.
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FEEDING TIME

SPECTRUM

Magimix mayhem

Name Cookie **System** 16 or 48K Spectrum **Price** £5.50 **Publisher** Ultimate Play the Game, The Green, Ashby de la Zouch, Leicestershire **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Smiths, Menzies, Sinclair dealers, mail order.

With no hype but just the simple expedient of putting out two excellent games, Ultimate has gone to the top of many people's Spectrum software league table. Admirers will be pleased to hear that its third release, Cookie, follows the tradition of Jet-Pac and Pssst. The bad news is that it is a very similar idea to Pssst, but the good news is that it's an even better game.

Objectives

The aim is to bake a cake by adding all the right ingredients and keeping out the wrong ones — unless you want a cake full of fish bones, of course. You can move Charlie the Chef around the screen by using the keyboard or with Kempston or Protek joysticks.

In play

The mixing bowl is at the bottom of the screen, with dustbins on either side. To the right are five drawers containing the cake's ingredients, though I don't think I'd care to eat the result of mixing together cheese, sugar, chocolate, mixed peel and custard. There are also five nasties lurking around the kitchen: tin cans, fish bones, washers, bolts and tacks.

Charlie's baking technique does leave somthing to be desired, being even more bizarre than that of the Swedish Chef from the Muppet Show.

Charlie can move around and throw flour bombs in eight directions, and with these he must stun the flying ingredients so that they fall in the mixing bowl. First to come, out of the top drawer, is Colonel Custard, and a number displayed on the bowl shows that you need ten of these in there to start the cake on its way.

The problem is that if one of the nasties falls into the bowl by mistake, felled by a badly-aimed flour bomb, the amount of custard required goes up.

The game is quite hard, as everything on the screen is against you and mustn't be touched at all. If this happens you lose one of your five lives, though this in itself is a pleasure just to see the chef's hat go sailing up off the top of the screen while he turns upside down and plunges into his own mixing bowl.

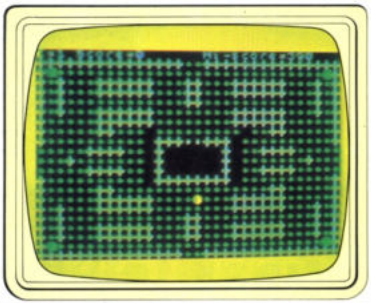
Verdict

Cookie has the fast-moving action, the colour and the superb graphics that set Ultimate's previous two games in a class apart. Very tasty.

Mike Gerrard

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	





SPECTRUM

What's all this hen?

Name Egg Farm **System** 16/48K Spectrum **Price** £5.50 **Publisher** Lasersound **Format** Cassette **Language** Basic **Other versions** None **Outlets** Mail order, Sinclair dealers.

Egg Farm is simply Pacman taking a holiday in the country, though at least the diet of eggs makes a change from fruit and power pills.

Objectives

There's no joystick option, but keyboard control moves a little munching ball round a farmyard maze, eating ordinary eggs as it goes, but with four giant eggs tucked away in the corners. All the while you're being pursued by two pecking chickens.

The aim is not to make the biggest omelette in the world, but simply to survive and notch up the highest score you can.

First impressions

The cassette cover shows a Busby-like bird in a green tee-shirt which bears the message, 'I'm a real mean chicken,' while inside there are detailed loading instructions and some helpful advice on tape loading problems, but I didn't experience any with this advance review copy.

In play

The instructions for the game are contained in the program, and one small complaint is that once you've passed these you can't get back to them for another look. A more serious complaint is that the game starts without any warning, not even giving you chance to switch off your cassette, so you lose one of your three lives before you know it.

You are offered a choice of fast or slow versions, with slow being exactly that.

The chickens hop in your direction at the same speed as you, but they also have the ability to hop diagonally, which gives them a slight advantage. If you eat one of the giant eggs these chickens are moved further away from you, so you soon learn that the technique is to escape through one of the four exits, come back on the opposite side of the screen, eat one of the corner eggs and escape again.

The second round is the same as the first, with no increase of speed or nastiness in the chickens that I could detect, and I did plough through to round 12 before falling asleep from the boredom of plodding along scoring ten more points for every egg. Your reward is a briefly flashing message of congratulation.

Verdict

The game is ridiculously easy to master especially as when the chickens are moved further away from you they're always moved to the same place. The graphics are adequate for what the game is, while the sound consists of 'plink-plink' as you move along. A waste of tape.

Mike Gerrard

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

OCEAN ADVENTURE

BBC B

Fleet of doom

Name Sea Lord **System** BBC B **Price** £7.50 **Publisher** Bug Byte, 051 227 2642 **Format** Cassette **Language** Machine code **Other versions** None **Outlets** Software Express, Boots, W H Smiths

This is a one-player arcade game where the action occurs near the sea bed in the domain of the Sea Lord. You have been admiring the scenery from your minisub, unwittingly tresspassing, when you are set upon by various unfriendlies.

Objectives

The enemy fleet of four enters from the top of the screen and each takes a different route, bouncing off the edges of the screen but not firing at you. Only the fourth fleet tries to ram you. You can rotate left and right and fire single torpedoes.

Your speed is constant in the direction you are facing.

Once one fleet has been disposed of, the scenery is redrawn and a different species of fleet continues the attack. After the fourth screen two previous types of fleet attack together.

You have three lives, which are lost by crashing into assailants.

In play

On loading you see a screenful of what look like pigs wearing ruffs — the BugByte bug. After a tidy title page with scores and brief instructions, the background of the sea bed (wavy blue lines) broken by rocks (cubes) is drawn. This process is accompanied by warnings of impending doom to relieve the boredom but it is still very tedious to have to wait these ten or so seconds before every attack wave.

Then the fleet is upon you. The problem is not so much fending off the attackers as preventing yourself from accidentally crashing into one of them — easy because rocks act as cover and often the fleet is hidden. It is also hard to tell which way your ship is moving after rotating under a rock as there are only two characters to represent it: one for when it is moving diagonally and one for when it is moving horizontally or vertically.

All the characters are quite small but movement is smooth. Sound effects are sparse (it is under water, after all) but sufficient.

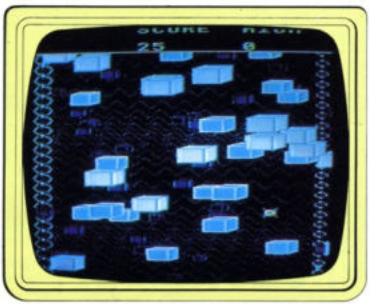
Verdict

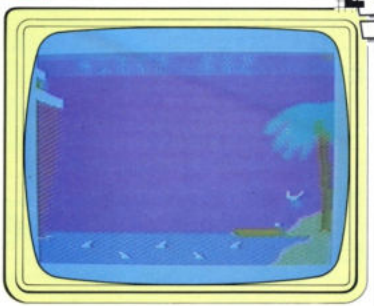
The game is badly let down by the rocks whose abundance often hides vital action and means frustrating loss of life. It is reminiscent of Asteroids but is not as addictive. Seasoned gamesters will soon master the lower levels but at high levels and with more intelligent fleets on the screen the action could become quite hectic.

Bobby Rao

RATING

Lasting Appeal	
Playability	
Use Of Machine	
Value For Money	





Dragon 32

Men overboard

Name Lusitanic **System** Dragon 32 (joystick optional) **Price** £4.95 **Publisher** Dragontree, Coppice Software, 7 March Street, Kirton in Lindsey, Gainsborough, Lincs DN21 4PH **Format** Cassette **Language** Basic and machine code **Outlets** Mail order and some dealers

This is a game similar in style to the little LCD ones that can be bought as mini-clocks, or played with on shop counters while you're waiting to be served.

Objectives

The story behind this is that of a sinking ship whose passengers are leaping overboard onto a rubber raft, which can bounce them to safety on the nearest island.

In play

You have a choice of joystick or keyboard.

Once the program is loaded you get an average high resolution drawing of a passenger liner, a quick burst of 'La Cucaraca', then the game itself begins. The side of the sinking Lusitanic is to the left of the screen, safe land is to the right, and there's shark-infested water between the two. For some reason it's only at this point that everyone discovers there are no lifeboats, and the first passenger takes a dive into the water. You move your raft to meet him, he bounces to the centre, you meet him and bounce him again over to the right, and a final bounce lands him safely on the island. By this time the next idiot is jumping and the process is repeated.

At first there's little skill needed as the raft can only be in one of three required positions, whether you're using joystick or keyboard. The latter employs the J, K, and L keys for the three raft positions, so when only one passenger at a time is jumping you use these three keys in turn to get him to land.

Passengers then start to jump in twos, though they both hit the first place before you need to move to the middle so that's not too difficult either. The tricky part comes when the passengers decide there is safety in numbers and start to come down in threes. You then have to judge which one's going to hit the se first and make sure you save him from becoming a shark's breakfast. Lose three passengers and you become the shark's breakfast, though this only happens in the instructions, not on screen. If you're good at juggling then perhaps you'll be good at this, as I found it impossible to keep three in the air at the same time.

Verdict

Although the responses are quick, the graphics are nothing special, there's precious little sound and the game left me completely cold. I would imagine that most people with a Dragon and with a whole array of arcade and adventure games at their fingertips would have gone beyond this kind of thing long ago.

Mike Gerrard

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

ADVENTURES

COMMODORE 64

Island of the lost

Name The Island **System** Commodore 64 **Price** £10 **Publisher** Superb Software, 9B Oval Road, Camden, London NW1 (01) 482 1993 **Language** Basic **Outlets** Mail order, some Spectrum dealers

Any company calling itself Superb Software is asking for trouble. And as I waited for The Island to load (waited as in ate a sandwich, enjoyed a cigarette, scribbled on my notepad, looked at my watch, sighed, cursed, sighed etc) I felt my hostility threshold get lower.

Some 12 minutes later the title screen and instructions appeared.

Presentation

The Island comes on cassette with a shoddy looking inlay without pictures or instructions. The initial title screen looks good, an outline map of some unspecified island with the title in impressive script. Two screens of instructions follow, then you're into the game.

Objectives

You are a competitor in a round-the-world motorbike race and your immediate problem is to cross the island. You have limited supplies of money and petrol (and commands) and a very limited amount of time to succeed.

In play

This, alas, is where the disappointment occurs. The Island is billed as 'an interactive graphical adventure'. On a 64K machine with built-in high resolution graphics and sprites you (and I) might expect great things.

What you see is what you get, and what you get is block graphics and line after line of print statements. Very repetitive they are too.

Second major criticism. The commands you have available are listed in the instructions and they do give the game away a little (what do you make of Embark and Disembark?).

But it is the syntax of the commands that spoils things. How do you take seriously a game that requires you to enter 'verb . . . noun' with only three letters in each?

For example, to look at the sign, you enter 'Loo sig'! To push your bike southwards you enter 'Pus sou'.

Each move takes several minutes' game time, more if you are pushing. I won't reveal how long you have to complete the game because that is probably the only surprise you'll get. But it isn't long.

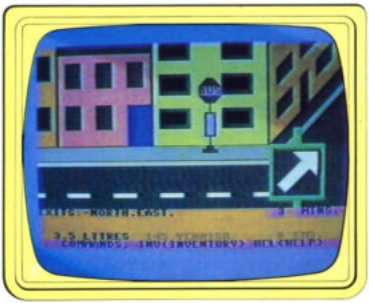
Verdict

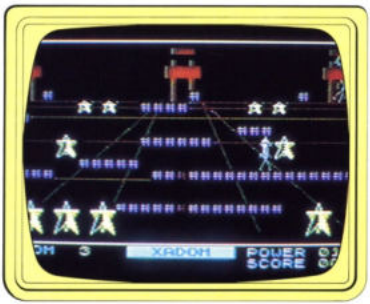
Definitely not recommended. This is the kind of thing that was just about acceptable in the dim past of computer games. Commodore 64 owners have a right to expect better for their machine.

Peter Worlock

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	





SPECTRUM

A deadly dimension

Name Xadom **Application** 3D adventure game **System** Spectrum 48K **Price** £6.95 **Publisher** Quicksilva, 0703 20169 **Format** Cassette **Language** Basic **Outlets** Sinclair dealers

Well, I never did agree with those scenarios included in games packaging that cast one as a sleazy spaced out Marlowecum hired gun. It doesn't fire my imagination or encourage me to play. Otherwise this is an attractive mix of 3D (well almost) arcade maze and the traditional room adventure.

Objectives

The game starts in the briefing room where you can assume any name and must surrender your weapons. The Empire which commands you to find the 'Artifact' (their secret ultra device) isn't too innovative. You must search through 20 rooms with a variety of aliens, objects and traps to encounter.

The game provides lists of aliens and their relevant anti-objects, but it pays to sprint for the nearest door rather than to stay and battle it out. Incidentally, it also gives you one of those cards to place over the controlling keys of the Spectrum, even if you do have to trim a bit off the lower edge to fit it.

Once in room 20 you'll find a teleport, which if, artifact in hand, you enter you'll be treated to a neat little graphics display and a promotion.

In Play

'U' (as the game likes to put it) are standing on a perspectival grid with a number of obstacles in front of you and three doors at the top left, centre and right. As you go through the rooms numbers appear on the tops of the doors, indicating the rooms that you've been through before.

Dotted along your way are traps that form mazes. You can go through some but they drain power; others are total barriers. Pick up the flashing objects and you can conquer them and the truly nasty aliens that lurk in every other room. You don't have much time to think. Once a Wattdog or a Vampbat has you the others join in, and it's like being eaten by several man sized insects . . . you wander about blindly, a mass of writhing pixels, and it takes such a long time to die!

Verdict

This is a good, if slightly predictable, cross between Space Invaders, Pac-man and . . . well, whatever game that is typified by the line, 'You are in a maze of twisty little passages, all alike'. I wouldn't call it 3D, since it would appear to be two dimensions once the grid is removed.

It's not hard to get through skill level 1, and the pace doesn't really increase with levels 2 and 3, just the number of rooms and nasties. I think it's pretty good value from all aspects, except it's a touch slow and repetitive.

Dolores Fairman

RATING

Lasting appeal	
Playability	
Use of machine	
Overall value	

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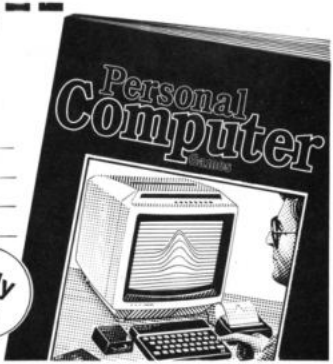
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PCN ProgramCards

It's action all the way in ProgramCards this week with a crop of games for the Oric, Vic and BBC.

Starting off, Oric owners will find the concluding cards for Meteor Shower.

This week's offering for the Vic 20 is a laser-blasting space game for Nigel Littlewood, of Ashton-under-Lyne, Lancs. Starship is a neat variation on the Space Invaders theme in which the enemy come at you horizontally along the space lanes.

Starship has a number of interesting features, including excellent use of sound, and demonstrates what you can achieve with the Vic's block graphics and a little imagination.

There are also some neat programming ideas which you might like to study and incorporate in your own games.

First among these is the inclusion of a self-play mode: if no key is pressed after a while, your Vic runs the program of its own accord. Although the technique used is a simple one, it does give Starship an extra touch of professionalism.

For BBC owners there is a full-featured version of the light cycle duel from the film *Tron*, here called Surround. You'll find the first half of the program this week with the final cards in the next issue.

Author Keith Taylor has written the program in two sections. The first presents a title screen and instructions and autoloads the main game program. You should be careful to SAVE the second part under the correct name.

The prime feature of Surround is that you can either play against the computer or against a second player, with the further option of using joysticks or keyboard.

Don't miss next week's PCN for the final part of this first-class game.

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PCN ProgramCards

Meteor Shower Card 2 of 4

Oric (48K)/Oric Basic/Bartlett & Davies/Cont.

8324MS2/4

```
100 GOTO35
200 LI=LI-1
205 IFLI=0THEN300
210 IFF<1THEN CLS:!10,15;"YOU RAN OUT OF FUEL"
215 !12,17;"LIVES LEFT=";LI
220 WAIT100:CLS:S=S-30
230 IFS<0THENS=0
240 GOTO25
300 POKE623,27:CLS
305 PRINT:PRINT:PRINT:PRINT:PRINT
310 PRINT"          "CHR$(27);"N GAME OVER"
320 PRINT"          "CHR$(27);"N GAME OVER"
325 WAIT300:CLS:PRINTCHR$(20)
330 PRINT:PRINT:PRINT"YOU SCORED ";S;"POINTS"
340 WAIT200
345 IFS>HSTHENGOSUB3000:GOTO350
350 IFS>HSTHENINPUT"ENTER YOUR NAME";HS$
355 IFS>HSTHENHS=S
360 PRINT:PRINT"HIGH SCORE "HS"BY "HS$
370 PRINT:PRINT"DO YOU WANT TO PLAY AGAIN?"
375 GETA$
376 IFA$="N"THENPRINTCHR$(6)CHR$(17):CLS:PRINT"END OF PROGRAM":END
377 IFA$="Y"THENCL=FRE(""):PRINTCHR$(20)CHR$(12):GOTO20
380 GOTO375
700 PAPER6:INK0
710 RESTORE
770 REPEAT
780 READDTA:POKE#400+CL,DTA
790 CL=CL+1
800 UNTIL DTA=#FF
```

100	Loop again	345-360	Hall of fame routine for high scores
200-240	Checks for game ending with all lives lost or out of fuel	370-380	Option to play again
	Reduce score on loss of life	700-800	Read data to create user-defined characters
300-340	Routine for end of game		

PCN ProgramCards

Meteor Shower Card 3 of 4

8324MS3/4

```
810 DATA#20,#96,#D9,#AC,#F8,#02,#C8
820 DATA#8C,#69,#02,#A5,#1F,#A4,#20
830 DATA#05,#12,#84,#13,#A9,#3B,#20
840 DATA#DB,#CF,#4C,#61,#CB,#FF
850 DOKE#2F5,#400
900 REM DEFINE CHARS
910 FORA=46592TO46592+7
920 READDTA:POKE A,DTA
925 NEXT
930 DATA0,12,12,12,30,63,63,51
950 FORA=46384TO46384+7
960 READDTA:POKEA,DTA
965 NEXT
970 DATA63,30,30,63,63,63,63,63
1000 REM INSTRUCTIONS
1010 CLS
1020 !6,9;CHR$(27);"N * METEOR SHOWER *"
1030 !6,10;CHR$(27)!"N * METEOR SHOWER *"
1035 !4,20;" DO YOU WANT INSTRUCTIONS ?":GETA$
1036 IFA$="n"THEN CLS:GOTO20
1037 IFA$()"n"THENCLS:GOTO1050
1040 WAIT250:CLS:PRINT
1050 PRINT"              INSTRUCTIONS"
1060 PRINT"              ============"
1070 PRINT:PRINT"The objective of the game is to hit"
1075 PRINT
1080 PRINT"the fuel dumps.............";CHR$(129);"&"
1085 PRINT
1090 PRINT"and avoid the meteors.......*"
1095 PRINT
```

800-840 Data for user-defined characters
900-970 Further routines for user-defined characters
1010-1040 Give player option for instructions
1050-1095 Print instructions

PCN ProgramCards

Meteor Shower Card 4 of 4

8324MS4/4

```
1100 PRINT"To move use curser keys"
1102 PRINT:PRINT:PRINT
1105 PRINT:PRINTCHR$(140)!"  PRESS ANY KEY TO CONTINUE ":GETA$
1106 CLS
1110 PRINT:PRINT"You start with 3 lives but you loose":PRINT
1120 PRINT"one life and 30 points when you hit a":PRINT
1130 PRINT"a meteor.":PRINT
1131 PRINT"You get 500 blocks of fuel to start ":PRINT
1132 PRINT"with but the fuel runs out at ":PRINT
1133 PRINT"10 blocks/second.":PRINT
1135 PRINT"If you run out of fuel then you loose":PRINT:PRINT"a life.":PRINT
1136 PRINT:PRINT:PRINTCHR$(140)"    PRESS ANY KEY TO CONTINUE":GETA$:CLS:WAIT
     10
1137 PRINT
1140 PRINT"If you hit the fuel dumps then you":PRINT
1150 PRINT"get 15 points and 70 blocks of fuel.":PRINT
1160 PRINT"At the start of the game the hi-score":PRINT
1170 PRINT"is set at 100 by ORIC but if you beat":PRINT
1190 PRINT"the hi-score then you input your name.":PRINT
1700 PRINT:PRINT:PRINTCHR$(140)"    PRESS ANY KEY TO START"
1800 GETA$:CLS:WAIT50
2000 RETURN
3000 REM PLAY TUNE
3010 T$="0102030405060708090800908070605040302010"
3020 FORL=1TOLEN(T$)
3030 N=ASC(MID$(T$,L,1))-47
3040 MUSIC1,3,N,0:MUSIC2,4,N,0
3050 PLAY3,0,1,1600:WAIT19:NEXTL
3060 WAIT50:PLAY0,0,0,0:PRINT:PRINT"YOU BEAT THE HI-SCORE":PRINT:RETURN
```

1100-1190 Continue with instructions
1700-2000 Wait for keypress before starting game
3000-3060 Sound routine for fanfare on new high score



Inside: Information

The wonderful world of the PCW Show opens up again on 29th and 30th September and 1st and 2nd October.

