

# PERSONAL *weekly* COMPUTER

50p

March 3, 1984

No 51

NEWS

BRITAIN'S BIGGEST WEEKLY

## SPEEDY SPECTRUM

Handy utilities  
for the Microdrive

## ACORN ARCADE

Racy millipede game  
for the Electron/BBC

## 64 SUPERBASE

New database gets  
Pro-Test approval

## SOFT SCORECARD

Games on the Atari,  
Spectrum and TI99/4A

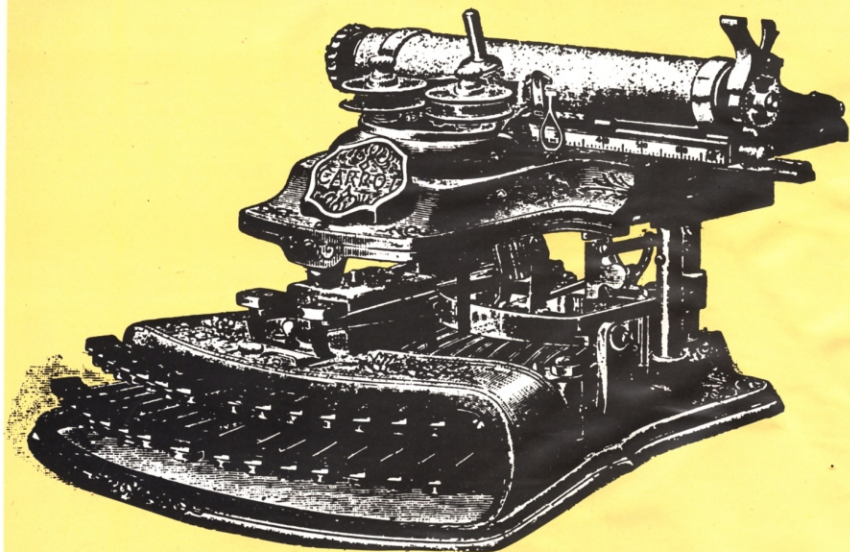


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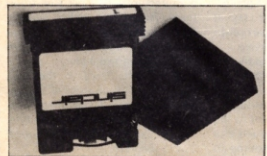
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# MENUPCN

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Cover photography, Howard Kingsnorth

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The lap-held portable competition is hotting up and this new contender, says Dominic Powlesland, could send Sharp to the front of the field.

## MICROPAEDIA

Pull out and keep

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The second in our three-part competition in conjunction with Micropaedia gives you the chance to win one of these superb dot matrix printers. The RX80 is a versatile machine capable of fast draft quality print, or high quality output in a variety of styles. Don't miss your chance to win one.



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Millipede: a frantic game involving a high-speed insect growing by the second.



# What's up with Oric upgrade?

By Piers Letcher

Oric-1 owners hoping to upgrade to the Atmos may have a long wait.

At the moment Oric itself does not know exactly what the upgrade will consist of, how much it will cost, or exactly when it will be available. All the company could say was that it would be two to three months before the upgrade service would be offered.

Reliable sources point to several

of the raw materials.

It also needs more time to set up a mass production procedure for the upgrade. Since new casings and ROMs are already available in Atmos form, PCN can't see the need for such a substantial delay. Rumours that the delay is being caused by problems with the Atmos's ROM were also denied by Oric.

On the equally thorny subject of forthcoming disk drives Oric said that they were in production, but that their dealer's orders were being met first.

A February 4 demo of the drives to the press was subsequently cancelled. Since then no more have been heard of the drives. They were first due to be launched six months ago, and said by a spokesman at the Which Computer? Show to be in production over a month before that.

Oric is now advertising the drives as being available at several high street stores. But PCN couldn't find any at Dixons, which said it had none, and didn't know when it would. Laskys also had none, but had been told by an Oric representative that they would be available in the next few weeks. One of the chains in the advert, Rumbelows, hasn't yet been told about the disk drives, and said that if it were going to have them available in the next month it would know about it now.

A feature of Oric's new image (exemplified by the Atmos) was to have been more reliable delivery guarantees under the new regime.

## Translation challenge

By Bryan Skinner

Software engineering has come a long way in the brief history of computers. But one problem still posing a major challenge to programmers is that of natural language translation — training a computer to handle English and other languages.

The topic came under examination at a conference at Cranfield Institute of Technology recently. It's still largely the preserve of universities but the interest of business and the possibilities offered by micros mean that it's gradually breaking out.

Most of the development work to date has been done in universities, and the field is jealously guarded by academics who seem bent on keeping knowledge shrouded in mystery.

Little progress seems to have

been made in the last decade, mainly because there's no agreement over approach. No-one's been able to define clearly just how humans solve the problem. This isn't actually essential; you can get a computer to simulate complex activities without using directly analogous methods, but it would certainly be a help.

The latest trend is towards using a 'bridge' or intermediate language. This would mean that text would be translated in the bridge first, then into the target language. Such an approach would greatly reduce the number of programs needed for multi-lingual translations.

Moreover, it would provide for some form of standardisation. Several institutions are looking at using Esperanto as a bridge, while an English system called SLUNT uses a numerically coded system.

Academia seems to be a brake on progress and it looks as if the most significant practical achievements will come from individuals and companies which want results.

## Oric drives

Disk drives are on their way for the Oric 1.

The drives will be launched by early October, according to an Oric spokeswoman. They will be the Hitachi 5M units already available.

Flashback to September 1983.

forms that the upgrade might take: sending Oric-1 owners new ROMs, fitting new ROMs into Oric sent to the factory, or the full Oric to Atmos conversion, including keyboard and new red and black trim.

One of these options will probably be offered to Oric owners. But the first of these would require them to invalidate their guarantees.

The cost could be between £10 and £70 depending on the upgrade offered. Oric says that it will offer the upgrade at a 'sensible' price, and that this will depend on the cost

## SV-818 yet to reach UK

Spectravideo is gearing up for two launches.

One is intended to be a portable, competing in the Tandy Model 100 market, while the other is liable to be a revamped 328 — one that actually is an MSX machine (Issue 50). Currently the only way you'll be able to get an MSX Spectravideo SV-328 is by waiting for the adaptor, which for around £30 is intended to bring the machine up to MSX standard.

But so far, even the UK distributors haven't seen the adaptor — it's expected in April or May — and no-one seems able to explain how you produce a cartridge adaptor and a ROM rewrite for £30.

Spectravideo UK has little information about the portable,

which will be named the SV-818, apart from saying it will have better specifications than the Tandy 100.

However, a source close to Spectravideo's shredder in the US allows us to reveal exclusively the specifications of the 818, as projected last autumn. It was then intended to be an LCD portable, Z80A running at 3.6MHz, 36K RAM standard, 32K RAM-pack, 40K Basic, 40K Multiplan WP and applications software built in, 80K ROM cartridge, 80x16 character LCD screen, RS232 with a baud rate up to 19200, built-in modem and MSX Basic with a stringy floppy built in, too.

Our informant agrees with that this sounds very like the machine Spectravideo would like to build.

## Rescued

What's green and slimy and lies in the mud at the bottom of a pond? The answer is a pair of Research machines 480Z systems four weeks after being stolen from a south London school.

The machines may have been slung into the pond by thieves when they discovered that the loot wasn't simply game-playing hardware. But the micros were almost as good as new after a wash and brush up.



RML engineer George Robinson — with a rescued 480Z.

# Timex quits US home market

Timex has quit the home computer market in the US.

The decision means the end of the line for the ZX81 and Spectrum in America and raises questions about the prospects for the QL in that country.

Under its licensing agreement with Sinclair, Timex sold a range of micros in the US which were essentially the same as the ZX81 and Spectrum but in different casings.

The Timex decision is not totally unexpected. The company had been finding the going tough for some time (Issue 25). Even with the TS1000 (the ZX81) officially priced at \$49 and discounted down to \$15

before Christmas, the company has not been able to hold on to its share of the market.

Announcing the decision, CN Jacobi, vice-president of marketing and sales, said: 'We believe the instability in the market will cause the value of inventories to decline, making it difficult to make a profit.'

The company, however, says it will continue to honour warranties and provide after-sales service.

Timex's withdrawal from the US market poses problems for Sinclair, which was earning a five per cent royalty on every machine sold.

More serious is the threat to the credibility of Sinclair products at a time when Sinclair is planning to

launch the QL in North America.

The company was anxious last week to distance itself from the circumstances surrounding the Timex decision.

'Sinclair do not believe the conditions described by Mr Jacobi will in any way affect the market for the QL,' it said.

But it has clearly given up hope for the ZX81 and the Spectrum. Nigel Searle, Sinclair's managing director, visited the US last week and said that the company has no plans to re-enter the US market with these products, pinning its hopes instead on the QL.

Timex is the latest in a line of manufacturers to have withdrawn from America's highly volatile home computer market. Texas Instruments and Mattel are two other well-known names.

Meanwhile, back in the UK, there were still no signs of the QL being delivered to customers. This means that Sinclair is now running two weeks late on its promised 28-day delivery.



# JLC dodges MoD ban

By David Guest

Jim Lamont, the new champion of the software protection lobby, is set to sidestep the Ministry of Defence (MoD) and the Patent Office in his fight against the pirates.

Mr Lamont's attempts to patent what he calls a 100 per cent foolproof software protection scheme (Issue 49) could be banned until July 1985 while the Patent Office and the MoD decide whether his invention is a risk to the UK's security. But Mr Lamont has an earlier alternative that is now undergoing field trials.

'At least we still have something to offer the software industry,' he said last week. He might have added that his company, JLC Data,

could earn some money from it; certainly the prospects of JLC seeing much compensation from the Patent Office for its blocked application are bleak.

The original application now goes from the Patent Office to the MoD where the process will be inspected for features 'prejudicial to the defence of the realm'. Mr Lamont can do nothing further with that process until it is cleared by the MoD, under threat of fines not greater than £1,000 or two years' imprisonment.

Neither he nor the Patent Office nor the MoD could say exactly how a software protection device could be a threat to national security. It is possible that he inadvertently used

asensitive encryption technique, or that his method has implications for data communications — a patent, once granted, leaves the details of the method open for inspection.

An MoD spokesman said that it was very unusual for an independent inventor to fall foul of the section of the 1977 Patent Act that has trapped Mr Lamont. He offered figures that suggest that only 0.28 per cent of applications might be subject to MoD restrictions. If Mr Lamont's is cleared by the MoD's experts, he said, 'it could go back by return of post' and continue through the Patent Office procedure.

So far, he said, the MoD had not seen the application and could not

comment on it. The Patent Office would not comment on an individual case. Neither had anything to say about the interests of UK software producers and users.

Ironically, it is clause 22 of the Patents Act that has sifted out his application, but it won't be a Catch-22 as far as he is concerned. 'We did come up with an alternative,' he said last week, 'and we're not going to put a patent on it.' This means that it can be subject to no restrictions, but of course it can also be copied by anybody with the means to tackle it. The technique is undergoing field trials with a software house in Yorkshire, and it already has the interest of the Guild of Software Houses (Gosh).



**LINE MANAGEMENT** — Sub-£100 modems are becoming more common, bringing the cost of various types of networks down to home users at least as far as the initial investment is concerned. The latest is the Telemo 2, which costs £84 from OEL (0768 66748). This is a V23 modem which sits beneath your telephone and is supplied with an extension British Telecom connector. It will connect to most micros via an RS232C or serial port. For viewdata connections OEL sells the appropriate interfaces in comms packages from £15 to £80. Telemo 2 is British Telecom approved.

## Silver Reed's system entry

Printer specialist Silver-Reed has moved into the systems business with a micro that uses a typewriter as its keyboard.

The Silver Screen is a Z80, CP/M system which costs £2,357 in its minimum 64K configuration. Apart from its unusual keyboard arrangement the micro also breaks new ground in design — the monitor, which sits on top of twin 300K disk drives, closely resembles a bread bin but still gives an 80 by 24 green display.

Silver-Reed is best known outside the computer field for its typewriters, so it is hardly surprising that the Silver Screen should be provided with this input option. But

you can also buy a keyboard attachment and printer to add to the main unit, bringing the price to £2,788.

The micro only has one interface at present — an RS 232C — although a Centronics one is planned. This means that you can't attach both a typewriter and a printer to the Silver Screen at the same time — to do this, you'd need a special adaptor to be brought out in two months for £57.50.

Next month should also see the introduction of two more printers in Silver-Reed's range. The EXP 400 daisywheel will do 10 cps, have a choice of RS232C or Centronics interface, take A4 paper and cost £327.75.

Also due for unveiling is the £400 Thermal Multiprinter EXD 15 with six different typefaces.

Silver Reed is on 0923 45976.

## IBM Portable is taking off

As IBM releases more details of its portable micro it has become clear that the delivery of the new micro has been brought forward to fill a gap caused by poor demand for the PC Jr.

IBM says that the Portable PC will be available for demonstration and purchase in the US from March 1, but: 'initial supplies will be limited'.

One reason for the limited supplies could be the lack of chips (a world-wide problem for most micro makers). But IBM has taken steps to protect itself by buying shares in Intel, manufacturer of the 8088 processor chip used in the PC, Jr and Portable PC.

If sales of the Jr are below target, then switching the components to production of the portable would make sense.

This seems to be backed up by reports from America. The Jr

seems to be selling well to corporate customers who want a Jr at home because of its compatibility with the machine in the office. But sales to new customers seem to be relatively thin on the ground.

Main criticisms about the Jr stem mainly from the keyboard (roundly criticised by many reviewers of the micro) and its high price. By bringing out the Portable PC ahead of schedule IBM could fill the shortfall in Jr sales while making life tougher for other manufacturers which have attempted to fill the gap in IBM's product range.

The Portable PC weighs more than some of its competitors (it's a luggable 30 lbs) and doesn't offer as full a range of facilities (although these will surely come).

The basic machine costs \$2,795 and features a 9in amber monitor, 256K or RAM (expandable up to 512K RAM), a universal power supply for use in different countries, a single 300K disk drive (with a second drive available as a \$425 option) and a colour graphics monitor adaptor.

## Anco's answer

By Ralph Bancroft

Users have been caught in the crossfire of a continuing feud between Anco Software and Cascade.

Cascade was granted an injunction against Anco towards the end of last year to stop it selling a compilation games tape which Cascade said infringed its copyright. Anco is still selling a games compilation tape which it maintains does not infringe Cascade's copyright, but readers have complained to PCN that the company has banked cheques and not sent the goods or sent faulty goods.

When we spoke to Mr Philip Sands, proprietor of Anco, he said that any complaints about non-delivered goods would be followed up. 'We have had problems with goods lost in the post. They are now being dealt with,' he said.

Informing him of the identity of the readers who had written in he said: 'Ah yes, I recognise the

names. I will personally look into it today and you can feel that they should receive their money back.'

On the subject of Cascade's injunction he said: 'The injunction stops me from advertising and selling their tape. The tape I am selling is not their tape so the injunction doesn't apply. Quite honestly, their tape is not worth copying'.

'There are now 60 games on my cassette and none of them are Cascade's.'

That view is flatly contradicted by Cascade. 'We obtained an injunction on only one of his tapes whereas two tapes infringe our copyright,' said Cascade.

In common with other magazines PCN is currently not accepting advertising from Anco.

Mr Sands' telephone number is 0236 32381.



## VIEW FROM AMERICA



## Atari pins survival hopes on 800XL

By Chris Rowley

A weird little anxiety attack has been afflicting the US micro industry for the past month. 'Is Atari going down the tubes?' blared the front page of *Infoworld*, America's leading micro weekly. It may seem absurd to think that a company with 16 million video games and one million home computers installed in US homes could be allowed to just disappear, but the question marks continue to rise over Atari.

Will the 800XL sell strongly enough? International newspaper tycoon Rupert Murdoch is bidding to buy more shares in Warner, Atari's owners. What might Murdoch do if Murdoch could? New chairman James Morgan bravely rebuts the doomsayers and points to a revamped company which after a night of the long knives is free of the old fiefdoms and politics.

Even so, there is no hiding the anxiety at Atari as they wait to see what comes out of the courthouse door, Chris Craft (another company becoming involved with Warner) or the Bengal Murdoch.

Elsewhere the mainstream pundits keep chomping on Apple and predicting the Big Blue World. As though it is the only response open to them, the other manufacturers bend a knee, voluntarily or otherwise. When Coleco laid off 50 employees at its headquarters, Wall Street promptly slashed 15 per cent off Coleco stock, noting that on the Adam's slim profit margin 65,000 units a month was simply not enough to keep the banks at bay and meet the overheads.

At Commodore, smoke still swirls around the building after the eruption of Mount Tramiel. The common theme from Wall Street to the micro press is that Commodore will have a hard time coming up with son-of-64 and that by the last quarter of this year it will be squeezed ever tighter by the downwardly mobile Apple II, PC Jr, and a horde of predicted Japanese wonder machines.

The pundits also point to the number of specialist dealers who won't sell Commodore machines again, after being caught out in Jack Tramiel's great spring offensive of 1983, when he halved the price of the 64.

The dreaded IBM effect, as it limbers up its portable PC, will blow a chill wind through the corridors of Compaq, Eagle, and other IBM-compatible portable manufacturers. Prophets of doom are out in force with pronouncements on non-IBM-compatible micro makers. Articles and columns pose the question: 'How does a business machine break out of Catch 1-2-3?'

Lotus 1-2-3 is far and away the best-selling business software in the land. Hence the marketers of business machines that can't run 1-2-3 have had remarkably little to do lately.

So you develop an IBM clone to cash in, since it can run 1-2-3, and you and your venture backers are soon honoured guests at your bank? Sorry, but dealers have all the IBM-compatibles they can sell. Unless you're spending megabucks on television ads to start customer stampedes, you can forget it.

So instead you develop a wonderful non-compatible system with 256K of RAM, 32-bit processing and so on; but it won't run 1-2-3. You'll have to pay the dealers on your knees to get shelf space.

And so to the vision of IBM world domination, formed by the unstoppable urge of American business to shackle itself to IBM's progress, which will lead to a day three years hence when all businesses will be integrated blends of IBM workstations. In this scenario the sales of stand-alone micros for business customers will start falling back in 1985 and IBM will take control of the market after Apple goes bust.

All very gloomy stuff, but hard to believe in the light of new developments. This is the year of 32-bit chips, 1-2-3 faces hordes of competitors, and there are fascinating possibilities in mainframes.

The last word this week should lie with the hot-eyed brigade bravely soldering on — two professors at a Pasadena technology institute have wired 64 8088 chips into a 60in by 14in by 8in box called the Cosmic Cube and have developed software to synchronise the array to run up to three million instructions per second, for about \$80,000.

## H-P gets the soft touch

By Geof Wheelwright

You should be able to buy a Hewlett-Packard HP-150 micro in your local computer shop by the end of this month with the confidence that at least some MSDOS software has been converted to run on the machine's 'touchscreen' system.

Hewlett-Packard said last week that it has signed up an additional 100 dealers in preparation for this month's start to shipping of the £2,995 16-bit machines.

Both the Memomaker and Wordstar word processors as well as Visicalc have been configured to work with the touchscreen system.

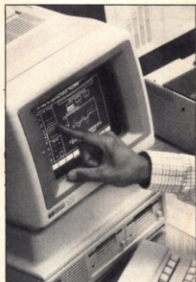
The screen is HP's alternative to Apple's mouse system and allows you to move around objects, text or the cursor by merely pointing at the appropriate spot on-screen.

Hewlett-Packard managing director David Baldwin expects a good deal more software to be ready soon for the HP-150's MSDOS 3.1/2in disk format. Mr Baldwin said that although some work is required in configuring packages to use the capabilities of the touchscreen, the actual 'porting across' of programs is made much easier by HP's decision to go with an IBM-PC compatible processor and MSDOS.

This means that some software will be running on the HP-150 without using the touchscreen. The

famous 1-2-3 package from Lotus, for example, has been converted to run on the HP-150 but doesn't use the screen's special capabilities.

No matter what some people think of the touch screen, the HP-150 has to be considered an expensive micro at £2,995 for the basic twin-disk version (a £2,395 configuration is also available but you can only use that model as a terminal in a mainframe system). HP's first entry into the personal computer field faces tough competition from Apple's new lower-priced Lisa machine and from the IBM PC.



HP — losing its touch with 1-2-3?

## Logo logs on

Logo has taken a further step towards popular acceptability with the general release of Atari Logo.

The language comes on a plug-in cartridge costing £60 and works with any Atari micro with a minimum of 16K of RAM. It is a full implementation of Logo including the powerful list processing features as well as the more well-known turtle graphics.

The Logo was written for Atari by Logo Computer Systems, which has taken full advantage of the colour graphics available on Atari micros.

Atari Logo can display 128 colours simultaneously and have up to four turtles on screen at any one time. Using the player/missile graphics (sprites) the turtles can take on user-defined shapes. Collision and animation are also supported as is the use of four joysticks.

Atari wants to make the language attractive to schools by packaging it with the 600XL micro for an inclusive price of £175 plus VAT.

The cartridge comes with two comprehensive manuals — *Introduction to Programming Through*

*Turtle Graphics and Atari Logo Reference Manual.*

The language is already in use in several schools where it appears to have won a favourable response. It is also on the final shortlist for the creative software category of the British microcomputer Awards, sponsored by PCN's publisher, VNU Business publications.



Atari logo — no language barrier.



# Lotus adds lost chord

How do you follow an act like 1-2-3? The Lotus Development Corporation, producer of last year's most successful software package, aims to do it with a Symphony.

This is the name of its follow-up, which it claims will turn your IBM PC or XT into the workstation of the future. The whole world and his dog seems to have their sights on the workstation of the future but from Lotus it may be a more convincing promise.

Symphony offers word processing, database management, spreadsheet and graphics capabilities in an integrated package.

Coupled with a windowing system and extensive communications facilities, Lotus calls Symphony 'the most complete business productivity tool ever offered for the micro-computer market', but of course it would say that.

Really an extension of 1-2-3, Symphony will be available in the UK from mid-1984. The UK price has yet to be decided, but the introductory US price is \$695. A trade-in deal for your old 1-2-3 will also be available, one estimate being about \$200 — the price difference between the two products.

The drawback is that you'll also have to lash out on a memory expansion for your micro, unless it's an XT. Symphony needs at least 320K, but will run happily on a single disk system and can support up to 16 in-line displays.

The idea of such memory use is that you won't have to wait for programs or data to be loaded in from disk, as is usual — the whole program will reside in RAM, making switching between the modules and data updating quick and easy.

Symphony provides a programming environment for developing dedicated applications programs

via its Command Language and Lotus plans to release 'add-in' applications such as time management and project scheduling to the open-ended system. These will become optional extras to the package.

The system has been designed with international communications in mind; it incorporates the Lotus International Character Set, intended to allow simple translation of menus and other information including date/time and currency formats.

After 1-2-3 Lotus has a reputation as a trend-setter to maintain.

## Score draw

A clearance sale at a Chelmsford stockist could put you in line for a bargain plotter.

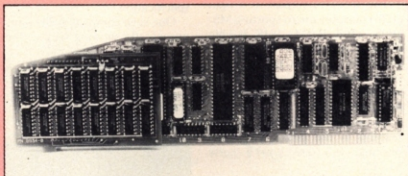
Future Music is selling off the Roland DG DXY100R plotter for £399, a reduction of £300. The 100R has serial and parallel interface and puts out very detailed hard copy, drawing its single pen over A3 paper at 700mm a second.

Rick Cannell, peripherals manager for Roland UK, said the

company would continue to maintain the plotter.

Taking the 100R's place are two more plotters, the £460 DXY-101 (a faster version of the 100-R) aimed at education and the £599 DXY 800 using eight colour pens, which is aimed at designers and art departments. These are already in stock at 12 dealers throughout the country, and although in short supply, can be ordered usually within a week.

Future Music is contactable on Chelmsford (0245) 352490.



**CARD TRICK** — Digital Research's newly formed hardware division has produced its first product, an add-on for the Apple II, IIe and II+ that puts CP/M on these systems. Its CP/M Gold Card slots into any of the internal slots and carries its own 6MHz Z80 with 64K and an option on another 128K of cache memory. It also provides for an 80 column display. With the cache memory the card costs £640; without, it is £399. Volume shipments were due to begin in mid-February. DR can be reached on 0635 35304.

## Big Country promises big storage

Country Computers (0527 29826) is giving away a free Qume terminal with its new 20Mb hard disk micro. The system will sell for £2950 plus VAT.