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PCN ProgramCards

Starship

Card 1 of 3

8324S1/3

Vic 20
Commodore Basic

Application: Game
Author: Nigel Littlewood

A simple game which gives an excellent demonstration of sound and block graphics on the Vic

```
100 POKE650,128:POKE198,0:Y=30720:W=36879:SE=16:AM=7768:CC=25
111 POKEW,12:PRINT"■■■
```



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Starship — Card 3 of 3

8324S3/3

```
590 POKEW-1,15:POKEW,PEEK(W)AND247:FORX=128TO255STEP.2:POKEW-3,X:NEXTX:POKEW,PEE
K(W)OR8
610 POKEW-1,0:POKEW-2,0:PRINT"■■■■■■  YOUR SCORE WAS "S1
620 PRINT"■■      ON PHASE "P
625 PRINT"■■IFFICULTY LEVEL "O$
630 PRINT"■■■ENTER E TO EXIT.■■"
635 PRINT"■ANY KEY TO PLAY AGAIN":POKE198,0:PY=0
640 GETA$:PY=PY+1:IFPY=>2000THENA$="U"
641 IFA$=""THEN640
650 IFA$="E"THEN860
670 RUN
680 POKEW-5,0:IFRJ=8THENS1=S1+4
681 M=0:L=0:V=2::POKEJ+N,V:POKEJ+1+N,V:POKEJ+2+N,V:POKEJ+3+N,V
690 POKEW-2,220:FORL=15TO0STEP-.15:POKEW-1,L:NEXTL:SH=SH+1:POKEW-2,0:POKEW-1,0
730 FORC1=0TO3:POKEJ+C1,32:NEXTC1
740 IFCC=SHTHENS=S+1:CC=CC+25:P=P-1:AM=AM+2:SE=SE-2:GOSUB800
760 IFE=SETHENGOSUB820
770 GOSUB842:POKEW,PEEK(W)OR8:GOTO230
800 FORX=200TO255:POKEW-3,X:NEXT
820 POKEW-1,15:POKEW-2,220:FORL=15TO0STEP-.1:POKEW-1,L:NEXT:POKEW-2,0:POKEU,60:R
ETURN
842 PRINT"■■SHIPS■"S:PRINT"■■■■■■■■■■■■■■■■■■■■PHASE■"P"■SCORE■"S1:GOSUB500:RET
URN
860 PRINT"■■■■  BYE FOR NOW !!":END
900 R(1)=95:R(2)=98:R(3)=121:R(4)=70:RETURN
910 R(1)=32:R(2)=62:R(3)=232:R(4)=223:RETURN
```

590	Sound routine	842	Update and print screen status line
610-625	End of game routine	900-910	Subroutine to allocate spaceship graphics
630-670	Offer option to play again		
680-820	Destruction sound and graphics routine		

Surround Setup — Card 1 of 1

8324SS1/1

BBC Model B
BBC Basic

Application: Game
Author: Keith Taylor

Sets up the title and instructions for the succeeding game of Surround. NB: SAVE this program as Surround and the game proper as Surron 2 so the first will chain the main program

```
 10 MODE7
 20 PRINTTAB(8,1);CHR$(141);CHR$(129);"SURROUND INSTRUCTIONS"
 30 PRINTTAB(8,2);CHR$(141);CHR$(129);"SURROUND INSTRUCTIONS"
 40 PRINTTAB(0,4);CHR$(131);" The object of the game is to surround "
 50 PRINTTAB(0,5);CHR$(131);"your opponent, thus making him crash "
 60 PRINTTAB(0,6);CHR$(131);"into yours or his trail."
 70 PRINTTAB(0,7);CHR$(131);" You have a choice of several versions"
 80 PRINTTAB(0,8);CHR$(131);"which include playing against a friend"
 90 PRINTTAB(0,9);CHR$(131);"or against me!"
100 PRINTTAB(15,10);CHR$(131);CHR$(136);"KEYS"
110 PRINTTAB(0,12);CHR$(131);"        PLAYER 1   :  PLAYER 2 (computer)"
120 PRINTTAB(0,14);CHR$(131);"UP      S             '"
130 PRINTTAB(0,15);CHR$(131);"DOWN    Z             close brackets"")"""
140 PRINTTAB(0,16);CHR$(131);"LEFT    caps lock     @"
150 PRINTTAB(0,17);CHR$(131);"RIGHT   control       open brackets""("""
160 PRINTTAB(0,18);CHR$(131);"TRAIL   D             cursor up"
170 PRINTTAB(0,20);CHR$(131);"You can also use joysticks"
180 PRINTTAB(0,21);CHR$(131);"for surround if you wish"
190 PRINTTAB(10,23);CHR$(136);"PRESS ANY KEY"
191 VDU28,0,24,39,23
195 A=INKEY(500)
200 CHAIN"SURRON2"
```

10	Select screen graphics mode	191	Set up a text window in the bottom two lines of the screen
20-110	Print the game instructions using various teletext colours	195	Perform a five-second delay or wait for keypress
120-190	Print instructions using CHR$ to access various colours	200	CHAIN the main game program

PCN ProgramCards

Surround

Card 1 of 8

8324Su1/8

BBC Model B
BBC Basic

Application: Game
Author: Keith Taylor

```
30ON ERROR RUN
40V=0:var=0:var2=0:var4=0:why%=0
50MODE 7:?&FE00=10:?&FE01=32
60PROCchoice
70key1%=0
80PROCchoice2
90MODE5
100VDU19,0,3;0;19,1,1;0;19,2,5;0;19,3,4;0;
110GCOL0,130:CLG
120VDU24,64;64;1215;927;
130GCOL0,131:CLG
140play1%=0:play2%=0
150PROCscore
160VDU23,240,0,0,0,0,0,192,192,192,192
170X%=192:Y%=476:DD%=0:DS%=0:DS1%=0:X1%=1056:Y1%=476:Cc%=RND(4)+1
M%=16:A1%=1:A2%=1:alp=0
180IF var4=0 THEN PROCmove1 ELSE PROCmoveC
190IF DD%=1 THEN 170
200IF DS1%=1 THEN 320
220PROCprint
240PROCmove2
250*FX15,0
```

30	Allows Esc to be used to restart the game	100-130	Select colours, create a graphics window		opponent, let either player make a move
40	Declare various variables	140	Zero players' scores	190	Reset variables for the next game
50	Select teletext mode and turn off flashing cursor	150	Call procedure to display scores	220	Print trail of player one
60	Call game variations Procedure	160-170	Define character 240, set variables	240	Get player two move
80	Procedure to select keyboard or joysticks	180	Check for computer as	250	Clear input buffer

PCN ProgramCards

Surround

Card 2 of 8

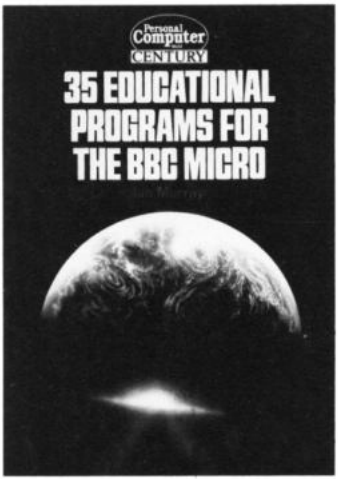
8324Su3/8

```
260IF DD%=1 THEN 170
270IF DS%=1 THEN 370
290PROCprint1
300IF var=1 THEN 180
310PROCbutton:GOTO180
320CLG:GCOL0,0
335MOVE192,480
340IF var4=1 THEN 360
350PRINT"PLAYER 1 WINS!":GOTO420
360PRINTTAB(3,15);"YOUR BBC WINS!":GOTO420
370CLG:GCOL0,1
385MOVE192,480
390IF var4=1 THEN 410
400PRINT"PLAYER 2 WINS!":GOTO420
410PRINT"YOU WIN!"
420F=TIME+600:REPEAT:UNTIL TIME>F
430MODE 7:PROCagain
440GOTO90
450DEFPROCmove1
460IF key1%=1 THEN 520
470IF ADVAL1>44000 THEN 1010
480IF ADVAL1<21000 THEN 1090
490IF ADVAL2<21000 THEN 1170
500IF ADVAL2>44001 THEN 1250
510GOTO 560
520IF INKEY(-88) THEN 1010
530IF INKEY(-73) THEN 1090
540IF INKEY(-89) THEN 1170
550IF INKEY(-41) THEN 1250
560IF A1%=1 THEN 1010
570IF A1%=2 THEN 1090
580IF A1%=3 THEN 1170
590IF A1%=4 THEN 1250
600DEFPROCprint
610GCOL0,0
620 MOVEX%,Y%:VDU240
630ENDPROC
640DEFPROCmove2
6451Fkey1%<>2THEN710
650IF ADVAL3>44000 THEN 1330
660IF ADVAL3<21000 THEN 1410
670IF ADVAL4<44000 THEN 1490
680IF ADVAL4>21001 THEN 1570
690GOTO 750
710IF INKEY(-65) THEN 1330
720IF INKEY(-2) THEN 1410
730IF INKEY(-98) THEN 1490
740IF INKEY(-82) THEN 1570
750IF A2%=1 THEN 1330
760IF A2%=2 THEN 1410
770IF A2%=3 THEN 1490
780IF A2%=4 THEN 1570
790DEFPROCprint1
800GCOL0,1
810 MOVEX1%,Y1%:VDU240
820ENDPROC
```

260-270	Check for a win	430	Call procedure for play-again option	520-550	Get keyboard direction
290	Display player two move	440	Restart game	600	Print player one move
300-310	Check to blank trails	450	Player one's move	620	Move to position and print
320-410	Display the winner	460-500	Get joystick direction and move	640	Player two move
420	Six-second delay			790	Print player two move

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CENTURY

Surround — Card 3 of 8

8324Su3/8

```
830DEFPROCbutton
840IF key1%=1 THEN 880
850C%=ADVAL(0) AND 3
860C%=C%+1
8700N C% GOTO 920,930,970,930
880C%=1
890IF INKEY(-58) AND INKEY(-51) THEN 930
900IF INKEY(-51) THEN 970
910IF INKEY(-58) THEN C%=2:GOTO 930
920ENDPROC
930MOVEX%,Y%
940GCOL0,3
950VDU240
960IF C%=2 THEN ENDPROC
970MOVEX1%,Y1%
980GCOL0,3
990VDU240
1000ENDPROC
1010IF A1%=2 THEN 1180
1020A1%=1
1030X%=X%-H%
1040IF X%<64 THEN X%=1200
1050LEFT1%=POINT(X%+6,Y%-16)
1060IF LEFT1%=0 OR LEFT1%=1 THEN X%=X%+H%:GOTO1650
1070IF var2=1 AND X%=1200 THEN1650
1080ENDPROC
```

830 Allows trail to be turned on or off
1010-1080 Player one move left. Check for surround and illegal positions

Surround — Card 4 of 8

8324Su4/8

```
1090IF A1%=1 THEN1260
1100A1%=2
1110X%=X%+H%
1120IF X%>1200 THEN X%=64
1130RIGHT1%=POINT(X%+8,Y%-16)
1140IF RIGHT1%=0 OR RIGHT1%=1 THEN X%=X%-H%:GOTO 1650
1150IF var2=1 AND X%=64 THEN 1650
1160ENDPROC
1170IF A1%=4 THEN 1020
1180A1%=3
1190Y%=Y%-H%
1200IF Y%<90 THEN Y%=942
1210DOWN1%=POINT(X%+8,Y%-16)
1220IF DOWN1%=0 OR DOWN1%=1 THEN Y%=Y%+H%:GOTO 1650
1230IF var2=1 AND Y%=942 THEN 1650
1240ENDPROC
1250IF A1%=3 THEN 1100
1260A1%=4
1270Y%=Y%+H%
1280IF Y%>950 THEN Y%=92
1290UP1%=POINT(X%+8,Y%-16)
1300IF UP1%=0 OR UP1%=1 THEN Y%=Y%-H%:GOTO 1650
1310IF var2=1 AND Y%=92 THEN 1650
1320ENDPROC
1330IF A2%=2 THEN 1500
1340A2%=1
1350X1%=X1%-H%
```

1090-1160 Player one move right
1170-1240 Player one move down
1250-1320 Player one move up
1330-1350 Player two move right plus checks

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**Strategy Games.
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SEE AUGUST "SINCLAIR USER". DETAILS p.36-37.

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



'What Do You Do After You Plug It In?' by William Barden Jr, published by Prentice-Hall at £9.30 (paperback, 196 pages).

As the title suggests, this one's written for those who go out and buy a computer, much as they would buy the family car, get it home, plug it in, and then try to figure out what exactly they're going to use it for and who's going to sell them the software and peripherals to go with it.

This type of computer purchaser has founded many a fortune over the past five years or so.

William Barden Jr has probably identified a good market for his book. There are other books like this one. They are usually called *How to Chose a Micro* or something similar. Most of the content of this one is familiar stuff. It attempts to fill out all the background and put things in perspective for the novice.

The style is good and bouncy and the content is general enough to ensure that its US origins don't detract from its relevance for the UK reader.

The book comes in three sections. The first covers the hardware and peripherals — what they do and how they do it. The second goes into software along the same lines. And the third looks at applications and procedures.

This procedure idea is a good one. It covers such handy items as data backup — a sort of hints and tips. There are also chapters on data communications, speech synthesis and real-time control.

This book would be a good primer for the more methodical computer buyer (who reads before he buys), as well as the impulse buyer. **IS**

'Mathematical Problem-Solving with the Microcomputer' by Stephen L Snover and Mark A Spikell, published by Prentice-Hall at $8.95 (paperback, 190 pages).

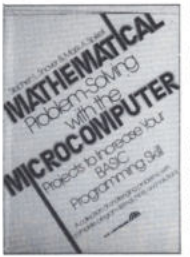
With its subtitle 'Projects to Increase your Basic Programming Skill', the title of this book could hardly be more specific, yet it doesn't tell you about some of the most appealing features of the book: the introduction to many mathematical peculiarities, the exploration of programming techniques that usually get thrust into a footnote, and a layout whose playfulness calls to mind enlightened French textbooks.

The book is primarily for those who like the kind of feature that is usually referred to as a brain-teaser. You need not be a programmer and you need not be Einstein, although you may have a head start on chapter 16 if your name is Ronald Reagan: 'How many jelly beans?'

The problems are presented in Basic and the authors use commands that they say will not oblige you to alter the programs for your own system.

The book consists of a series of mathematical puzzles and problems; each is illustrated by a cartoon, explained in words and amplified by a 'core' program. The actual solution is left to you, and extensions to the problem are added in case you feel like pursuing the solution further.

For anybody interested in numbers and their properties this is an excellent book. Pythagorus would have loved it. **DG**





'Microcomputers: A Parents' Guide' by Kenneth P Goldberg and Robert D Sherwood, published by John Wiley & Sons at £7.50 (paperback, 196 pages).

Not every book written for the US market is suitable for UK tastes and *Microcomputers: A Parents' Guide* certainly isn't. It's written for American parents, not those over here.

In the UK there is a wide variety of machines available for the home market — not so the US. The IBM, Apple, Commodore Pet, Vic 20, Atari 400 and 800, Commodore 64, TRS-80 Model III, TI99/4A and Timex Sinclair are the only machines referred to.

Another pitfall of this book is that its appendix gives names and addresses of companies in the US. This isn't much good to the UK user.

These major quibbles apart, this 196-page paperback offers useful information. In an easy-to-learn fashion you grasp the concepts of what micros are, what they can do and what to expect in the future. There are seven chapters, scattered with pictures of machines and program listings.

If this book is intended for parents concerned about the use of micros in the school and wanting to learn about them, however, it fails to fulfill that aim.

We don't have to put up with American cast-offs any more. The UK book publishing scene for microcomputers seems to be booming. If you can, buy British. A home-produced book will be more relevant to the situation here. **SG**

'Osborne User's Guide' by Leo Conrad, Lance Zimmerman, and Larry Goldstein, published by Prentice-Hall at £12.70 (paperback, 256 pages).

With Osborne decimating its productive capacity as the Executive takes the ground out from beneath the Osborne 1, this might not be the best time to be considering an Osborne user's guide. On the other hand, it could by the same token become a collector's item.

This book is specifically for the Osborne 1 and it aims to cater for uninitiated users. As such it may well be superfluous alongside the official manual that you'll have taken with the system — a thick, comprehensive, and well written book. (Adam Osborne was a journalist and still regards himself as a writer.)

So perhaps you may look at this relatively slim volume as a subset of Osborne's offering, and you may hope to use it as a simplified guide. This is a possibility. The only shortcomings of Osborne's manual lie in the area of Basic programming — Conrad, Zimmerman and Goldstein concentrate closely on MBasic, and their guide is subtitled 'Applications and Programming'.

There are still considerable areas of overlap, and some of Osborne's tutorial style seems to have rubbed off on the trio. But by and large the book proceeds from simple introductions to detailed complexities, clearly laid out and with frequent standing counts to make sure you are taking its lessons in.

There are only so many things that you can do visually to liven up programming guides and this one errs on the sober side. **DG**



A NEW ELAN WILL BE LAUNCHED ON SEPT 14.

Elan Home Computers start up on September 14.
Elan Computers Ltd., 31-37 Hoxton Street, London N1 6NJ.

Clubnet keeps you in touch with enthusiasts throughout the country. It is divided into two sections — microcomputing and user groups.

We publish a list of these groups on alternate weeks. This week clubs are listed alphabetically by county and town.

Each week we focus on an individual club or group with a report and this week it's the North London Computer Club.

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

The clubs listing is based on that of the Association of Computer Clubs.

A full program at the Poly

North London Computer Club, with 370 members (120 of them children), must be one of the largest and most active computer clubs in the country.

It meets four nights a week during term-time — at the North London Polytechnic in Holloway Road — and once a week during holidays.

In addition, the club's founder and organiser Robin Bradbeer runs Computertown, a weekly children's meeting which attracts 40 or 50 children per session.

The main meetings all serve specific purposes which could include a course on programming, watching a manufacturer demonstrate a particular piece of equipment or listening to a talk.

The hardware group uses the Polytechnic's technical equipment for testing machines, and members are taught how to build micros and peripherals and how to interface them.

Come October, the ZX Group will be relaunched and will meet at 6.30 each Monday, and an introduction to digital electronics will be held on the same day in a separate room. The women's group was scrapped due to lack of attendance.

The club was lucky enough to receive funds from Islington Council for the machines used at meetings, and it was one of six that formed the Association of London Computer Clubs.

Membership is very varied. Len Stuart, secretary of the ALCC, earns his living by doing maintenance on electronic equipment at the Department of Industry, while



Roland Kemp

Club organiser Robin Bradbeer give advice on setting up new clubs.

PCN contributor Ted Ball owns the Fantasy Centre bookshop in Holloway Road selling science fiction books.

Special events in the future will include fairs, meetings on networks and communications, conferences and seminars. The club has already run one-day seminars on librarianship and Prestel editing, and one of its major events will be the London Computer Fair next April at Central Hall Westminster, where it will have its usual stand.

On the evening that I visited the club, members worked on a variety of machines including a Commodore 8032, Atari 800, Epson MX80K/T printer, Vector 3, BBC and Apple II, and Robin Bradbeer gave a talk on how to set up a computer club.

Wendie Pearson

Name North London Computer Club **Venue** Polytechnic of North London, Holloway, London N7 **Meetings** Monday, Tuesday, Wednesday and Thursday evenings during term-time and one evening a week during holidays **Contact** Robin Bradbeer, 01-607 2789.

CLUBS

AVON

Bristol Berkeley Nuclear Laboratories Club. Contact Neil Walker, 53 Wolfridge Ride, Alveston, Bristol, 0454 414262.

Bristol Micro Computer Club. Meets at the Pavilion, Southend Road, Filton, Bristol, every other Tuesday. Darryl Collins, 60 Mackie Rd, Filton, Bristol BS12 7NA. 0272 792982.

Bristol Format 40/80 Disc Club, for BBC disk users. Contact Peter Hughes, Format 40/80 Disc Club, c/o The Lending Library, Five Marshal Street, Bristol BS1 4AA.

Multi-User Club Valerie Boyde-Shaw, Nailsea 851337.

Worle Computer Club. Meets at Woodsprings Inn Functions Rooms on alternate Mondays at 7-10.30pm. H Bennett, 0934 514902 or F Feeney, 0934 833122.

BEDFORDSHIRE

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

Chiltern Computer Club. Meets at Five Bells, Eaton Bray, Near Dunstable, Leighton Buzzard on second and fourth Monday of each month. Contact Steve Betts, 42 Wallace Road, Eaton Bray, OU6 2DF, 0525 220922.

Luton College Computer Club. John Rodger, 0582 3411.

Luton Computer Club. J P Fletcher, 1 Trowbridge Gardens, Luton, LU2 7JY, 0582 450687.

BERKSHIRE

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

BIRMINGHAM

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

BUCKINGHAMSHIRE

Aylesbury Computer Club. Meets at Quarrendon Youth Club every Friday at 7.30pm and at Mandsville County Secondary School the first Thursday of each month at 7pm. Ken Knight, 22 Mount Street, Aylesbury, 0296 5181.

Chiltern Microcomputer Club. Meets at the Garden Centre, School Lane, Chalfont St Giles, on the first Wednesday of each month. Mrs W Tibbitts, Ellwood, Deanway, Chalfont St Giles. 024 07 4906.

Iver Computer Club. P A Seal, 1 Ormonde Flats, Church Road, Iver Heath, 0753 652792.

Iver Computer Society meets at Huntsmoor room, Iver Village Hall on the second and fourth Thursday every month at 7.30. John Haigh, 141 Leas Drive, Iver, SL0 9RP.

CAMBRIDGE

Cambridge Microcomputer Club, meets on the third Wednesday of month. Derek Tripp, 3 Spurgeons Avenue, Waterbeach. 0223 315662.

Haverhill Microcomputer Club, meets at St Marys' Church Hall, Camps Road, Haverhill, on the second, third and fourth Wednesday of month at 7.30 to 10.30pm. Andrew Holliman, 5 Trinity Close, Balsham, CB1 6DW, 022 029 583.

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

CHESHIRE

Altrincham Computer Club. Meets at N Cestrian Grammar School, Durham Road, Altrincham, fortnightly. Martin Hickling, 39 Barrington Road, Altrincham, WA14 1H2, 061 941 4547.

Brunel Computer Club. Meets at St Werburgh Community Centre on alternate Wednesdays at 7 to 10pm. Mr R Simpson, 4 The Coots, Stockwood.

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

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

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

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

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

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

Northwest Computer Club meets fortnightly. John Lightfoot, 13 Aston Drive, Frodsham, Warrington, WA6 7PU. 0728 31519.

Northwest Computer Club, weekly meetings. Tom Wyatt, 29 Summer Lane, Halton, Runcorn Cheshire WA7 5PG. Runcorn 77545.

Mid-Cheshire Computer Club meets at Winsford Library on the second Friday every month at 7.30pm. Simon Sadler, Winsford 53339.

Stockport Software Exchange Club. Send SAE to P Redford, 53 Cavendish Road, Hazel Grove, Stockport, Cheshire.

CLEVELAND

Cleveland Micro Club meets on the second and third Tuesday of each month, under 18s on second of month, over 21s on third Tuesday of month. J Telford, 13 Weston Crescent, Norton.

Stockton Amateur Computer Club meets at YMCA, Stockton, each alternate week at 7-9pm. Peter Cheshire, 60 Croft Road, Eaglescliffe, Stockton-on-Tees, TS16 0DY.

CORNWALL

Cornish Radio Amateur Club — Computing Section. Bob Reason, 24 Mitchell Road, Camborne.

Cornwall Area PAICC meets at the Penzance Micro Centre every Friday. S Zenith. Hayle 754845.

70 ▶

St Austell Computer Club and Computer Town meets at ECIP Labs., Penpewan Road, fortnightly on Mondays at 7.30pm. N G Day, 2 Glendale Close, St Austell.

CUMBRIA

Ambleside Computer Club. Contact Jeremy Westerman, 8 Hill Top Road, Ambleside, Cumbria. Tel: Ambleside 2452.

DERBYSHIRE

Derby Micro Society meets at Littleover Church Hall, Sheperd Street, on every other Thursday at 7pm. Mike Riordan, 0332 769440.

Glossop Computer Club. John Dearn, 2 Spinney Close, Glossop.

DEVON

Brixham Computer Users Club. Meets at Computer Systems (Torbay), Pump Street, Brixham, Saturdays at 2.30pm. Ian Chipperfield, 22 Brookdale Court, Brixham, Devon (Brixham 59224).

Computers Against the Bomb. Contact Paul Couchman, 29 Clifton Place, North Hill, Plymouth, Devon.

Exeter & District Computer Club meets at Exeter School, Magdalene Road, Exeter, on the second and fourth Tuesday every month. T G Holden, 14 Greenville Avenue, Teignmouth, TQ14 9NT.

Exeter & District Amateur Computer Club meets second Tuesday every month. Doug Bates, Fortescue House, Stoke Cannon, Exeter. Specialist meetings on third and fourth Tuesday.

Okehampton Computer Club. Contact Cherri Graebe, Okehampton 3523, or Okehampton Community College, Okehampton 3800. Meets 7pm each Monday during term time.

South Molton Computer Club. Meets at South Molton Tool Hire, Dootson House, Cooks Cross Industrial Estate, South Molton, North Devon, each Thursday at 7pm. Contact Nick Hewe on 07695 3446.

Torbay Users Computer Club meets at Devon Computers, 39 Totnes Road, Paignton on Mondays fortnightly.

DORSET

Bournemouth Area Computer Club meets at Kinson Community Centre on the third Wednesday every month. Peter Hibbs, 54 Runnymede Avenue, Bournemouth, BH11 9SE. 0202 576547.

TOPIC meets at Canteen English Truck Centre on the second and fourth Wednesday every month at 7pm. David Washford, 1 Alexander Road, Bournemouth, BH6 5JA.

Purbeck Computer Club, contact 31 North Street, Wareham, Dorset BH20 1AD.

DURHAM

Darlington Computer Club, weekly meetings. L Boxell, 8 Vane Terrace, Darlington DL3 7AT. 0325 67766.

ESSEX

Genius Computer Club. 30 Webber House, North Street, Barking.

Great Dunmow Computer Club. Contact T Coombs: 4 Oakroyal House, Oakroyal Avenue, Great Dunmow, Essex CM6 1HQ.

Brentwood Amateur Computer Club, meets once a month. R Sadler, 18 Warescot Road, Brentwood, CM15 9HD. Brentwood 232463.

Springfield Computer Club meets on the first Friday of every month. Stephen Cousines, 1 Aldeburgh Way, Springfield, Chelmsford, CM1 5PB. 0245 50155.

Canvey Computer Club. Contact Dean Williams, 17 Mornington Road, Canvey Island, Essex SS8 8AT.

Colchester Microprocessor Group meets at University of Essex on the second and fourth Wednesday of every month at 7.30pm. Information Centre, University of Essex, near Colchester.

Colchester Computer Society. Meets at Severals Hospital Social Club, Colchester. Contact A Potten, 14 Foxmead, Rivenhall, Witham, Essex CM8 3HD, Witham 516335.

Stanway School Computing Club, only school members at present. G Floyd, c/o Physics Department, Stanway School, Stanway, Colchester.

Nailsea Multi-User Club. Contact Valerie Boyde-Shaw. 0272 851337.

Romford Club, a new club. Mr D Norden, 138c Church Road, Romford.

Roundacre Micro Computer Users Club. Meets at the Roundacre Youth House, Laindon Link, Basildon every Wednesday at 7.30pm. Contact Mrs L Daden, Basildon 285119.

South East Essex Computer Society meets at Hockey Club at Roots Hall, near Southend Football Stadium on Wednesday at 7.30pm. Robin Knight, 128 Little Wakering Road, Little Wakering, Southend-on-Sea. 0702 218456.

GLOUCESTERSHIRE

British Amateur Electronics Club. Mr J Margetts, 3 Bishopstone Close, Golden Valley, Cheltenham.

Cheltenham Amateur Computer Club meets on the third Tuesday of each month at 7.30pm. Mike Pullin 0242 25617 or Robin Phelps 0242 584343.

GCHQ. D W Adam, 16 Court Road, Prestbury, Cheltenham.

Cheltenham Amateur Computer Club meets at Prestbury Scout Headquarters, on the third Tuesday of every month at 7.30pm. M Hughes, 36 Riverviews Way, Cheltenham.

HAMPSHIRE

Commodore Computer Club. Meets on the first Friday of every month at Bury House, Bury Road, Gosport at 7.30pm. Brian Cox, Fareham 280530.

Fareham and Portsmouth Amateur Computer Club. Alan Smith, c/o Francis Close, Lee-on-the-Solent, Gosport, Hants PO13 8HB. 0705 550907.

RAF Odiham Computer Club. Contact c/o Officer i/c, Royal Air Force, Odiham, Nr Basingstoke, Hants.

Southampton Amateur Computer Club meets at Crestwood Centre, Shakespeare Road, Boyatt Wood, Eastleigh, Hants. on the second Wednesday of every month at 7.30pm. Paul Blitz, Chandlers Ford 69050.

HEREFORD

Hereford Amateur Computer Club, proposed new club. Stuart Edinborough, 2 Warwick Walk, Bobblestock, HR4 9TG. 0432 269700.

HUMBERSIDE

Bridlington Microcomputer Club. Meets 7.30pm alternate Fridays at Old Star Inn, High Street, Bridlington. Contact D Compieman, 0262-601859.

Grimsby Computer Club meets at Grimsby Central Library fortnightly on Mondays at 7.30pm. Jenson Lee, 29 Park View, Cleethorpes. 0472 4259.

Scunthorpe & District Microprocessor Society meets at Community Centre, Lindun Street, Scunthorpe, every Tuesday at 7.30pm. G Hinch, 21 Old Crosby, Scunthorpe, South Humberside DN15 8PU.

KENT

Canterbury ACC proposed new club. Contact L Fisher, 21 Manwood Avenue, St Stephens, Canterbury, CT2 7AH.

Gravesend Computer Club. Meets at School Room Extra Tuition Centre, 39 The Terrace, Gravesend. Contact c/o The Extra Tuition Centre, 0474 56677.

Medway Amateur Computer & Robotics Organisation. Meets at 7.30pm on first Tuesday and third Wednesday of every month. Annual subs £5. Contact Paul Cameron, Unit 3, Walderslade Centre, Walderslade Road, Chatham, Kent, 0634-63036.

North Kent Amateur Computer Club meets at Lecture Theatre, Charles Darwin School, Jail Lane, Biggin Hill, on the first Thursday of every month at 7.30pm. Iain House, 28 Canadian Avenue, Catford SE6 3AS. 01-690 5441.

Orpington Computer Club meets at The Large Hall, Christ Church, Chaterhouse Road, Orpington, every Friday at 8pm-10.30pm. Mr R Pyatt, 23 Arundel Drive, Orpington, Kent BR6 9JF. Orpington 20281.

Amateur Computer Club. Rupert Steele, St John's College, Oxford OX1 3JP.

National Personal Computer User Association. Eric Keeley, 11 Spratling Street, Manston, Ramsgate, Kent.

Sevenoaks School Computer Club. G Sommerhoff, Technical Centre, Sevenoaks School, Sevenoaks, Kent. 0732 456340.

Tonbridge & Tunbridge Wells ACC. Ray Szatkowski, 1 Cromer Street, Tonbridge. 0732 355960.

LANCASHIRE

Blackburn Micro Computer Club. Roger Longworth, 12 Sharp Close, Accrington.

Bolton Computer Club meets at E4/24 Bolton Institute of Higher Education, Deane Road, Bolton, on Thursdays. David Atherton, 16 Douglas Street, Asherton, Manchester M29 9FB. 0942 876210.

Burnley Computer Club. Meets at Burnley Technical College on Tuesdays, 7.30-11pm. Contact Clive Tallon, 27 Basnett Street, Burnley, Lancs.

Chorley Computer Club meets at Townley Arms, Chorley, every other Tuesday at 8pm. Tony Higson, 23 Brock Road, Chorley, Lancs. Chorley 68429.

Ribble Valley Computer Club meets at Staff Canteen, Needle Carpets Ltd, West Bradford, on the second and fourth Monday of month at 7-9pm. Contact Ian Thornton-Bryar, 25 Southfield Drive, West Bradford, Clitheroe, BB7 4TU.

Lancaster & Morecambe Computer Club. Sarah Blackler. 0524 33553.

South Cadderton Computer Club meets at Turf Lane Centre, Turf Lane, Chadderton, on Thursdays at 7-9.30pm. David Sholes, 18 Beech Avenue, Oldham, Lancs.

LEICESTERSHIRE

East Leake Computer Club. Andrew Jones, 59 Bateman Road, East Leake, Loughborough, LE12 6NN.

Hawker Siddeley Computer Club. Contact R Wrathall, 6 Naseby Drive, Loughborough LE11 0WU.

LINCOLNSHIRE

Lincoln Computer Club, meets at Blandings Public House, High Street, Lincoln on the first and third Wednesday of every month. John Clifford, 448 Newark Road, Lincoln LN6 8RX. 0522 2168.

Skegness Computer Club, meets at County Hotel every other Monday, 7.30-9.30pm. Reg Potter, 118 Beresford Avenue, Skegness. 0754 3594.

LIVERPOOL

BBC Microgroup Liverpool meets at Old Swan Technical College, Liverpool, on the first Wednesday of month. Nick Kelly, 56 Queens Drive, Walton, L4 6SH.

LONDON

Croydon Computer Club. BBC group meets 7pm, first and fourth Tuesday of each month at Croydon Central Library. Contact Mr Khabaza, 10 Lawrence Road, South Norwood, London, SE25, 01-653 3207.

Computer Users Club. Tony Latham 01-304 3910.

East London Amateur Computer Club meets at Harrow Green Library, Cathall Road, E11, on the second and fourth Tuesday of month at 7-10pm. Fred Linger on 01-554 3288.

Forum-80 London. Leon Jay, 01-286 6207.

Forum-80 Wembley. Victor Saleh, 01-902 2546.

Harrow Computer Group meets at Harrow College of Higher Education, Room W24, Northwick Park, on alternate Wednesday at 7pm. Bazyle Butcher, 01-950 7068.

Imperial College Microcomputer Club meets at room 145, level 1, on Tuesdays at 7.30pm. Tim Panton, c/o I.C. Union Office, Prince Consort Road, London SW7 2BB.

London School Computer Club. Burlington Danes School, Dane Building, DuCane Road, Hammersmith.

Metropolitan Police Amateur Computing Club meets on the first Thursday of month at 7pm. S Farley, 01-725 2428.

68 Microgroup meets at Regents Park Library, Robert Street, NW1, on the third Tuesday of month at 7.30pm. Jim Anderson, 41 Pebworth Road, Harrow, Middlesex.

North London Computer Club meets at the Polytechnic of North London, Holloway, N7 8DB, on Monday, Tuesday, Wednesday and Thursday during term time and one evening a week during holidays. Robin Bradbeer, 01-607 2789.

Paddington Computer Club meets at Paddington College, 25 Paddington Green, W2 1NB. Peter Hill, 01-723 5762.

Post Office HQ Microcomputer Club meets at room B145, River Plate House, 12-13 South Place, off Moorgate, on the second Thursday of month. Vernon Quaintance, British Telecom Enterprises, Cheapside House, 138 Cheapside EC2U 6JH. 01-726 4716.

Queens Crescent Computer Club. Meets at Queens Crescent Library, 165 Queens Crescent, London NW5, 01-485 4551.

The SOBAT Computer Club meets once a fortnight. Mr T Kayani, 12 Calderon Road, London E11.

South East London Microcomputer Club meets at Thames Polytechnic, Greens Ends, Woolwich SE18, on alternate Wednesdays at 7pm. Peter Phillipps, 61 Graigerne Road, SE3. 01-853 5829.

Southgate Microcomputer Club meets at Room B106 Southgate Tech, fortnightly on Thursdays at 7.30pm. Kevin Pretorius 01-882 2282. See Prestel page 25820645.

West London Personal Computer Club meets at Back room, Fox & Goose pub, Hanger Lane, Alperton, on the first Tuesday of month at 7.45pm. Graham Brain, 01-997 8986.

MANCHESTER

Manchester Computer Club meets at the Department of Computer Science, Manchester University, Oxford Road, on the first and third Thursday of month at 7.30pm. David Wade, 061-941 2486.

Small Business Computer Users Club. Proposed new club to meet the last Tuesday of month. K Wadsworth, 061-740 7232 after 5pm.

South Trafford Microcomputer Club. Meets fortnightly. Contact Ian White, 16 Leicester Avenue, Timperley, Altrincham WA15 6HR, 061-969 2080.

MERSEYSIDE

Merseyside Microcomputer Group meets at Merchant Taylor's School, Crosby, on second Thursday month. Mr F Shaw, 14 Albany Avenue, Eccleston Park, Prescot. 051-426 5536.

Southport Computer Club meets weekly. Ian Bristone, 28 Weld Road, Southport, Merseyside PR8 2DL. 0704 64524.

Wirral Microcomputer Users Group meets at Birkenhead Technical College every Monday. J Phillips, 14 Helton Close, Birkenhead, Merseyside L43 9HP.