The company specialises in Z80 hard disk systems running CP/M. The new C3000-20 micro complements two other new products announced at the same time.

The C3010 is a Winchester system with a 5Mb fixed disk and a 5Mb

removable disk and sells for £4500. The 64K RAM can be expanded up to a total of 192K.

The C3005 is a networking system using CP/NET. Up to five users can be connected to a plug-in circuit board that fits into a C3000 series micro. The board carries five processors to give station-to-station transfers at processor speed.

A basic five-user system comprising five 'requesters', each with 64K RAM, and a file server with 128K RAM, 10Mb Winchester and a 500K floppy costs under £5,000. Two additional five-user requesters can be added for £1950.

The Qume on offer is a VDU called the QVT-102, supplied by ISG Data Sales.

## Chain mailing

Starting next month you will be able to use your micro to write telex messages as well as to send and receive international telexes.

The 'One to One' service is being introduced by Kensington Datacom, which will charge an annual subscription fee of £50 to anyone who wants to use its electronic mail, telex and telexmailing services.

There will be a charge every time you use the service — but the charges are substantially different from normal British Telecom rates. Sending a telex, for example, will cost 40p a minute over the price of normal telex rates plus a 10p a minute connect time charge (although the first 30 seconds of any call is free).

Harvey Coleman, managing director of the new company, said last week that since the company's £150 telecommunications software allows for preparation of electronic mail and telex message 'off-line', the connect time charges need be only minimal for most messages.

Perhaps the service's two most unusual features are the ability to send and receive telexes using your micro and the ability to use a telexmailing service to write a

letter on your micro and have it sent out through the post by the One to One service.

Prestel allows you to send telexes within the UK only — you cannot receive them by electronic mail. Torch Computers' Torchmail service allows sending of international telexes through a Torch — but that's not much good to you if you don't have the machine.

The Comet electronic mail system is in the process of opening an international telex service. But the telexmailing service is probably unique and will give micro users the ability to send 'electronic' mail to people who don't have micros or electronic mailboxes.

The charge for this service will be 75p for the first page of a letter (100 characters) and 16p for each subsequent page of each letter.

The company will also be offering a £280 auto-dial, auto-answer modem for use with the service. But any 300-300 baud or 1200-1200 baud modem will suffice, as will any good telecommunications package.

If you don't even have a micro, they'll set you up with a terminal for £620. More information on the service is expected to become available next week.



Country store — Winchester fitting into the micro range.



# Communication situation . . .

By Ralph Bancroft

Everywhere you turned at Info 84 somebody was demonstrating how to hook up something to something else. Micros to mainframes, typewriters to networks, typesetters to telephones and telephones to disk stores.

Thrusting aside these blandishments, most visitors made a bee-line for the GRiD stand. There was the most amazing piece of technology just arrived on these shores after a successful trip abroad the space shuttle.

The GRiD Compass is a light (10lb) portable micro sporting MS-DOS, 256K RAM, 384K bubble memory and a truly amazing 80-column-by-25-line flat screen. It also comes with a bewildering array of plug-ins, add-ons and communication capability.

Of course one of the amazing features is the price. The basic machine will cost you a hefty £5,195.

The innovative screen is one of the reasons why this technology will set you back an arm and a leg. Unlike the LCD screens used in other lap-held portables, GRiD has opted for the so far rarely tried electroluminescent technology.

The result is a 6in screen that can display a whole screen of information at a time and generate displays with a 320 by 240 graphic resolution.

The MS DOS connection comes from the 8086 processor (the Compass also features an 8087 maths

co-processor as standard) and optional 360K portable disc drive.

As with other products GRiD is advertising a built-in modem. Further inquiries revealed that it has yet to get the appropriate approvals (so you will have to wait at least six months).

Despite the horrendous prices the Compass is still a very impressive looking machine.

Unfortunately, British companies fail to score in the good looks stakes even though they can deliver in terms of price and specification.

One such company is Plessey. It was quietly showing its new business computer.

Uninspiredly called the Plessey Business Computer (to be shortened to the Plessey BC perhaps) it features the true go-faster 16-bit 80816 chip from Intel. Add in



Torch's Unicorn — a mythical beast on show.



The GRiD Compass — blazing a new trail in portable computing.

256K Ram and twin 400K Sony microfloppies and you have an interesting machine. Equally interesting is the price of £1,895.

The opposite of 'leading edge' technology must be 'trailing edge', and so to the Commodore stand. Still no sign of a 16-bit machine but at long last it has got around to CPM. Its Z80 cartridge with CP/M on disk was on show.

All that it requires now is some software.

Commodore also announced at

the show a dual drive 2Mb floppy disk system. The 8250 costs £895.

Commodore was also promising delivery of its own modem in the next few weeks. This may be optimistic. One complaint to be heard regularly around the show was the cost and delay involved in getting modems approved.

Torch is particularly aggrieved because it wants approval for a modem to go into its new triple processor, Unix-running machine.

The only problem was that the company was unable to demonstrate any applications software. This may explain why it announced at the show that it has just signed a deal with Pipeline, the Unix subsidiary of Tamsys, to supply software.

Another drawback is the price of £6,050. A cheaper option is to buy Torch's new Unicorn (surely a play on the word Acorn) hard disk add-on for the BBC B. For £2,895 you can get a 20Mb hard disk, 400K floppy, Z80B second processor, 68000 third processor and 256K for RAM. Unix will set you back an additional £800. Some peripheral for a £400 micro.

## SOFTWARE

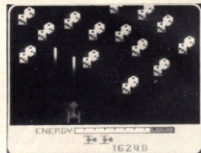
The new releases

### Games

**Commodore 64:** Artic Computing (0401 43553) has brought out a new clutch of games for the 64, all priced at £6.95. Planet of Death, Inca Curse, Ship of Doom, Espionage Island and Golden Apple are all adventure games translated from the Spectrum originals.

**Spectrum:** New from Artic is Monkey Business, yet another variation on the King Kong theme.

**Atari:** Parker Video Games is branching out with implementations of its games to run on home micros. Frogger and Q\*bert are the first two releases priced at £29.95 and £34.50. In the pipeline is Star Wars — The Arcade Game. Activision has already gone down the same road and its latest release is MegaManiac,



Megamania — Activision zaps invading dice.

priced at £29.95. If you are bored with zapping aliens, this game has you shooting down hamburgers, bow ties, steam irons, ice cream, sandwiches, radial tyres and a host of other totally improbable articles.

### Business

**Tandy/Nec/Olivetti:** PCalc is a spreadsheet designed specifically to work with lap-held portables. Prices at £25 it re-

tains data when switched off. Results can also be saved on cassette or printed out. Details from Capra-Cinderstan Associates on 01-764 8899.

**Unix Analyst:** is a cut-down database manager from Sphinx (0628 75343) ideal for card index-type applications. The price is £400.

**Sirius/Apricot:** The Merchant is an integrated stock and financial analysis system for retailers. It costs £300 from Ashfield Business Systems (0623 516584).

### Education

**Spectrum:** Silversoft (01-748 4125) has launched a version of the Grunberg Linkword Language System (Issue 50). Using psychological and memory techniques it is a computer assisted learning system for the teaching of foreign languages.

**BBC B:** Datapen (0256 770488) has produced a geography program that works with a light pen. Called Britain, it costs £6.95 and teaches the location of features of the British Isles.

### Utilities

**Commodore:** Simply Assemble is an assembler for the 64 and Pet versions 3.0 and 4.0. It costs £22 on disk or tape from Simple Software (0273 504879). Meanwhile, Oxford Computer Systems (0993 812700) has made its Pascal compiler available for the Commodore 64. It comes on disk, priced at £49.95. Also just released for the 64 is Infodisk, the data processing and information retrieval system. It is available from Beaver Software (Harby 61318) at £75.



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|-------------------|-------------------------|--------------------|-------------------------------|
| Football Manager  | Addictive £8.95 £8.00   | Pilot              | Abbe £7.50 £6.50              |
| Krakatoa          | Albex £5.95 £5.00       | Frog Run           | Anirog £5.95 £5.00            |
| Chuckie Egg       | A&F £6.90 £6.00         | Skramble           | Anirog £7.95 £6.99            |
| Manic Minor       | BugByte £5.95 £4.95     | Kong               | Anirog £7.95 £6.99            |
| Zoom              | Imagine £5.50 £4.75     | Serendity          | Interceptor £7.00 £6.00       |
| Birds and Bees    | BugByte £6.95 £5.95     | Mutant Camels      | Liamasoft £7.50 £6.50         |
| Hunch Back        | Alchemist               | Manic Miner 64     | Software Projects £7.95 £6.95 |
| Flight Simulation | Ocean £6.00 £5.20       | Grand Master Chess | AudioGenic £17.95 £15.95      |
| Chequered Flag    | Pison £7.95 £6.95       |                    |                               |
| 3D Ant Attack     | Pison £6.95 £5.95       |                    |                               |
| Bugs Boo          | Quicksilver £6.95 £5.95 |                    |                               |
| Jet Pack          | Ultimate £5.50 £4.95    |                    |                               |
| Luna Jetman       | Ultimate £5.50 £4.95    |                    |                               |
| Atic Attack       | Ultimate £5.50 £4.95    |                    |                               |

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# PCN charts

## Hardware Top Ten up to £1,000

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



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

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

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

## Top Ten over £1,000

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

**Distributors:** AC Acorn ACT ACT/Sirius AP Apple AT Atari BW Brainwave CKC CKC Computers CO Commodore Dragon Data DEC Digital Equipment EP Epson ICL ICL IBM IBM NCR NCR MD Midelectron OR Oric SI Sinclair Wang Wang.

**Machines:** SP Sinclair Spectrum AC Acorn BBC 64 Commodore 64 V20 Commodore Vic 2081 Sinclair ZX81 DR Dragon OR Oric AT Atari

## Games Top Thirty

| GAME TITLE |                      | PUBLISHER             | MACHINE COMPATIBLE |    |    |     |    |    |    |    |        |        | PRICE |
|------------|----------------------|-----------------------|--------------------|----|----|-----|----|----|----|----|--------|--------|-------|
|            |                      |                       | SP                 | AC | 64 | V20 | 81 | DR | OR | AT | OTHERS |        |       |
| ▲ 1 (2)    | Manic Miner          | S/W Projects/Bug Byte | *                  |    | *  |     |    |    |    |    |        | £7.95  |       |
| ▼ 2 (1)    | Hunchback            | Ocean                 | *                  |    | *  |     |    |    | *  |    |        | £6.90  |       |
| ▲ 3 (9)    | 3D Ant Attack        | Quicksilver           | *                  |    |    |     |    |    |    |    |        | £6.95  |       |
| ▲ 4 (7)    | Chequered Flag       | Psion                 | *                  |    |    |     |    |    |    |    |        | £6.95  |       |
| ▼ 5 (4)    | Stonkers             | Imagine               | *                  |    |    |     |    |    |    |    |        | £5.50  |       |
| ▲ 6 (8)    | Flight               | Psion                 | *                  |    |    |     |    |    |    |    |        | £7.95  |       |
| ▲ 7 (10)   | Mr Wimpy             | Ocean                 | *                  |    |    |     |    |    |    |    |        | £6.90  |       |
| ▼ 8 (5)    | Space Shuttle        | Microdeal             | *                  | *  | *  |     |    | *  | *  |    |        | £8.00  |       |
| ▲ 9 (11)   | Alchemist            | Imagine               | *                  |    |    |     |    |    |    |    |        | £6.50  |       |
| ▲ 10 (—)   | Scuba Dive           | Durell/Martech        | *                  |    | *  |     |    |    | *  |    |        | £6.95  |       |
| ▲ 11 (12)  | Fighter Pilot        | Digital Fantasia      | *                  |    |    |     |    |    |    |    |        | £7.95  |       |
| ▲ 12 (13)  | Lunar Jetman         | Ultimate              | *                  |    |    |     |    |    |    |    |        | £5.50  |       |
| ▼ 13 (6)   | Death Chase          | Micromega             | *                  |    |    |     |    |    |    |    |        | £6.95  |       |
| ▲ 14 (22)  | Pool                 | CDS                   | *                  |    |    |     |    |    |    |    |        | £5.95  |       |
| ▲ 15 (18)  | Jet Pac              | Ultimate              | *                  |    |    | *   |    |    |    |    |        | £5.50  |       |
| ▲ 16 (25)  | Valhalla             | Legend                | *                  |    |    |     |    |    |    |    |        | £14.95 |       |
| ▼ 17 (3)   | Atic Atac            | Ultimate              | *                  |    |    |     |    |    |    |    |        | £5.50  |       |
| ▲ 18 (—)   | Falcon Patrol        | Virgin                |                    |    | *  |     |    |    |    |    |        | £7.95  |       |
| ▲ 19 (28)  | Twin Kingdom Valley  | Bug Byte              |                    |    | *  | *   |    |    |    |    |        | £5.95  |       |
| ▲ 20 (—)   | Rommels Revenge      | Crystal               | *                  |    |    |     |    |    |    |    |        | £6.50  |       |
| ▲ 21 (—)   | Hobbit               | Melbourne House       | *                  | *  | *  |     |    |    |    |    |        | £14.95 |       |
| ▲ 22 (—)   | Crazy Kong           | Interceptor           |                    |    | *  |     |    |    |    |    |        | £6.95  |       |
| ▼ 23 (16)  | Rev Of Mutant Camels | Llamasoft             | *                  |    | *  |     |    |    |    |    |        | £5.95  |       |
| ▲ 24 (—)   | Skull                | Games Machine         | *                  |    |    |     |    |    |    |    |        | £6.95  |       |
| ▲ 25 (—)   | Doomsday Castle      | Fantasy Software      | *                  |    |    |     |    |    |    |    |        | £6.50  |       |
| ▲ 26 (—)   | International Soccer | Commodore             |                    |    | *  |     |    |    |    |    |        | £9.95  |       |
| ▲ 27 (29)  | Snooker              | Visions               | *                  | *  | *  | *   | *  |    |    |    |        | £8.95  |       |
| ▲ 28 (—)   | The Snowman          | BugByte               | *                  |    |    |     |    |    |    |    |        | £6.95  |       |
| ▲ 29 (30)  | Hovver Bovver        | Llamasoft             |                    |    | *  |     |    |    |    |    |        | £7.50  |       |
| ▲ 30 (—)   | Wheelie              | Microsphere           | *                  |    |    |     |    |    |    |    |        | £5.95  |       |

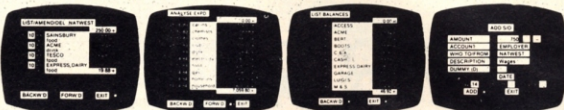
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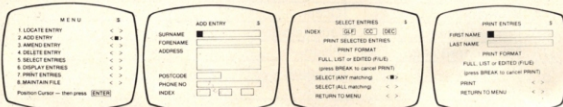


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## Are disks on the 64 a waste of time?

Like many other microcomputer owners I despair frequently at the length of time spent on loading software from cassette.

I own a CBM 64 and have been contemplating the move to disk for some time now. However, after reading several reviews on the 1541 disk drive, which is the drive recommended by Commodore for CBM 64 owners, I now wonder whether it is worth the extra expense, and what alternatives I have in the sub-£300 market.

According to published figures the average time to load a typical 16K program from cassette is five minutes. This figure only reduces to approximately 42 seconds using the 1541 disk drive. How on earth is retrieval from disk this slow?

There are several utility programs on the market which enable Commodore owners to reduce their tape load/save times. One from Supersoft decreases tape save/load times by a factor of seven, as fast as the 1541.

Unfortunately, presumably like the other utilities, it can only be used on software that has already been saved using the cartridge.

This brings me to my second criticism, that old chestnut of software piracy. To be able to use such a utility I would have to infringe copyright by taking backup copies of my favourite tape-based software.

This is obviously highly desirable as, for instance, I could then load *The Hobbit* in two minutes instead of 15. Copyright exists to protect the author from losing the proceeds from his/her hard work, however, I

## PCN £10 Star Letter



see no reason why the taking of backup copies on either disk/tape for one's own personal use should technically be a criminal act. In any case I would have thought that the sale of any software that enables you to copy protected software is in itself illegal, because it is inciting people to perform a criminal act.

Further, how many programs published in magazines/books are breaking copyright because they use routines 'lifted' from other programs? I have picked up several ideas/techniques from other people's programs. Is it illegal to use these routines, or even use the ideas behind those routines suitably modified?

Is it also illegal to publish work which has used, say, an assembler or compiler marketed by someone else to produce it?

The whole area of copyright in



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

computer software needs reviewing and defining explicitly. We all believe that the author(s) of software should receive the full rewards of their work, but it is the full scale piracy that is causing the problem. It is about time some firm guidelines were published to clear the matter up once and for all.

J Gardner,  
Burton-on-Trent, Staffs

## Disillusionment in wake of QL delays

I am afraid that I have been very naive. On Jan 25th I ordered a Sinclair QL over the phone, after an assistant had reassured me about some of the specifications of the machine. She had also reassured me that deliveries were on target and that I would have my QL by Feb 22. This morning I received a letter confirming my order and apologising for the delay, and saying that I could expect my QL by the end of May.

Nigel Searle also said that he hoped it would be worth the wait. I decided it was not, and I have cancelled my order. I have also written to the Advertising Standards Authority.

I feel sorry for the many people who cannot afford to lend Sinclair £400 or so for a few months while they wait for a QL, and I think they should be entitled to some redress. It is fairly immaterial to a customer whether a company has suffered genuine setbacks that could not be foreseen, or it is guilty of lack of foresight, or it is running a racket—he ends up at a disadvantage.

In my opinion, however good and honourable the reasons for the delay may be, the fact is that there has been a unilateral change in the agreement about the transaction, and I would like to add my voice to the many who believe that the regulations involving computer advertisements should be tightened up.

A K Black,  
London NW5

## Cheap software = money in the bank

To say: 'The consumer pays for software piracy' (Issue 43) is arguable, because to increase the prices due to copying surely incites more consumers to piracy. Therefore manufacturers are still getting further away from their rewards.

The easiest way to combat piracy would be to reduce prices, thus reversing the effect by selling it at a price that wouldn't justify copying. Apart from the initial groundwork, producing software must be very cheap and £2.50 wouldn't be out of the question, nor would it encourage under-cutting in the trade (which wouldn't be a bad thing), it would merely make software buying a pleasure, an adventure, a hobby.

At the moment, like most others, I go to the shop with £10 and see lots of software I would like but can only afford one. This becomes a lengthy process. What do the reviews say? Is it in the charts? Will it be as good as its says.

The whole charade is like investing in oil shares, especially if you spend £7.95 on a piece of rubbish. Now if they were only £2.50, with £10 I could and indeed would buy four cassettes, and I wouldn't be too distressed if the odd one wasn't very good. After all, the cover looks good in my collection.

If I had written a piece of software I would insist it goes out at around £2.50 and make lots of lovely money, after all four times 20% of £2.50 is better than one times 20% of £7.95. Also, people will tend to buy a cassette at £2.50 on the off chance, which they will never do at £7.95, in which case 20% of £2.50 is better than 20% of nothing.

So if there's a software company reading: take heed; and remember the first one to give it a whirl gets an extra bonus from being the only one. Money, money, money...  
C Ketchell,  
Loughborough, Leics.

## QL may be creating a captive audience

I read with surprise reports of Sinclair's despatch office being inundated with orders for the new QL Computer. Does this mean that many people actually ordered machines on the strength of information in the promotional brochure?

Two points — first, despite the liberal scattering of the phrase '32-bit' throughout the literature, a glance at the specification reveals the CPU to be a 68008. This isn't anything like a true 32-bit CPU as it has an 8-bit data bus. Second, presuming that many of those who ordered the QL are home and not business users, have they considered the problem of software?

Any program to run on the QL must be on Microdrive media — the unit cost of this, assuming reasonable quantities are available, is £4.75 compared to around 60p for compact cassettes. This does not bode well for reasonably-priced commercial software either.

It seems a clever strategy to offer an irresistible machine with built-in Microdrives and no option of floppy or cassette storage. This guarantees a captive audience for Microdrive cartridges and complete incompatibility with any other machine.

This leads me to think that software is supplied with the QL out of sheer necessity. £399 is a lot of money to pay for a paperweight even if it does have built in Microdrives.

R Rancans,  
London SW1

But Sinclair has promised a hard disk interface for the QL, and it's a reasonable bet floppies will be available in some case before the QL itself! — Ed.

## Variations on a theme by Rust

A small addition to Chris Rust's Word Processor program, recently serialised in PCN (Issues 38-40). Change lines 21099 & 21100 to read: 21099 REM Page Clear \*\*\* 21100 PUT#tg.cl:gosub4002:#tg.cln \$:RET

IT MAY BE of use to those who wondered what 'IGNORE' meant in subroutine 21099. This will re-enable the use of Shift/Home to clear a page, whilst retaining the page title.

D Dawson-Taylor,  
Fareham, Hampshire

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Oxford Street, London W1A  
2HG.

## Picture quality improved for BBC

**Q** I am sixteen years of age, studying for my computer studies 'O' level. I have a BBC model B computer and an Amstrad 14 inch colour television.

I get a reasonable colour picture from my television but I was wondering if, by replacing the on-board UHF modulator with a modulator of superior quality with a higher bandwidth, the picture quality could be improved. If such a modification is possible could you inform me of the approximate price of the unit and where it could be obtained?

James Dow,  
Broughty Ferry, Dundee

**A** The answer to this is yes, but a better modulator is 50 per cent larger and would not fit inside the case without cutting some holes. An alternative would be to modify the composite video output by means of an additional capacitor, to obtain colour, and then connect your new modulator to the video output on the outside of the case (as on the Vic and Memotech machines).

The new modulator (a UM1286 costing £11.90 from Maplin is a possibility) will allow sound to be put through the television and give a video bandwidth of 8MHz and thus an improved picture.

Before starting any modification you would do well to bear in mind that colour video monitors are becoming cheaper, for instance the JVC 1302-1 costs around £180 (PCN, issue 48). A monitor should give far better resolution than any television but will usually cost you a little more.

## BBC ROM needs a push

**Q** Quite recently my one-year-old BBC micro, fitted with an Acorn DFS, has started to give the 'Acorn DFS' message a miss. If you turn the machine on and off several times you get the correct message. Please could you tell me what is wrong and

**what I should do about it.**  
Niall Habba,  
Prestel 01-997 7557

**A** Since the DFS chip is a sideways ROM, it will have been placed in one of the sideways ROM sockets. These sockets are not of the highest quality and the ROMs have a tendency to come loose.

The best thing to do to cure your problem is to remove the top of the BBC and then the keyboard to gain access to the ROMs. Push all the ROMs in solidly and then switch the machine back on. If the 'Acorn DFS' note still does not appear telephone the nearest Acorn dealer and ask his advice, and if necessary get the machine serviced.

The message not appearing problem is caused by the ROM not being recognised by the operating system, ie either the ROM is bust or not connected properly. The latter is the more likely cause and making sure that the ROMs are in properly is best fix.

## Commodore twin processors

**Q** I am a student with the 6502 assembly language as part of my course. I'm interested in the Commodore 64 computer as I understand it uses a microprocessor compatible with the 6502. Is this true and if so can you tell me where I can get the necessary assembler?

Also, I am planning to move abroad and will be taking a micro with me. Can you suggest a book on repairing microcomputers as I think I might have to do the job myself?

J. Sturrock,  
Aberdeen.

**A** You're right — the 6510 processor used by the 64 is completely compatible with the 6502. In fact, with the exception of a couple of registers designed to manipulate the 64's memory configuration, it is identical.

As to possible assemblers, you have a wide choice from simple monitors upwards. Perhaps the best come from Supersoft, Commodore and Hewlett. Supersoft's version comes on cartridge, so it is instantly available and allows the use of labels etc.

Commodore's product is disk-based and offers just about every feature you could want

including the use of macros. For cassette, Hewlett offers the 6510 Development System which is a multi-pass assembler. All of these are available from good software stores.

With regard to taking a micro abroad and repairing it yourself, this course of action is unnecessary unless you're thinking of going to a desert island. Commodores, Apples, Spectrums and other best-sellers are now available in many countries and repair facilities should be available. Of more importance is whether you micro's power supply and display facilities will work with foreign systems. Check before you buy or be prepared to sell your system and buy another when you arrive abroad.

## RAMpack reusable on ZX80 or ZX81

**Q** I bought one of the original ZX80 computers some years ago and upgraded it to a ZX81 and fitted the ZX80 16K RAM-pack. I am now about to buy a ZX81 and would like to know if my ZX80 RAMpack will work with it.

R B White,  
Flore, Northants

**A** It's comforting to hear from someone who doesn't rush into buying a new untried wonder micro, and your sense of fiscal responsibility is commendable. The RAMpacks for the ZX81 and the ZX80 are interchangeable, so you should have no problems once you've taken the plunge.

## QL needs persuasion to take on Star

**Q** I am considering ordering a QL, but wonder whether I will be able to use it with my Star DP510 printer. This has a Centronics interface, but I believe that the QL only has an RS232C port.

My second query concerns an intermittent problem with my Oric hooked up to the Star. When I get a printout from any of my programs a triangle (ASCII code 245) appears instead of some of the characters.

S Hazelgrove,  
Leeds

**A** You'll certainly encounter problems linking a QL to your Star — you're quite right about the QL's ports. You

would need an adaptor to convert the serial output of the QL to a parallel format. Sinclair Research says that a parallel interface will be available as an optional extra for the QL.

A serial/parallel converter is available from Micropote on 0625-615384 for £115. A more complex buffered interface is available from Mutech on 0225-743289. Micropote's interface has a 2K buffer, while Mutech can offer buffers from (£175) to 32K (£245).

The problem you have with your Oric is probably that the keyboard interrupt routine is occasionally sending erroneous data to the printer port. All you have to do is turn off the keyboard scanning routine with CALL EGCA before sending anything to the printer. To turn it back on, issue a CALL ER04.

Using these CALLS in a program has the added bonus of increasing the running speed by up to 20 per cent, useful if you have lengthy calculations or complex string-handling. Do not, however, use a WAIT command between the two CALLS, as WAIT counts keyboard interrupts, and if they've been turned off you'll be a bit stuck.

## Some dos and don'ts of Simons Basic

**Q** If you write a program using Simons Basic, will it run on the 64 without the cartridge in place? Also, is there likely to be a compiler for the 64, and if so would you be able to compile a program using Simons Basic.

S L Clarke,  
Louth, Lincs.

**A** For a full review of Simons Basic See Issue 25, but briefly: no program which uses the extra commands in Simons Basic will run on the ordinary 64. However, Simons Basic does include toolkit utilities such as AUTO, RENUMBER etc which, while not affecting the program itself, make life easier for the programmer.

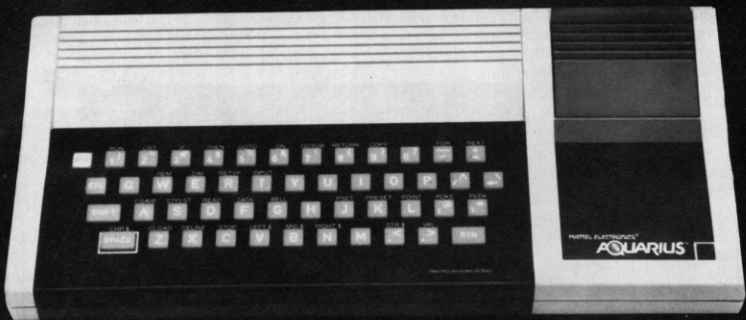
There are at least two compilers for the 64 already available, DTL Basic from Dataview in Colchester which comes on cassette, and Petspeed 64 which was produced by Oxford Computer Systems but is marketed by Commodore under its own label. This comes on disk. Neither will work with Simons Basic programs.



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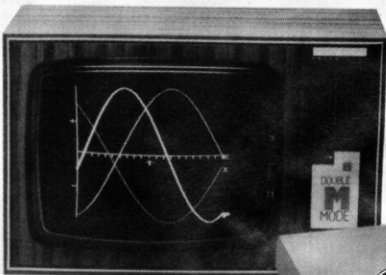
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## Memotech bug swatted

Owners of Memotech MTX micros may have discovered that there is a bug in the Basic concerned with the editing of DATA statements. Basic syntax dictates that a space be left between the keyword DATA and the first data item. Unfortunately, after typing such a line into the Memotech, the Editor kindly inserts another space after the DATA keyword. This does not matter if the data items are numeric, but if the first item to be read is a string then the additional space character will be read as the first character of the string. The problem is compounded by the fact that subsequent edits will lead to more spaces being inserted in front of the first data item.

The solution is to use the Memotech's shorthand version of the DATA keyword D., leaving no spaces between this and the first data item:

## Reformed Commodore characters

The following machine code routine can be used for redefining the character set in bank 0 (14363-16383). I chose this set as it is the highest in the bank therefore leaving the most memory free. It is possible to use different banks but this means moving the screen to a new part of the memory and this may complicate programs.

The usual Basic program

```
10 >=49152
20 REMOR
30 IF#0-1 THENEND
40 FOR E=R
50 S=1
60 GOTO200
```

```
100 DATA 173,14,220,41,254,141,14,220,173,1,0,41,251,141,1,0
110 DATA 162,40,169,0,389,157,0,56,189,0,209,157,0,57,169,0
120 DATA 210,157,0,59,189,0,211,157,0,59,189,0,212,157,0,60
130 DATA 169,0,213,157,0,61,169,0,214,157,0,62,189,0,215,157
140 DATA 0,63,200,209,173,1,0,2,4,141,1,0,173,14,220
150 DATA 9,1,141,14,220,162,56,134,52,134,56,96,1
```

100 D:string1,string2,string3  
When a line is typed in this way, D. will be expanded to DATA and a space inserted as usual, but now this space will not be READ as part of the first item. To prevent the addition of further spaces, the line must be changed back to the D. form if it is subsequently edited.

Steve Jenner,  
Caton, Lancs

## Flags flying on the Z80

Here is a tip for Z80 programmers. At some time, you may find that you need to manipulate the flags register. This is usually done using the set, reset and bit instructions (for looking). The trouble comes when you want to alter the flags. The following sequence should help:

PUSH AF; Store AF on stack  
POP BC; Load BC from stack,  
getting AF in process

Manipulate C as required since it contains the Flag register.

PUSH BC; Stack BC  
POP AF; and return to Flag reg  
NB: BC can be any of the double registers.

Graham McConney  
Tooting, London

## Spectrum key considerations

When writing an educational program or a program for users not familiar with the Spectrum quirks, a 'Press any key' routine can be puzzling if it does not recognise every key:

10IF INKEYS="" THEN GOTO10

## 64 screen dump — in black and white

The following short listing for the CBM 64 dumps the screen display to the Commodore printer. Although a program to do this is given in the CBM printer manual, it will not produce characters generated by reverse video.

This program will reproduce all CBM characters and is also shorter and, I believe, more efficient.

```
60000 REM*****SCREEN DUMP*****
60001 REM***
60002 REM*****BY D.K. THINBERROU***
60010 HT=1
60020 F=0:DIHRS=(80)
60030 OPEN4,4:PRINT#4,CHR$(15)
60100 FORI=124TO2023STEP40
60105 FORJ=0TO29
60110 CH=PEEK(J*32+I)
60120 IFCH=0 AND CH<31 THEN RS$(S)=RS$(S)+CHR$(CH+4)
60130 IFCH=32 AND CH<63 THEN RS$(S)=RS$(S)+CHR$(CH)
60140 IFCH=64 AND CH<95 THEN RS$(S)=RS$(S)+CHR$(CH+32)
60150 IFCH=96 AND CH<127 THEN RS$(S)=RS$(S)+CHR$(CH+64)
60160 IFCH=128 THEN CH=CHR$(128+RS$(S)+CHR$(15)):F=1
60170 IF F=1 THEN RS$(S)=RS$(S)+CHR$(146):F=0
60180 RT=RT+RS$(S):RS$(S)=""
60200 NEXTJ
60210 PRINT#4,RT
60220 RT=""
60230 CLOSE4:RETURN
```

does not recognise any of the shift keys.

This can be resolved using 'IN' statements as shown below. This will recognise all keys and can be incorporated into your own programs.

Peter Duns  
Lowestoft, Suffolk  
(Note that some Spectrums may need to alter line 110 so that 65278=190 and 32766=189 KG).

```
100 PRINT"Press any key"
110 IF IN "P" THEN GOTO 110
OR IN "2766=283 THEN GOTO 200
120 GOTO 110
200 PRINT "Key pressed"
```

## Padding gives a soft centre

Terry Holden's article on Wordwise (Issue 42) was most interesting, particularly the way Basic can co-exist with Wordwise. However, there is a very simple solution to the problem of underlining centred text. The secret is to enclose everything after the CE command with 'PAD' characters. The formula is:  
CE'PAD'OC27.XX:HEADING  
OC27.YY'PAD'  
XX and YY being the on and off codes of the printer mode required. With the NEC-8023 printer try:  
CE:OC27.33,27,88,ENHANCED  
AND UNDERLINED OC27,34,27,89

I presume that this works with other printers.

Nick Darby,  
Richmond, Surrey

## A shorter Spectrum scroll

Sometimes I find that I want to scroll the screen just a few lines at a time. On my Spectrum, this can be done with the instruction INPUT AT X, 0.

Where X is one greater than the number of clear lines required at the bottom of the screen. As no variable or string is specified in the instruction, the computer does not wait for any input but goes straight on to the rest of the program.

W Rippon,  
Basildon, Essex

## Star of the BBC screen

In Issue 44, Routine Inquiries, Jonathan Loose asked how the BBC screen could be saved to tape. The method explained was cumbersome. The command \*SPOOL can be used instead. If the first line of the program has 'SPOOL' file name' and the last has 'SPOOL' then the program will run but will save the contents of the screen as it does so.

To recover the screen, type \*EXEC 'file name'.

Andy Spamer  
Hull, N Humberide

Note that this method will only save characters written to the screen between the SPOOL commands — KG.



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

## GET MORE FROM THE TI99/4A



GARRY MARSHALL

'Get more from the TI99/4A', by Garry Marshall, published by Granada at £5.95 (paperback, 112 pages).

Home computers seem to inspire both the '101 Games for...' type of book or the 'Expose your micro' type. This book is neither. And then again it's both. Garry Marshall has taken familiar programming ideas and presented them in a way which shows the machine's capabilities in an interesting way.

An introductory section deals with TI Basic, graphics and sound. Here, as everywhere else in the book, there's a strong bias towards graphics.

Once the main features of the machine have been established there's a break from things practical. Marshall is a firm believer in good program structure, and consequently devotes a section to 'Top Down' design.

The rest of the book is concerned with three programming projects: a Space Invaders game, a simple database and a simulation program. All are well laid out, following the rules previously mentioned, and all are open ended, allowing further development.

Everything in this book can be tried with just the basic console. No additional hardware or software is necessary, though Marshall does set aside a chapter to discuss add-ons.

The reference section is clear and helpful, there's even a chapter further reading guide, and the use of examples and illustration is effective.

The only major fault I found was the use of the word 'data-

base' applied to a program which is nothing more than a very elementary file handling routine. On the whole though, the book is well thought out, well presented and at £5.95 exceptionally good value. **IT**

## DISK SYSTEMS FOR THE BBC MICRO



IAN SINCLAIR

'Disk Systems for the BBC Micro', by Ian Sinclair, published by Granada at £6.95 (paperback, 115 pages).

This book seems to cash in on the fact that most BBC owners will consider disk systems as more and more software be-

comes disk based and disk technology gets cheaper.

The author's explanations of current technology have been kept simple, but it's only fair to point out that disk and drive technology is changing so rapidly that this information could soon be out of date.

However, within these limits the book is informative. It starts with a detailed description of what disks look like, how they work and where they go, and goes on to describe the need for, and implementations of, disk filing systems (DFS).

Until this point the book kept things general, but the rest of it explains everything with reference to the BBC, from every angle: machine code and text, disk utilities and Basic filing techniques are all covered, and the book closes with an interesting section on the three main Disk Filing Systems for the BBC and their principal differences.

While £7 seems too expensive for a book this thin, it is interesting and the programs in the 'Basic Filing Techniques' chapter are good. **PL**

**PCN  
COMPETITION**

# 5 Epson

## RX80s to be won

Not only are you getting a free guide to printers over three issues of Micropaedia, but also a chance to win one of the best printers on the market: Epson's RX80. The first part of the printers Micropaedia and this competition was presented last week. You will need the information in that issue to complete the competition entry form next week, so if you don't have it contact our back issues department (01-439 4242) to get it. Your task here is simple: over the next three weeks of the competition we will be printing a list of four printing terms along with four definitions each week, so after three weeks you'll have a list of 12 definitions and terms. All you have to do is match the terms to the definitions. The first five correct entries drawn will win a printer, and you'll find the entry form in Issue 52.

### TERM

5. Control Code
6. Print buffer
7. Sheet feed
8. Dot matrix

### DEFINITION

- The type of printer technology which uses groups of dots to form the characters and numbers that will be printed out on a printer
- A built-in program that resides in a printer's ROM allowing it to display the full printer character set and capabilities without using a computer.
- The term that describes the line-by-line movement of a printer.
- An interchangeable wheel which holds the typefaces which are impact-printed onto paper.



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# Sharp with bubbles

Sharp incorporates desktop power in a truly portable package. Dominic Powlesland digs into the PC5000.

**T**he Japanese electronics giant, Sharp has a reputation for producing equipment that is both innovative and reliable.

It should not therefore be surprising that Sharp's latest portable marks a breakthrough in this, the most competitive part of the rapidly changing computer market. The fast development of portable computers over the last two years reflects the need for instant access to the computing power available in any place at any time.

The term portable has frequently been abused by the computer industry, whose advertising agencies seem to have little idea of what the word means. Many of the machines claiming to be portable are transportable rather than easy to carry as the word implies. The arrival of the PC5000 indicates that Sharp actually understands both the meaning of portable and computer.

The Sharp PC5000 is small and light enough to be easily carried around and it also has facilities which place it in a league that draws comparison not with the many portables currently available but with the most recent desktop business micros. The PC5000 is aimed at anyone who requires the high power of a desktop machine but cannot bear to leave it in the office.

## Out of the box

Out of its box one is forced to admire the PC5000's neat design. At first sight, folded up, it looks more like a smart record deck than a computer. Like the Gavilan, its expensive competitor, the lid incorporating the screen is hinged and folds down over the keyboard. There is also an AC adaptor, and a rather fat ring-bound A5 manual. A printer is available as an extra which fits cunningly inside the standard casing.

Measuring 12 x 12.5 x 3.5 inches the PC5000 weighs just over 12 lbs including the printer, and has an 80 character x 8 line LCD display screen, and 128K non-volatile Bubble memory cartridge. The whole package, though not fitted with a

handle, can be easily slotted into a small attache case.

At the heart of the system a CMOS 8 bit CPU and an Intel 8088 16 bit CPU provide a processing environment that is directly compatible with the IBM PC and the large number of IBM workalikes. 192K of CMOS ROM is divided up into 64K for the operating system and 128K for the DOS and Basic. 128K of RAM is provided as standard which is expandable to 192K or 256K if a 64K RAM module is used to replace the Basic ROM module. Access to the ROM/RAM expansion sockets is easily gained by removing two screw-in panels on the base. The same sockets provide a facility for ROM based software which is currently being prepared by a number of companies.

Internally, control support is provided for the printer, LCD display, keyboard and a small speaker. A real-time clock provides for a number of sleep and alarm facilities. The clock on/off switch is provided on the base and must be set before the machine can be used.

A series of ports on the back of the machine provide for a number of peripherals and the AC adaptor. Connectors for cassette cables link with an audio cassette interface providing a transfer rate of 1,000 bits per second. An external Bus driver provides for the connection of a dual mini-floppy disk unit while other devices are catered for with an RS232 interface socket and a serial interface for a dial direct telephone modem, and definable key pad.

The AC adaptor, weighing another pound, provides a direct power supply from the mains as well as charging facilities for the lead acid battery which will provide up to eight hours of power away from the office. The lead acid battery has a longer life, shorter charging time (only four hours of charging time is required to restore full power) and is lighter and more compact than a NiCad battery of similar power. A

simple clip connector links the battery and machine, so replacement is easy. For those working in remote locations spare batteries may be purchased as accessories.

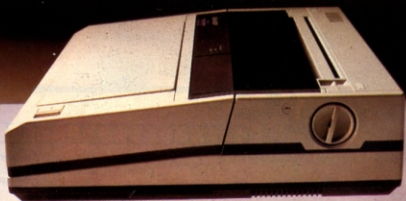
## Bubbles and disks

Perhaps the strongest advantage of this machine over others for those on the move is the bubble memory facility. Bubble memory has had little publicity of late, and though developed several years ago has never been widely introduced. Its use in the PC5000 instantly pushes the machine to the forefront of the portables. Bubble memory units have no moving parts, are comparatively sturdy and win hands down against any sort of disk unit for mass storage on the move.

They are also very fast. The PC5000 Bubble unit, with 128K capacity in a 2in square package, functions for the user in, exactly the same way as a single disk system. Two Bubbles may be addressed as A and B while external mini-floppy disks, if attached, are addressed as C and D. The Bubble units, which are formatted during manufacture, store data in 512 byte sectors with 8 sectors to a track. They can be write protected by sticking a reflective label on one side. Sensitive to extreme temperatures, the cartridges have a built-in lock which prevents use at temperatures below 32 and above 104°F; like disks they should not be placed near strong magnetic fields. Besides the software on ROM chips, packages will be available on Bubble units which, though expensive by comparison with disks, are exceptionally convenient both to use and to carry.

The disk drive (CE-510F) is an accessory which cannot be powered by battery. The dual sided double density drives with a capacity of 320K per disk are directly compatible with IBM PC disks, so the PC5000 may well become the basic portable for IBM based offices. Text or data files created almost anywhere can be

All is revealed — features like the folding flat screen lends the system full portability without compromising functionality...







It looks small but the eight-line LCD with 80 characters across offers a reasonable display area. The keyboard has also benefited from careful thought. Proper finger-tip sized qwerty keys and extra function keys have been incorporated without making the keyboard too big for the portable concept.

held on the Bubble for transfer either by phone or from disk to the master system. The use of MSDOS as the operating system means a large variety of software will certainly soon be available. Only configuration for the 8 line display is required to run available software on the PC5000.

### The screen

The 80 character  $\times$  8 line display may be operated in 40 character mode for those who find the small character size difficult to use; characters may be shown in reverse, double width and underlined; the cursor may likewise be set to a number of different sizes. The presence of the LCD makes the lid rather heavy, but following the high Sharp design standards it has been fitted with a ratchet to allow a number of screen positions and a damping system stopping the lid crashing if tipped forward.

LCD type displays can be difficult to read especially when showing small characters. In order to see the display clearly it is important to sit square on to the machine; a thumbwheel on the right hand side of the machine adjusts the angle of the display. After a few days the LCD became much easier to work with. No doubt future versions will be fitted with the new electroluminescent displays currently under development.

The eighth or bottom line of the display may be reserved for labelling the 12 special function keys, an arrangement likely to be frequently used in commercially available software packages.

As well as the standard ASCII character set the PC5000 is equipped with an extensive graphics and foreign language character set. The screen is based upon a  $640 \times 80$  dot matrix, each character being



The bubble memory pack beside what used to be termed the "mini-floppy" 5.25 inch disk.

formed from a  $5 \times 7$  pixel block. Individual pixels may be addressed from Basic which also includes instructions for lines, circles/ellipses, and fixed or relative drawing commands. If treated as a partial screen quite sophisticated graphics may be printed by printing several screen dumps in sequence (a feature that may be of some use to the scientist in the field rather than

## RAM PACKS

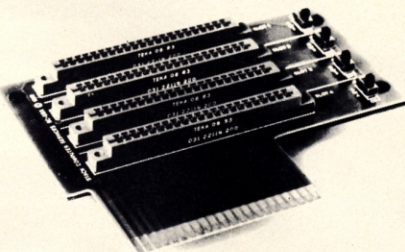


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for the businessman); no simple graphics screen dump routine is currently available though I understand this lack is shortly to be rectified.

## Keyboard

The importance of a well laid out and comfortable keyboard is one of the most underrated features of micro computer design. Except where mice, touch screens, and other similar devices are concerned it is through the keyboard that the user operates any machine. The keyboard has to provide facilities for rapid and simple data, text, and program entry, each task having slightly different demands.

In the case of the desktop machine the problem is solved by using oversize keyboards with separate numeric keypads and other special function keys laid out in groups. On many portables and small machines functions are assigned to a small number of keys meaning the user has to be a contortionist to call up special functions. For the most part the keyboard is arranged in standard typewriter layout.

Besides the standard typewriter keys there are five extra keys on the main keyboard and a row of 15 special keys above the standard qwerty arrangement. The oversized return key to the right indicates the thought that has clearly gone into the design. A key labelled ALT provides the programmer with single stroke Basic keywords such as PRINT and INPUT, thus making programming both easier and less time consuming.

Using the CTRL key with the letter P turns the printer on and off. In MSDOS the printer may be used as a typewriter echoing anything displayed on the screen as it types in.

In Basic, using the CTRL key with numeric 1 turns the graphics character set on and off, permitting more elegant designs both on the screen and in printout. An ESCape key is provided for running certain applications. The special function keys include on, break and off which provide a break facility in Basic and an on/off facility to put the machine into sleep mode and thus conserve batteries. Eight special function keys labelled F1-F8, four cursor keys and an INSet make up the remainder.

The special functions are set up as LIST, RUN, SAVE, LOAD, CONT, LPT1:, TRON, and TROFF in Basic; all may be user defined. The cursor keys are arranged in the sequence left, right, up, and down; not an arrangement that I am accustomed to but I soon got used to it.

The keys are well shaped for ease of use and are coloured light grey for alphanumerics and orange for the on/off keys, the remainder being grey-brown. This arrangement helps focus the eyes on the alphanumeric keys for fast typing.

## PCN PRO-TEST HARDWARE

### Manuals and programming

The manual has two parts. About a third is devoted to an introduction to the PC5000, its components, and peripherals and the use of MSDOS. The introductory chapters are clear, concise and well illustrated and clearly written with the first time user in mind.

MSDOS was selected as the operating system of this machine: a major point in the PC5000's favour for those who wish to use off the shelf software. Those who have struggled in vain to understand the mysteries of CPM will be delighted with MSDOS since it offers a number of powerful facilities for file handling, communications, and editing while at the same time demanding no attention from the user during applications packages. Never having used MSDOS before I was delighted to find the simple file listing facilities which enabled communications results to be checked.

Each MSDOS command is given a page of explanation. This is adequate for most users who will never need to use such facilities as batch processing, but for someone wishing to understand the ins and outs of the operating system the manual is of little assistance; fortunately it does not throw the first time user into the same state of utter confusion faced by those using the

CPM manual for the first time.

While I am happy with the extent of the information supplied concerning MSDOS, I cannot say the same for the Basic manual: Microsoft appears to have short-changed both Sharp and the user. It seems amazing that Microsoft Basic (G W Basic in this version) should be the most common implementation of Basic for micros. The Basic itself is fast and has some powerful commands, but is not as powerful or as 'friendly' as Sharp's own FDOS Basic available on the MZ3500 business computer, to name one of many.

Microsoft Basic will do the job and it is so widely used that Sharp can hardly be blamed for its choice. What is surprising is that the manual should remain as appalling as ever, merely regurgitated in a different format with the odd change which relates specifically to the PC5000. The manual seems designed to make it as difficult as possible for the first time user to learn to write their own software. The manual, like many others, is written by those who are totally familiar with the language and appears to be a reference manual for others who already know what they are doing. First time users will need to find another book before they can jump into the delicate art of programming.

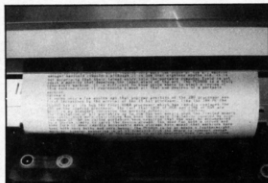
Surely it would do Microsoft no harm to include some simple programs to demonstrate the different instructions related to sequential and random access files; the explanation of arrays is totally inadequate. Nowhere is a simple program explained which indicates for the first time user how data can be collected, stored, analysed, and retrieved. The error messages frequently fail to do anything other than leave the programmer bemused (does G W stand for Guess What or Where the error is?). It may simply be a sign of laxity on the programmer's part to value those Basics which indicate, through cursor positioning, where an error has been detected, but it is incredibly useful. That a manual can have errors in its index does little to raise one's confidence in a company marketing wordprocessing packages. (RENUM and

RESUME have swapped places in the index).