Wirral Computer Club. Contact Gary Metcalfe, 24 Marlston Avenue, Irby, Merseyside.

MIDDLESEX

Brigadier Computer Club. Meets on the first and third Monday of every month at Brigadier Youth Centre, Brigadier Hill, Enfield at 7.30 pm. Subs: £2. Contact Steve Ward, 28 Brodie Road, Enfield, Middx EN2 0EU, 01-363 3786.

Micromodeller User Association. Meets three times a year. Contact Philip Matthews, Phillip Morris House, 21 High Street, Feltham TW13 4AD, 01-751 6388.

Sunbury Computer Club meets at St Benedicts Hall, Napier Road, Ashford, on the last Tuesday of month at 8pm. Simon Taylor, 8 Priory Close. **Sunbury-on-Thames, Middlesex. Simon Clark, 83 Watling Street, Towcester, Northants NW12 7AG.**

ZX Micro Club. Contact Paul Hargreaves, 10 The Ride, Brentford, Middx.

CLUBNET

NORTHAMPTONSHIRE

Corby Universal Micro Club. Meets at Lodge Park Sports Centre fortnightly on alternate Wednesdays and Thursdays. Contact Peter Wilson, 26 North Cape Walk, Corby. tel: Great Oakley 742622.

NOTTINGHAMSHIRE

Ashfield Computer Club meets at Carsic Junior School, St Mary's Road, Sutton in Ashfield on the first and third Thursday month. Derick Daines, c/o Cuttings Avenue, Sutton in Ashfield, Notts.

Eastwood Town Micro Computer Club meets at Devonshire Drive Junior School Wednesday at 5.45pm. Ted Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Nottingham Microcomputer Club meets at Castle Gate Centre, Nottingham, Monday at 7.30pm. Mr E Harvey, 68 Roseleigh Avenue, Nottingham NG3 6FH. Nottingham 608491.

Worksop Computer Group. New club, first meeting June 14 in Worksop library lecture room. Mr Andrews, Worksop 487327.

NORFOLK

Anglia Computer User Group. Jan Rejzl, 128 Templemere, Sprowton Road, Norwich. 0603-29652.

Brecklands Computer Club. Contact Andrew Hiom, 11 Annafewes Close, Thetford, Norfolk. Meets each Saturday, 5pm at this address.

Dereham & District Computer Club. Meets at Middle School, Westfield Road, Toftwood, East Dereham on every second Wednesday at 7.30pm. Contact Mrs Fran Cook, Dereham 67732.

East Anglian Computer User's Group meets at Crome Community Centre, Telegraph Lane, Norwich. Gill Rijzl, 88 St Benedicts, Norwich.

South Northants Computer Group meets at Anchor House, Moat Lane, Towcester, on Wednesdays at 7.30pm.

OXFORDSHIRE

Association of Computer Clubs. Rupert Steele, St John's College, Oxford OX1 3JP.

Micronac meets at Clarendon Lab, Parks Road, Oxford, every week during term. Rupert Steele, St John's College, Oxford OX1 3JP.

Oxford Personal Computer Club. Len Phelps, Southport Cottage, Sutton Courtenay, Nr Abingdon, Oxon OX14 4AU.

Ridgeway Computing Club meets at Swan Hotel, East Ilsley, on the second Tuesday month. Mike Magney, Beavers, South Street, Blubury, Didcot, Oxon OX11 0JU.

SHROPSHIRE

Ludlow & District Microcomputer Club meets at Diocesan Education Centre, Lower Galdeford, Ludlow, on the second Monday of month at 7.30pm.

Shrewsbury Micro Club meets at Shrewsbury Shirehall once a month. Mr V Ives, 6 Bramley Close, Severn Meadows, Shrewsbury SY1 2TP.

Telford Computer Club meets at Telford ITEC on Monday 6-9pm. John Murphy, 10 Brichmore, Brookside, Telford TF3 1TF. 0952 595959.

SOMERSET

Sharp MZ80 Club, Tim Powell, Computer Centre, Yeovil College, Yeovil, Somerset.

Yeovil Computer Club. D G Carrington, 2 Romsey Road, Yeovil, BA21 5XN.

STAFFORDSHIRE

Alsager Computer Club, meets at Alsager Comprehensive School, Stoke-on-Trent, Staffs, fortnightly on Tuesday. Rex Charlesworth, 09363 77270.

The Amateur Computer Club of North Staffs meets on the third Wednesday month. J Roll, 16 Hill Street, Hednesford, Staffordshire WS12 5DS.

ICL Birmingham Branch Micro Club, c/o WBA Ecclestone, 26 Browns Lane, Tamworth, Staffs.

Tame Valley Computer Club, Tim Marshall, 32 Milton Avenue, Leyfields, Tamworth, Staffordshire B79 8JG.

SUFFOLK

Newmarket Home Computer Group. Meets at Anchor House, Moat Lane, Towcester, at 7.30pm. Contact Simon Clark, 83 Watling Street, Towcester, Northants NN12 7AG, 0327 52191.

Suffolk Microcomputer Club meets monthly. Mr S Pratt, c/o Microtek, 15 Lower Brook Street, Ipswich.

SURREY

Ashtead Computer Club meets on the last Thursday of month. Contact P Palmer, 8 Corfe Close, Ashtead.

Deaf Microcomputer Users Group. Contact Chris Marsh, 3 Delaporte Close, Epsom, Surrey KT17 4AF.

Thames Valley Amateur Computer Club meets at Grifton, Caversham, on the first Tuesday of month. Brian Quarm, 25 Roundway, Camberley, GU15 1NR, Camberley 22186.

Ewell Micro Club, Dave De Silva, 316 Kingston Road, Ewell, KT19 0SU.

Farnham Computer Club, meets at Farnham 6th Form College, Morley Road, Farnham, on the second Wednesday of month. Adam Sharp, 14 Thorn Road, Boundstone, Farnham.

West Surrey Computer Club meets at Paddock Room, Green Man Public House, Burpham, Guildford, the first Thursday of month. Chris Karney, 0483 68121.

ITH Computer Club meets on Fridays. A Bond, 54 Farnham Road, Guildford, Surrey GU2 5PE. 0485 62035.

CBBS London meets on Sundays 4-10pm. P Goldman, PO Box 100a, Surbiton, KT5 8HY.

Sutton Library Computer Club meets at Central Library, St Nicholas Way, Surrey, on the first Friday of month at 6pm and second and third Tuesday of month. Dave Wilkins 01-642 3102.

Midhurst & District Computer User Group. Meets at the Grange Centre, Midhurst, at 7pm on the second and fourth Thursday of every month. Contact Val Weston, tel: Midhurst 3876.

Association of London Computer Clubs, Len Stuart, 89 Mayfair Avenue, Worcester Park, KT4 7SJ.

SUSSEX

CVGC Video Games Club. Contact G Bond, 7 Swift Lane, Langley Green, Crawley Sussex.

West Sussex Microcomputer Club meets at Room RO6, Robinson Road Annexe, Crawley, on the first and third Monday of month. J Clarke, 31 Hyde Heath Court, Pound Hill, Crawley, 0293-884207

Mid-Sussex Microcomputing Club. Contact Jeff Hayden, 2 Hilary Close, East Grinstead, RH19 3XQ.

Arun Microcomputer Club meet at Wick Amenity Centre, Wick Farm Road, Littlehampton, on the first Monday of month at 8pm, and third Sunday of month at 6pm. P Cherriman, 7 Talbot Road, Littlehampton, West Sussex DN17 7BL.

Brighton, Hove & District Computer Club. Meets 7.30pm every second Wednesday at Southwick Community Centre. Contact J Smith, 30 Leicester Villas, Hove, E Sussex.

Worthing & District Microcomputer Club meets at Rose Wilmot Youth Centre, Littlehampton Road, Worthing, on alternate Sundays 11am-1pm. B. Thomas, 11 Gannon Road, Worthing, W. Sussex, BN11 2DT. 0903 36785.

Richmond Computer Club meets at Richmond Community Centre, Sheen Road, on the second Monday of month at 8pm. Bob Forster, 18a The Barons St Margarets, Twickenham, Middlesex, 01-892 1873.

TYNE & WEAR

Newcastle upon Tyne Personal Computer Society meets at Room D103, Newcastle Polytechnic on the first Tuesday of every month. Pete Scargill, 21 Percy Park, Tynemouth. 0632 573905.

WEST MIDLANDS

Cannock Computer Society meets at Cannock Computer Systems, Old Penkridge Road, Cannock, fortnightly. Terry Sale, 20 Redwood Drive, Chase Terrace, Walsall WS7 8AS.

Coventry Computer Circle. Contact Chris Baugh, 9 Hillman House, Smithford Way, Coventry CV1 1FZ.

Walsall Computer Club meets at Park Hall Community School on the second and fourth Monday month 6.45-9 45pm. Alison Hunt, 58 Princes Avenue, Walsall, WS1 2DH. 0922 23875.

National Westminster Personal Computer Society. P Moore 021-236 6176, ext 382.

West Midlands Amateur Computer Club meets at Enfield School, Love Lane, Stourbridge, on the second and fourth Tuesday of month. John Tracey, 100 Booth Close, Brierley Hill, Kingswinford, 0384 70097.

WILTSHIRE

Chippenham and Calne, proposed new club. Matthew Jones, Pinhills, Caine SN11 0LY.

WORCESTER

Worcester & District Computer Club meets at Old Pheasant Inn, New Street, Worcester, on the second Monday month at 8pm. D Stanton, 55 Vauxhall Street, Rainbow Hill, WR3 8PA.

YORKSHIRE

Barnsley Co-Operative Computer User Group meets at Co-Op Social Club, Pogmore, Barnsley, on the last Tuesday month at 7.30pm. James Bridson, c/o 39 Kenilforth Hall Road, Barnsley, South Yorks S70 6NF. 0226 41753.

Greenhead Grammar School Computer Club. Brian Smith, Greenhead Road, Keighley, West Yorks BD20 6EB, 0535 62828.

Huddersfield Computer Club meets every Monday. Chris Townsend, 760/4 Manchester Road, Linthwaite, Huddersfield, 0484 657299.

Leeds Microcomputer Users Group meets at 8 Regent Street, Chapel Allerton, fortnightly on Thursday at 6pm. David Parsons, 22 Victoria Walk, Horsforth LS18 4PL.

Program Power, R Simpson, 5 Wemsley Road, Leeds LS7 2BX, 0532 683186.

Pennine & District Computer Club meets at 26 Mill Hey, Haworth, W Yorks, on Saturday and Sunday. Douglas Bryant, 26 Mill Hey, Haworth, W Yorkshire, 0535 43007.

Shipley College Computer Group meets on Tuesdays. Paul Channell, tel: 0274 595731.

South Yorkshire Personal Computer Group meets at General Lecture Theatre, St Georges Building, Mappin Street, Sheffield, on second Wednesday month at 7.30pm. Paul Sanderson, 8 Vernon Road, Tetley, Sheffield S17 3QE.

Thurnscoe & District Micro Users' Club meets at Thurnscoe Comprehensive School, Physics Lab, Clayton Lane, Thurnscoe, Wednesday at 7.30pm during school term. Mr James Davis, 62 Tudor Street, Thurnscoe East, 0709 893680.

West Yorkshire Microcomputer Group meets on Tuesdays. Phillip Clark, c/o Suite 204, Crown House, Armley Road, Leeds LS12 2ES, 0532 632532.

York Computer Club meets at the Enterprise Club every Monday at 8pm. K Thomas, Green Lea, Ripon Road, Harrogate, HG1 2BY, 0904 38239.

SCOTLAND

Bishopton Computer Club meets at 'Owa Ben', Sachlecourt Avenue, Bishopton, Renfrewshire, on Sunday once a month Alasdair Law, 10 Dunglass Road, Bishopton, Renfrewshire PA7 5EF.

Edinburgh Home Computing Club meets at Claremont Hotel, Edinburgh, on the 2nd, 3rd and 4th Wednesday of month. I. Robertson, 031 441 2361.

Scottish Amateur Computer Society, Mike Anthony, 46 Moredun Park Gardens, Edinburgh EH17 7JR.

Central Scotland Computer Club meets at Falkirk College of Technology, Grangemouth Road, Falkirk, on the first and third Thursday of month. James Lyon, 78 Slamannan Road, Falkirk FK1 5NF.

Fife Computer Users Club meets fortnightly. Murray Simpson, 31 Tom Steward Lane, St Andrews, Fife, KY16 8YB.

Grampian Amateur Computer Society meets at 35 Thistle Lane, Aberdeen, on the second and fourth Monday every month at 7.30pm. Alan Morrison, 21 Beech Road, Westhill, Skene, Aberdeenshire AB3 6WR.

Kennay Computer Club meets weekly. S Stubbs, 15 The Glebe, Kennay, Inverurie, Aberdeenshire.

Inverness Personal Computing Club meets every second Tuesday at 7.30pm. Gyl Mackenzie, 38 Ardconnel Street, Inverness IV2 3EX. 0463 220922.

Perth & District Amateur Computer Society meets at Hunters Lodge Motel, Bankfoot, on the third Tuesday of month at 7.30pm. Alastair McPherson, 154 Oakbank Road, Perth PH1 1HA.

Strathclyde Computer Club meets at Wolfson Centre, 106 Rottenrow, Glasgow, on the third Wednesday of month. B Duffy, 24 Lomand Drive, Condorrat, Cumbernauld G4 8NW.

WALES

Abergele Computer Club meets at Abergele CI Offices every Thursday at 7.30-10pm. W Jones, 77 Millbank Road, Rhyl, Clwyd.

Colwyn Computer Club meets at the Greens Hotel, Colwyn Bay, at 7pm. Contact D Bevan, c/o Abergele Road, Colwyn Bay, Clwyd LL29 7PA.

Connah's Quay Computer Club. Meets second and fourth Thursday of each month at the Community Centre, Cable Street, Connah's Quay, at 7pm. Contact G Johnson, tel Deeside 821945.

Gwent Amateur Computer Club meets at St Mary's Institute, Stow Hill, Thursday at 7.30pm. Rothery Harris, 16 Alanbrook Avenue, Newport, Gwent, Wales NPT 6QJ.

Llantwit Major Computer Club. Meets at Adult Education Centre, Llantwit Major, every Tuesday. Contact Douglas Mountain, 16 Denbigh Drive, Llantwit Major, South Glamorgan CF6 9GQ.

Mold Computer Club. Meets 7.30pm on first and third Thursday of each month at the Daniel Owen Centre, Earl Street, Mold. Contact G Johnson, 18 Daytona Drive, Northop Hall, Mold, Clwyd, Wales. Tel Deeside 821945.

Milford Central Computer Club. Open to schoolchildren, meets every lunch time and evening. Contact Harry Evans, Milford Central School, Prioryville, Milford Haven, Dyfed, 043 784 571.

Pencoed Amateur Computer Club meets fortnightly on Saturdays at Pencoed Welfare Hall. Philip Williams, 38 Bryn Rhedyn, Pencoed, Bridgend, Mid-Glamorgan CF35 6TL, 0656 860307.

Pontypool Computer Club meets at The Settlement, Roackhill Road, Pontypool, Gwent, on Friday. Graham Loveridge, on Pontypool 2827.

Swansea & Southwest Wales Amateur Computer Club meets on the last Friday every month. Paul Griffiths, 1 Prescelli Road, Penlan, Swansea SA5 8AF.

Swansea Computer Club. Meets at No 10 (pub), Union Street every Tuesday at 7.30pm. Contact Robert Palmer, 044 123 602.

Wrexham & District Computer Club. Meets each Thursday. Contact Mike Houghton, 1 Snerwell Avenue, Wrexham, Clwyd, Wales.

NORTHERN IRELAND

North Down Micro Users Club. Meets at Bangor Central Library, Hamilton Road, every fourth Monday. Contact A Robson, 0247 67060.

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The PCW Show is Britain's most popular micro event. Hardly surprising, with over 200 exhibitors showing an exciting range of micros, software and peripherals — for business and commerce, education, science, industry and the home.

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DATABASICS

This six-page guide lists as many of the micros on the market for under £12,000 as possible. In Databasics you'll find all the specifications for the machines, add-ons and software necessary to make your buying decisions.

PCN keeps you up to date in three-week cycles, starting with hardware, then peripherals and finally software.

PRICE Specifications listed for each machine indicate what you get for the basic price quoted, which includes VAT.

PROCESSOR TYPE a microprocessor is the heart of the computer. The Z80 and 6502 are popular 8-bit chips. The 8088 and 68000 are common 16-bit chips. If a machine has an 8-bit and a 16-bit processor we have listed the 16-bit only. Cust. means custom-built.

SPEED IN MHz Speed of the clock used to drive the microprocessor, measured in MegaHertz (million cycles per second).

STANDARD RAM Amount of main memory used on the system. The capacity is expressed in kilobytes.

MAX RAM normally at extra cost Amount of memory to which the system can be expanded.

MAX CHARACTERS columns × lines The number of characters that can be displayed across the screen and the number of lines down.

METHOD (at extra cost) This indicates the way the computer displays information. **M** on its own means that a monitor is included in the basic price. **Tv** indicates that you can plug the computer into a television set (**M+**) indicates that the monitor costs extra. **LCD** = Liquid crystal display.

COLOUR CAPABILITY tells you whether the machine can give colour at the basic price quoted.

MAX DOT RESOLUTION gives the maximum number of points across the screen by the number of points down the screen that are available for graphics.

KEYBOARD This tells you the type of keyboard that comes with the machine. **W** = word processing, **C** = calculator and **T** = touch-sensitive.

No OF FUNCTION KEYS refers to the number of keys that can be used for different jobs by different programs.

NUMERIC PAD indicates whether the machine has a separate calculator-style group of number keys to enter data quickly.

INTERFACES BUILT-IN shows the number of standard connections built into the machine.

CASSETTE FACILITY gives a yes or no as to whether or not the machine can use a cassette to store data.

CAPACITY PER DISK AND DISK SIZE tells you how many disk drives come with the machine, and the amount of data in kilobytes (K) or megabytes (Mb) that can be stored on each drive. There are two sizes for disks, 5¼" or 8", and they can be floppy (**F**) or hard (**H**).

OPERATING SYSTEM gives the program that looks after the general running of a computer.

LANGUAGES INC is a column which lists the programming languages that come with the machine at the basic price.

OTHER LANGUAGES AVAILABLE indicates whether or not other programming languages are available for the machine.

DISTRIBUTOR To find which company distributes the machine refer to the distributor table from the code listed in this column. The table is at the end of the listings, and gives the distributor's name and telephone number.

All details given are the latest available. We ask distributors to let us know as soon as machine specifications change so Databasics can be kept right up to date. This guide has been meticulously researched and the information collected from individual distributors listed.