More serious is the fact that the parameter string for communications has been incorrectly stated; it took me over two days to set up communications between the PC5000 and the PC1500 simply because the string as quoted in the manual:

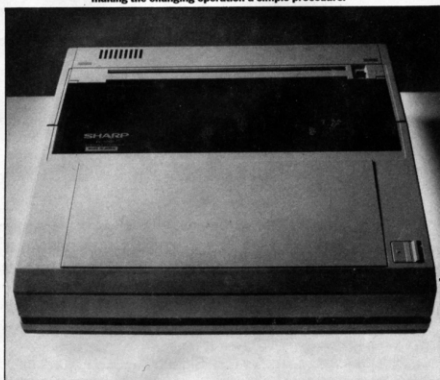
10 Open "Com1: 600, 8, N, 1, RS, CSO, DSO, CDO, LF, ASC" as #1  
has the Bit setting sequence in the wrong order — for MSDOS it should read:  
10 Open "Com1: 600, N, 8, 1, etc.

The discovery of this error was made more difficult since the manual quoted sequence is that which is conventionally used. The error persists on a correction label pasted into the



The 24 dot matrix thermal transfer printer is capable of 37 characters per second and completely silent. The output is almost daisywheel quality.

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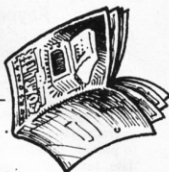


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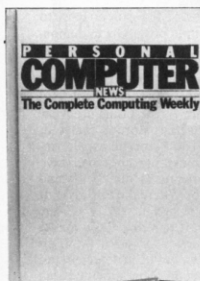
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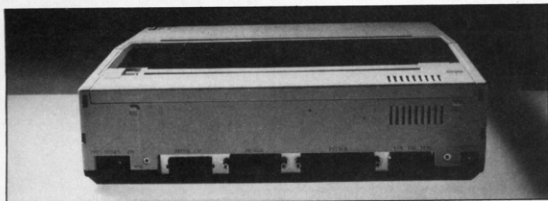
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## PCN PRO-TEST HARDWARE



At the back — the I/O. From left — serial I/O port, RS 232, expansion bus, and cassette sockets. Chances are that Sharp will eventually provide a monitor interface with the necessary software to switch program display to the conventional 24 lines by 80 characters. An AC adaptor can be plugged into the back also to run the machine and recharge the lead acid battery.

manual. This should not reflect on the judgement of the PC5000. This problem is universal to all machines and to most computer manuals. For those who have already overcome the idiosyncrasies of the Basic, remembering for instance to enter all spaces as shown since these are not automatically set, the PC5000 will be a delight to program if only by virtue of its total portability.

The 8 line maximum capacity of the screen encourages the user to commit more to paper during program writing than is necessary when using a full size CRT; not a bad thing if one is to write efficient programs. Short programs can be written to printout variable, string sequence, and subroutine position charts for use while programming. Having a full width printer is an absolute boon when programming on the move and to some extent obviates any need for a full screen.

I was able to complete a suite of programs while flying the Atlantic without any difficulty. After four hours of use the batteries showed little sign of power loss although a considerable amount of printing was done. I hope that Sharp will soon produce a CRT interface and provide the facility for switching output configuration from the 8 line to a 24 line screen. Such an arrangement would allow the user to specify which configuration was required each time the program was run and so use the excellent computing power of the machine to its utmost advantage.

### The printer

In a word, it's exceptional. The printer is easy to fit, though the manual was not very clear on this point. I spent several minutes failing to understand it; a vital part of the installation procedure is the connection of one ribbon cable to a connector which includes a clamping sleeve which fits so well that at first I was unable to find it. The sliding clamp must be pulled up before inserting the ribbon cable from the printer; a rectangular plastic plate is provided to push the sleeve back down once the ribbon is in position. Slide the printer into position, secure it with four screws, fit the paper advance handle, replace covers, and you are ready to go.

To say that the printer is a dot matrix type would be correct but may give the wrong impression. A dot matrix it is, but by

using a 24 dot matrix the characters have more in common with daisywheel characters. Although the print speed is not superfast at up to 37 characters per second, it is perfectly adequate.

More importantly, the printer is silent: it employs a thermal transfer system using either Thermal Transfer paper with a one time ribbon, or may be used without a ribbon or a whisper using Heat Sensitive paper. A small thumbwheel located on the printer chassis can be used to alter the density of the print. Electric eye sensors detect both when out of paper and, if using the ribbon, when that runs out. Paper has to be sheet fed, the printer handling paper sizes up to A4. A pair of hooking points on the back of the frame may indicate that a roll paper holder was incorporated into the design though none is yet available.

### Software

The PC5000 is to be supplied with Sorcim SuperWriter and a communications package, SuperComm.

The software is not yet available in the UK and I was unable to persuade Sharp USA to let me have a set for evaluation so I can make little comment on the supplied software. But I was able to try out SuperWriter while visiting the US. The whole package is completely Menu based and is thus fairly easy to use. Certainly I found little difficulty in using it without reference to the manual, a fact which will appeal to the business user who has no desire to lug about hefty extras.

### Verdict

It is difficult after a very short evaluation to say much more than how fast or easy to use

any given micro is. After three weeks use I can say that regardless of the specifications (which are outstanding anyway) or any benchmark tests that the PC5000 is a superb computer.

I have used it in the office, on a plane, on a train and for demonstration purposes at an archaeologists' conference. For any task requiring the collection of large bodies of data in remote situations the PC5000 is the perfect machine. It offers powerful communication facilities which allow field data collected using a handheld computer such as the PC1500 to be quickly downloaded, verified, printed out and analysed in the field.

The wordprocessing package allows reports to be generated directly on-site whether they are for scientific or business purposes; this is a valuable luxury made totally viable on account of the operating capacity of the machine with the Bubble. On returning to the office, data and documents can be unloaded either onto the accessory disks or to another host computer for permanent storage.

At present, the situation is such that almost any computer becomes technologically backward almost as soon as it is released, buyers seem concerned that they should not buy the wrong machine because a better one will almost instantly be available. There is absolutely no logic in this argument: if you find a machine that does what you want it to you have found the machine that you need. With both a wordprocessing and a communications package supplied with the machine, a spreadsheet available and other software on the way, the PC5000 will acquire a leading place among portables. There is sure to be a huge demand for the machine — all that remains is to see if Sharp can satisfy it.

Given a large demand, it must be only a matter of time before other peripherals such as a CRT interface are produced to take this small machine into direct competition with more conventional office machines.

Despite my reservations about G W Basic and the machine's graphic limitations the machine is well designed, very powerful, easy to use within the limits imposed by the LCD screen and also cheap, costing half the price of the only comparable portable, the Gavilan, and considerably less than an IBM PC. We can expect to see it around for several years to come.

PCN

### SPECIFICATION

|                  |   |
|------------------|---|
| Price            | £1374, £194 per bubble memory   |
| Processor        | 8088 plus 8-bit CMOS  |
| ROM              | in CMOS 192K  |
| RAM              | 128K  |
| Screen           | 80 character by 8 line LCD  |
| Keyboard         | standard typewriter plus five extra keys and 15 special function keys       |
| Interfaces       | cassette, RS232, modem output, external disk                                |
| Operating system | MSDOS   |
| Software         | Sorcim SuperWriter word processing package SuperComm communications package |
| Distributor      | Sharp UK (061) 205 2333   |

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| <b>HP 82900A</b><br>CP/M option                      | <b>£250</b>  | <b>TVI 806/10</b><br>Multi-user system    | <b>£3800</b> |
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Data storage on microdrives can be made more efficient using Gavin Monk's programs.

# Microdrive data files

**Z**X Microdrives are at last available to most Spectrum owners, but most users are still unable to make the most of their Microdrive systems because of the very poor manual. The **LOAD\*** and **SAVE\*** commands are fairly well explained, but data files are explained very poorly. This is a great pity, because using this type of file allows the maximum potential of the system to be exploited. The simple and very useful routine described below illustrates the use of data files.

## The catalogue to zs routine

This routine reads the catalogue from a cartridge and places it into **zS**. This allows a Basic program to examine **zS**, and hence see if a file is on a cartridge or check the space on a cartridge. A very crude way of doing this would be to first clear the screen then do a **CAT** command and use the **SCREEN#** function to read the details from the screen.

This is the method used by Sinclair in the production of its demo cartridge, but although it works fine it has two main drawbacks. First, all information on the screen is lost, and second, if the cartridge contains more than twenty files, the screen will scroll up and the routine will give very false results.

A much better method is to store the catalogue in a data file on the cartridge then read it into the string and erase the file. To do this the format of the data returned from the **CAT** command must be known. It is as follows: The first ten bytes contain the cartridge name, the next two are both newlines (*ie* **CHRS** 13), then the cartridge contents follow in alphabetical order. Each file name is ten characters long followed by a newline, and lastly another newline followed by one or two bytes containing the number of K bytes left unused on the cartridge, followed by yet another newline.

The routine is placed at the front of a program so that it operates faster. Stream four is used to store the catalogue as a data file named **index.d** on the cartridge. First stream four is closed, just in case it was already open, then it is opened again and attached to a Microdrive channel in drive d with the name **index.d**.

Next the catalogue of the cartridge in

## CATALOGUE TO ZS ROUTINE

```

99 REM cartridge catalogue to
zS routine, ddrive no.
100 CLOSE #4: OPEN #4;"m";d;"in
dex.d"
110 CAT #4,d
120 CLOSE #4
130 LET z$="": LET eof=0
140 OPEN #4;"m";d;"index.d"
150 INPUT #4;#
160 IF #=1 THEN LET eof=eof+1
: IF eof=2 THEN GO TO 150
170 LET z$=z$+#
180 IF eof<2 THEN GO TO 150
190 CLOSE #4
200 ERASE "m";d;"index.d"
210 RETURN

```

## LISTING 1

|   |  |
|---|--|
| <pre> 1 REM ***** 2 REM *ZX Microdrive Indexed* 3 REM * Loader v2.0 * 4 REM *Copyright G.B. Monk* 5 REM ***** 99 REM cartridge catalogue to zS routine, ddrive no. 100 CLOSE #4: OPEN #4;"m";d;"in dex.d" 110 CAT #4,d 120 CLOSE #4 130 LET z\$="": LET eof=0 140 OPEN #4;"m";d;"index.d" 150 INPUT #4;# 160 IF #=1 THEN LET eof=eof+1 : IF eof=2 THEN GO TO 150 170 LET z\$=z\$+# 180 IF eof&lt;2 THEN GO TO 150 190 CLOSE #4 200 ERASE "m";d;"index.d" 210 RETURN 999 REM Initial setup procedure \$ 990 LET old=0 1000 GO SUB 5000: REM print titl e 1010 PRINT INVERSE 1;" INITIA L SETUP PROCEDURES 1020 PRINT TAB 4;"Selection Opti on Required" 1030 PRINT "Which files to appea r in index?" 1040 PRINT TAB 2;"1. All files" 1050 PRINT TAB 2;"2. All files e nding in .p" 1060 PRINT TAB 2;"3. All files s tarting with a capital let ter" 1070 LET a\$=INKEY\$ 1080 IF a\$&lt;"1" OR a\$&gt;"3" THEN GO TO 1070 1090 LET files=VAL a\$ 1100 FOR i=1 TO 50: NEXT i: PRIN T TAB 2;"Drive Number?" 1110 LET a\$=INKEY\$ 1120 IF a\$&lt;"1" OR a\$&gt;"8" THEN GO TO 1110 1130 LET d=VAL a\$ 1140 GO SUB 5000: REM print titl e 1150 PRINT "Reading Catalogue - Please wait Approx. 40 seconds" 1160 GO SUB 100: REM Cat to z\$ r outine 1999 REM remove files not requir ed in index 2000 LET i=z\$( TO 10): LET z\$=z \$(11 TO ) 2010 LET i\$="" 2020 IF LEN z\$&gt;10 THEN GO SUB 50 00+100*files: REM select files t o appear 2030 GO SUB 5000: REM print titl e 2040 PRINT TAB 5;"Saving Indexed Loader" -----Please wait----- 2050 IF old=1 THEN ERASE "m";d;" run" 2060 SAVE "m";d;"run" LINE 3000 2070 GO SUB 5000: REM print titl e 2080 PRINT "Indexed Loader now saved &amp; ready for use...Type GOT O 3000 TO RUN." 2090 IF old=1 THEN POKE 23766,1: GO TO 3000: REM poke drive no system variable and jump to inde x 2100 STOP 2999 REM read and print index 3000 LET d=PEEK 23766: REM drive loaded from 3010 GO SUB 5000: REM print titl e 3020 PRINT INVERSE 1;" MAIN I NDEX FOR DRIVE #4;" 3030 PRINT "Cartridge Title: "t i\$ </pre> | <p>Catalogue to <b>zS</b> routine.</p> <p>Select option of which files to appear in index.</p> <p>Select drive number.</p> <p>Call catalogue to <b>zS</b> routine.</p> <p>Call required splicing routine.</p> <p>Save program with index.</p> <p>If program has been run for first time then print message and stop.</p> <p>List files available for loading from <b>iS</b>.</p> |
|---|--|



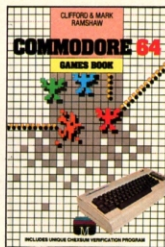
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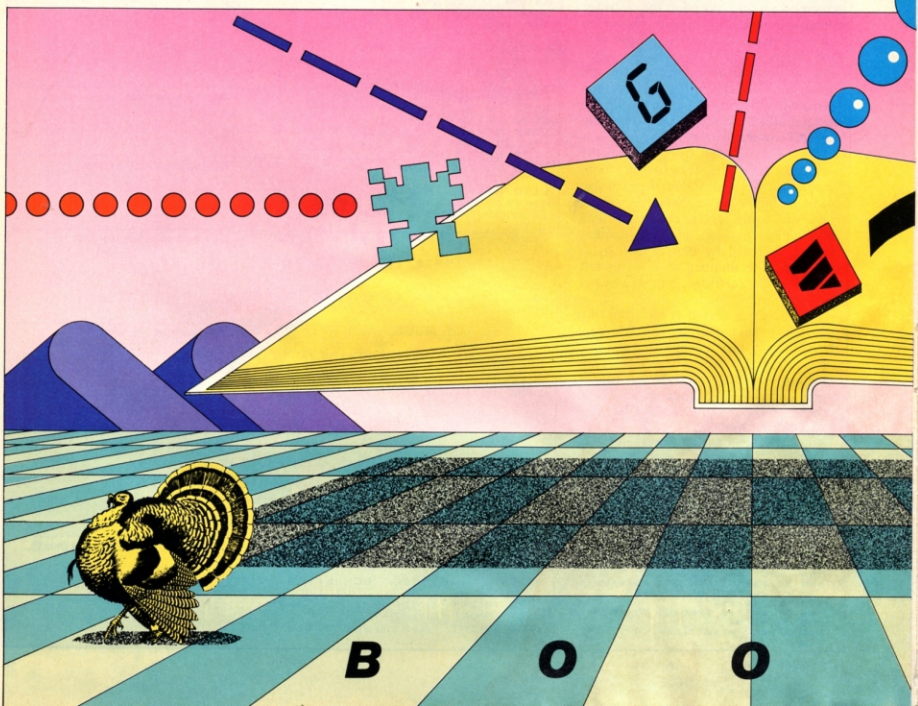


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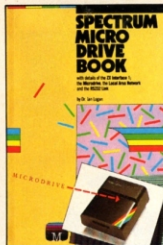


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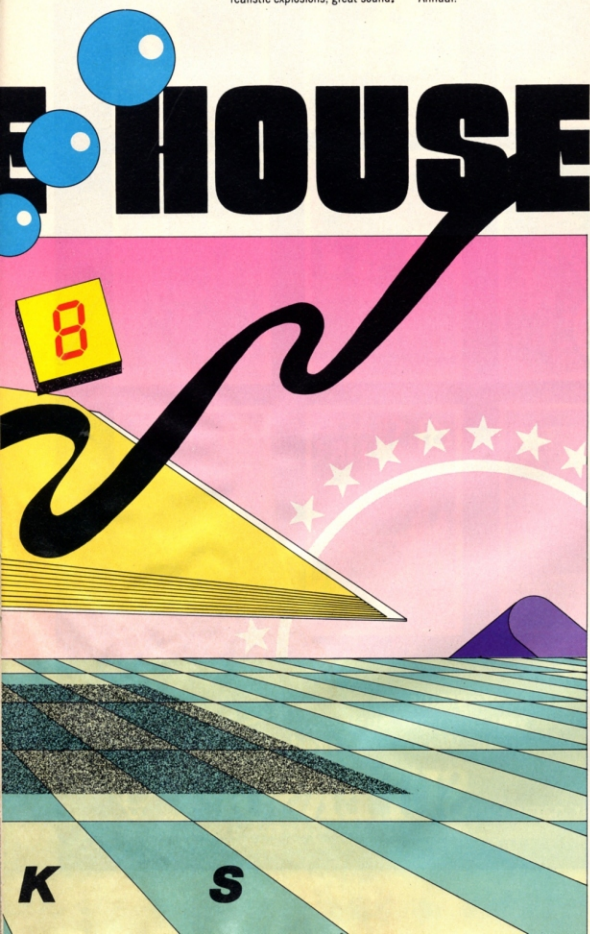
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drive d is sent to the file-line 110. The file is then closed for writing and opened for reading-lines 120 and 140. Line 150 reads data from the file until a newline code appears and places it into r5. If two newline codes appear adjacent in the file then r5 will be a null string.

This will happen twice, once after the cartridge name and again before the amount of space left on the cartridge. This therefore can be used to detect the end of the file "index.d". Line 160 checks to see if r5 is a null string, and if this is so the end of file counter eof is incremented by one. If eof=2, then this means that the next item on the file is the remaining space left on the cartridge. Then r5 is added to z5, and the program loops back to read the next item from the file unless eof=2, indicating that the end of the file has been reached.

If eof=2 then the file is closed and erased by lines 190 and 200. This leaves z5 containing the cartridge catalogue. The format of z5 is as follows. The first ten characters are the cartridge name. This is followed by the file names in alphabetical order (each ten characters long), and lastly one or two characters containing the amount of spare space remaining on the cartridge.

The routine can be tested by the following short Basic program:

```
10 LET d=1: REM drive 1
20 GOSUB 100: REM call CAT to z5
   routine
30 CLS: PRINT z5
40 STOP
```

This short program will, after about 40 seconds, print z5 on the screen. It should look like a chain of names followed by a number.

The programs presented here show uses of this routine. They are a ZX Microdrive indexed loader, and a simple Microdrive database program.

## ZX Microdrive indexed loader

This program requires approximately 5K of cartridge space, although this can be reduced considerably by the removal of REM statements and use of multi-statement lines. The program creates a program file named 'run' which allows a file from a cartridge to be loaded, without remembering its name, and by pressing only three keys.

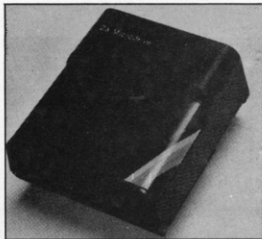
The program relies on the fact that identifiers are included within the file names. This is performed by the use of a dot suffix similar to the system used in CP/M. The required identifiers are:

```
.P Program file
.c Code file
.d Data file
```

In addition to this the option to just list some files from the catalogue has been included. This is performed by the file name beginning with an upper case letter. This is very useful if the cartridge contains, say, a program file which when run loads a machine code file. For example, if a program called Snake loaded some machine code called snake code when run, then if the two files were called Snake.p and snake.c respectively the index would

## LISTING 1 (CONT)

|  |   |
|--|---|
| 3040 IF f\$="" THEN PRINT TAB 4;"Sorry no files in Index": STOP  |   |
| 3050 LET i=65  |   |
| 3060 PRINT CHR\$(i);TAB 3+16*(INT (i/2)+1/2);f\$(i-65)+10+1 TO (i-64)+10;  |   |
| 3070 IF LEN f\$(i-64)+10 TO (i-64)+10 THEN GO TO 3100  |   |
| 3080 LET i=i+1   |   |
| 3090 GO TO 3060  |   |
| 3100 PRINT "1 Redex Index";: I f d<3 THEN PRINT "2 Next Drive"   |   |
| 3110 PRINT "TAB 10; FLASH 1; SE LECT OPTION"   | Scan keyboard for valid selection.                                  |
| 3120 LET a\$=INKEY\$   |   |
| 3130 IF (a\$<"a" OR a\$>"z") AND a\$<"1" AND a\$>"2" THEN GO TO 3120   |   |
| 3140 IF a\$="2" AND d=8 THEN GO TO 3120  |   |
| 3150 IF a\$="1" THEN LET old=1: G O TO 3009 REM Initial setup  | If key '1' pressed redo index.                                      |
| 3160 IF a\$="2" THEN LOAD a\$+m;d+ 1:"run"   | If '2' pressed load index from next drive.                          |
| 3170 LET i=CODE a\$+32   |   |
| 3180 LET r\$=f\$(i-65)+10+1 TO (i-64)+10;  | If letter key pressed let r\$ = file name.                          |
| 3190 LET c=0: LET db=0   |   |
| 3200 FOR j=2 TO 9  |   |
| 3210 IF r\$(j TO j+1)=".c" THEN L ET c=1   | Check if code or data file and if so set c(code) of db(data) flags. |
| 3220 IF r\$(j TO j+1)=".d" THEN L ET db=1  |   |
| 3230 NEXT j  |   |
| 3240 GO SUB 5000: REM print titl e   | If not code or data file load it.                                   |
| 3250 PRINT "TAB 11;r\$   |   |
| 3260 IF c=0 AND db=0 THEN PRINT AT 11,6; INVERSE 1;"LOADING PLE ASE WAIT": LOAD a\$+m;d;r\$ REM i f program file load it   |   |
| 3270 IF db=1 THEN PRINT "This is a code fil e if you wish to lower RAMTOP pl ease enter the new value otherwis e just press ENTER."  | If data file stop.  |
| 3280 INPUT "RAMTOP? "; LINE a\$  |   |
| 3300 IF a\$<"0" THEN FOR i=65368 TO 65377: POKE i,CODE a\$(i-65367 )   |   |
| 3310 NEXT i: POKE i,d: CLEAR VAL a \$: LET r\$="": FOR i=65368 TO 653 77: LET r\$=r\$+CHR\$(PEEK i): NEXT i: LET d\$PEEK i: REM if RAMTOP l owered then put file in UDG area then move RAMTOP and restore fi le name | If code file lower RAMtop if required and load file.                |
| 3310 GO SUB 5000: REM print titl e   |   |
| 3320 PRINT "TAB 11;r\$   |   |
| 3330 PRINT AT 11,6; FLASH 1;"LOA DING PLEASE WAIT"   |   |
| 3340 LOAD a\$+m;d;r\$CODE  |   |
| 3350 GO TO 16000: REM cause prog ram finished report   |   |
| 4000 STOP  |   |
| 4999 REM print title   |   |
| 5000 CLS #1: PRINT INVERSE 1;" Z X MICRODRIVE INDEXED LOADER "   | Print title.  |
| 5010 PRINT INVERSE 1;" U2.0 COP YRIGHT G B MONK 1984 "   |   |
| 5020 RETURN  |   |
| 6099 REM all files   |   |
| 6100 LET r\$=r\$+z\$(1 TO 10)  | Splice z5 and place all files in r5.                                |
| 6110 LET z\$=z\$(11 TO 1)  |   |
| 6120 IF LEN z\$>10 THEN GO TO 610 0  |   |
| 6130 RETURN  |   |
| 6199 REM all files ending in .p  | Splice z5 and place all files ending in 'p' in r5.                  |
| 6200 LET r\$=r\$+z\$(1 TO 10)  |   |
| 6210 LET z\$=z\$(11 TO 1)  |   |
| 6220 FOR i=2 TO 9  |   |
| 6230 IF r\$(i TO i+1)=".p" THEN L ET r\$=r\$+r\$   |   |
| 6240 NEXT i  |   |
| 6250 IF LEN z\$>10 THEN GO TO 620 0  |   |
| 6260 RETURN  |   |
| 6299 REM all files starting with a capital letter  | Splice z5 and place all files starting with a capital letter in r5. |
| 6300 LET r\$=r\$+z\$(1 TO 10)  |   |
| 6310 LET z\$=z\$(11 TO 1)  |   |
| 6320 IF r\$="A" AND r\$<="Z" THEN LET r\$=r\$+r\$  |   |
| 6330 IF LEN z\$>10 THEN GO TO 630 0  |   |
| 6340 RETURN  |   |



just include the file name Snake.p, and not snake.c as well.

Type in the program as shown in Listing 1 and type RUN 990 Enter. Now you should be presented with a menu asking you which of the three options is required. Select the option required and you will now be prompted for the drive number. The program will read the catalogue from the selected drive and place it into z\$. Now z\$ is spliced so that t\$ contains the cartridge title and f\$ contains the list of files as previously selected.

The program is then saved onto the cartridge with the file name 'run'. Now type RAND USR 0 to reset the Spectrum and type RUN Enter. After a short delay you will be presented with an index of the files on the cartridge.

Select the file that you require to be loaded by pressing the letter which occurs before that file name on the screen. The file will now be loaded by the program unless it is a code file. If this is so you will be asked to input a value for RAMtop as required. If this is not required then just press Enter. The file will now be loaded by the program. Also if key 1 is pressed the index will be updated. This should be performed after new files have been added to the cartridge. If key 2 is pressed the menu program will be loaded from the next drive.

## Simple Microdrive database program

This is a simple database program which allows you to store and sort dual file lists. Possible examples of its use are catalogues of magazine articles, software lists and telephone numbers.

Type in the program shown in listing 2 and type RUN 500 Enter. You will be presented with a menu of the available options, which are as follows:

1 Add To File  
Enter Name  
Enter Details

You will then be asked if name and details are OK. At this point pressing y allows more data to be entered, n deletes the last entry and allows the correct one to be added, and s stops adding and sorting data then returns to main menu.

2 Delete From File

Enter name to be deleted, and the name and details will be deleted.

3 Search and Print Items

Enter string to be searched for in the name list, and all items containing the string will be listed.

```

1 REM *****
2 REM * Simple Microdrive *
3 REM * Database Program v2.3 *
4 REM * Copyright G.B. Monk *
5 REM *****
6 REM BUBBLE SORT routine
10 PRINT AT 20,0; FLASH 1;"SOR
TING, PLEASE WAIT."
20 LET t=0: REM sort flag
30 FOR i=1 TO c-1
40 IF a$(i,1)<a$(i+1,1) THEN
GO TO 70
49 REM swap
50 FOR j=1 TO 2: LET s=a$(j,1)
: LET a$(j,1)=a$(j+1,1): LET a$
(j+1,1)=s: NEXT j
60 LET t=1
70 NEXT i
80 IF t=1 THEN GO TO 20
90 BEEP 1,0: RETURN
99 REM cartridge catalogue to
z$ routine, d$drive no.
100 CLOSE #4: OPEN #4;"a";d;"in
dex.d"
110 CAT #4,d
120 CLOSE #4
130 LET z$="": LET eof=0
140 OPEN #4;"a";d;"index.d"
150 INPUT #4,r$
160 IF r$="" THEN LET eof=eof+1
IF eof=2 THEN GO TO 150
170 LET z$=z$+r$
180 IF eof<2 THEN GO TO 150
190 CLOSE #4
200 ERASE "a";d;"index.d"
210 RETURN
499 REM Initial Procedures
500 DIM a$(2,1000,15): DIM d$(1
5)
510 PAPER 1: BORDER 1: CLS: IN
K 7: PRINT AT 5,10;"G.G.B.MONK":
PAUSE 100: CLS
519 REM main options
520 CLS: PRINT AT 2,4;"SELECT
OPTION"
530 PRINT AT 6,2;"1-ADD TO FILE"
540 PRINT AT 6,2;"2-DELETE FROM
FILE"
550 PRINT AT 10,2;"3-SEARCH AND
PRINT ITEMS"
560 PRINT AT 12,2;"4-PRINT FILE
S"
570 PRINT AT 14,2;"5-PRINTER "
"ON" AND pr=2: "OFF" AND pr=3
580 PRINT AT 16,2;"6-SAVE OR LO
AD DATA"
590 PRINT AT 20,6: FLASH 1;"Ple
se NUMBER required..."
600 LET k$=INKEY$
610 IF k$<"1" OR k$>"6" THEN GO
TO 600
620 BEEP 3,15: CLS: GO SUB 10
00:VAL k$: GO TO 520
999 REM add to file
1000 IF c<100 THEN PAPER 0: INK
7: BORDER 0: CLS: PRINT TAB 0;
FLASH 1: BRIGHT 1;"SORRY FILE F
ULL": PAUSE 200: BORDER
R 1: PAPER 1: INK 7: RETURN
1010 PRINT AT 20,0;TAB 5;"NAME";
TAB 20;"DETAILS": RANDOMIZE US
R 3582
1020 LET c=c+1: REM increase fil
e counter
1030 INPUT "Name? ";a$(1,c)
1040 PRINT AT 20,0;a$(1,c)
1050 INPUT "Detail 1? ";a$(2,c)
1060 PRINT AT 20,15;a$(2,c)
1070 PRINT AT 21,0;"O.K. (y/n) o
r s TO STOP."
1080 IF INKEY$="n" OR INKEY$="N"
THEN GO TO 1030
1090 IF INKEY$="y" OR INKEY$="Y"
THEN PRINT AT 21,0;"": RANDOMIZ
E USR 3582: GO TO 1020
1100 IF INKEY$<"s" AND INKEY$>
"s" THEN GO TO 1030
1110 RANDOMIZE USR 3582: GO SUB
10: REM sort
1120 RETURN
1999 REM delete from file
2000 LET d=0: REM d$delete count
2010 INPUT "Item to be deleted?
";d$
2020 FOR i=1 TO c
2030 IF a$(i,1)=d$ THEN LET a$(i
,1)=CHR$ 143: LET d=d+1: REM 143
=inverse space
2040 NEXT i
2050 GO SUB 10: REM sort
2060 LET c=c-d: REM decrease fil
e counter
2070 RETURN
2999 REM search and print
3000 LET t=1: REM found flag
3010 INPUT "Item to be searched

```

Bubble Sort Routine — c is the file length and t is a flag used to detect the end of sorting. This routine is placed first so that it runs fast.

Cat to z\$ routine.

Set up initial arrays and flags.

Main menu and selection of option routine.

Add to File Routine — line 1000 checks to see if the file is full. RANDOMIZE USR 3582 — scrolls the screen up 1 line. Lines 1030 — 1070 prompt for the new data and print it.

Line 1080 — 1100 read the keyboard for a response to the OK question.

Line 2010 prompts for the file name to be deleted.

Line 2030 makes that name an inverse space (CHR\$ 143), so that when the file is sorted it will go to the end.

Lines 2050 — 2060 call the sort routine and decrease the file counter which in effect removes the last item.

t is used as a flag to detect that the file has been found. Line 3010 prompts the user



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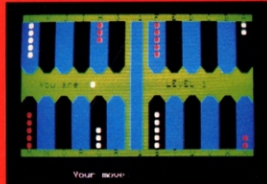
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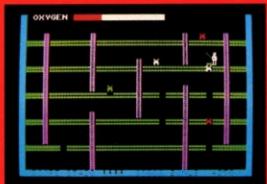
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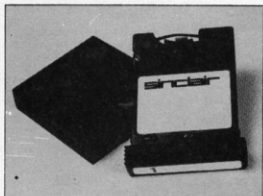


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# SPECTRUM DATA



## Print File

Prints the whole file.  
5 Printer On/Off

This is a toggle to switch data output to screen or printer  
6 Save or Load Data

This allows the program and its current data to be saved to cassette or Microdrive. If the Microdrive option is chosen then the required cartridge is checked to see if the file already exists, and that there is enough spare space on the cartridge. The Cat to ZS routine is used to do this and hence errors are trapped.

In its current form this program can be used only for simple types of data storage. However, the program is very user friendly and includes a very powerful search routine. The program could be further improved by adding a faster sort algorithm and increasing the number of data fields.

## Microdrive clinic

Microdrives can take a bit of getting used to, and this isn't helped by the fact that, since their launch, Sinclair has been carrying out various modifications to deal with problems that have arisen in use.

But there are a couple of common problems you can look out for. If you try to load a program or data file from Microdrive when there isn't enough memory for it you get an 'out of memory' error, the computer hangs up but the tape keeps whizzing round. Even though the manual warns you not to switch off while the tape is turning, it's the only way out of this one.

This kind of crash is most likely to happen when you have a program that lowers RAMtop with CLEAR. Using RANDOMISE USR 0 before loading the program helps avoid this.

If you have a ZX Printer connected as well as Interface 1, you may find it impossible to load programs from tape. The only way out of this is to unplug the printer, with consequent wear and tear on the edge connector.

There are other bugs which sometimes appear when Interface 1 and the ZX Printer are connected concerning INKEYS and BEEP. These sometimes cause the machine to hang up, but at other times it may take four BEEPs before this happens. They can be demonstrated with:

```
10 BEEP 1,50
```

This makes the computer display thin black lines in the border, then it hangs up.

```
10 IF INKEYS = "a" THEN GO TO 10
```

This works properly if the first key you press is 'a', but if you press any other key first the program won't stop when you press 'a', or when you press BREAK. **PCN**

```
1077 ";;$
3020 PRINT AT 19,0;"Searching fo
r";$
3030 PRINT #P;AT 20,0;TAB 4;"IT
EM";TAB 20;"DETAILS"
3040 IF P#3 THEN LPRINT
3050 LET I=LEN S$-1
3060 FOR I=1 TO C
3070 FOR J=1 TO 15-IN
3080 IF A$(I,J) TO J+IN)=$$ THE
N RANDOMIZE USR 3562;LET T=0:P
RINT #P;AT 21,0;A$(I,J);A$(2,I)
3090 NEXT J
3100 NEXT I
3110 RANDOMIZE USR 3562
3120 IF T=1 THEN PRINT AT 21,0;"
Sorry item not in file.";RANDOM
IZE USR 3562
3130 IF P#2 OR T=1 THEN PRINT A
T 21,0;"Press S when ready.";I
F INKEYS="" THEN GO TO 3130
3140 RETURN
3599 REM Print file
4000 PRINT #P;AT 20,0;TAB 4;"IT
EM";TAB 20;"DETAILS"
4010 IF P#3 THEN LPRINT
4020 FOR I=1 TO C
4030 RANDOMIZE USR 3562
4040 PRINT #P;AT 21,0;A$(I,J);A
$(2,I)
4050 NEXT I
4060 PAUSE 1: PAUSE 100
4070 RETURN
4599 REM printer on/off
5000 IF P#2 THEN LET P#3:PRIN
T "PRINTER ON";PAUSE 1:PAUSE 5
0:RETURN
5010 IF P#3 THEN LET P#2:PRIN
T "PRINTER OFF";PAUSE 1:PAUSE
50:RETURN
5999 REM save and load
6000 PRINT AT 2,4;"SELECT OPTION
";
6010 PRINT TAB 4;"1-CASSETTE"
6020 PRINT TAB 4;"2-MICRODRIVE"
6030 LET K$=INKEYS
6040 IF K$<"1" AND K$<"2" THEN
GO TO 6000
6050 IF K$="2" THEN GO TO 6500
6059 REM cassette
6060 CLS
6070 PRINT "Prepare data tape."
6080 PRINT "Disconnect EAR lead."
6090 SAVE "Data Base" LINE 510
6100 CLS
6110 PRINT "Verification. Rewind
tape & connect EAR lead."
6120 PRINT "If error then "" GOT
0 6060 ""
6130 PRINT "Play the tape."
6140 VERIFY "Data Base"
6150 PRINT "O.K."
6160 PAUSE 1:PAUSE 200
6170 RETURN
6499 REM microdrive
6500 CLS:PRINT "Drive Number ?
(1-3):";FOR I=1 TO 50:NEXT I
6510 LET K$=INKEYS
6520 IF K$<"1" OR K$>"3" THEN GO
TO 6510
6530 LET D=VAL K$
6540 CLS:PRINT "Drive Number "
;D
6550 INPUT "File Name ? ";S$
6560 IF LEN S$>10 OR LEN S$=0 TH
EN GO TO 6550
6570 PRINT "File Name: ";S$
6580 PRINT "Reading The Catalo
gue";PAUSE 100
6590 GO SUB 100:RECAT TO Z$
6600 LET Z$=Z$(11 TO )
6610 LET S$=0:REM save flag
6620 IF Z$(1 TO LEN Z$)=S$ THEN L
E T S$=Z$
6630 LET Z$=Z$(11 TO )
6640 LET Z$=Z$(11 TO )
6650 IF LEN Z$>10 THEN GO TO 660
0
6660 IF S$=1 THEN GO TO 6600
6670 IF VAL Z$(35 THEN PRINT "No
t enough space on cartridge.";P
AUSE 1:PAUSE 200:RETURN
6680 PRINT "Saving";$
6690 SAVE "A";D;S$ LINE 510
6700 PRINT S$;" Saved."
6710 PAUSE 1:PAUSE 100
6720 RETURN
6800 PRINT #1;AT 0,0;"File exist
s - Replace (y/n)"
6810 LET K$=INKEYS
6820 IF K$="N" OR K$="n" THEN RE
TURN
6830 IF K$<"Y" AND K$<"y" THEN
GO TO 6810
6840 PRINT "Erasing File ";S$
6850 ERASE "A";1;S$
6860 GO TO 6680
9999 CLEAR:ERASE "A";1;"Dbase
2.3":SAVE "A";1;"Dbase 2.3"
```

for the string to be searched for. Line 3050  
— 3100 are the search routine.

Prints out whole file.

Toggle printer on-off.

Check if cassette or microdrive.

Cassette save routine.

Microdrive save routine.  
Lines 6500 — 6570 prompt for the drive  
number and file name.

Line 6590 calls the cat to Z\$ routine.  
Lines 6610 — 6660 check to see if file  
called S\$ already exists on the cartridge  
and sets the flag S as required.  
Line 6670 checks the space on the  
cartridge.  
Line 6690 saves the file.  
If file exists already ask if a replacement is  
required (6800) if so erase old file (6850)  
and save new file.

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**Ron Street looks at a package that makes oric graphics easier.**

**T**he 48K Oric has been treated to a package from Dream Software to make the drawing of screen pictures far simpler.

'Graphics Package' is designed to enable the Oric owner to go where (probably) no Oric owner has gone before; to explore more fully the potential of the machine. The program contains 26 easily-remembered commands and is well on the way to becoming user-friendly to the beginner plus allowing the more experienced user to complete tasks more efficiently. Spectrum owners might like to note that a 48K version is also available for their machines.

## Features

Each of the 26 commands is represented by a letter of the alphabet which has been assigned as logically as possible. For example, the command letter for drawing a circle is a 'C', a triangle 'T', a rectangle 'R' and so on. However, this system sometimes falls short of perfection, as in the case of 'B', which stands for box, but is actually drawing a three dimensional cube. On the whole, it works well enough in practice.

Drawing on screen can be achieved in two ways. The first, and by far the simplest, is to select one of the eight predefined shapes, and apart from the four already mentioned there's a parallelogram, square, whole rectangle (which means it's solid, as opposed to just a line drawing) and a straight line. Any one of these can be reproduced simply by entering its command letter and pressing RETURN, when the machine will ask what size? Depending upon the chosen shape, the user supplies either one or two lengths. For example, suppose the letter 'R' is given to the program's request for a command. 'R'

stands for rectangle, and because its sides are of two different lengths, two different values are expected. But in the event of the same value being entered both times, a two-dimensional square will appear on screen. In the case of squares, cubes, triangles and circles only one value is requested.

Having seen how these predefined shapes are reproduced on the screen, the next thing is to get them drawn in the desired position. This is achieved by using the 'K' function which, phonetically enough, refers to cursor movement. So, once 'K' has been given to the command prompt, the cursor control keys are activated and each press of one of these keys will move the cursor on pixel position. Holding the key down will, as normal, operate the auto-repeat. Then, once the cursor is in the desired position, 'E' must be entered to end the cursor function and return to control mode.

This method, however, is slow if the cursor has to be moved any great distance, and to overcome the problem there's the O (origin) function, which sets the current cursor position to any point on the screen, and requests two numeric values that represent the 'X' and 'Y' co-ordinates of the new position.

The second method of drawing on screen moves away from limited predefined shapes to the more flexible user-defined varieties—which are further sub-divided. First of these is the A (Alternative) shapes function, which allows you to design custom shaped graphics. By entering A, followed by the D (define) option, a grid of 24 x 24 pixels will be displayed; the idea is to move a flashing marker around the grid by using the cursor control keys. Pressing

the space bar will either set or unset a grid location depending upon whether it was previously set or not. Up to a maximum of 40 grids can be defined, with other options allowing the user to A (mend), V (visualise), S (ave) to tape or L (oad) from tape. Entering the E (nd) option will terminate the function and return control to command mode.

There are two other functions for drawing user-defined shapes, and these are the U (ser points) and the Y (our shapes). User points allow the user to assign a letter (A-Z) to a maximum of 26 points on the screen, allowing the design of all manner of weird and wonderful shapes. Your shapes, on the other hand, let the user allocate a letter to a shape and consequently draw it anywhere on the screen, referencing only the assigned letter.

## Presentation

Graphics Package comes in an unexceptional plastic box.

The manual is arranged alphabetically, with everything explained clearly and concisely, but sometimes the distinct lack of punctuation can lead to temporary misunderstandings.

## In use

This graphics package is simple enough to use, and responds quite quickly to commands, but it does have one or two problems.

For example, suppose the last shape drawn was not quite what the user intended, the E (rase) function can be called up to wipe the image from the screen. But should this image overlap a previously drawn shape, its erasure will leave gaps in the first shape.

Another limitation is the use of colour. Both paper and ink settings can be changed easily by using the P (aper) and I (nk) functions. But when I tried to draw a cube of one colour, then change the ink value to something different and draw a circle, both shapes came out the same colour.

Perhaps there is a way round this, but if so, it's not immediately apparent from the manual.

## Verdict

The software behaves just as the manual claims but, unfortunately, the manual also suggests numerous limitations which are to be found. Nevertheless, the package is fun to use though the potential purchaser should realise it will never draw highly detailed graphics.

## RATING (5)

**Features**  
**Documentation**  
**Performance**  
**Usability**  
**Reliability**  
**Overall Value**



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# CP/M facelift

Ralph Bancroft spruces up his printouts

**T**he idea of using a word processor to produce final copy for inclusion in printed documents is attractive and using a daisywheel printer seems a solution but they are expensive and offer a limited and insubstantial choice of typefaces.

The alternative is to use the graphics and overstrike capability of a dot matrix printer. Until recently the necessary software to drive the printer has not been available but Soft Craft's Fancy Font system held out a lot of promise.

## This is 12 point Roman

Justification, proportional spacing, wide selection of type faces and a range of point sizes are necessary features and first impressions were more than favourable.

Alas, all good stories come to an end and it was only after a longer evaluation that a couple of omissions from the package revealed serious weaknesses.

### Presentation

Fancy Font comes on two 5¼ in disks. One holding the main programs and some of the fonts, the other holding the remaining fonts. The disks are held in a clear plastic sleeve at the rear of a ring folder that also contains the manual (typeset, as one would expect, using Fancy Font).

The documentation is well designed and presented with each chapter consisting of a general explanatory text followed by an excellent reference section giving detailed definitions of syntax and usage of each of the Fancy Font commands.

Fancy Font is by no means easy to use,

## This is 18 point Sans Serif

which is to be expected, and a careful reading of the manual is recommended.

### In use

Fancy Font works on a CP/M micro with a

Font commands that specify typeface and size and other options like line spacing and tab commands. These commands are entered by preceding the command with a / (backslash character) or you can define an alternative character to do the same thing.

The document is then printed from within the Fancy Font program which translates the embedded commands into control codes understood by the printer.

The result, supposedly, is a document that has all the appearance of being typeset. The examples printed on this page may help you judge the accuracy of the claim.

Once you have got the hang of it, Fancy Font is relatively easy to use. The different fonts are sequentially numbered in the text as they occur. Thus /f0 would be the first font used, /f1 the second and so on.

Other command characters are equally simple. r right aligns the remaining text on a line, /c centres a line of text, /j justifies the following text until a /k is encountered which switches off the justification, /b switches off the justification temporarily such as at the end of a paragraph or short line.

When printing out a document, Fancy Font expects to receive a list of parameters specifying line lengths, margins and the fonts to be used. These parameters can be specified in one of three ways. First, they can be entered on the command line when calling the Fancy Font program.

Alternatively, Pfont can be run and the

parameters specified as separate command lines in response to the Fancy Font prompt (↵). This is useful for the beginner as any error message appears immediately after an invalid parameter is specified. You can

also type ? to get help if needed.

The third way is to put all the parameters into a special file called up by the Pfont command.

The choice of fonts is fairly comprehensive. Roman is the main font which is available in regular, italic, bold, super-script and subscript styles with sizes from 8pt (the text in this article is 9pt) up to 40pt (headlines in PCN range from 42pt to

about 60pt). Other styles available are sans serif, old english and script together with some special characters that can be selected as a font file.

If the choice of fonts on offer are too limiting you can either adapt an existing one or create your own using the Hershey character database that comes with the package.

There are two main limitations. The first

**Super and sub script are available.**

concerns justification. A proper typesetting machine achieves an evenly spaced effect by adding microspaces between individual letters. Fancy Font achieves the same effect by inserting microspaces between words.

The result is no better than using a standard word processor. The crucial feature of a typesetting machine is the microspacing and I conclude that to call Fancy Font a typesetting program is misleading.

The second limitation is the way it handles long lines. Fancy Font drops characters if a line is too long to fit in the specified width. The first you know about this is during printing when an error message appears on screen. You cannot specify where you want a word or line break to appear. Fancy Font just continues churning out the document — minus the characters that were dropped.

## This is 20 point Olde English

The only way round this is to run Fancy Font several times: in draft mode to check the line lengths, in draft mode again to check that you have not made any new over-long lines, and again if more changes are needed.

Finally, you can produce the finished copy.

### Verdict

It is a shame that after so much thought and creativity have gone into what appears to be an innovative product, the package should fall down in two crucial areas which should be well within the technology's ability to handle.

If you think you can suffer the limitations of Fancy Font by all means go ahead and buy it. But be prepared for the drawbacks.

**RATING (5)**  
Features  
Documentation  
Performance  
Usability  
Reliability  
Overall value



**Name** Fancy Font **Application** Printing utility **System** CP/M or Torch **CPN Format** disk **Price** £150 (demo disk £10) **Distributors** PCML, Royal Mills, Esher, Surrey KT10 8AS (0372) 67282 Review copy from AIM Research (0223) 353985.

# This is 40 point Script

minimum of 48K RAM, or an MS-DOS machine with a minimum of 128K RAM. The only printers it works with are Epsoms with a graphics capability such as the FX and RX series.

To use Fancy Font, you first create your document using a suitable word processing program (notes for using the program with Wordstar are included as an appendix). You have to embed in the text the Fancy



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# PCN PRO-TEST SOFTWARE

# 64 SUPER BASE

When a computer has sold in the numbers the Commodore 64 has, the market is ripe for powerful databases to attract the business user. Superbase is one such program.

## Getting started

The manual, a substantial A5 book, outlines the starting-up procedures. The program loads in about two minutes from a 1541 drive and, having created or inserted a data disk, you're ready to use Superbase.

## Features

The program is both command and menu driven. Each record is limited to a generous 1,100 characters and the maximum size of a file is only restricted by the capacity of the disk drive in use; from the small 1541 to a hard disk. There's a maximum of 15 files in one database and, although only one file at a time may be opened, you can switch to another from within the program. This opens interesting possibilities for inter-file activities.

Records are selected by Key, giving access in three seconds, no matter how large the file or how slow your disk unit. Keys can be up to 30 characters from anywhere in a record and you can use any field in a file to call on records from other files. Large records will not usually fit on a single screen and can be split over a maximum of four.

Fields may be defined as constants or formulae and in the latter case are automatically recalculated when the contents of one of the source fields in a record is altered. This means you can have a small spreadsheet within each record.

Data validation occurs when Key, Date or Numeric data are entered and comprehensive browse features make it easy to update records. Finding records is carried out rapidly. Boolean comparisons are allowed and you can match with contents of fields and/or the whole record, looking for strings in specific locations or on a sliding basis (rather like INSTR in Basic). This is invaluable; often you may know what you want to find, but have no idea where the item may be. A list of Keys of records matching your chosen criteria can be saved to disk for use in reports.