PRICE GUIDE

Sinclair ZX81	£40
Casio PB100	£50
TRS-80 PC4	£50
Sharp PC1251	£80
Aquarius	£90
Casio FX702P	£90
Jupiter Ace	£90
Sinclair Spectrum	£99
Comx 35	£120
Tandy TRS-80 Pocket 2	£130
Oric 1	£139.95
Acorn Atom	£150
Atari 400	£150
Sord M5	£150
TI-99/4A	£150
Colour Genie	£168
Commodore VIC 20	£170
Sharp PC1500	£170
Dragon 32	£200
Camputer Lynx	£225
Tandy TRS-80 Colour	£240
New Brain A	£269
Multitech MPS II	£269
BBC Micro Model A	£299
Genie II	£299
Atari 800	£300
Nascom 2	£327
Genie I	£330
Commodore 64	£345
Microtan 65	£389
BBC Micro Model B	£399
Datac Micro Controller	£431
Cortex	£454
Epson HX20	£472
Nascom 3	£549
Sharp MZ80A	£549
Commodore 4016	£632
Research Machine 480Z	£650
DAI PC	£684
Apple II	£776
Commodore 500	£799
HP 75C	£883
Sharp MZ80B	£900
Apple IIe	£972
Commodore 8032	£1,129
Commodore 710	£1,144
Microdecision	£1,144
Fujitsu FM8	£1,150
Sanyo MBC 1000	£1,195
Pied Piper	£1,226
Positron 900	£1,259
Tandy TRS-80 Model III	£1,299
Commodore 8096	£1,374
Pascal 640	£1,437
NEC PC8000	£1,454
Signet 2	£1,483
Irvine Business Systems	£1,489
Televideo TS-800 Series	£1,495
HP 86A	£1,541
Osborne I	£1,581
Signet 10025	£1,599
APL Signet	£1,610
Zenith Z89-81	£1,668
Basis 108	£1,683
Commodore Spr. Pet 9000	£1,719
Gemini Galaxy 2	£1,719
British Micro Micro 803	£1,720
Microsolution Brit. Genius	£1,840
Globe 101	£1,850
Genie III	£1,897
Toshiba T-100	£1,900
Sord M23	£1,932
Kaypro II	£1,949
Transtec BC2	£1,949
Kenilworth 83G	£1,953
Transam Truscan	£1,983
Epson QX10	£1,995
IDS Datamachine	£1,995
Tandy TRS-80 Model II	£1,999
Kenilworth 83N	£2,012
Caltext Micro	£2,019
LSI M3	£2,064
Haywood 9000 Composite	£2,064
Hawk Model 110	£2,070
Positron 9000	£2,134
Research Machines 380Z	£2,147
Superbrain JR	£2,150
Future Computers FX-20	£2,156
Comart Communicator	£2,180
Adler Alphatronic P2	£2,197
Country Com'ters C3000	£2,242
Kemitron K2000E	£2,242
Rair Black Box 320S	£2,242
Sanyo MBC 2000	£2,242
Toshiba T-200	£2,242
TMK 332	£2,242
Bonsai SM 3000	£2,294
CAL PC	£2,294
North Star Horizon	£2,294
Sanyo MBC 1250	£2,294
Casu Mini C2	£2,300
Seed System I	£2,300
Sharp PC3201	£2,300
HP 85	£2,360
HP Series 100, 120	£2,362
Sord M23P	£2,369
TI Prof. Computer	£2,386
IBM PC	£2,392
Xerox 820 Model II	£2,415
Haywood 3000	£2,439
LSI M4	£2,472
Canon CX-1	£2,500
Adler Alphatronic P2U	£2,524
IQ Tech Iona	£2,539
HP 87XM	£2,571
Quantum 2000	£2,587
Canon AS100	£2,633
CP1100	£2,639
Seed System 19	£2,600
Enterprise 1000	£2,645
Facit 6520	£2,645
Olympia Boss Model A	£2,645
Britannia Baby	£2,657
Adler Alphatronic P3	£2,696
Eagle II	£2,702
Almarc 801	£2,708
DEC Rainbow 100	£2,714
ICL PC Model 10	£2,754
Millbank SX10	£2,754
Olivetti M20D	£2,754
Sirius I	£2,754
Victor 9000	£2,754
North Star Advantage	£2,766
Apple III	£2,780
Sanyo MBC 4050	£2,817
Bonsai SM 4000	£2,842
Logica VTS Vitesse	£2,863
Decision-1 Computer O11	£2,869
DMS Fox	£2,875
Eagle III	£2,950
Zenith Z89-81	£2,978
Monroe EC 8800	£2,990
Philips P3500	£3,000
Tanberg EC10	£3,000
Archives 1	£3,003
Cromemco System 1	£3,025
DECPC 325	£3,080
Direct 1000	£3,093
Equator	£3,099
Clenio Table-Tops 925	£3,105
ITT 3030	£3,105
Monroe PC 8810	£3,162
HP Series 200 Model 16A	£3,211
Cifer Series 1	£3,214
Samurai	£3,214
Torch	£3,214
Sord M223	£3,277
Kontron RS180	£3,306
Columbia PC 1600-1	£3,392
Digico Prince	£3,392
OEM Orion	£3,392
Ajile	£3,400
Barcelos AMT 100	£3,450
Kalamazoo 1050	£3,450
Cromemco System 2	£3,560
Digital Microsystems 3	£3,576
Decision-1 Computer 012	£3,674
Televideo TS 1602-C	£3,714
Adds Multivision	£3,795
Clenio Pronto	£3,795
Panasonic JD800M	£3,795
Kemitron K3000	£3,795
DEC PC 350	£3,850
Vector 4	£3,852
Sage II	£4,019
Eagle IV	£4,190
C-1010	£4,197
Tandy TRS-80 Model 16	£4,199
Hytech H4500	£4,310
BMC OK 11 F800, Model 20	£4,360
ADS 42	£4,500
Televideo TS-802H	£4,533
Country Com'ters C1000	£4,542
Corvus Concept	£4,887
ICL PC Model 31	£4,939
Cromemco System 3	£5,170
Micro Five 1000	£5,175
Fortune 32:16 System 2	£5,204
Zeus 4	£5,400
Hawk Model 2110	£5,405
Molecular M200	£5,462
Altos 800/15	£5,663
Durango F85	£5,744
Triton 4	£5,744
Marin Chip M9900	£5,750
SW Tech. Products S0/9	£5,750
BASF 7100	£5,805
Computar	£5,837
Sord M243	£5,842
Archives IV	£5,905
Sage IV	£5,961
ICL PC Model 32	£6,037
Rair Business Computer	£6,037
Digital Microsystems 4	£6,210
Superstar	£6,296
Racal 6000	£6,327
Eagle 1600	£6,497
TI System 200-250	£6,695
Compucorp 675	£6,780
Wicat 150	£6,846
Suridance I	£6,969
Pascal Mod. Microengine	£7,003
Diablo 3000	£7,250
Onyx 5001 MU	£7,607
Suridance II	£8,205
Haywood Hinet	£9,550
Altos 856-10	£9,631
Apple Lisa	£9,775
Micro Five 3000	£10,350
Sundance 16	£10,480
Spectrum	£11,442

ABBREVIATIONS

Ap: APL
As: Assembly
Ba: Basic
Co: Cobol
Cm: Comal
Fr: Forth
Fr: Fortran
Pa: Pascal

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM — normally at extra cost	Display: Max characters columns × lines	Display: Method (at extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEEE 488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
Acorn Atom	£150	6502	1	2K	40K	32×16	Tv(M+)	●	256×192	W							1	●		Cassette	BaAs	●	A1	Hobbyist micro
Adds Multivision	£3,795	8085A	5	64K	256K	80×25	M		640×240	W	28		1			1			1×350K5¼F	CP/M2.2, Muon	Ba	●	A2	Multi user system
Adler Alphatronic P2	£2,197	8085A	3	48K	64K	80×24	M			W	6	●	2			1	3		2×160K5¼F	CP/M	Ba	●	T1	Good software choice
Adler Alphatronic P2U	£2,524	8085A	3	64K		80×24	M			W	6	●	2			1	3		2×320K5¼F	CP/M	Ba	●	T1	£327 buys extra storage
Adler Alphatronic P3	£2,696	8085A	3	64K		80×24	M			W	6	●	2			1	3		2×790K5¼F	CP/M		●	T1	16 bit option-promised
ADS 42	£4,500	8085A	4	32K		40×8	M		40×8	W		●	3				3	●	1×82K5¼F	Holland Automation	Ba		A3	Intelligent cash register
Ajile	£3,400	8088	4	256K		80×25	M		640×250	W	10	●	1	1		2			2×320K5¼F	MS-DOS	BaAs	●	A9	16-bit portable micro
Almarc 801	£2,708	Z80	4	64K	512K	80×25	(M+)	●		W			2				11		2×800K5¼F	CP/M		●	A4	8-bit range goes to 20Mb
Almarc 1601	£3,445	8086	8	128K	1Mb	80×25	(M+)	●		W			2				11		2×800K5¼F	CP/M86		●	A4	Pseudo 16-bits go to 20Mb
Aquarius	£90	Z80A	4	4K	52K	40×24	TV	●	320×192	C							1	●		Cassette	Ba		M7	Competition for Uncle Sir Clive
Altos 800/15	£5,663	Z80	4	192K	208K	80×24	M			W	8	●		1					1×450K5¼F	MP/M		●	L1	Multi user business machine
Altos 856-10	£9,631	8086	10	512K	1Mb	80×24	M			W	16	●	6						2×500K5¼F	Xenix	Xenix	●	L1	The 16-bit version
APL Signet	£1,610	Z80A	4	64K		80×25	Tv(M+)*	●		*			2						2×188K5¼F	APL, CP/M	Ap	●	M1	*APL terminal recommended
Apple II	£776	6502	1	48K	128K	40×24	Tv(M+)	●	256×192	W							7	●		CP/M, DOS 3.3, UCSD-P	Ba	●	A8	Plenty of software and extras
Apple IIe	£972	6502		64K	128K	80×24	M+	●		W						1	8			DOS	Ba	●	A8	Not an Apple III
Apple III	£2,780	6502	2	128K	256K	80×24	(M+)	●	560×192	W		●	1				4		1×140K5¼F	SOS, DOS		●	A8	Will emulate Apple II
Apple Lisa	£9,775	68000	8	1Mb		120×30	M		792×360	W		●	2	1			3		2×860K5¼F	Lisa		●	A8	Learning time 30 mins
Archives I	£3,003	Z80	4	64K		80×25	M	●	240×100	W	23	●	2	1		1	5		2×386K5¼F	CP/M		●	S1	Standard CP/M + graphics
Archives IV	£5,905	Z80	4	512K		80×25	M	●	240×100	W	23	●	1			1	3		1×10Mb5¼H+1×7445¼F	CP/M, MP/M		●	S1	Hard disk version
Atari 400	£150	6502B	1.79	16K		40×24	Tv	●	320×192	T	3					7		●		Cassette	Ba	●	A5	Games computer, Basic extra
Atari 800	£300	6502	1.8	48K		40×24	Tv(M+)	●	320×192	W	3					7	4	●		Cassette	Ba	●	A5	Versatile, good graphics
Barcellos AMT 100	£3,450	Z80A	4	64K	256K	80×24	TvM			W	8	●	1	1		2	3		2×500K8F	CP/M	BaCo	●	B1	Up to four users
BASF 7100	£5,805	Z80A	4	64K		80×24	M			W	26	●	1	1					3×163K5¼F	BOS	Ba	●	C1	Hard disc promised
Basis 108	£1,683	6502	1	64K	126K	80×24	TvM	●	820×168	W	15	●	1	1			6	●				●	C12	Apple bus, Z80, 80 columns
BBC Micro Model A	£299	6502	1.8	16K	32K	40×30	Tv(M+)	●	320×256	W	10					1		●		MOS	BaAs	●	A1	Upgradable to Model B
BBC Micro Model B	£399	6502	2	32K		80×30	Tv(M+)	●	640×256	W	10			1		5	3	●		MOS	BaAs	●	A1	Versatile and expandable
BMC OKI if 800, Model 20	£4,360	Z80B	5	64K	256K	80×25	M	●	640×200	W	15	●	1					●	2×340K5¼F	CP/M	Ba	●	E1	Built-in printer
Bonsai SM 3000	£2,294	Z80	2	64K		80×24	M		80×24	W	14	●	1	1					2×350K5¼F	CP/M		●	B2	CP/M business machine
Bonsai SM 4000	£2,842	8088	5	128K	256K	80×24	M			W	14	●	1	1						CP/M, MP/M, MS-DOS		●	B2	Z80 for 8 bit software
Britannia Baby	£2,657	8085	6.14	64K		80×25	Tv(M+)		80×25	W	11	●	2	1					2×500K5¼F	CP/M	AsBaCo	●	B3	Cobol language included
British Micro Mimi 803	£1,720	Z80A	4	64K		80×25	(M+)		512×256	W	17	●	1	1		1			2×400K5¼F	OS/M		●	B4	This is CP/M compatible
C-1010	£4,197	6502	1	64K	128K	80×24	TvM		256×192	W	12	●	1	1		1	8	●	1×1405¼F+1×10MbH	CP/M, DOS, UCSD-P	Ba	●	C2	Apple II compatible
CAL PC	£2,294	8088	5	128K	256K	80×25	TvM	●	256×512	W		●	2	1		1	5		2×400K5¼F	CP/M	Ba	●	C3	Also Z80B Processor
Caltext Micro	£2,019	Z80A	4	64K	256K	80×24	TvM			W	36	●	1	1			3		2×400K5¼F	CP/M		●	C3	Range of software included
Camputers Lynx	£225	Z80A	4	48K	192K	40×24	Tv(M+)	●	248×256	W			1	1				●		Cassette	Ba	●	C5	Unusual — promise of CP/M
Canon AS100	£2,633	8088	4	128K	512K	80×25	M	●	640×400	W	12	●		1			4		2×640K5¼F			●	C4	Choice of CP/M86 or MS-DOS
Canon CX-1	£2,500	6809	4	128K	256K	80×24	M		80×25	W	15	●	3	1	1		2		2×320K5¼F	MCX	BaAs	●	C4	Pascal, Fortran as extras
Casio FX 702P	£90	Cust.		2K		20×1	LCD			C								●		Cassette	Ba		C6	Pocket computer
Casio PB100	£50	Cust.		0.7K	1.7K	60×1	LCD			C		●					1	●		Cassette	Ba		C6	Business pocket computer
Casu Mini C2	£2,300	Z80A	4	64K		"	(M+)		"	*			4	1			6		2×1Mb8F			●	C7	*Choose your own terminal
Cifer Series 1	£3,214	Z80	4	128K	320K	132×32	TvM			W	40	●	3	1					2×800K5¼F	CP/M		●	C17	Other models available
Cienlo Pronto	£3,795	Z80A	4	64K	1Mb	"	Tv(M+)		"	*			2	2			18		2×600K8F	CP/M	Ba	●	C8	*Choice of terminal
Cienlo Table-Top 925	£3,105	Z80A	4	64K	128K	80×25	M			W	11	●	2	2					2×600K8F	CP/M		●	C8	Watch out for the weight
Columbia PC1600-1	£3,392	8088	4.77	128K	1Mb	80×24	M	●	640×200	W	10	●	2	1			8		2×320K5¼F	CP/M, MS-DOS	Ba	●	I1	An IBM lookalike
Commodore VIC 20	£170	6502	1	5K	32K	22×23	Tv(M+)	●	176×158	W	8									Kernal	Ba	●	C9	Very popular home micro

Commodore 64	£345	6510	1	64K		40×25	Tv(M+)	●	320×200	W	8					3		●		Kernal	Ba	●	C9	Good value for money
Commodore 500	£799	6509	1	128K	896K	40×25	Tv(M+)	●	320×200	W	10	●	1		1	3	1	●		Kernal	Ba	●	C9	Available by summer?
Commodore 4016	£632	6502	1	16K	32K	40×25	TvM			W		●			1	1	3	●		Cassette, PETDOS	Ba	●	C9	The original PET
Commodore 710	£1,144	6509	2	128K	896K	80×25	TvM			W	10	●	1		1	2	1	●		Kernal	Ba	●	C9	Might be a long wait
Commodore 8032	£1,129	6502	1	32K	96K	80×25	TvM			W		●			1	1		●		Cassette, PETDOS	Ba	●	C9	The 80-column PET
Commodore 8096	£1,374	6502	1	96K		80×25	TvM			W		●			1	1		●		Cassette, PETDOS	Ba	●	C9	Fully expanded PET
Commodore Super Pet 9000	£1,719	6502	2	96K		80×25	TvM			W		●	1		1	1	2	●		Cassette, PETDOS	Ba	●	C9	Top of the range
Compucorp 675	£6,780	Z80	4	64K	256K	80×20	M			W	20	●	1				4		2×655K5¼F	Compucorp		●	C10	Unusual O/S
Compustar	£5,837	Z80A	4	64K		80×25	M			W		●	2						1×10Mb8H+1×350K5¼F	CP/M	Ba	●	I10	Networking system
Comart Communicator CP100	£2,180	Z80	4	64K	512K	80×24	M			W		●	2	1			10		2×390K5¼F	CP/M		●	C13	Business CP/M micro
Comx 35	£120	1802		35K	67K	40×24	Tv	●		C								●		Cassette	Ba		C14	Built-in joystick
Cortex	£454	9995	12	64K	1Mb	40×24	Tv(M+)	●	256×192	W	12	●	1					●			BaAs		M2	Mainly sold as £340 kit
Corvus Concept	£4,887	68000	8	256K	1Mb	120×60	M		720×560	W	10	●	2		1	4				Merlin	Pa	●	K1	A4 shaped screen
Country Computers C1000	£4,542	6502	1	64K	128K	80×24	M		280×192	W	12	●	1				3		1×10Mb5¼H+1×140K5¼F	DOS, CP/M	Ba	●	C16	Runs all Apple software
Country Computers C3000	£2,242	Z80A	4	64K	256K	"	"			"			1	1					1×5Mb5¼H+1×500K5¼F	CP/M			C16	*Terminal own choice
CP1100	£2,639	8086	6	128K	1Mb	"	(M+)"			"			2	1			7		2×390K5¼F	CP/M 86		●	C13	Choose your own terminal
Cromemco System 1	£3,025	Z80	4	64K		80×24	(M+)	●	450×735	W	20	●	1				8		2×390K5¼F	CDOS, Crom		●	C13	Designed for business
Cromemco System 2	£3,560	Z80	4	64K		80×25	(M+)			W	20	●	1				21		2×390K5¼F	CDOS, Crom		●	C13	Large business machine
Cromemco System 3	£5,170	Z80	4	64K		80×25	(M+)			W	20	●					21		2×1.2Mb8F	CDOS, Crom		●	C13	Top end Cromec
DAI PC	£684	8080	2	48K		60×24	Tv(M+)	●	255×335	W			1					●		Cassette	Ba		D9	Optional maths chip
Datac Micro Controller	£431	Z80	2	16K		40×24	Tv(M+)		80×60	W			1		1	1	●				Ba	●	D1	Mainly used in labs
DEC Rainbow 100	£2,714	8088	N/A	64K	192K	132×24	M	●	960×240	W	20	●	2				3		2×400K5¼F	CP/M		●	D2	Competitor for IBM PC
DEC PC 325	£3,080	PDP11/23	N/A	256K		132×24	M	●	960×240	W	20	●	2				1		2×400K5¼F	P/OS		●	D2	Mini in micro clothing
DEC PC 350	£3,850	PDP11/23	N/A	256K		132×24	M	●	960×240	W	20	●	2				4		2×400K5¼F	P/OS		●	D2	Mini in micro clothing
Decision-1 Computer MDC-011	£2,869	Z80A	4	64K	192K		(M+)"			"			3	1		1			2×400K5¼F	CP/M	Ba	●	I2	*Buy your own terminal
Decision-1 Computer MDC-012	£3,674	Z80A	4	64K	192K		(M+)"			"			3	1		1			1×400K5¼F+1×5Mb5¼H	CP/M	Ba	●	I2	*You choose the terminal
Diablo 3000	£7,250	8085	3	32K	64K	80×24	M			W	8	●	1				4		2×1.8Mb8F	DACL	Ba	●	B5	Unusual O/S
Digico Prince	£3,392	Z80A	4	64K		80×25	M			W	50	●	2				7		2×400K5¼F	CP/M		●	D3	Unusual keyboard
Digital Microsystems DMS-3	£3,576	Z80A	4	64K			(M+)"			"			3		1				2×512KBF	CP/M		●	D4	*Choice of terminal
Digital Microsystems DMS-4	£6,210	Z80A	4	128K	½Mb		(M+)"			"			4						2×512KBF	MP/M		●	D4	*Depends on terminal chosen
Direct 1000	£3,093	Z80	4	64K		80×25	M		132×28	W			2						2×300K5¼F	CP/M		●	D5	Standard CP/M machine
DMS Fox	£2,875	Z80A	4	64K		80×24	M			W	16	●	3	1		1			1.2Mb5¼F	CP/M		●	D4	Portable machine
Dragon 32	£200	6809E	1	32K	64K	32×16	Tv(M+)	●	256×192	W				1		4	1	●		Cassette	Ba		D6	Tandy colour lookalike
Durango F85	£5,744	8085A	5	64K	196K	80×64	Tv(M+)			W		●	4			1	12		2×1Mb5¼F	Star Basic	BaCo	●	C3	Built in printer
Eagle II	£2,702	Z80A	4	64K		80×24	M		80×24	W		●	2	1		1			2×500K5¼F	CP/M	Ba	●	M3	Includes WP/SS software
Eagle III	£2,950	Z80A	4	64K		80×24	M		80×24	W		●	2	1					2×1Mb5¼F	CP/M	Ba	●	M3	Includes WP/SS software
Eagle IV	£4,190	Z80A	4	64K		80×24	M			W		●	2	1		1			1×1Mb5¼F+1×12.5Mb5¼H	CP/M	Ba	●	M3	Includes WP/SS software
Eagle 1600	£6,497	8086	8	128K	512K	80×25	M	●	720×352	W	24	●	2	1		1	8		1×1Mb5¼F+1×12.5Mb5¼H	MS-DOS, CP/M 86		●	M3	High speed IBM copy
Enterprise 1000	£2,645	"	8	64K			M			W	10	●	2			2			2×358K5¼F	Enterprise		●	D7	Micro Nova 16-bit
Epson HX20	£472	6301	1	16K	32K	20×4	LCD		120×32	W	13	●	2				2	●		Cassette	Ba		E2	Powerful portable
Epson QX10	£1,995	Z80	4	192K	256K	80×25	M		640×400	W	18	●	1	1			5		2×320K5¼F	CP/M	Ba	●	E2	Expansion required for Valdocs
Equator	£6,842	Z80A	4	64K	448K	80×24	M		255×560	W	14	●	7	1		1	8		1×5Mb5¼F+1×750K5¼F	CP/M, MP/M, Turbo DOS		●	E3	Two bigger models available
Facit 6520	£2,645	Z80	4	64K	128K	80×24	M		80×24	W	8	●	2						2×320K5¼F	CP/M, Facit DOS	Ba	●	F1	Concurrent printing
Fortune 32:16 System 2	£5,204	68000	6	256K	1Mb	80×24	M	●	1024×1024	W	16	●	1				20		2×800K5¼F	Unix		●	I3	Genuine 16-bit
Fujitsu FM8	£1,150	6809	1	64K		80×25	(M+)	●	640×200	W	10	●	1	1		4	1	●		Flex	Ba		S2	Good for business graphics
Future Computers FX-20	£2,156	8088	8	128K	1Mb	80×25	M		800×400	W	20	●	2			2			2×800K5¼F	CP/M 86, MS-DOS		●	E1	Still on a promise
Genie I	£330	Z80	1.7	16K	48K	64×16	Tv(M+)		128×48	W			1	1			1	●		Cassette	Ba	●	L2	Compatible with TRS 80 I
Genie II	£299	Z80	1.7	16K	48K	64×16	Tv(M+)		128×48	W	4	●	1				1	●		Cassette	Ba	●	L2	Speeded-up Genie I
Genie III	£1,897	Z80A	3.2	64K		80×24	M		160×72	W	8	●	1	1		1	3		2×700K5¼F	New DOS	Ba	●	L2	CP/M costs extra
Colour Genie	£168	Z80	2.2	32K		40×24	Tv(M+)	●	160×96	W	8		1	1		2	1	●		Cassette	Ba		L2	Home games machine
Gemini Galaxy 2	£1,719	Z80	4	64K	512K	80×25	M		160×75	W	10	●	1	1		1	5	●	2×400K5¼F	CP/M		●	G1	Low cost British system
Globe 101	£1,850	8085	3	64K		80×24	M			W	20	●	3						2×325K5¼F	CP/M		●	G4	Wordstar plus Mail Merge inc.
Hawk Model 110	£2,070	Z80A	4	64K	256K	"	(M+)"	●	"	"			2	1			3		2×390K5¼F	CP/M, MP/M2		●	L6	*Choose your terminal
Hawk Model 2110	£5,405	Z80A	4	64K	256K	"	(M+)"	●	"	"			2	1			3		1×390K5¼F+1×21MbH	CP/M, MP/M2		●	L6	*Choose your terminal
Haywood 9000 Composite	£2,064	Z80A	4	64K	192K	80×25	M		64×255	W	34	●	2				8		2×320K5¼F	CP/M	As	●	H1	Designed for network

HARDWARE

Make and model	Price inc VAT	Processor type	Speed in MHz	Standard RAM	Max RAM — normally at extra cost	Display: Max characters columns × lines	Display: Method (at extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEEE 488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk side	Operating system	Languages inc	Other languages available	Distributor	Comments
Haywood Hinet	£10,982	Z80	4	64K	128K	80×24	M			W	34	●	3	1		1			1×11MbBH	CP/M		●	H1	Large network machine
HP 75C	£883	Cust.	N/A	16K	24K	32×1	(M+)			C						1	4	●	1.3K card reader	HP	Ba		H2	Calculator/computer
HP 85	£2,360	Cust.	N/A	16K	32K	32×20	M		255×191	W	8	●	1			4	4	●	Cassette	HP	Ba	●	H2	Engineers' machine
HP 86A	£1,541	Cust.	N/A	64K	512K	80×24	M		544×240	W			1	1	2	4				HP	Ba	●	H2	CP/M optional
HP 87XM	£2,571	Cust.	N/A	128K	640K	80×24	M		544×240	W	14	●	1	1	1	3	4			HP DOS	Ba	●	H2	Special technical uses
HP Series 100, 120	£2,362	Z80A	3.68	64K		80×24	M		80×24	W	8	●	2			1				CP/M	Ba	●	H2	Top end HP business system
HP Series 200 Model 16A	£3,212	68000	8	128K	750K	80×25	M			W	5		1		1		2			HP		●	H2	Genuine 16-bit
Hytech H4500	£4,310	Z80	4	64K	208K	80×25	M		80×25	W	26	●	1				3		2×403K5¼F	CP/M	Ba	●	H3	Standard CP/M micro
IBM PC	£2,392	8088	4.7	64K	576K	80×25	(M+)	●	640×200	W	10	●		1			5		1×360K5¼F	MS-DOS	Ba	●	I9	Slow but reliable
ICL PC Model 10	£2,754	8085	3	64K	256K	80×24	Tv(M+)			W	11	●	2				8		2×700K5¼F	CP/M	Ba	●	I4	Repackaged Rair Black Box
ICL PC Model 31	£4,939	8085	3	128K	256K	80×24	(M+)		80×24	W	11	●	4				8		1×250K5¼F+1×5MbH	CP/M, MP/M	Ba	●	I4	Multi user Black box
ICL PC Model 32	£6,037	8085	3	256K		80×24	(M+)		80×24	W	11	●	8				8		1×250K5¼F+1×5MbH	CP/M, MP/M	Ba	●	I4	Top of ICL range
IDS Datamachine	£1,995	Z80	4	64K	1Mb	"	Tv(M+)		"		2						15		2×400K5¼F	CP/M	Ba	●	I8	*Depends on terminal
IO Tech Iona	£2,539	Z80	4	69K	960K	80×24	M	●	160×75	W	12	●	1	1			8	●	2×400K5¼F	CP/M		●	I5	Good colour versatility
Irvine Business Systems	£1,489	Z80	4	64K		80×25	M			W		●	2						2×400K5¼F	CP/M		●	I6	Inexpensive CP/M machine
ITT 3030	£3,105	Z80A	4	64K	256K	80×24	Tv(M+)		80×24	W	8	●	1			1	1		2×280K5¼F	CP/M, BOS		●	I7	Top end business system
Jupiter Ace	£90	Z80	3.25	3K	51K	32×24	Tv(M+)		64×46	C		●					1	●			Fr		J1	Native Forth machine
Kalamazoo 1050	£3,450	8085	6	64K		80×24	Tv(M+)		80×24	W	10		1						2×250K5¼F	Kalamazoo		●	K3	Only Kabol language
Kaypro II	£1,949	Z80	4	64K		80×24	M			W		●	1	1					2×200K5¼F	CP/M	Ba	●	C15	A portable business machine
Kemitron K2000E	£2,242	Z80	4	64K		80×24	(M+)		80×24	W			2	1			11		1×300K5¼F	CP/M		●	K4	Scientific Keyboard
Kemitron K3000	£3,795	Z80	4	64K	256K	80×24	(M+)		80×24	W		●	2				14		2×1Mb8F	CP/M, MP/M		●	K4	For scientific use
Kenilworth 83G	£1,953	Z80A	4	64K		80×25	TvM		160×75	W	10	●	1	1			5		2×350K5¼F	CP/M		●	K5	British portable
Kenilworth 83N	£2,012	Z80	4	64K		80×25	TvM		160×75	W	10	●	1	1			5		2×350K5¼F	CP/M	Ba	●	K5	Includes Basic
Kontron RSI 80	£3,306	Z80	4	64K	128K	80×25	M		256×512	W	16	●	2	1			8		2×303K5¼F	Kontron	Ba	●	K6	O/S CP/M based
LSI M3	£2,064	Z80	2.5	64K		80×24	M		80×24	W	31	●	1	1					2×200K5¼F	CP/M		●	L3	Big, British and CP/M
LSI M4	£2,472	8088	5	128K	256K	80×24	M		160×72	W	31	●	2	1			1		2×400K5¼F	CP/M 86, CP/M80		●	L3	Z80 for 8-bit software
Logica VTS Vitesse	£2,863	8086	5	64K	256K	80×24	M	●	640×288	W	12	●	1	1			4		2×1Mb5¼F	CP/M, MS-DOS	Ba	●	L4	High-res colour graphics
Marin Chip M9900	£5,750	9900	3	64K	1.6Mb	24×80	M		24×80	W	8	●	4				12		2×1.2Mb8F	MOS, MDEX	Ba	●	M2	Genuine 16-bit
Micro Five 1000	£5,175	8088	8	128K	512K	25×80	TvM		512×512	W	20	●	10				2		2×1Mb5¼F+2×6.3Mb5¼H	"		●	F2	*Choose your own O/S
Micro Five 3000	£10,350	8086	5	128K	1Mb	25×80	TvM		512×512	W	20	●	5				3	●	1×10Mb8F	"		●	F2	*Choose your own O/S
Microdecision	£1,144	Z80	4	64K		80×24	(M+)		"				2						1×200K5¼F	CP/M	Ba,Pilot	●	I2	*Terminal extra
Microsolution British Genius	£1,840	Z80	4	64K		80×24	TvM		80×24	W	21	●	1	1					2×160K5¼F	CP/M		●	M4	'Genius' by nature?
Microtan 65	£389	6502	1	8K	48K	25×64	(TvM+)			W		●	1	2				●		Tanbug	Ba	●	M8	Expandable in many ways
Millbank SX10	£2,754	Z80A	4	65K	256K	80×25	M		80×25	W	10	●	2			1			2×350K5¼F	CP/M	As	●	M5	Scientific applications
Molecular M200	£5,462	Z80	4	64K	320K		(M+)"			"			2			1	16		1×10Mb8H+1×500K8F	CP/M	BaAs	●	G2	*Terminal required
Monroe EC8800	£2,990	Z80A	3	128K		40×24	M		240×240	W	32	●	3			3			1×320K5¼F	Monroe	BaPsPilot	●	F3	Only 40-character screen
Monroe OC8810	£3,162	Z80A	3	128K		80×24	M		80×24	W	32	●	3			2	1		1×320K5¼F	Monroe	BaPa	●	F3	Bigger model available
Multitech MPFII	£269	6502	1.2	64K		40×24	Tv(M+)	●	280×192	C				1		1	1	●		Cassette	Ba	●	S8	Apple soft compatible
Nascom 2	£327	Z80A	4	2K	64K	16×48	Tv(M+)		48×96	W			1				4	●		NAS, SYS	BaAs	●	L5	Old reliable
Nascom 3	£549	Z80	4	48K		16×48	Tv(M+)		48×96	W			1				4	●		NAS, SYS	BaAs	●	L5	Fully expanded Nascom
NEC PC8000	£1,454	Z80	4	32K	64K	80×25	M	●	160×100	W	10	●	2	1					2×300K5¼F	CP/M, NEC, DOS	Ba	●	N1	Superb colour graphics
New Brain A	£269	Z80A	4	32K	512K	80×30	Tv(M+)		640×220	C			2				1	●		Cassette	Ba		G3	A lot of promise
North Star Advantage	£2,766	Z80	4	64K		80×24	M		640×240	W	15		1				6		2×360K5¼F	CP/M		●	T9	16-bit option
North Star Horizon	£2,294	Z80	4	64K	512K	"	"		"	"			2	1		1	9		2×360K5¼F	North Star DOS		●	T9	*Choose your own terminal
OEM Orion	£3,392	8086	8	128K	896K	80×25	TvM		800×400	W	13	●	11				6		2×500K5¼F	CP/M 86	BaCo	●	O5	*Full communications machine.

Olivetti M20D	£2,754	Z8000	3	160K	512K	80×25	M	●	512×256	W		●	1	1			5		2×320K5¼F	PCOS	Ba	●	B6	Real 16-bitter
Olympia Boss Model A	£2,645	Z80A	4	64K		80×28	M	●	80×28	W	10	●	1				4		2×140K5¼F	CP/M		●	O1	Useful 28 lines on screen
Onyx 5001 MU	£7,607	Z80A	4	128K	256K	"			"	"			5	1				●	1×7Mb5¼H	CP/M	Ba	●	T2	*Terminal extra; other models
Oric 1	£139.95	6502A	1	48K		40×28	Tv(M+)	●	240×200	C				1		1		●		Cassette	Ba		O2	16K promised
Osborne 1	£1,581	Z80	4	64K		52×24	M		128×32	W	10	●	1		1				2×185K5¼F	CP/M	Ba	●	O3	Portable, includes software
Panasonic JD 800M	£3,795	8085A	4	60K		80×24	M		80×24	W	21	●	3						2×250K8F	CP/M	Ba	●	P1	Larger model costs £5,002
Pasca 640	£1,437	Z80A	4	64K		80×24	M			W		●	1	1					2×250K8F	CP/M		●	W1	Regular CP/M micro
Pascal Modular Microengine	£7,003	WD9000	2	128K		"	"		"	"			4				8		2×1.2Mb8F	UCSD-P	Pa	●	P2	*Terminal extra
Pied Piper	£1,226	Z80A	4	64K		80×24	Tv			W	36				1		1		1×1Mb5¼F	CP/M			S11	Incl. four software packages
Philips P3500	£3,000	Z80A	4	64K	320K	80×25	M			W	11	●	2						2×0.6Mb5¼F	Turbo-DOS	Co	●	P3	Fast O/S as standard
Positron 900	£1,259	6809	1	64K	256K	"	(M+)		"	"			4		1		3			O/S 9	Ba	●	P4	*You choose your terminal
Positron 9000	£2,134	6809	1	64K	256K	80×24	TvM	●	480×240	W	12	●	4		1		3			O/S 9	Ba	●	P4	Multi user version
Quantum 2000	£2,587	Z80A	4	64K	192K	80×25	M		160×75	W	18	●	1	1			5	●	3×860K5¼F	CP/M		●	Q1	Mono, low-res graphics
Rair Black Box Model 3/20S	£2,242	8085	5	64K	512K	80×24	(M+)			"			2				8		2×1Mb5¼F	CP/M	Ba	●	R1	*VDU extra; many versions
Rair Business Computer	£6,037	8088	5	256K	1Mb	80×25	M	●		W	10	●	2			4	8		1×19Mb5¼H+1×1Mb5¼F	CP/M, PCDOS	Ba	●	R1	Hybrid 8/16 bit
Racal 6000	£6,327	Z80	5	64K	256K	80×26	M		80×26	W	21	●	1	1					1×600K8F	CP/M		●	R2	CP/M languages available
Research Machines 380Z	£2,147	Z80A	4	32K	56K	40×24	Tv(M+)			W			1	1			4	●	2×144K5¼F	CP/M	Ba	●	R3	Widely used in schools
Research Machines Link 480Z	£650	Z80A	4	32K	256K	40×24	Tv(M+)			W	4		2	1	1	2	●			Cassette	Ba		R3	CP/Net version available
Sage II	£4,019	68000	8	128K	512K	"	(M+)		"	"			2	1	1				2×640K5¼F	UCSD-P System	BaAsPaFn	●	T10	*Terminal extra
Sage IV	£5,962	68000	8	128K	1Mb	"	(M+)	●		"			6	1	1				2×640K5F+1×6Mbh5¼	UCSD-P System	PaBaFn	●	T10	*Terminal own choice
Samurai	£3,214	8086	4.6	128K	768K	80×25	M	●	720×400	W		●	3	1			3		2×1.2Mb8F	MS DOS, CP/M 86		●	M6	High-res colour graphics
Sanyo MBC 1000	£1,195	Z80A	4	64K		80×25	M		80×25	W	17	●	1	1					1×320K5¼F	CP/M	Ba	●	L1	Standard CP/M model
Sanyo MBC 1250	£2,294	Z80	4	64K		80×40	M		640×400	W		●	1	1					2×640K5¼F	CP/M	Ba	●	L1	High-res graphics
Sanyo MBC 2000	£2,242	8085A	5	64K		80×24	M		80×24	W	24	●	2	1		2			2×328K5¼F	CP/M	Ba		L1	Big disc model costs £3,622
Sanyo MBC 4050	£2,817	8086	5	128K	512K	80×24	M		80×24	W			1	1					2×640K5¼F	CP/M 86	Ba	●	L1	Pseudo 16-bit
Seed System 1	£2,300	6800	2	32K	64K	80×24	M		80×24	W	3	●	2			8			2×160K5¼F	DOS 68 Flex	Ba	●	S3	Ageing business machine
Seed System 19	£2,600	6809	2	48K	1Mb	80×24	M			W	3	●	2			8			2×160K5¼F	OS-9		●	S3	Latest from Seed
Sharp MZ80A	£549	Z80	2	48K		40×25	M		80×50	W		●						●		Sharp Basic	Ba	●	S4	CP/M facility extra
Sharp MZ80B	£900	Z80A	4	64K		80×25	M		320×200	C	10	●						●		Sharp Basic	Ba	●	S4	Unusual keyboard
Sharp PC1251	£79.95	Cust.	.58	4.2K			LCD		24×1	C	18	●					1	●		Sharp Basic	Ba		S4	Pocket computer
Sharp PC1500	£170	Cust.	1.3	3.5K	11.5K	26×1	LCD		156×7	C	6	●	1	1			2	●		Cassette	Ba		S4	Optional 4-pen plotter
Sharp PC3201	£2,300	Z80A	2.6	64K	112K	80×25	M		160×50	W	10	●					5		2×500K5¼F	Sharp Basic	Ba	●	S4	Powerful Sharp Basic
Signet 10025	£1,599	Z80B	6	64K		80×24	M	●	512×512	W		●	2	1			1		2×200K5¼F	CP/M, Macnos		●	S9	Choice of keyboards
Signet 2	£1,483	Z80	4	64K		80×24	(M+)	●	512×256	W	18	●	2						2×200K5¼F	CP/M			S9	Multi-user system
Sinclair ZX81	£40	Z80A	3.5	1K	16K	32×24	Tv		64×44	C							1	●		Cassette	Ba		S5	Sold a million
Sinclair Spectrum	£99	Z80A	3.5	16K	48K	32×24	Tv	●	256×192	C							1	●		Cassette	Ba	●	S5	Very popular home micro
Sirius I	£2,754	8088	5	128K	896K	80×25	M		800×400	W	7	●	2		1		4		2×600K5¼F	CP/M 86, MS/DOS	Ba	●	A7	IBM style
Sord M5	£150	Z80A	4	4K	16K	40×24	Tv(M+)	●	256×196	C				1		2		●		Cassette	Ba		S6	Japanese home computer
Sord M23	£1,932	Z80A	4	128K		80×25	M	●		W	14	●	2	1		2	3		2×330K5¼F	Sord O/S, SB80	BaPips	●	S6	CP/M compatible
Sord M23P	£2,369	Z80A	4	128K		80×25	Tv(M+)	●	640×200	W	14	●	2	1		2	2		2×290K3½F	Sord O/S, SB80	BaPips	●	S6	Complete with suitcase
Sord M223	£3,277	Z80	4	64K		80×25	M			W		●	2			4			2×350K5¼F	Sord O/S, SB80	BaPips	●	S6	Standard business machine
Sord M243	£5,842	Z80	4	192K		80×25	M	●	640×400	W	15	●	4	1		4			2×1Mb8F	Sord O/S, SB80	BaPips	●	S6	Large and powerful
SW Technical Products SO/9	£5,750	6809	2	256K	1.2Mb	80×24	M			W	15	●	1	1					2×1.5Mb5¼F	Flex, Uniflex		●	S7	Top end SWTP
Spectrum	£11,442	68000	8	256K	4Mb	"	(M+)		"	"			4				16		2×720K5¼F	Mirage	Ap	●	M1	*As terminal
Sundance I	£6,969	Z80A	4	64K	256K	132×24	M			W	4	●	1	1				●	1×7Mb5¼H	CP/M	Ba	●	T2	Ordinary CP/M machine
Sundance II	£8,205	Z80A	4	128K	256K	132×24	M			W	4	●	1	1				●	1×7Mb5¼H	CP/M	Ba	●	T2	Middle-range Sundance
Sundance 16	£10,480	Z8001	6	256K	1Mb	80×24	M			W		●	5	1				●	1×14Mb5¼H	BOS			T2	Tape backup for hard disc
Superbrain JR	£2,127	Z80A	4	64K		80×24	M		560×240	W		●	2			1		2	2×160K5¼F	CP/M	Ba	●	I10	Bigger models available
Superstar	£6,296	Z80	4	64K		80×24	Tv(M+)		80×24				1	1		8			1×19Mb5¼H+1×400K5¼F	CP/M 80	Ba	●	B7	Includes hard disk
Tandberg EC10	£3,000	8080A	2	64K		80×25	M			W		●	7						1×250K8F	CP/M, TOS	Ba	●	T3	Very early machine
Tandy TRS-80 Model II	£1,999	Z80A	4	64K	256K	80×24	M		80×24	W	2	●	2	1					1×500K8F	TRS-DOS	Ba	●	T4	Big business machine
Tandy TRS-80 Model III	£1,299	Z80A	2	48K		64×16	M		128×48	W		●	1	1	1			●	2×184K5¼F	TRS-DOS	Ba	●	T4	Latest TRS80
Tandy TRS-80 Model 16	£4,199	68000	8	128K	512K	80×24	M			W	2	●	2	1					2×1.2Mb8F	TRS-DOS	BaAs		T4	True 16-bit
Tandy TRS-80 Colour Computer	£240	6809E	1	16K	32K	32×16	Tv	●	256×192	W			1					●	-	Cassette	Ba	●	T4	Very popular
Tandy TRS-80 PC4	£50	Cust.	N/A	½K	1½K	12×1	LCD		12×1	C	9	●			1	1				Cassette	Ba		T4	Low-cost pocket computer