## Reports

Superbase goes beyond the restricted report facilities of other databases. Any list of selected keys can be used and the sorting facilities are substantial: sorts can be made on the basis of part fields. A report can be sent to screen or printer and any text can be inserted at any point. You can truncate fields and use formatting to align numeric data.

Calculations can be performed as part of the report generation process and the results printed.

Superbase has a CALC function, so spreadsheet-like activities can be performed. CALC can be used for immediate calculations on a given field in any record,

Need a database for your 64?  
Barry Miles reviews a new package

### Some Superbase programming verbs

ALL  
ASK  
CALCULATE  
EOL  
FROM  
GOTO  
IMPORT  
LINK  
MENU  
RESTART  
SORT  
SELECT

- output data in specified field for all records
- get keyboard entry (like INPUT)
- see text
- End of List condition test (like EOF)
- specifies list of Keys for record selection
- as in Basic
- collect data from another file
- insert data from another file
- return user to main menu
- repeat operation after system error (like RESUME)
- sort records
- retrieve records on basis of Key list

specify what is to happen if a record does not match, or only partially matches criteria.

## User image

Superbase is frustrating to use in a number of ways, these were mostly related to a poor user interface. The opportunity to tell you what to do next is woefully neglected. Sometimes you are asked which file you want to access, but there is no simple way of getting a directory of file names on the logged data disk. Similarly, when setting out details of a report, you cannot find field names, but have to rely on printout.

The two main menus are not numbered, nor do they have different headings.

Sometimes you have to press 'q' for 'Quit', sometimes the stop key and there are no exit prompts.

A major shortfall is the lack of facilities within the program to create files as subdivisions of existing files. While this is possible by programming, most users probably won't be able to cope with this kind of problem.

The manual doesn't explain how to obtain a selective sequential file for use with a word processor. You can do this using the command OUTPUT in a special way, but the information needed is tucked away in another part of the manual.

The introductory section of the Output part of the manual only covers screen and printer and it's not until a further eight pages that disk output is mentioned. There's a similar problem when trying to obtain a selective list of Keys of records which match criteria you have selected. The function key which invokes this operation automatically puts the information in a disk file called 'Hlist'. The manual instructs you to type in the command with a file name to avoid the default list. This is fine, but why no warning? Inexperienced users are likely to lose a previously prepared list.

## Verdict

Superbase contains powerful facilities and extends the capabilities of the 64 as a business machine. It needs tidying up for easier use; the manual needs an index and more information showing how to carry out infrequent but vital operations easily.

### RATING (/5)

Features  
Documentation  
Performance  
Usability  
Reliability  
Overall value



or with the command BATCH to affect a number of records at a time.

## Programming

Superbase provides a programming environment, so Superbase programs can be tailored to meet your own needs. This is a powerful addition to a database. Any command in the menu may be used in a sort of execute file and there are a variety of other words.

Other programming tools are available, and these are mostly to do with print formatting: setting page and line lengths; sending line-feeds; page break handling and so on.

Seven conditional commands let you

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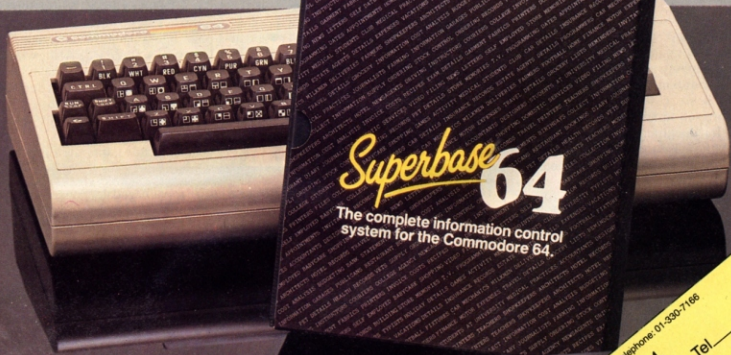
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# Colour scheme

Three colour printers are compared by Piers Letcher.



## Seikosha GP-700A

**Pro-Test PCN, Issue 20**

**Price** £489 inc VAT

**Text speed** 50 cps

**Graphics speed** 4-5 mins for full screen dump.

**Interface** Centronics parallel, RS232 serial (£50 extra)

**Comments:** This was the first cheap full colour printer, halving the cost of anything previously available. It operates (unusually) by having four wedge-shaped hammers hitting a multi-coloured ribbon — overstriking can be used to mix colours.

By dot matrix standards the printer is both bulky and noisy (due to four hammers striking in unison). Its ribbons tend to get messy since the ink merges across the four bands, though this can be cured to some extent by putting the printer into self test mode to revolve the ribbon. Its documentation also lets it down. Although most of the necessary information is included, it's aimed at experienced users.

But it has the advantages of speed (at the expense of silence) and paper versatility — the others use roll paper whereas this will take tractor feed or single sheet.

**Contact** DRG (0934) 419914.



## Integrex Colorjet

**Pro-Test PCN, Issue 44**

**Price** £575 inc VAT

**Text speed** 37 cps

**Graphics speed** full screen dump 6 mins, half size full screen dump 1.5 mins.

**Interface** Centronics parallel, RS232 serial (£140 extra). Viewdata including Centronics and RS232 (£165 extra).

**Comments:** Although the Colourjet is the most expensive of these three printers, it is the most versatile. It is primarily for BBC and Apple users, but with Centronics as standard and RS232 as optional it works with almost any machine. A BBC graphics dump program listing comes with it, and in March there will be software for an IBM high resolution dump.

The internal software allows you to do double strike and double resolution while in text mode, and though this slows the printer further, the results are impressive.

**Contact** Integrex (0283) 215432

### COLOUR INK JET PRINTERS

The Tandy CGP-220 and the Integrex Colorjet are repackaged versions of the Cannon A1210 colour ink jet printer. They run almost silently, printing one pixel at a time by squirting ink through a very fine nozzle. To print a line, or character, takes seven runs across the page. Two clip-in cartridges — one black, one colour — provide the ink, thus avoiding ribbon trouble. Special roll feed paper is used, though the printer will cope with single sheets, or tractor feed with the edges torn off.



## Tandy CGP-220

**Pro-Test PCN, Issue 39**

**Price** £499 inc VAT

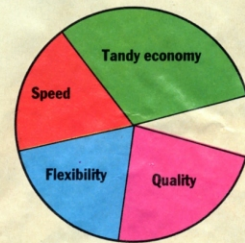
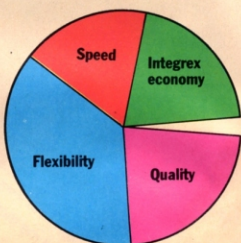
**Text speed** 37 cps

**Graphics speed** 6 mins for full screen dump

**Interface** parallel for Tandy colour computer, and switchable serial 600/2400 baud.

**Comments:** The CGP-220 is cheap, quiet and of high quality, though unfortunately if it is difficult to attach to anything except a Tandy. This problem is caused by Tandy's pins being slightly different from the Centronics standard. Also, when hitched up to anything else you have to write the program to get your screen dump. Printing characters is fairly slow, but elongated and colour characters are easily selected with control codes.

**Contact** Tandy Computer Centres.



Over the past few months PCN Pro-Tested new printers that drastically reduced the cost of colour printing. Their merits are compared here and depicted in a PCN printer's pie. This indicates the trade off between the four major variables — Note that the cheaper a printer is, the larger its slice of the pie, and therefore the smaller the price/performance gap.



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## THE UNORTHODOX ENGINEERS: THE PEN AND THE DARK

Adventure game program by Keith Campbell

Based on the story by Colin Kapp

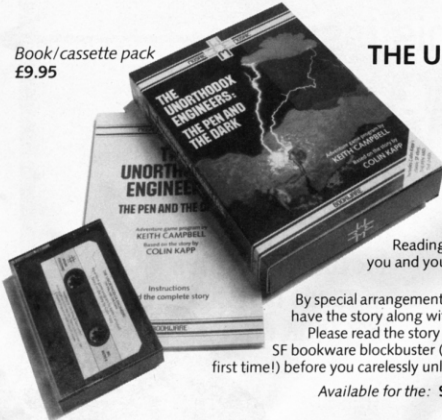
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# BBC gets IEEE

Interfaces from Cambridge — Victor O'Neill plugs in a couple.

**H**ot on the heels of the DCP interface for the BBC (Issue 50) comes a pair of IEEE interfaces: the IEEE488 from Acorn, at £325, and CST's Procyon IEEE controller, at £385.

By attaching an interface to your BBC you get the chance to send and receive information to a variety of equipment. The type of equipment you want to use defines the choice of interface. The BBC already comes with parallel (Centronics) and serial (RS232) interfaces, but hooking up electrical instruments or the better (and more expensive) printers and plotters often calls for an IEEE interface. IEEE 488 is a universally accepted data transfer standard in the electronics world, and is also widely used with a number of add-ons for micros: eg the new high density Commodore disk drives.

## First impressions

The Acorn arrives well packaged and with a 75-page manual, the IEEE488 EPROM, a single IEEE-488 compatible connecting lead and the interface itself. This comes in Acorn's BBC-matching cream box, about one-third the width of its host, as used for second processors or Teletext adaptors.

By contrast the CST is much smaller, encased in an industrial looking box about the same size as a 3.5in disk drive. This is small enough to fit onto the computer but looks clumsy compared to Acorn's model.

Three LEDs across its front indicate the bus status and the back panel houses an IEEE socket, a 34-way connector (for the 1MHz bus on the BBC) and a mains inlet. It has no fixed cables, just plug and socket connectors keeping it tidy and making transportation easy. The unit is supplied, like the Acorn, with the ROM-based filing system and manual, and with 34-way and mains cables.

## Setting up

With both devices one of the first things to do is fit the ROM. Both manuals give detailed instructions for this but Acorn stresses that if in doubt a dealer should do the job.

Once the ROM is fitted you can plug in the interface and attach the kit to work with it. This is simple on either device, though since Acorn's ribbon cable has single connectors at either end, it can only be attached to one device. The IEEE standard specifies double-ended connectors (enabling them to be stacked onto one another) and furthermore the transmission characteristics of ribbon cable could not meet the IEEE specification. But this won't matter to most users, particularly since cables and connectors that do meet IEEE standards are very expensive.

## Documentation

The documentation for both interfaces is good. Acorn provides a spiral-bound A5 manual which, though thorough, doesn't match the standard of CST's 110-page ring-bound file, which lets you add notes and contains a first-rate index.

## In use

Both systems send and receive control signals and data via the filing system. They control handshaking routines in part of the data transfer cycle. With the Acorn you must address the current device as a listener or a talker, so programs are littered with 'talk', 'untalk', 'listen' and 'unlisten' commands. In the CST this is controlled automatically and the corresponding software is easier to read — as shown in the two example programs.

One of the most successful commands on the Procyon is 'HELP IEEE', which returns a screenful of information summarising the commands and options available in its filing system. The same command on the Acorn gives only filing and operating system numbers.

Acorn makes you work harder than CST, especially on programming. On the Acorn two channels have to be opened from software: a COMMAND channel, via which the interface standard is monitored and IEEE488 commands are transmitted, and a DATA channel for reading and writing data to other devices on the bus.

For most applications the BBC can process data while reading it because of its fast Basic, but sometimes, particularly with a long experiment, it may be necessary to store data and process it later, so you'll need a disk drive if you want to do a lot of processing.

## Verdict

The extra cost of the Procyon seems worthwhile. The cheaper Acorn version is harder to use and its matching box doesn't compensate for practical disadvantages.

The interfaces are likely to be widely used in educational establishments, as well as in research and development offices.

The two programs shown measure the response of an amplifier. The input is provided by a signal generator and the output is measured by a digital voltmeter. In the program for the Acorn lines 10-50 set up the files and channels needed, and lines 60-100 specify the device addresses and initialise them. The loop from lines 110-220 measures the response as the signal generated is incremented and stores the data to disk. Line 180 converts the voltage (read as a string) into the amplifier's response (measured in dB). The last few lines close the files and return to the DFS.

The Procyon program is shorter for three reasons: By making default assumptions lines 60-80 of the Acorn program can be left out. Lines 40, 50, 120, 140, 150, and 170 are not necessary because the talking and listening commands aren't used, and simpler file handling allows the open and close commands in 90, 100, 230 and 240 to be dropped.

## Frequency responses measured on the Acorn . . .

```
1 REM PROGRAM TO MEASURE FREQUENCY
  RESPONSE USING ACORN INTERFACE
10 #DISC
20 RESULTS=OPENOUT("RESULTS")
30 #IEEE
40 CHDS=OPENIN("COMMAND")
50 DATAS=OPENIN("DATA")
60 PRINT ECMD$, "BNC DEVICE NUMBER", 1
70 PRINT ECMD$, "CLEAR"
80 PRINT ECMD$, "REMOTE, ENABLE"
90 $IGEN$=OPENIN("I")
100 DVW$=OPENIN("I")
110 FOR FREQUENCY=1000 TO 10000 STEP 100
120 PRINT
    ECMD$, "LISTEN", $IGEN$, "EXECUTE"
130 PRINT
    EDATA$, "O.IV.", "STR$(FREQUENCY)*"HZ"
140 PRINT ECMD$, "UNLISTEN"
150 PRINT ECMD$, "TALK", DVW$
160 INPUT EDATA$, READINGS
170 PRINT ECMD$, "UNTALK"
180
    RESPONSE=20*LOG(VAL(READINGS)/(10.180.707
190 #DISC
200 PRINT RESULTS, FREQUENCY, RESPONSE
210 #IEEE
220 NEXT FREQUENCY
230 CLOSE EDVW$
240 CLOSE $IGEN$
250 #DISC
260 CLOSE RESULT
```

## . . . and (concisely) on the Procyon

```
1 REM PROGRAM TO MEASURE FREQUENCY
  RESPONSE USING CST INTERFACE.
10 #DISC
20 RESULTS=OPENOUT("RESULTS")
30 #IEEE
40 $IGEN$=7
100 DVW$=3
110 FOR FREQUENCY=1000 TO 10000 STEP
120 PRINT
    $IGEN$, "O.IV.", "STR$(FREQUENCY)*"HZ"
160 INPUT EDVW$, READINGS
170
    RESPONSE=20*LOG(VAL(READINGS)/(10.180.707
180 #DISC
200 PRINT RESULTS, FREQUENCY, RESPONSE
210 #IEEE
220 NEXT FREQUENCY
230 #DISC
240 CLOSE RESULT
```

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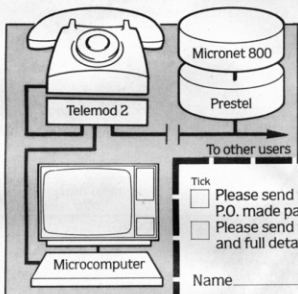
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ATARI

# Bricks and mortar

**Name** Batty Builders **System** Atari (16K) 400/800XL **Price** £9.95  
**Publisher** English Software, Manchester 061-835 1358 **Format** Cassette **Language** Machine code  
**Other versions** None

Do-it-yourself experts seem to be able to turn their hands to any job needing a bit of building know-how. Constructing a wall of Italian bricks would normally be child's play to them, but it's likely they'll meet their match in this new and original game from prolific English Software.

## Objectives

Using bricks that fall off an overhead conveyor belt, you have to complete an already partially constructed wall. The bricks topple off the belt from random positions; you must catch them and then throw them up into position on the wall.

The bricks have different colours and designs; you must endeavour to match them up during building. A bodged wall will earn you points but not as many as a perfectly matched one will.

Five lives are all you have. Get hit by a falling brick and you'll lose one.

## In play

The screen is divided into three roughly equal horizontal sections. At the top is the conveyor belt, full of bricks and fairly racing along from left to right.

In the centre is the almost finished wall. At the bottom is a clear area where a simply drawn little man stands.

The man can be moved left and right for you to position him beneath a falling brick. The bricks fall regularly but from random places on the conveyor belt. Pressing the joystick button causes the man to raise his arms high. To catch a brick, he must be exactly beneath it with his arms in the air — if he's slightly off-centre of the falling brick or has his arms lowered, he is zonked by the brick.

Having caught a brick, the man can be moved to an appropriate position below the incomplete wall. A press of the fire button and the held brick is ejected skywards. With luck, it should land in precisely the place on the wall you want. If you haven't aimed it with care it may fall to either side of the target, adding to the wall but making a mess of the pattern. If you're really out of luck it may simply bounce straight back and flatten you.

There are eight walls to build, each different and with added dangers. Higher levels have you dodging around boxes of explosives.

## Verdict

An unusual game, simple yet extremely addictive, just as any really good game should be.

**Bob Chappell**

### RATING (5)

**Lasting appeal**



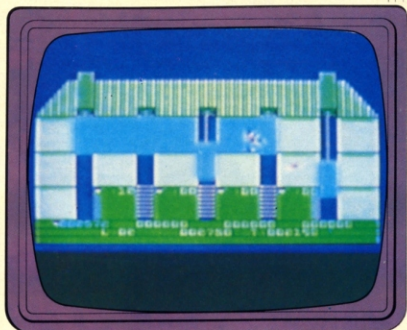
**Playability**



**Use of machine**



**Overall value**



# D-I-Y delirium

**Name** Bristles **System** Atari (32K) 400/800/XL **Price** £24.95 **Publisher** First Star, USA **Format** Cassette & disk **Language** Machine code **Outlet** Norwich Camera Centre, 20 White Lion Street, Norwich NR2 1QB (0603) 612537

Painting and decorating is not one of my favourite jobs but after playing Bristles, it will seem like a good way to relax.

## Objectives

Up to 4 players each have to paint 8 different rooms in a building. You can choose to be any one of 8 differently named painters (4 are male, 4 female) and select any of the 6 skill levels. Trying to hamper your painting and decorating is a weird assortment of objects: dumb flying buckets, intelligent flying half-pint paint pots, a relentless bucket chucker, steam pipes and, last but not least, Brenda the Brat.

Elevators and ladders help you move from floor to floor but you have to watch out that you don't get squashed by a moving lift. Other objects, such as candy bars, paint rollers, safe rooms and paint mixers can help you out of a tight spot.

## In play

Each painter is represented by an amusing, large-sized, cartoon-style character, suitably garbed in cap and overalls.

Up comes the first room, a three-tiered chamber linked by ladders and lifts. All your painter has to do is to rush around the room, passing every blank wall in sight — the paint is

automatically slapped on as he/she passes. The painter can run, climb up and down, leap to the left and right, jump and duck. The animation is most entertaining.

The first lesson you learn is to keep out of the way of any moving lift, otherwise it will bowl you over knocking you head-over-heels back to the start position at the bottom centre of the room. Every time you get knocked down you lose one of your ten brushes (lives). What you're supposed to do is jump on and off a lift when it is stationary.

As well as lifts zipping up and down, there are flying buckets to dodge, paint rollers to grab (for bonus points) and a time limit to beat.

In some rooms Brenda the Brat (the Building Superintendent's horrible little daughter) appears. She has the nasty habit of leaving sticky hand-prints all over your painted walls, so you have to redecorate them. The only way to keep her out of mischief, albeit temporarily, is to grab hold of a candy stick and pass it to her.

All the difficulties are made more bearable by the humorous sound effects and snatches of light classical music which accompany the game throughout.

## Verdict

Bristles has an imaginative plot, excellent animation, good use of sound and a host of challenges. Thoroughly recommended.

**Bob Chappell**

### RATING (5)

**Lasting appeal**



**Playability**



**Use of machine**



**Overall value**



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Bob Chappell proves that the art of conversation has not been killed by the dreaded micro games.

# Game talk

Since the Currah speech box arrived on the market, a number of software houses have taken the plunge and incorporated speech in their programs for the Spectrum 48K. This group could turn into an army as publishers realise the potential of the device. Here is a clutch of programs showing the pioneer spirit.

## VOICE CHESSE II



Artic have an excellent range of chess programs, including one that speaks without the use of any add-ons. Its existing Voice Chess program was an obvious candidate for conversion. As chess is a game normally played between people, what could add more realism to computer chess than having your electronic opponent speak?

Every time you or the computer makes a move, the voice makes an announcement. A capturing and/or checking move is spoken: 'D5 takes F6 check'. An illegal move gets the response 'Invalid move'. Castling is voiced as 'Castles and mate as 'Checkmate'. It can be a little disconcerting to suddenly hear 'Mate in two' when you were not expecting it — fortunately, the voice has no trace of smugness.

If you type in 'm' when it is your move, the computer announces 'I recommend E6 E7' if it thinks that is your best move. Having done as told, you will hear, not unreasonably, 'I expected that'.

The speech is clear and certainly adds that extra something to a program that plays a very good game of chess. Excellent.



## BIRDS AND BEES



This is a super little game to be used with or without the speech facility. The game commences with the rousing 'Flight of the Bumble Bee' (what else) and a spoken 'The Birds and the Bees'. A point to note here, for all games, is that any sound effects generated by the program are output through your TV if the Currah box is connected.

Playing Boris Bee, you buzz across the meadows in your hunt for nectar. The sun rolling across the sky, drifting clouds and a passing plane (towing a Bug-Byte advert!) adds to the animation. Swaying flowers beckon and when alighted on, open their petals to 'Nectar'.

Boris faces many hazards, these include: nectar overload, flying ducks, blackbirds, centipedes, and many more.

Spoken announcements include 'Oh dear' (when Boris gets duffed up), 'Game over', 'New high score' and, to warn Boris of approaching danger, something like 'Full alert'.

An addictive game with a good scenario.



## LUNAR JETMAN



The follow-up to Ultimate's successful Jet Pac, has you jetting about a planet with the assistance of a Moon Rover — not a dog but a buggy. The Rover is used to carry various strange objects, you must discover their use as part of your mission to destroy the enemy defence installations. With sideways scrolling screens and brilliant hi-res animation, this is a worthy inheritor of Jet Pac's fame.

A drawback with the speech

unit is that it cannot be used with a joystick. Jetman is hard enough with a joystick — use of keyboard alone makes it more so.

Speech is used randomly and frequently, and is a mixture of statements, commands and threats. They include 'Oh, no!', 'I'll get you, Jetman', 'Exterminate!', 'Destroy enemy missile base', 'Pull yourself together' and 'Missile fired'.

Although control of Jetman is complex, this is a superb game which benefits by the extra dimension of speech — the taunts generate a psychological obstacle to add to the challenge.



## BLASTERMIND



This is the most talkative of all the programs and the only one that attempts to use the voice as a personality.

The objective is to guess the computer's code (colours or digits) before it guesses yours. The fun part comes in the computer's comments. To start with, halfway through the loading of the program, you hear 'Keep your hands off my keyboard!' Once loaded, it declares, 'My name is Howard but you may call me Sir.' It continues by referring to you in a variety of insulting terms.

Not only that but, if given suspect information following one of its guesses at your code, it says, 'You cheated. I suppose I must expect that sort of thing from you humans.'

When you decide to finish, the computer begs 'Please don't switch me off, I'll let you win a game if you let me live.' If you agree, it says 'Thank you', but it doesn't honour the promise. I never managed to beat it — judging by its megalomania, I suspect it cheats.

I found it amusing — fellow masochists will, too. Most of the pleasure came from waiting to see what it would say next. If you want one program to show off your speech box to your friends, this could be the one.

## THE ISLAND



An interesting text adventure in the classic mould, the program makes use of speech to repeat your commands ('Inventory', 'go east', etc) and for some responses ('I don't understand'). A unique feature of this program is the ability to switch the speech on and off during the game (the commands are SPEAK and SHUT UP!).

An interesting adventure in its own right — as is the case with some graphics adventures, the speech adds little to the enjoyment but, if you've got the unit, it's an added, optional bonus.



## LUNAR RESCUE



This is a competent version of rescuing humans from the planet surface by guiding your craft down from a mothership, gathering them up and returning from whence you came. The spoken items include such phrases as 'Chocks away' and 'Rockets fired'. An old favourite, the speech here is more a question of gilding the lily than adding a real bonus.