HARDWARE

Make and model	Price inc VAT	Processor type	Speed of MHz	Standard RAM	Max RAM — normally at extra cost	Display: Max character columns / lines	Display: Method (if extra cost)	Display: Colour capability	Graphics: Max dot resolution	Keyboard: Type of keyboard	Keyboard: No. of function keys	Keyboard: Numeric pad	Interfaces built-in: No. of RS232	Interfaces built-in: No. of Centronics	Interfaces built-in: No. of IEEE 488	Interfaces built-in: No. of others	Interfaces built-in: No. of expansion slots	Storage: Cassette facility	Storage: Capacity per disk and disk size	Operating system	Languages inc	Other languages available	Distributor	Comments
Tandy TRS-80 Pocket Computer 2	£130	Cust.	1.3	2.6K	16K	26×1	1 CD		156×7	C	6	●						●		Cassette	Ba		T4	Plotter available
Televideo TS-802H	£4,533	Z80	4	64K		80×24	M		80×24	W	15	●	2			1			1×256K5¼F+1×7Mb5¼H	CP/M		●	C11	Recently upgraded
Televideo TS-800 Series	£1,495	Z80A	4	64K		80×24	M		80×24	W	15	●	2			1				CP/M		●	C11	Standard CP/M machine
Televideo TS 1602-C	£3,714	8088	5	128K	256K	80×24	M		576×424	W	15	●	2			1			2×256K5¼F	CP/M-86		●	C11	Graphics, but no colour
TI Professional Computer	£2,386	8088	5	64K	256K	80×25	M			W	12	●		1					1×320K5¼F				T5	Choice of operating systems
Texas Instruments TI-99/4A	£150	9900	3.5	16K	52K	32×24	Tv(M+)	●	256×192	W						2		●		DOS	Ba	●	T5	This has sprite graphics
TI System 200-250	£6,695	9900	4	64K		80×24	M		80×24	W	12	●	1						1×5Mb5¼H	UCSD-P, PX10		●	T5	Bigger version available
TMK 332	£2,242	8085A	5	64K		80×24	M		190×96	W	22	●	2	1					2×320K5¼F	CP/M	Ba	●	P5	*6502 I/O processor
Torch	£3,214	Z80*	4/2	96K		80×30	TvM	●	640×256	W	15	●	1	1		4		●	2×400K5¼F	CPN	Ba	●	T6	CP/M compatible
Toshiba T-100	£1,900	Z80A	4	64K	96K	80×25	TvM	●	640×200	W	8	●	1	1	1	2			2×256K5¼F	CP/M	Ba	●	O4	Pro test March 18
Toshiba T-2*0	£2,242	8085	2.6	64K		80×24	M		80×24	W	15	●	1		1				2×256K5¼F	CP/M	Ba	●	O4	Standard CP/M machine
Transam Truscan	£1,963	Z80A	4	64K		80×24	TvM		640×288	W		●	2	1		1	5		2×190K5¼F	CP/M		●	T7	S-100 machine
Transtec BC2	£1,949	Z80A	4	64K	256K	80×24	M		80×24	W	13	●	2	1			6		2×386K5¼F	CP/M		●	T8	Fully definable characters
Triton 4	£5,744	Z80A	4	64K	160K	80×24	M			W	8	●	1	1			3		2×1.2MbBF	MPSL-BOS		●	T11	Upgradable to Winchester disk
Vector 4	£3,852	8088	5	128K	256K	80×24	M	●	640×312	W	15	●	1	1		1	2		2×630K5¼F	CP/M, CP/M 86	Ba	●	A4	8-bit and pseudo 16-bit
Victor 9000	£2,754	8088	5	128K	896K	80×25	M		800×400	W	7	●	2	1			4		2×600K5¼F	CP/M 86, MS-DOS	Ba	●	D8	Same as Sirius 1
Wicat 150	£6,846	68000	8	256K	1.5Mb	80×25	M		400×300	W	20		2	1			1		2×616K5F	MCS	Ba	●	S10	Upgradable to 32 user system
Wilkes YD8110	£4,025	8086	5	128K	896K	80×24	M	●	960×624	W	21	●			1		6		2×1.2MbBF	CP/M 86	Ba	●	W2	Standard CP/M machine
Xerox 820 Model II	£2,415	Z80A	4	64K		80×24	M		1024×512	W		●	2	2			2		2×160K5¼F	CP/M		●	R4	Powerful graphics
Zenith 120-22	£2,978	8088	5	128K	192K	80×25	M		640×225	W	18	●	2	1	1	1	5		2×320K5¼F	CP/M, MS-DOS, Z Basic		●	Z1	Graphics includes turtle
Zenith Z89-81	£1,668	Z80	2.5	48K	64K	80×24	M			W		●	2	1					1×100K5¼F	CP/M	Ba	●	Z1	Elderly CP/M machine
Zeus 4	£5,400	Z80	4	64K	320K	80×25	(M+)		80×25	W	11	●	10						1×6Mb5¼H+1×250K5¼F	CP/M, Muse	As	●	M5	Designed as multi-user

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Radofin TAD-110 Teletext adaptor (updated model), nearly new, only £125, including postage. MC Mycars, 25 Rona Road, London, NW3 2HY.

Wanted, Sinclair User No's 1--. Spectrum software especially adventure and stategy games, also utility tapes. Mike, 55 Haden Park Road, Cradley Heath, W Mids B64 7HE.

ZX81 with Sinclair 16K RAM, power pack, leads, manual, software catalogue etc. Good condition, £45 o.n.o. Tel: 640 2820 (5pm–8pm).

Sinclair printer, complete with manual and box, £20. Tel: Medway 404437.

Telephones, army hand two, £5 the pair. D Buckley, 142A Lynton Road, West Acton, London W3. Tel: 01-211 3192 day 01-993 3123 eve.

Core store, magnetic, 256 byte, core planes only no drivers, £10. D Buckley 142A Lynton Road, West Acton, London W3. Tel: 01-211 3192 day 01-993 3123 eve.

Prestel adaptor (Tantel numeric), as new, best cash offer, or swop for Spectrum 48K or similar computer. Tel: 048 67 (Brookwood) 4755, also ZX81 books.

Tape recorder ¼in miniature portable, 1960s collector's item, works, £5. D. Buckley, 142A Lynton Road, West Acton, London W3. Tel: 01-211 3192 day 01-993 3123 eve.

UK101 8K beautifully cased + 110/600 baud, assembler, monitor tapes, KSR33 teletype £200. D Buckley, 142A Lynton Road, London W3. 01-211 3192 day 01-993 3123 eve.

BBC B + disk interface + Canon drive, all leads, manuals, software by main software houses. worth £200, reasonable offers, quit. Tel: 01-337 0599 evenings/weekends (Micronet).

Dragon software, Meteor-Run, Calixto, Quest, Pyramid, Dragon Compendium, Saint George £20, will split, wanted M/Minataur Flight Simulator. Stewart. Tel: 01-4305773 before 4 pm, week days.

Spectrum software (original tapes) for sale, Flight Simulator, Arcadia, Time-gate, Chess, Assembler, Escape 75% of original cost wanted, may swop. Tel: Stevenage 65508.

Apple II 64K language card, complete as new. Offers please. Tel: 01-205 4529.

Spectrum software for sale: jackpot (48K) featuring hold, nudge gamble, £3.50; boxer one or two players with City Bomber £3.50. D Pritchard, 65 Vicarage Road, Thetford, Norfolk.

Jarbreaker wanted, original apple version only, swop for Gorgon, Typhoon etc, or reasonable price paid. Tel: 01-485 4306 after 6 pm.

Sharp MZ-80K, 48K 2Mhz/4Mhz reset SW to Basics, Pascal, Forth, Fortran, hundreds of games and utilities, many newsletters £300 without software, £350 with. Simon. Tel: 959-5278.

Mastering machine code on your ZX81 or ZX80? Book for sale for only £5. Tel: Andrew, Frinton 2451.

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BBC software, Program Power, Chess, Spacemaze, Killer Gorilla, £4 each. Acornsoft Snapper, Monsters, Planetoid, Rocket Raid £6 each, or swop for other BBC software, Tony. Tel: 041-636 1239 (Glasgow).

ZX81 books, hints + tips Mastering M/C ZX81 Pocket book, Getting Acquainted with ZX81, 30 hour Basic ZX81 Companion, all £5. Tel: 0295 720812.

BBC compatible printer, Star DP8480, Centronics, tractor/friction feed, high resolution screen dumping 80 CPS plus enlarged, condensed printing, excellent value, £180 ono. Deliver South east. Tel: Canterbury 750600.

Wanted BBC A16 or 32K RAM, up to £260. 53 Kylemore Avenue, Mossley Hill, Liverpool L18 4PZ. Tel: 051-724 5081.

Lynx 48K, three months old with two years guarantee, still boxed, hardly used, £195 or exchange Commodore 64 with cash adjustment. Tel: 01-337 2694 anytime. (Worcester Park).

ZX81 + 16K RAM + software including Trader, Scramble, 3D Defender, etc. As new, £55 ono. Tel: Luton (0582) 593333.

Newbrain model AD with printer cable, £220 ono. Seikosha GP250X serial and parallel, 30 CPS, £230. 35 Coverdale Road, Sheffield S7 2AX. Tel: 0742 588058.

Atari 400, Recorder, Basic, Donkey Kong, Pac-man, Galaxions, Pool, Super Cube, Euro-Scene Jigsaws and Air-strike, two joysticks, give to best offer. Tel: Gary, 01-778 1016.

BBC Model B, 1.2OS, only four months old, with cassette lead, software and dust cover, only £300 for quick sale. Tel: Preston (0772) 734053.

Vic20 +8K, C2N cassette, Reference Guide, Vic Revealed, six games, Assembler, as new, all boxed. Worth over £200, sell for £120. Tel: Mossley 4343.

ZX81, DkTronics keyboard, 16K RAM, printer, cassette player, Flight Simulator, other software, £75 the lot. 22 Woodstock Road, North St. Albans, Tel: St. Albans 58316.

ZX81 plus 16K Memopak boxed, also games including Asteroids, Gulp, Scramble plus others. Worth £100, £50 for quick sale. Tel: Reading (0734) 341359.

21R Vic 20 plus cassette deck, Intro to Basic, joysticks, magazines, cartridges Gorf, Sargon II, Jelly Monsters, Shoplifter. Worth £90, Many new cassettes, all worth £450. £250 ono. Tel: Co. Durham 506880.

Mattel Intellivision and seven cartridges, £230. Also Spectrum software compiler - Hobbit etc. Tel: Peter Grove, Bedford 713104 (Olney).

Arfon Expansion Unit with lid, seven slot motherboard with integrated power unit, for use with Vic 20 computer, £45 ono. Tel: 01-850-4732 evenings.

Vic 20 + 24K, cassette unit, Arfon expansion, 1515 printer + paper, books, cartridges, cassettes. Worth £750, offers near £350. Won't separate. Tel: 01-942 6324.

TRS-80 16K Level II CPU, educational and games programs, books and Z80 assembler tape, all for £175 ono. Tel: Bracknell 85372.

Oric 1, 48K, taperecoder and programming books, £120. Tel: Haywards Heath (0444) 455846 Evenings/Sundays.

Spectrum Forth with graphics, cost £15, will accept, £10 ono, or exchange for Softex Basic Compiler. Tel: Northampton 412254 evenings.

Apple Video 80-COL card with underline Eprom, £120. Olivetti Praxis 35 daisy-wheel typewriter, £230. Microline 80 dot matrix printer, £140. B/W 9" monitor, £60. All perfect. Tel: 01-740 5929 evenings.

Olivetti Praxis 35 electronic daisywheel typewriter, suitable for interfacing, £230. Microline 80 dot matrix printer, £140. Video 80 COL card, £120. B/W monitor, £60. All perfect. Tel: 01-740 5929 evenings.

Commodore 64, cassette, programmers, guide, manual, gent's cycle, Russian binoculars, all £430 or exchange for BBC model B plus??. Tel: Charles on 01-677 2461 (Streatham).

Dragon 32 for sale, leaving UK, must sell, includes 13 games, over £100 of software, only three months old. All £125. Tel: Framingham Earl 4193.

TRS-80 LII, 16K with monitor, printer, cassette, light pen, plus software, books, manuals, magazines. Complete system for only £375 ono. Tel: (0903) 65287.

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Acorn Atom 12K+12K, BBC Basic FP/ROM PSU manual, leads,O12130 lots software, including Invaders, Breakout, Atom Calc ROM. Cost over £300. Quick sale, £330 Deal. Tel: (03845) 62857.

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TRS-80 LII 16K, 32K expansion disk drive, printer, DMP-100, VDU, software, as new, £450, may separate. Tel: 041-427 1972.

BBC model B + 1.2 OS + disk interface + Wordwise. Will demonstrate, boxed with manuals and leads, price £400. Tel: B Alderwick on Dursley 810451 Ext. 202 (work), Dursley 78432 (home).

Oric 1 48K, only £120. Software includes Forth plus five Oric cassettes, unused, perfect condition, one month old. Cash crisis forces sale. Tel: 01-370 1805.

Osborne 1 single density, beige box model, complete with CpM Wordstar, Supercalc, MBasic, CBasic, C language optional, £650 ono. Tel: 01-883 5153.

Oric-1 48K, two months old, plus five cassettes incuding Xenon, Oric Base, £130. Tel: 01-399 5809 evening.

Atom computer 12K+8K+FP, much software for beginner or experienced, virtually unused present, few months old, £110 ono. Daran Brown, 58 Pearl Street, Roath, Cardiff. Tel: (0222) 497642.

Twin disks for BBC, Canon 40 track with PSU, manual, format disk, cables, most Acornsoft cards, hardly used, as new, £290. Tel: 01-567 2232. evenings/weekend.

Dragon 39, three months old, boxed, many good games and software, plenty books, joystick cartridge, £170. With recorder, £190. Tel: Steven, Gravesend 64608.

Sharp MZ80K, Basic plus Fig-Forth, 4MHZ conversion, reset PB Sharpsoft user notes, boxed, £250 ono. Tel: Faversham 283195.

Sharp MZ80K. This computer has everything! Built in monitor and cassette deck. Basic, Pascal, Fortran, Forth, M/code, all manuals included, £272. Tel: Colchester (020 622) 4060.

Dragon 32, five months' guarantee, two joysticks, new, £20. Cassette recorder, £85. Software, all worth £325, best ofer over £220. Tel: Merseyside 051-6785356 after 50m. Possible Commodore 64 exchange.

Oric 148K, mint, £130 ono. Tel: (Ayrshire) 047 553 368.

Oric 1 48K, as new, Zodiac Flight and other games incuded. Only £130. Tel: Burgess Hill 42425 evening.

TI99/4A plus cassette recorder, cassette leads, Home Budget Management Module, Basic manuals, joysticks, two Apex Adventure tapes, seven months old, under guarantee, £135. Tel: Gosport (070 17) 20412.

Dragon 32, two months old, good condition, all leads etc., with tape recorder, joystick, software, magazines, £175 ono. Tel: (Glasgow) 041-634 0756 weekend.

MZ80A, why pay £549 new? Mine for sale at £325 for quick sale incl. carriage. P White, 52 Abbotswood, Yate, Avon.

Jupiter Ace for sale with £20 of software and membership to owners club, £70. 34 Mill Grove, Whissendine, Oakham, Leicestershire. Tel: Whissendine 283.

ITT 2020 48K computer, complete with colour TV, modulator and paddles, £370. Plus some software. Tel: 01-421 2451 after 6pm.