### Currah Speech Synthesiser (£29.95)

Currah Compot Computers, Graythorpe Industrial Estate,

Hartlepool TS25 2DF

### Voice Chess II (£8.95)

Artic Computing, Main Street,

Brandsburton, Driffield YO25

RRL (0401)-43553

### Birds and the Bees (£6.95)

Bug-Byte, Mulberry House, Canning Place,

Liverpool L1 8JB (051)-709-7071

### Lunar Jetman (£7.50)

Ultimate Play The Game, The Green, Ashby de la

Zouch, Leics. LE65 1JU (0530)-

411485

### Blastermind (£5.50)

Martech Games, Martech House, Bay

Terrace, Pevensey Bay, E Sussex

BN24 6EE (0323)-642719

### The Island (£7.50)

Crystal Computing, 2 Ashton Way, East

Herrington, Sunderland SR3 3RX

### Lunar Rescue (£5.95)

Lyversoft, 66 Lime Street, Liverpool L1 1JN



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# TI99/4A

## Tumbling robots

**Name** Robopods **System** TI99/4A  
**Price** £6.95 **Publishers** Virgin Games  
Ltd, 61/63 Portobello Road,  
London W11 0JTS **Mail**  
**order/Retail**

If you've a lot of time on your hands, you might like to consider a games tape from Virgin called Robopods. Yet another chance for you to save the Earth from impending doom.

### Objectives

From the final frontiers of space comes yet another invading alien force intent on mischief on the planet Earth. An orbiting mothership is responsible for landing a force of Robopods which are protected by a number of landmines (alien ones, of course).

Your task is to deactivate each Robopod in numerical order without crossing your own path.

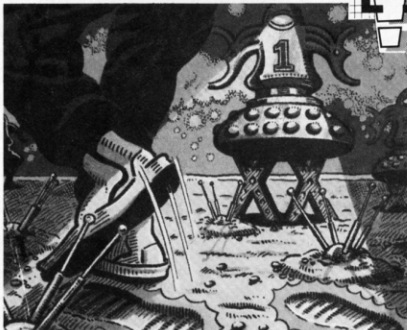
### In play

There are five levels of skill — novice, experienced, master, joker and totally insane — and this relates to the number of Robopods and landmines on the screen; five Robopods appear for the novice, while the totally insane among you will have to cope with nine of the beasts.

Setting up the screen is a slow business and becomes quite a tedious event. The Robopods resemble American footballers with large bulky bodies and spindly legs, each sporting a number on their chests. The landmines are even more peculiar bringing to mind the top half of the robots which appear in a certain mashed potato advert.

Once your character is in position, you move around the screen leaving a trail of curious footprints. Having manoeuvred your character between the appropriate Robopod's legs, with a primitive dance, the figure is drawn up inside the pod.

Should your character step



on a landmine or cross its own path, you are treated to a small puff of smoke and the sudden appearance of a tombstone. You may be lucky enough to be awarded safety mats allowing you to cross your path.

Once you have deactivated all the Robopods, you are rather lamely congratulated on saving the Earth.

### Verdict

The game's idea, though not original, is a good one and once

in the thick of the action, is fairly engaging. However, the 'in-between games' periods are somewhat tedious — unless you fancy a trip to the kitchen to treat yourself to a cup of coffee each time.

Sue Denham

### RATING (5)

**Lasting appeal**



**Playability**



**Use of machine**



**Overall value**



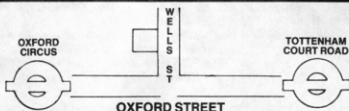
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This companion volume to *Advanced BASIC for the Dragon* aims to teach 6809 assembler language to anyone with only a previous knowledge of BASIC. Each chapter includes examples and many "cookbook" style routines for immediate use by the reader who will then be able to write programs, in assembler language, that are faster than BASIC programs. This is particularly important for high speed "arcade" style games programs.

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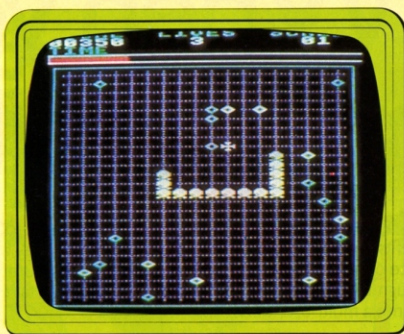
# MILLIPEDE

Millipede is a fast arcade style game written for the Acorn Electron by Peter Scott of Bedlington, Northumberland. Since it was written on the Electron it will run on both the BBC model B or expanded model A (at a higher speed to boot).

You play the part of Morris the millipede; the object of the game is simply to keep alive as long as possible and eat as much as you can. Millipedes, as everyone knows, have a voracious appetite. The food comes in the form of green diamonds and bonus crosses. It is not possible to eat the multi-coloured obstacles or your own body. Trying to eat these or the edges of the screen gives Morris terminal indigestion and is not recommended.

Twenty points are awarded for eating a diamond and 75 points for a cross. A bonus life is awarded if you pass level five and there are nine levels in all.

The author gives the following hints on getting a good score: 'Only press a key when you want to change direction, as the millipede keeps going regardless. Start on level nine and graduate up through the skill levels as you get better. Don't take too many risks, especially towards the end of the screen as you get bonus points depending on the length you have attained.'



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PCN PROGRAMS: ELECTRON/BBC

Title: *Millipede*  
Machine: *Electron/BBC B*  
Language: *BBC Basic*  
Author: *Peter Scott*  
Application: *Game*

9 This line can read ON ERROR  
GOTO173  
15-23 Main game loop

```

1REM
2REM Morris the Millipede!!
3REM for the Acorn Electron
4REM by Peter Scott.
5REM
6REM All REM's can be omitted
7REM
8REM
10MODE5
11PROCinit
12REM
13REM Main game loop
14REM
15REPEAT
16sc%=0:li%=3:lev%=1:A%=135
17PROCinstructions
18PROCdrawscreen
19PROCgame
20IFli%>OPROCnewscreen:GOTO18
21PROCalldead
22UNTIL FALSE
23END
24REM
25REM Screen sense procedure
  
```



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## MILLIPEDE

- 27 Function to read a character on the screen.  
 31 Procedure to pause for a while.  
 35 Print the score in format 00750.  
 36 Print the level in the form 03.  
 43 Main game loop.  
 44 Check the keyboard and change direction accordingly.  
 46 Move the millipede.  
 47 Call screen sense procedure-check if you've hit an obstacle or food.  
 48 Hit a bonus cross.  
 49 Print centipede, update position array, make sound and reduce time.  
 50 If a random condition is met then print cross.  
 51 Check if you are dead, print food if you aren't.  
 56 You are dead.  
 58 If all lives are gone then end the game.  
 60-62 Explode the millipede then erase it.

```

26REM
27DEF FNs(q%,w%):A%=135:VDU31,q%,w%,=(
USR(&FFF4)AND&FF00)DIV&100
28REM
29REM   Pause a while
30REM
31DEF PROCw(t%):FORwait%=0TO19*t%:NEXT
:ENDPROC
32REM
33REM   Print score,level & CLS
34REM
35DEF PROCscore:VDU17,3,31,0,1:PRINTL
EFT$("00000",5-LEN(STR$sc%))sc%:ENDPROC
36DEF PROClevel:VDU17,3,31,16,1:PRINT
LEFT$("00",2-LEN(STR$lev%))lev%:ENDPROC
37DEF PROCcls:FORa%=0TO9:SOUND1,1,a%*
20,2:VDU28,a%,31-a%*1.5,19-a%,a%*1.5,17,
129+a%:CLS:*FX19
38NEXT:PROCw(15):VDU17,128:FORa%=9TO0
STEP-1:SOUND1,1,a%*20,2:VDU28,a%,31-a%*1
.5,19-a%,a%*1.5:CLS:*FX19
39NEXT:VDU26:CLS:ENDPROC
40REM
41REM   Play the screen
42REM
43DEF PROCgame:end%=0:REPEAT:co%=0:RE
PEAT:a$=INKEY$:IFA$=""THEN46
44 IFA$="Z"d%=ELSEIFA$="X"d%=1ELSEIF
a$="/"d%=2ELSEIFA$="."d%=3ELSEPROCpause:
GOTO46
45dx%=dx%(d%):dy%=dy%(d%)
46x%=x+dx%:y%=y+dy%:s%=FNs(x%,y%):I
F s%=157t%=t%+1:VDU17,1,31,x%(t%),y%(t%),
253:GOTO49
47IF s%=1550Rs%=OPROCdead ELSEIF s%=158
SOUND1,2,100,2:sc%=sc%+20:PROCscore:GOTO
49
48IF s%=156sc%=sc%+75:PROCscore:FORa%=
50TO250STEP50:SOUND1,2,a%,1:NEXT
49VDU17,3,31,x%,y%,251:h%=h%+1:x%(h%)
=x%:y%(h%)=y%:SOUND1,1,60,1:FORd%=1TOdel
%:NEXT:ti%=ti%-3:MOVETi%,923:DRAWti%,900
50IFRND(1)>.99 THEN VDU17,3,31,RND(18
),RND(25)+5,252:SOUND&11,2,230,1
51co%=co%+1:UNTILend%ORco%=no%:VDU17,
2,31,RND(18),RND(25)+5,254:UNTILti%<=0OR
end%
52ENDPROC
53REM
54REM   Oops!!-You are dead
55REM
56DEF PROCdead:SOUND&0000,-15,4,15:FO
Ra%=1TO10:VDU19,1,710:19,2,610:PROCw(6)
57VDU19,1,110:19,2,210:PROCw(6):NEXT
:FORa%=100TO10STEP-5:SOUND1,2,a%,1:NEXT
58li%=li%-1:IFli%=0end%=TRUE
59VDU17,3:PRINTTAB(9,1);li%:tt%=t%
60VDU17,2:REPEAT:tt%=tt%+1:VDU31,x%(t
t%),y%(tt%),251:UNTILtt%=h%:VDU17,3:FORa
%=255TO125STEP-10:SOUND1,2,a%,1:NEXT
61tt%=t%:REPEAT:tt%=tt%+1:VDU31,x%(t
t%),y%(tt%),250:UNTILtt%=h%:VDU17,1:FORa%
=120TO10STEP-10:SOUND1,2,a%,1:NEXT
62tt%=t%:REPEAT:tt%=tt%+1:VDU31,x%(t

```





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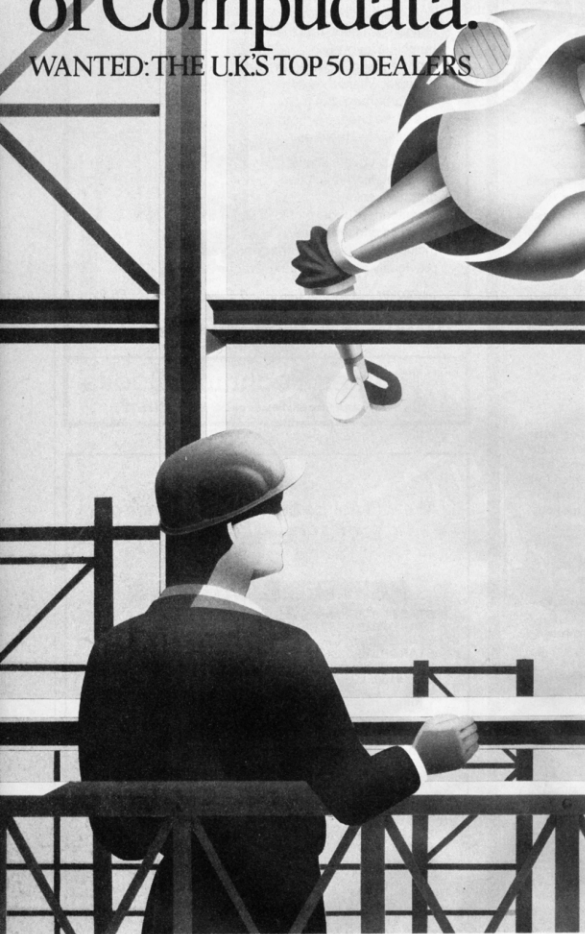
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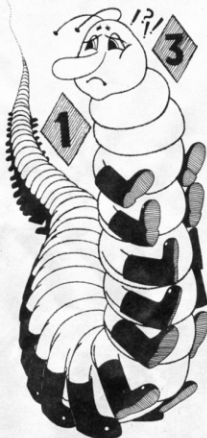


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## MILLIPEDE

- 69 Pause until you press a key.  
 74 Completed this screen.  
 77 Work out your length and if  
 greater than 1 add a bonus.  
 82 You're past level 5 add a life.  
 87 Draw the screen — change all  
 colours to black to hide  
 printing.  
 91 Work out the delay for this  
 screen.  
 92 Randomise the random  
 generator, set up the  
 variables.  
 100 Start the game.  
 106 All your lives are up.  
 107 Rub out the screen.  
 109 Inquest on your performance.  
 110 You are on the high score  
 table.  
 115 Start the printing of the high  
 score table.  
 126 Input your name and rank on  
 the high score table.  
 131 Swap variables for the score  
 table.  
 135 Print instructions in MODE 4.  
 145 Input whether you want  
 sound or not.  
 149 Input the skill level.  
 153 Initialise the game.  
 158 Set the logical colours.  
 159-160 Define the graphics  
 characters.  
 161-164 Set up some variables.  
 165 Define the sound envelopes.  
 166-167 Define colour variables and  
 obstacle string.  
 173 Error — is it an escape; if it is  
 then go back to the  
 instructions and reset the  
 score.  
 174 Print the error and reset the  
 computer to normal:END.



```

% ), y%(tt%), 253: UNTIL tt%=h%
63*FX15,0
64IFend% THEN ENDPROC
65x%=1:y%=30:VDU17,3,31,x%,y%,251:PRO
Cstart:ENDPROC
66REM
67REM   Pause the game
68REM
69DEF PROCpause:GCOL3,3:VDU5:MOVE352,
31:PRINT"PAUSING":*FX15,0
70N$=GET$:MOVE352,31:PRINT"PAUSING":G
COLO,0:VDU4:SOUND1,2,50,2:ENDPROC
71REM
72REM   Move to the next screen
73REM
74DEF PROCnewscreen:lev%=lev%+1:IFlev
%=6PROCbonuslife
75PROClevel:PRINTTAB(0,2)STRING$(40,"
");:VDU17,129
76VDU17,3:PRINTTAB(0,2)"      Milliped
e.      "c0$:"New level coming up!"c3$:
VDU17,128
77bo%=h%-t%:IFbo%>1VDU17,1,17,131,31,
0,0:bonus%=bo%*15:PRINT"BONUS":c0$TAB(0,
1)LEFT$("00000",5-LEN(STR$bonus%))bonus%
$:SOUND1,2,170,12:VDU17,128,17,1:PROCw(1
10):sc%=sc%+bonus%:PRINTTAB(0,0)"SCORE":
PROCscore
78FORa%=10TO250STEP5:SOUND1,1,a%,1:NE
XT:PROCw(85):ENDPROC
79REM
80REM   You got a bonus life
81REM
82DEF PROCbonuslife:li%=li%+1:VDU17,1
29,17,3,31,9,1:PRINTli%$:SOUND1,3,100,20
:PROCw(25)
83VDU17,128,31,9,1:PRINTli%$:ENDPROC
84REM
85REM   Draw the screen
86REM
87DEF PROCdrawscreen:PROCcls:FORa%=1T
O3:VDU19,a%,0,0:NEXT
88VDU17,2,31,0,0:PRINT"SCORE  LIVES
SCREEN":PROCscore:PROClevel:PRINTTAB(9,1
)li%:VDU17,2,31,0,2:PRINT"TIME":VDU17,1,
17,131,31,0,3:PRINTSTRING$(20,CHR$(246)):
89VDU17,1,17,128:grid$=STRING$(18,CHR
$(253)):FORa%=5TO30:PRINTTAB(1,a%)grid$:N
EXT
90VDU18,0,2:MOVE31,15:DRAW1247,15:DRA
W1247,879:DRAW31,879:DRAW31,15:VDU18,0,0
91ti%=1279:del%=65-(lev%*8)+skill%:IF
del%<0del%=0
92randomize=RND(-TIME):t%=0:h%=1:x%=1
:y%=30:*FX15,0
93VDU5:FORa%=1TO5+(3*lev%):MOVERND(18
)*64,1023-(RND(24)+5)*32:PRINTob$$:NEXT:
VDU4,18,0,0
94VDU17,3,19,1,1;0;19,2,2;0;19,3,3;0;
:PRINTTAB(x%,y%)CHR$(251):PROCstart
95no%=14+lev%:VDU17,2,31,RND(18),RND(
25)+5,254,17,3:IFno%>20no%=20
96VDU17,1,31,x%,y%,253,17,3:ENDPROC
97REM
  
```

```

98REM Start the Millipede
99REM
100DEF PROCstart:SOUND1,3,75,4
101a$=GET$:IFa$="Z"d%=OELSEIFa$="X"d%=
1ELSEIFa$="/"d%=2ELSEIFa$=":"d%=3ELSE101
102dx%=d%(d%):dy%=dy%(d%):x(1)=x%:y(
1)=y%:t%=0:h%=1:ENDPROC
103REM
104REM Youv'e run out of lives
105REM
106DEF PROCalldead
107VDU5,18,0,3:MOVE351,528:PRINT"GAME
OVER":VDU4,18,0,0:FORa%=0TO512STEP4:SOU
ND1,1,a%DIV2,1:MOVE0,a%:DRAW1279,a%:MOVE
0,1024-a%:DRAW1279,1024-a%:NEXT
108u$=STRING$(20,"_"):VDU19,2,610:
109PRINTTAB(0,9)c1$u1$c2$TAB(0,11)"You
scored "c3$:PRINTLEFT$("00000",5)-LEN(S
TR$sc%)sc%;c2$TAB(0,14)" on level "c3
$lev%
110PRINTc1$u1$:IFsc%>hi%(10)PRINTTAB(
0,17)c3$"Your'e on the high score ta
ble!":FORa%=10TO250STEP10:SOUND1,3,a%,1:
NEXT:hi%(10)=sc%:hi$(10)=""
111PRINTTAB(0,19)c1$u1$:A=INKEY(175):
PROCc1s
112REM
113REM Print the Hiscore Table
114REM
115FORa%=9TO1STEP-1:IFhi%(a+1)>hi%(a
%)PROCswap
116NEXT:hi%=0:row%=0
117PRINTTAB(0,0)c1$u1$c3$'Today's Hig
h Scores."c1$u1$
118FORa%=1TO10:pr%=4+a%*2:PRINTTAB(0,p
r%)c3$LEFT$("00000",5)-LEN(STR$hi%(a)))h
i%(a)c1$"--