Printer — Centronics 739/2, 100 Cps mono-spaced, 80 Cps proportional letter quality. Suitable Atari, C/W Word Processor, VisiCalc, CCI-DMS, Touch Typing Management Simulator. Cost new, £1,000. £590 ono. Tel: 01-958 5600.

Bargain offer! Excellent condition ZX81 + 16K + fullsize professional keyboard. Selling the lot for only £50. Tel: 01-254 5952.

CBM 4022 printer, recently overhauled, new head plus word processor, ribbons, paper, £325 ono. Tel: Willie Stott on Milton Keynes (0908) 660459.

BBC model software Wordstar, Spellstar MailMerge, £260. The last one, £160. £550 the pair. All original disks and manuals. Small, 4 Stanley Terrace, London N19.

Acorn Atom 12K-ROM, 12K-RAM, 6522 VIA + bus buffers, boxed, tape recorder, PSU, all leads, manuals, magic book, programs, £175. Tel: Milton Keynes (0908) 582265.

For sale: BBC B (£500 software), Sharp GF57SZB portable, and Akai AP-D33 turntable, all offers considered. Tel: 01-794 9655.

Sharp MZ80K software to value of £400+, includes Wordpro, Calc II, Database, Forth, Sargon, Draughts, Bridge, Othello, the Valley etc £65 ono. Tel: 0908 677508.

ZX81 fully expanded 16K printer, Hi-Res 190×255 graphics, sound, three trucks, full keyboard, extra ROM M/C monitor, cost £225, accept £145. Tel: Maidstone 831142 evening.

Sinclair User issue one to six, Interface Vol. 2, Issue 9 to Vol. 3, Issue 8. Any offers. Tel: 01-699 6pm 01-699 5911.

Commodore Pet 3008 32K RAM professional keyboard, numeric keypad, cassette drive, Basic 2 sound box and tons of software, games and utilities, plus books. Cost £1,000, accept £500 o.n.o. Tel: 01-803 4733.

Sharp PC1211 pocket computer complete with printer, cassette interface and portable cassette recorder, £100. Also Casio FX501P programmable calculator, £45. Tel: (Aberdeen) 0224 713675.

Vic 20 Computer 16K cartridge. Cartridge book Innovative Computing, three cartridge games, five cassette games, excellent condition, £200. Tel: 01-808 0096.

Atari 400: program recorder, Star Raiders; Basic assembler editor cartridge; Eastern Front; Galaxian; joysticks; manuals include Hardware Reference Manual, bargain, £180. Tel: Retford 704705 (Notts).

Light pen for sale, for use with BBC Micro. Micro Management, worth £35, as new with tape, only £20. Tel: 0782 314860.

PCN Billboard

Oric 1 48K only £120. Software includes Forth plus five Oric cassettes (Unused). Perfect condition — one month old. Cash crisis forces sale. Tel: 01-370 1805.

21R Vic 20 + cassette deck. Intro to Basic, joystick, magazines, cartridges; Gorf, Sargon II, Jelly Monsters, Choplifter, worth £90. Many cassettes. All worth £450. £250 ono. Tel: Co. Durham 506880.

TRS-80 LII, 16K with monitor, printer, cassette, light pen, plus software, books, manuals, magazines. Complete system for only £375 ono. Tel: (0903) 65287.

BBC B four months old, excellent condition, cassette recorder, leads, cover, PCN 1-20, 27 Games (including 11 Acornsoft) selling for financial reasons, hence £395. Tel: 01-460 3171.

MZ80B software Wordstar, Spellstar, MailMerge £260, The Last One £160, £500 the pair. All original disks and manuals. Small, 4 Stanley Terrace, London N19.

TRS-80 16K Level II CPU, educational and games programs, books and Z80 assembler tape, all for £175 ono. Phone: Bracknell 85372.

Oric 1, 48K, taperecorder and programming book £120. Tel: Haywards Heath (0444) 455846 Evenings/Sundays.

Spectrum Forth with graphics cost £15, will accept £10 ono, or exchange for Softek Basic Compiler. Tel: Northampton 412254 evenings.

Apple Videx 80-Col card with underline Eprom £120, Olivetti Praxis 35 daisywheel typewriter £230, Microline 80 dot matrix printer £140, B&W 9' monitor £60, all perfect. Tel: 01-740 5929 evenings.

Olivetti Praxis 35 electronic Daisywheel typewriter suitable for interfacing £230, Microline 80 dot-matrix printer £140, Videx 80-Col card £120, B&W monitor £60. All perfect. Tel: 01-740 5929 evenings.

TRS-80 LII 16K, 32K expansion disk drive, printer, DMP-100, VDU, software as new £450, may separate. Tel: 041-427 1972.

Dragon 32 for sale, leaving UK, must sell, includes 13 games, over £100 of software, only three months old. All £125. Tel: Framingham Earl 4193.

Swop BBC games for others. Have Program Power, Killer Gorilla, Croaker, 3D Advent, & Galaxy Wars + others. Contact me with list. A P Saggat, 88 High Street, Southall, Middx, UB1 3DB.

Commodore 64, Cassette, Programmers Guide, manual, Gent's cycle, Russian binoculars, all £430 or exchange for BBC model B plus? ? Tel: Charles 01-677 2461 (Streatham).

HP75C cost £800 as new £495 ono. Epson HX20 with built in cassette £395 ono. Tel: (0245) 356218 day, T Taylor (0245) 469112 evening.

BBC model B + 1.2 OS + disk interface + Wordwise. Will demonstrate boxed with manuals + leads, price £400. Phone: B Alderwick, Dursley 810-451 Ext 202 (work), Stroud 78432 (home).

Acorn Atom 12K+12K BBC Basic FP/ ROM PSU manual, leads, lots software, including Invaders, Breakout, Atom Calc. ROM. Cost over £300. Quick sale £130. Deal (03045) 62857.

Arfon Expansion Unit with lid, (seven slot motherboard with integrated power unit) for use with Vic-20 computer. £45 ono. Tel: 01-850 4732 evenings.

Osborne 1 single density beige box model complete with CP M Wordstar, Supercalc, M Basic C Basic (C language optional), £650 ono. Tel: London 883 5153.

Oric-1 48K two months old, plus five cassettes including Xenon, Oric Base, £130. Tel: 01-399 5809 evenings.

Printer — Centronics 739/2, 100 CPS monospaces, 80 CPS proportional letter quality. Suitable Atari. C/W Word Processor, Visicalc, CCI-DMS, Touch Typing, Management Simulator. Cost new, £1,000. £590 ono. Tel: 01-958 5600.

Twin discs for BBC, Canon 40 trade with PSU, manual, format disc, cables, most Acornsoft games, hardly used, as new, £290. 01-567 2232, evening w/e.

Dragon 32, three months old, boxed, many good games and software, Pently books, joystick cartridge, £170 with recorder £190. Gravesend 64608. 25 Milton Road, Gravesend, Kent.

Sharp MZ80K, Basic plus Fig-Forth, 4MHZ conversion, reset PB Sharpsoft user notes, boxed, £250 ono. Phone: Fareham 283 195, G Douglas, 40 Nobes Ave, Bridgemary, Gosport PO13 0HT.

Sharp MZ-80K, this computer has everything! Built in monitor and cassette deck, Basic, Pascal, Fortran, Forth, M/code, all manuals included, £275. Colchester (020 622) 4060.

Dragon 32, five months guarantee, two joysticks, new £20 cassette recorder, £85 software, all worth £325, best offer over £220, 051-678 5356 Merseyside after 5pm. Possible Commodore 64 exchange.

Oric-1 48K, mint £130 ono. 047-553 368, Ayrshire.

Oric-1 48K as new, Zodiac Flight and other games included. Only £130, tel: Burgess Hill 42425 evening.

TI 99/4A plus cassette recorder, cassette leads, Home Budget Management Module, Basic manuals, Joysticks, 2-Apex Adventure tapes, seven months old, under guarantee, £135. Tel: Gosport (070-17) 20412.

Dragon 32, two months old, good condition, all leads, etc with tape recorder, joystick, software, magazines, £175 ono. Phone: Glasgow (041) 634 0756 at weekends.

I am willing to pay £50 for a 16K Spectrum. Phone: Harpenden 69152.

BK200A, why pay £549 new? Mine for sale at £325 for quick sale incl carriage. P White, 52 Abbotswood, Yate, Avon.

Jupiter Ace for sale with £20 of software and membership to owners' club, £70. 34 Mill Grove, Whissendine, Oakham, Leics. Tel: Whissendine 283.

ITT 2020 48K computer complete with colour TV, modulator and paddles £370. Also Apple disk-drive, £250 plus some software. Phone: 421-2451 after 6 pm. Harrow.

Bargain offer! Excellent condition ZX81 + 16K fullsize professional keyboard. Selling the lot for only £50. Tel: 01-254 5952.

Atom computer 12K+8K+FP. Much software, for beginner or experienced, virtually unused present, few months old, £110 ono. Daran Brown, 58 Pearl Street, Roath, Cardiff (0222) 497642.

CBM 4022 printer recently overhauled, new head plus word processor, ribbons, paper £325 ono. Willie Stott, Milton Keynes (0908) 660459.

BBC Micro software to sell or swap including Acornsoft, Program Power, Kamsas and all other leading companies. Telephone: 01-903 4308 after 6pm ask for Arun.

Acorn Atom 12K-ROM, 12K-RAM, 6522 VIA + bus buffers, boxed, tape recorder, PSU, all leads, manuals, Magic Book, programs, £175. Milton Keynes 0908 582298.

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Sharp MZ-80K software to value of £400+ includes Wordpro, Cale II, Database, Forth, Sargon, Draughts, Bridge, Othello, The Valley, etc, £65 ono. Tel: 0908 677508.

ZX81 fully expanded 16K printer, hi-res 190×255 graphics, sound, three tracks, full keyboard extra ROM M/C monitor, cost £225, accept £145. Phone: Maidstone 831142 (eve).

Mattel Intellivision and seven cartridges £120 also Spectrum software compiler Hobbit, etc. Phone: Bedford 713104 (Olney).

Vic-20 + 24K, cassette unit, Arfon expansion, 1515 printer + paper, books, cartridges, cassettes. Worth £750+, offers near £350. Won't separate. Tel: 01-942 6324.

Apple II + interface cards Videx Videoterm, Switchplate, manual £65, language card £55, Mountain Clock Card £75, 16K RAM card £30. Phone: Martin, Bristol 514698.

BBC compatible printer, Star DP8480, Centronics, tractor/friction feed, high-resolution screen dumping 80 CPS + enlarged, condensed printing, excellent value £180 ono. Deliver Southeast, Canterbury 750600.

Spectrum software to swop or sell including Penetrator, Black Crystal, Mad Martha, and Flight Simulation. Tel: Basingstoke (0256) 53497 anytime and ask for Geoff.

Commodore 4040 dual disc drive plus cable and manual, £400. Newbrain Model A, manual and beginners guide £220. Tel: 01-892 6521.

HX20 portable computer, unwanted gift, £225 for quick sale. Ring 01-854 3350 after 7pm.

Wanted BBC 'A' 16 or 32K RAM, up to £260. 53 Kylemore Avenue Mossley Hill, Liverpool L18 4PZ. Tel: 051-724 5081.

Lynx 48K, three months old with two years' guarantee, still boxed, hardly used, £195 or exchange Commodore 64 with cash adjustment. Tel: 01-337 2694 anytime (Worcester Park).

ZX81 + 16K RAM + software including Trader, Scramble, 3D Defender, etc. As new, £55 ono. Tel: Luton (0582) 593333.

Newbrain model AD with printer cable, £220 ono. Seikosha GP250X serial and parallel, 30 cps, £230. 35 Coverdale Road, Sheffield S7 2AX. Tel: 0742 588058.

Atari 400, Recorder, Basic, Donkey Kong, Pac-man, Galaxions, Pool, Super Cube, Euro-Scene Jigsaws, and Airstrike, two joysticks. Give to best offer. 01-778 1016, Gary.

BBC Model B, 1.2 OS, only four months old, with cassette lead, software and dust cover, only £300 for quick sale. Tel: Preston (0772) 734 053.

Vic20 +8K, C2N cassette, Reference Guide, Vic Revealed, six games, Assembler, as new, all boxed. Worth over £200, sell for £120. Tel: Mossley 4043.

Spectrum 16K, for sale, due to acquisition of larger computer for business use. Three months old, as new. £75. Tel: Fleet (02514) 3139.

ZX81, DK Tronics keyboard, 16K RAM, printer, cassette player, Flight Simulator, other software £75 the lot. 22 Woodstock Road, North St. Albans 58316.

ZX81 plus 16K Memopak boxed, also games including Asteroids, Gulp Scramble plus others. Worth £100, £50 for quick sale. Tel: Reading (0734) 341359.

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Commodore 64, disk drive, cassette, joystick, Visawrite, data base, Basic software and games, as new. Only £500. Tel: 01-952 1538.

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BACK ISSUES

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

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

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

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

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

Issue 6, April 15-22.
Pro-Tests: Tycom Microframe, IBM PC, Scorpio Disks, Dragon sound module, ZX81 graphics, Bottom- Line Strategist (CP/M), PaperClip word processor.

Features: IBM PC DOS, BBC word processing, PC-1251.
Gameplay: Mined Out (Spectrum), Transylvanian Tower (Spectrum), Lunar Leeper (Apple II), Evolution (Apple II).
ProgramCards: Wacky Racers (Oric), Mortgage Comparison (Sharp MZ80K), Computer Set Up (BBC), Day of Week.
Databases: micros.
Micropaedia: Graphics, part 1.



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

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

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

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

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

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

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

Issue 14, June 10-June 15.
Pro-Tests: Apple Accelerator II board, Modula-2 (Apple II), Oric-Base, Joystick Control Unit 86, Kempston Centronics Interface. BBC Speech Synthesiser.
Features: Newbrain Basic part 1, Sirius designing.
Gameplay: Ali Diddums (Spectrum), Monopole (Commodore 64), Automonopoli (Spectrum), Dragon dramatics.
ProgramCards: Time Bomb (Atari, cont), Sheep Drive (BBC B).
Databases: Software.
Micropaedia: Spectrum, Part 1

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



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

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

Micropaedia: Sound, part 1.

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



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



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

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Fractionally misleading

Once again Sir Clive has grabbed the limelight, and the word 'Microdrive' is on everybody's lips. Sinclair Research is back at the centre of attention and when the hubbub over the Microdrives dies down its future plans will come under the microscope.

But the *Daily Telegraph*, not noted for its coverage of the PC scene, has scooped all of us. It has discovered the name of the next system to come out of Sinclair.

Here it is for all to see in the issue of July 29:

> intense interest in Sinclair's new computer, expected in the first half of next year.
>
> Codenamed the ¾ ⅓ 83, it is to be a professional small business machine, which means Sinclair will be competing head-on with giants like I B M.

Or did the Telegraph just have an off day? On the same page it boldly named an Armenian terrorist:

> 23fiff B17x17, 32, a self-styled suicide mission terrorist, was convicted of carrying a

Or was he a Bulgar fraction?

High life

The simple native habitations that cling to life on the southern shores of Lake Titicaca in Bolivia have inspired a remarkable new space-saving product from Pete and Pam, which has quite a confident grip on life in the valleys of East Lancashire.

Not many of the inhabitants of Rossendale would have looked at a stilt house and spotted the revolutionary application of this primitive technology to an Epson printer. But a house on stilts has room beneath it; on the Altiplano this is usually occupied by gently lapping water, not often a threat to Epson printers. However the room can still be use for storage.



The result is clear from the photograph—a printer that not only has a strong cultural identity and is proof against floods, but which also has an orderly supply of paper from a source that doesn't clutter up the desk or the floor.

Well done, Peter and Pam! Jolly good show.

NEXT WEEK

Hardware — the Acorn Electron: will lightning strike twice?

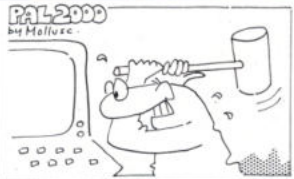
Software — New Brain bisected: CP/M interfacing and memory mapping.

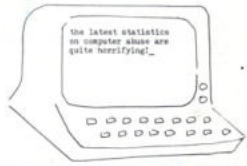
— Commodore made simple: Simons Basic on the 64.

Peripherals — Part II of the Microdrives story.

Gameplay — Arcade action on the Spectrum and the Dragon.

Plus all the regulars.





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

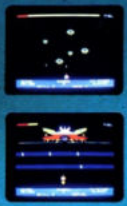
Event	Dates	Venue	Organisers
8th ZX Microfair	August 20	Alexandra Palace, London	Mike Johnstone, 01-801 9172
Acorn User Exhibition	August 25-18	Cunard International Hotel, London	Computer Marketplace Ltd, 01-930 1612
Strathclyde Home Computer Fair	August 26-27	McLellan Galleries, Sauchiehall Street, Glasgow	Jarak Sales, 25 Dungavel Gdns, Silvertonhill, Hamilton, Scotland. 0698 457204
Computer Open Day	September 1	Draganora Hotel, Leeds	Tony Kaminiski, Couchmead Communications Ltd, 01-778 1102
Video, Audio and Computer Show	Sep 16-18	Bradford Exposition Centre	R. Cooper, J. Wood & Sons Ltd, Bradford 720014
Home Entertainment Show	Sep 17-25	Olympia, London	Montbuild Ltd, 01-486 1951
Computer Open Day Exhibition	September 22	Central Hotel, Glasgow	Couchmead Communications Ltd, 01-778 1102
Microcomputers in Business	Sep 27-29	Warwick University, Coventry	Peter Bubb, 01-892 4422
Personal Computer World Show	Sep 29-Oct 2	Barbican Centre, London	Montbuild Ltd, 01-486 1951
Computer Fair	Oct 2	The Sir Frederic Osborn School, Welwyn Garden City	R Brown Welwyn Garden City 23367
European Computer Trade Forum	Oct 4-7	NEC, Birmingham	Clapp & Poliak Europe Ltd, 01-747 3131

OVERSEAS EVENTS

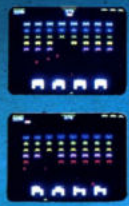
Event	Dates	Venue	Organisers
Personal Computers & Office Automation Systems Exhibition	Sep 5-8	Amsterdam, The Netherlands	RAI Gebouw BV, Europaplein 2, 1078 GZ., Amsterdam
Australian Computer Exhibition	Sep 13-16	Melbourne, Australia	Riddell Exhibition Promotions PTY Ltd, 166 Albert Road, South Melbourne, Vic 3205
International Peripheral Equipment & Software Exposition	Sep 13-15	Moscone Centre, Anaheim, USA	Cahners Exposition Group SA, 0483 38085
Computex	Sep 20-22	Limerick, Republic of Ireland	SDL Exhibitions, Dublin 763871
Gulf Computer Conference	Nov 22/23	Dubai International Trade Centre	Reed Conferences, Surrey House, Throwley Way, Sutton, Surrey. 01-643 8040

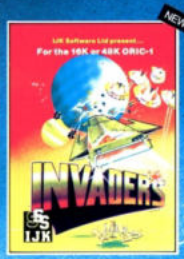
IJK Software and the ORIC-1 Micro continue to bring you into a new era...



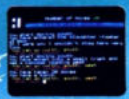


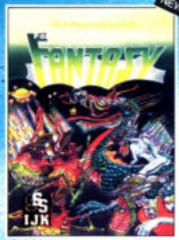
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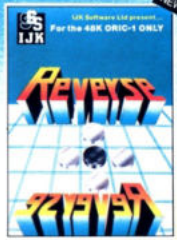


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