```

```

119PRINTTAB(6,pr)c3$hi%(a%):IFhi%(a%)
="hi%=a%:row%=pr%
120NEXT:IFhi%(<>OPROCinputname
121PRINTTAB(0,26)c1$u1$TAB(0,28)c2$"Pr
ess a key to start"c1$u1$:FX15,0
122N=GET:PROCc1s:ENDPROC
123REM
124REM Input name for Hiscores
125REM
126DEF PROCinputname:FX15,0
127VDU23,1,1,0;0;0;0;0;0;
128INPUTTAB(6,row%)hi$(hi%):hi$(hi%)=L
EFT$(hi$(hi%),14)
129VDU23,1,0,0;0;0;0;0;
130PRINTTAB(0,row%+1)STRING$(20," "):
ENDPROC
131DEF PROCswap:t%=hi%(a%):hi%(a%)=hi%
(a%+1):hi%(a%+1)=t%:t%=hi%(a%):hi%(a%)=h
i%(a%+1):hi%(a%+1)=t%:ENDPROC
132REM
133REM Print the instructions
134REM
135DEF PROCinstructions:CLS:@%=0
136VDU22,4,23,1,0;0;0;0;0;0,19,0,4;0;1
9,1,3;0;
137VDU17,0,17,129,31,0,2:PRINT"Acorn E
lectron Millipede by Peter Scott."VDU17
,129,17,1
138PRINTTAB(0,1)STRING$(40,"_")
139PRINTTAB(0,4)"You control Morris th
e Millipede,who is trapped inside a grid
.Morris is rather hungry,and you must s
teer him away from the multi-coloured ob
stacles,and to the green food-diamonds.H
it a obstacle or "

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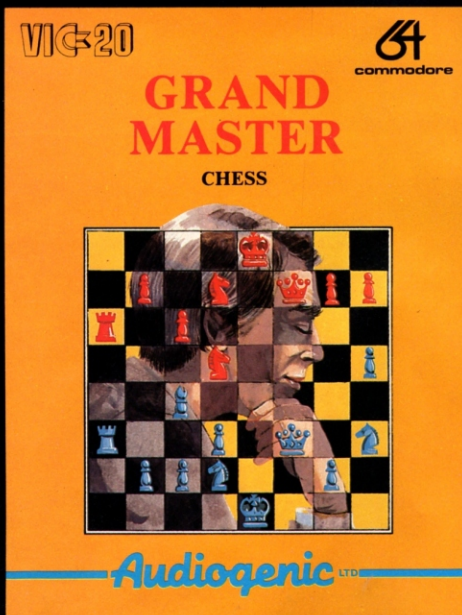
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## MILLIPEDE

140PRINT "the sides of the screen, or Morris and Morris is vapourized! Occasionally, a yellow cross may appear, which can be eaten for bonus points. When time runs out, you move onto the next, harder screen"

141PRINT "You have three lives, and a bonus life if you manage to pass the fifth screen."

142PRINT "VDU17,0,17,129:PRINT" Use these keys to control Morris " :VDU17,1,17,128

143PRINT " 'Z'-left 'X'-right 'Y'-down '\*' -up <SPACE-BAR>-To pause <ESCAPE>-restart"

144PRINT "Do you want sound? [PRESS Y OR N] " :;:FX15,0

145N\$=GET\$:IFN\$="Y" THEN PRINT "YES";:SOUND1,2,50,1;:FX210,0

146IFN\$="N" THEN PRINT "NO";:FX210,1

147IFN\$<"N" AND N\$<"Y" THEN VDU17:GOTO145

148PRINT "Skill level? [Press 1-9 (1=hardest)] " :;:FX15,0

149N\$=GET\$:SOUND1,2,50,1;:IFN\$<"1" OR N\$<"9" THEN VDU17:GOTO149 ELSE skill1%=(VAL(N\$)-1)\*9:PRINTN\$;:PROCW(10)

150VDU17,0,17,129,31,0,30:PRINT "P press any key to start the game " :;:FX15,0

151N=GET\$:SOUND1,2,50,1

152VDU22,5:VDU23,1,0,0;0;0;0;19,1,1;0;19,2,2;0;19,3,3;0;:ENDPROC

153DEF PROCinit

154REM

155REM initialise

156REM

157\*FX4,1

158VDU23,1,0,0;0;0;0;19,0,0;0;19,1,1;0;19,2,2;0;19,3,3;0;

159VDU23,255,56,84,170,170,214,254,92,

56,23,254,16,56,108,198,108,56,16,0,23,2

53,16,0,16,170,16,0,16,0,23,252,56,16,14

6,254,146,16,56,0,23,251,56,124,254,254,

190,92,56,198,23,250,16,40,68,130,68,40,

16,0,23,249,0,16,40,68,40,16,0,0

160VDU23,248,0,0,16,56,16,0,0,23,246

,0,255,255,255,255,255,255,0

161DIMx%(999),y%(999),dx%(3),dy%(3),hi%(10),hi\$(10)

162x%=1:y%=30:dx%=1:FORa%=0TO3:READdx%(a%),dy%(a%):NEXT

163DATA-1,0,1,0,0,1,0,-1

164FORa%=1TO10:hi%(a%)=(11-a%)\*100:hi\$(a%)="Electron":NEXT

165ENVELOPE1,129,-15,-8,-3,10,10,10,12

6,0,0,-126,126,126:ENVELOPE2,1,6,6,2,2,

1,126,0,0,-126,126,126:ENVELOPE3,1,1,-2

1,7,5,12,126,0,0,-126,126,126

166c1\$=CHR\$18+CHR\$0:ob\$=c1\$+CHR\$3+CHR\$

250+CHR\$8+c1\$+CHR\$2+CHR\$249+CHR\$8+c1\$+CHR\$1+CHR\$248

167c0\$=CHR\$17+CHR\$0:c1\$=CHR\$17+CHR\$1:c

2\$=CHR\$17+CHR\$2:c3\$=CHR\$17+CHR\$3

168skill1%=0

169ENDPROC

170REM

171REM Error-stop and report

172REM

173IFERR=17 SOUND1,2,50,1:

GOTO15

174MODE6

175PRINT "REPORT

176PRINT" at line ";ERL

177\*FX15,0

178\*FX210,0

179\*FX4,0

180END

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# DATA BASICS

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 280 and 6502 are popular 8-bit chips. The 8088 and 80800 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  | Sharp M280A              | £399   | NEC PC801                  | £1,375 | Haywood 9000 Composite | £2,064 | Ajile                   | £2,599 | Equator                 | £3,099 | BMC OK 11 F800, Model 20 | £4,360 |
| Casio PB100          | £49  | Sinclair QL              | £499   | Casio 640                  | £1,437 | Research Machines 3802 | £2,147 | Commodore AS100         | £3,100 | Hyperion                | £3,100 | ADS42                    | £4,500 |
| TRS-80 PC4           | £50  | Advance A                | £400   | NEC PC8000                 | £1,454 | Superbrain JR          | £2,150 | CP1100                  | £2,639 | Clenio Table-Tops 925   | £3,105 | Televideo TS-80ZH        | £4,533 |
| Aquarius             | £50  | Datatac Micro Controller | £431   | Signet2                    | £1,483 | Future Computers FX-20 | £2,156 | Seed System 19          | £2,300 | ITT 3030                | £3,105 | Country Com'ters C1000   | £4,542 |
| Laser 200            | £70  | Powertran Cortex         | £454   | Magnum                     | £1,489 | C/WP Cortex            | £2,179 | Enterprise 1000         | £2,645 | HP Series 200 Model 16A | £3,211 | Micro Five 1000          | £5,175 |
| Oric-1               | £80  | Epson 820                | £472   | Televideo TS-800 Series    | £1,495 | Adler Alphatronic P2   | £2,197 | Facit 6520              | £2,645 | Cerie Series 1          | £3,214 | Fortune 32 16 System 2   | £5,204 |
| Sharp PC1251         | £80  | Olivetti M10             | £494   | HP86A                      | £1,570 | Country Com'ters C3000 | £2,242 | Olympia Boss Model A    | £2,645 | Samurai                 | £3,214 | Zeus 4                   | £5,400 |
| Jupiter Ace          | £90  | Tandy TRS-80 Model 100   | £499   | Osborne I                  | £1,581 | Kemtron K2000E         | £2,242 | Britannia Baby          | £2,657 | Tiger                   | £3,214 | Altos 800u/15            | £5,663 |
| Casio FX702P         | £90  | NEC-8201A                | £546   | Comart Communicator        | £1,595 | Rair Black Box 320S    | £2,242 | Adler Alphatronic P3    | £2,696 | Thor                    | £3,214 | Durango F85              | £5,744 |
| Sinclair Spectrum    | £99  | Nascom 3                 | £549   | Signet 10025               | £1,599 | Sanyo MBC 2000         | £2,242 | Eagle II                | £2,702 | Ford FX30               | £3,220 | Trilon 4                 | £5,744 |
| Commodore VIC 20     | £100 | Commodore 4016           | £569   | APL Signet                 | £1,610 | Toshiba T-200          | £2,242 | Almarc 801              | £2,708 | Sord M230               | £3,277 | SW Tech. Products S09    | £5,750 |
| Tandy TRS-80 Pocket2 | £130 | Research Machine 480Z    | £650   | Basix 108                  | £1,683 | TMK 332                | £2,242 | DEC Rainbow 100         | £2,714 | Corona PC2              | £3,276 | BASF 7100                | £5,805 |
| Atari 400            | £149 | DAIPC                    | £684   | Commodore Spr. Pet 9000    | £1,719 | Mellin M2215           | £2,742 | ICL PC Model 10         | £2,754 | Kaytron RS180           | £3,306 | CompuStar                | £5,837 |
| Sord M45             | £150 | Apple II                 | £776   | Gemini Galaxy 2            | £1,719 | Bonsai SM 3000         | £2,294 | Millbank SX10           | £2,754 | Kayron 10               | £3,306 | Sord M243                | £5,842 |
| Atari 800XL          | £160 | Commodore 8032           | £776   | ACT Apricot                | £1,719 | ACT Apricot            | £2,294 | Sirius I                | £2,754 | Columbia PC 1600-1      | £3,392 | Sage IV                  | £5,962 |
| Colour Genie         | £168 | Commodore 500            | £799   | Microsolution Brit. Genius | £1,840 | Sanyo MBC 1250         | £2,294 | Victor 9000             | £2,754 | Digico Prince           | £3,392 | Rair Business Computer   | £6,037 |
| Sharp PC1500         | £169 | Apple IIe                | £845   | Globe 101                  | £1,850 | Casu Mini C2           | £2,300 | North Star Advantage    | £2,766 | OM Orion                | £3,392 | Superstar                | £6,296 |
| Dragon 32            | £174 | Tandy Model 4            | £861   | Grundig 8200               | £1,857 | Seed System I          | £2,300 | Apple III               | £2,780 | Barcelon AMT 100        | £3,450 | Rascal 6000              | £6,327 |
| Texas CC40           | £178 | HP 75C                   | £883   | Gemini PC 2601             | £1,877 | Sharp PC 2601          | £2,300 | Sanyo MBC 4050          | £2,780 | Kalamita 200-250        | £3,450 | Altos 800u/15            | £6,605 |
| Tandy TRS-80 colour  | £180 | Sharp M280B              | £900   | Toshiba T-100              | £1,900 | LSI Octopus            | £2,353 | Bonsai SM 4000          | £2,842 | Televideo TS 803H       | £3,478 | Sundance I               | £6,969 |
| Mattel Intellivision | £190 | Franklin Ace             | £914   | Sord M23                   | £1,932 | HP 85                  | £2,362 | Logica VTS Vitesse      | £2,863 | Digital Microsystems 3  | £3,576 | Pascal Mod. Microengine  | £7,003 |
| Electron             | £199 | Mupid 320 GB             | £918   | Kaypro II                  | £1,949 | HP Series 100, 120     | £2,362 | Decision-1 Computer 011 | £2,869 | Convus Concept          | £3,594 | Apple Lisa               | £7,653 |
| Camputers Lynx       | £225 | Husky Hunter             | £997   | Sord M23P                  | £1,949 | Sord M23P              | £2,369 | Olivetti M20            | £2,869 | Televideo TS 1602-C     | £3,714 | Altos 856-10             | £9,631 |
| Dragon 64            | £225 | Commodore 710            | £1,144 | Kenilworth 83G             | £1,953 | TI Prof. Computer      | £2,386 | DMS Fox                 | £2,875 | Adas Multivision        | £3,795 |                          |        |
| Commodore 64         | £229 | Microdecision            | £1,144 | Televideo Teleporta 1      | £1,955 | IBM PC                 | £2,392 | Eagle III               | £2,950 | Clenio Pronto           | £3,795 |                          |        |
| Sharp M2700          | £250 | Duet 16                  | £1,144 | Transam Tuscant            | £1,963 | Xerox 820 Model II     | £2,415 | Zenith ZF-120-22        | £2,978 | Panasonic JDB00M        | £3,795 |                          |        |
| Atari 800XL          | £250 | Tulip 1                  | £1,150 | NCR Decision Mate V        | £1,963 | Haywood 3000           | £2,439 | Kemtron K3000           | £2,990 | DECPC 350               | £3,850 |                          |        |
| New Brain A          | £269 | Fujitsu FM8              | £1,150 | Epson QX10                 | £1,965 | SM4                    | £2,472 | Philips P3500           | £3,000 | DECPC 350               | £3,850 |                          |        |
| Memotec MTX 500      | £275 | Sanyo MBC 1000           | £1,150 | IDS Datamachine            | £1,995 | Canon CX-1             | £2,500 | Tanberg EC10            | £3,000 | Vector 4                | £3,852 |                          |        |
| Genie II             | £295 | Pied Piper               | £1,226 | Tandy TRS-80 Model III     | £1,999 | Sirius I               | £2,525 | Archives I              | £3,003 | Cerie Club              | £3,904 |                          |        |
| Atari 800            | £300 | Positron 900             | £1,259 | Kenilworth 83N             | £2,012 | Televideo Morrow MD11  | £2,530 | Cromemco System 1       | £3,025 | Sage II                 | £4,019 |                          |        |
| Nascom 2             | £327 | Tandy TRS-80 Model III   | £1,299 | Calltext Micro             | £2,019 | IO Tech Iona           | £2,539 | Wang Professional       | £3,076 | Tandy TRS-80 Model 16   | £4,199 |                          |        |
| Microtan 65          | £389 | Cromemco C10             | £1,350 | Minstel                    | £2,059 | HP 87KM                | £2,571 | DECPC 325               | £3,080 | IBM PCXT                | £4,258 |                          |        |
| BBC Model B          | £399 | Commodore 8096           | £1,374 | LSIM3                      | £2,064 | Quantum 2000           | £2,587 | Direct 1000             | £3,093 | Hytech H4500            | £4,310 |                          |        |

### ABBREVIATIONS

Ap: APL  
As: Assembly  
Ba: Basic  
Co: Cobol  
Cm: Comal  
Fr: Fortran  
Fn: FORTH  
Pa: Pascal



| Make and model         | Price inc VAT | Processor type | Speed in MHz | Standard RAM | Max RAM — normally at extra cost | Display                        | Graphics               | Keyboard          | Interfaces built-in |                  |             |              |                   |                 | Storage       |                        | Operating system         | Languages inc | Other languages available | Distributor      | Comments                      |                           |                                  |
|------------------------|---------------|----------------|--------------|--------------|----------------------------------|--------------------------------|------------------------|-------------------|---------------------|------------------|-------------|--------------|-------------------|-----------------|---------------|------------------------|--------------------------|---------------|---------------------------|------------------|-------------------------------|---------------------------|----------------------------------|
|                        |               |                |              |              |                                  | Max characters columns x lines | Method (if extra cost) | Colour capability | Max dot resolution  | Type of keyboard | Numeric pad | No. of RS232 | No. of Centronics | No. of IEEE 488 | No. of others | No. of expansion slots |                          |               |                           |                  |                               | Cassette facility         | Capacity per disk and disk size  |
| <b>HARDWARE</b>        |               |                |              |              |                                  |                                |                        |                   |                     |                  |             |              |                   |                 |               |                        |                          |               |                           |                  |                               |                           |                                  |
| ACT Apricot            | £1,719        | 8086A          | 5            | 256K         | 768K                             | 80x25                          | LCD                    |                   | 800x400             | W                | 8           | ●            | 1                 | 1               | 2             | 2x315K3 1/4"           | MS DOS                   | Ba            | ●                         | A7               | PCN issue 37                  |                           |                                  |
| Adds Multivision       | £3,795        | 8085A          | 3            | 64K          | 256K                             | 80x25                          | M                      |                   | 640x240             | W                | 28          | 1            | 1                 | 1               |               | 1x350K5 1/4"           | CP/M2.2, Muon            | Ba            | ●                         | A2               | Multi user system             |                           |                                  |
| Adler Alphatron P2     | £2,197        | 8085A          | 3            | 64K          | 64K                              | 80x24                          | M                      |                   |                     | W                | 6           | ●            | 2                 | 1               | 3             | 2x320K5 1/4"           | CP/M                     | Ba            | ●                         | T1               | £327 buys extra storage       |                           |                                  |
| Adler Alphatron P3     | £2,696        | 8085A          | 3            | 64K          |                                  | 80x24                          | M                      |                   |                     | W                | 6           | ●            | 2                 | 1               | 3             | 2x790K5 1/4"           | CP/M                     | Ba            | ●                         | T1               | 16 bit option-promised        |                           |                                  |
| Advantage A            | £400          | 8086           | 4.7          | 128K         | 640K                             | 80x24                          | TV (M+)                | ●                 | 640x200             | W                | 10          | ●            | 1                 | 2               | ●             | 2x360K 5/4"            | MS DOS                   | Ba            | ●                         | A10              | Expandable for business use   |                           |                                  |
| Ajile                  | £2,599        | 8088           | 4            | 256K         |                                  | 80x25                          | M                      |                   | 640x250             | W                | 10          | ●            | 1                 | 1               | 2             | 2x320K5 1/4"           | MS DOS                   | BaAs          | ●                         | A9               | PCN issue 13                  |                           |                                  |
| Almarc 801             | £2,708        | 280            | 4            | 64K          | 512K                             | 80x25                          | (M+)                   | ●                 |                     | W                |             | 2            |                   | 11              |               | 2x800K5 1/4"           | CP/M                     | Ba            | ●                         | A4               | 8-bit range goes to 20Mb      |                           |                                  |
| Aquarius               | £68           | 280A           | 4            | 4K           | 52K                              | 40x24                          | TV                     | ●                 | 320x192             | C                |             |              |                   | 1               | ●             |                        | Cassette                 | Ba            | ●                         | M7               | PCN issue 7                   |                           |                                  |
| Altos 80015            | £5,663        | 280            | 4            | 192K         | 208K                             | 80x24                          | M                      |                   |                     | W                | 8           | ●            | 1                 |                 |               | 1x450K5 1/4"           | MP/M                     |               | ●                         | L1               | Multi user business machine   |                           |                                  |
| APL Signet             | £1,610        | 280A           | 4            | 64K          |                                  | 80x25                          | Tv(M+)                 | ●                 |                     | *                |             |              | 2                 |                 |               | 2x188K5 1/4"           | APL, CP/M                | Ap            | ●                         | M1               | *APL terminal recommended     |                           |                                  |
| Apple II               | £776          | 6502           | 1            | 48K          | 128K                             | 40x24                          | Tv(M+)                 | ●                 | 256x192             | W                |             |              |                   |                 | 8             | ●                      | CP/M, DOS 3.3, UCSD-P    | Ba            | ●                         | A8               | Plenty of software and extras |                           |                                  |
| Apple IIe              | £845          | 6502           | 64K          | 128K         | 80x24                            | (M+)                           | ●                      | 256x192           | W                   |                  |             |              | 1                 | 8               |               | DOS                    | Ba                       | ●             | A8                        | Updated Apple II |                               |                           |                                  |
| Apple III              | £2,780        | 6502           | 2            | 128K         | 256K                             | 80x24                          | (M+)                   | ●                 | 560x192             | W                |             | ●            | 1                 | 4               |               | 1x140K5 1/4"           | SOS, DOS                 |               | ●                         | A8               | Will emulate Apple II         |                           |                                  |
| Apple Lisa             | £9,775        | 68000          | 8            | 1Mb          |                                  | 120x30                         | M                      |                   | 792x360             | W                |             | ●            | 2                 | 1               | 3             | 2x860K5 1/4"           | Lisa                     |               | ●                         | A8               | PCN issue 1                   |                           |                                  |
| Archives I             | £3,003        | 280            | 4            | 64K          |                                  | 80x25                          | M                      |                   | 240x100             | W                | 23          | ●            | 2                 | 1               | 5             | 2x386K5 1/4"           | CP/M                     |               | ●                         | S1               | Standard CP/M + graphics      |                           |                                  |
| Atari 400              | £150          | 6502B          | 1.79         | 16K          |                                  | 40x24                          | Tv                     | ●                 | 320x192             | T                | 3           |              |                   | 7               | ●             |                        | Cassette                 | Ba            | ●                         | A5               | Games computer                |                           |                                  |
| Atari 800              | £300          | 6502           | 1.8          | 48K          |                                  | 40x24                          | Tv(M+)                 | ●                 | 320x192             | W                | 3           |              |                   | 7               | 4             | ●                      | Cassette                 | Ba            | ●                         | A5               | Versatile, good graphics      |                           |                                  |
| Atari 600XL            | £180          | 6502C          | 1.79         | 16K          | 64K                              | 40x24                          | (M+)                   | Tv                | ●                   | 320x192          | W           | 5            | 4                 | 1               | ●             | 1x127K5 1/4"           | DOS 2                    | Ba            | ●                         | A5               | Dos 3 available 1984          |                           |                                  |
| Atari 800XL            | £250          | 6502C          | 1.79         | 64K          |                                  | 40x24                          | (M+)                   | TvM               | ●                   | 320x192          | W           | 5            |                   |                 | 4             | 1                      | ●                        | 1x127K5 1/4"  | DOS 2                     | Ba               | ●                             | A5                        | 256 colours, 128 at any one time |
| Barcellos AMT 100      | £3,450        | 280A           | 4            | 64K          | 256K                             | 80x24                          | TvM                    |                   |                     | W                | 8           | ●            | 1                 | 2               | 3             | 2x500K8"               | CP/M                     | BaCo          | ●                         | B1               | Up to four users              |                           |                                  |
| BASF 7100              | £5,805        | 280A           | 4            | 64K          |                                  | 80x24                          | M                      |                   |                     | W                | 26          | ●            | 1                 | 1               |               | 3x163K5 1/4"           | BOS                      | Ba            | ●                         | C1               | Hard disc promised            |                           |                                  |
| Basis 108              | £1,683        | 6502           | 1            | 64K          | 126K                             | 80x24                          | TvM                    | ●                 | 820x168             | W                | 15          | ●            | 1                 | 1               | 6             | ●                      |                          |               | ●                         | C12              | Apple bus, 280, 80 columns    |                           |                                  |
| BBC Micro Model B      | £399          | 6502           | 2            | 32K          |                                  | 80x30                          | Tv(M+)                 | ●                 | 640x256             | W                | 10          | ●            | 1                 | 5               | 3             | ●                      | MOS                      | BaAs          | ●                         | A1               | PCN issue 3                   |                           |                                  |
| BMC OKI 800, Model 20  | £4,360        | 280B           | 5            | 64K          | 256K                             | 80x25                          | M                      | ●                 | 640x200             | W                | 15          | ●            | 1                 |                 | ●             | 2x340K5 1/4"           | CP/M                     | Ba            | ●                         | E1               | Built-in printer              |                           |                                  |
| Bonsai SM 3000         | £2,294        | 280            | 2            | 64K          |                                  | 80x24                          | M                      |                   | 80x24               | W                | 14          | ●            | 1                 | 1               |               | 2x350K5 1/4"           | CP/M                     |               | ●                         | B2               | CP/M business machine         |                           |                                  |
| Bonsai SM 4000         | £2,842        | 8088           | 5            | 128K         | 256K                             | 80x24                          | 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          |                                  | 80x25                          | Tv(M+)                 | ●                 | 80x25               | W                | 11          | ●            | 2                 | 1               |               | 2x500K5 1/4"           | CP/M                     | AsBaCo        | ●                         | B3               | Cobol language included       |                           |                                  |
| British Micro Mini 803 | £1,490        | 280A           | 4            | 64K          |                                  | 80x25                          | (M+)                   |                   | 512x256             | W                | 17          | ●            | 1                 | 1               | 1             | 2x400K5 1/4"           | OSM                      |               | ●                         | B4               | This is CP/M compatible       |                           |                                  |
| CAL PC                 | £2,294        | 8088           | 5            | 128K         | 256K                             | 80x25                          | TvM                    | ●                 | 256x512             | W                |             | ●            | 2                 | 1               | 5             | 2x400K5 1/4"           | CP/M                     | Ba            | ●                         | C3               | Also Z80B Processor           |                           |                                  |
| C-Base 64A             | £401          | 6502           | 1            | 64K          | 192K                             | 40x24                          | Tv(M+)                 | ●                 | 256x192             | W                | 51          | ●            |                   | 8               | ●             |                        | CP/M, DOS 3.3, UCSD-P    | Ba            | ●                         | W3               | Apple II compatible           |                           |                                  |
| Caltech Micro          | £2,019        | 280A           | 4            | 64K          | 256K                             | 80x24                          | TvM                    |                   |                     | W                | 36          | ●            | 1                 | 1               | 3             | 2x400K5 1/4"           | CP/M                     |               | ●                         | C3               | Range of software included    |                           |                                  |
| Computers Lynx         | £225          | 280A           | 4            | 48K          | 192K                             | 40x24                          | Tv(M+)                 | ●                 | 248x256             | W                |             |              | 1                 | 1               |               |                        | CP/M                     | Ba            | ●                         | C5               | Also 128K with CP/M           |                           |                                  |
| Canon AS100            | £2,633        | 8088           | 4            | 128K         | 512K                             | 80x25                          | M                      | ●                 | 640x400             | W                | 12          | ●            |                   | 1               | 4             | 2x640K5 1/4"           |                          |               | ●                         | C4               | Choice of CP/M86 or MS-DOS    |                           |                                  |
| Canon CX-1             | £2,500        | 6809           | 4            | 128K         | 256K                             | 80x24                          | M                      |                   | 80x25               | W                | 15          | ●            | 3                 | 1               | 1             | 2                      | 2x320K5 1/4"             | MCX           | BaAs                      | ●                | C4                            | Pascal, Fortran as extras |                                  |
| Casio FX 702P          | £90           | Cust.          |              | 2K           |                                  | 20x1                           | LCD                    | C                 |                     | C                |             |              |                   |                 |               | ●                      | Cassette                 | Ba            | ●                         | C6               | Pocket computer               |                           |                                  |
| Casio PB100            | £50           | Cust.          |              | 0.7K         | 1.7K                             | 60x1                           | LCD                    | C                 |                     | C                | ●           |              |                   |                 |               | 1                      | ●                        | Cassette      | Ba                        | ●                | C6                            | Business pocket computer  |                                  |
| Casu Mini C Mark 2     | £2,300        | 280A           | 4            | 64K          |                                  | (M+)                           |                        |                   |                     |                  |             |              | 4                 | 1               | 6             | 2x1Mb8F                |                          |               | ●                         | C7               | *Choose your own terminal     |                           |                                  |
| Cifer Series 1         | £3,214        | 280            | 4            | 128K         | 320K                             | 132x32                         | TvM                    |                   |                     | W                | 40          | ●            | 3                 | 1               |               | 2x800K5 1/4"           | CP/M                     |               | ●                         | C17              | Other models available        |                           |                                  |
| Cifer Club             | £3,904        | 280A           | 4            | 64K          | 256K                             | 80x24                          | M                      |                   | 1024x300 opt        | W                | 20          | ●            | 3                 | 1               | 1             | 1x800K 5/4"            | CP/M, MP/M opt, UNIX opt |               | ●                         | C17              | Optional 68000 processor      |                           |                                  |
| Clenio Pronto          | £3,795        | 280A           | 4            | 64K          | 1Mb                              | *                              | Tv(M+)                 |                   |                     | *                |             |              | 2                 | 2               | 18            | 2x600K8F               | CP/M                     | Ba            | ●                         | C8               | *Choice of terminal           |                           |                                  |
| Clenio Table-Top 925   | £3,105        | 280A           | 4            | 64K          | 128K                             | 80x25                          | M                      |                   |                     | W                | 11          | ●            | 2                 | 2               |               | 2x600K8F               | CP/M                     |               | ●                         | C8               | Watch out for the weight      |                           |                                  |
| Columbia PC1600-1      | £3,392        | 8088           | 4.77         | 128K         | 1Mb                              | 80x24                          | M                      | ●                 | 640x200             | W                | 10          | ●            | 2                 | 1               | 8             | 2x320K5 1/4"           | CP/M, MS DOS             | Ba            | ●                         | I1               | An IBM lookalike              |                           |                                  |
| Commodore VIC 20       | £100          | 6502           | 1            | 5K           | 32K                              | 22x23                          | Tv(M+)                 | ●                 | 176x164             | W                | 8           |              |                   | 3               | 1             | ●                      | Commodore DOS            | Ba            | ●                         | C9               | Very popular home micro       |                           |                                  |
| Commodore 64           | £229          | 6510           | 1            | 64K          |                                  | 40x25                          | Tv(M+)                 | ●                 | 320x200             | W                | 8           |              |                   | 1               | 4             | ●                      | Commodore DOS            | Ba            | ●                         | C9               | PCN issue 24                  |                           |                                  |
| Commodore 4032         | £569          | 6502           | 1            | 32K          |                                  | 40x25                          | TvM                    |                   | 80x50               | W                |             |              |                   | 1               | 1             | 3                      | Commodore DOS            | Ba            | ●                         | C9               | The original PET              |                           |                                  |
| Commodore 700          | £1,144        | 6509           | 2            | 128K         | 256K                             | 80x25                          | TvM                    |                   |                     | W                | 10          | ●            | 1                 | 1               | 2             | 1                      | ●                        | Commodore DOS | Ba                        | ●                | C9                            | PCN issue 5               |                                  |



| Make and model              | Price inc VAT | Processor type | Speed in Mhz | Standard RAM | Max RAM - normally at extra cost | Display                        |                        | Graphics          |                    | Keyboard         |                      | Interfaces built-in |              |                   |                 | Storage       |                        | Operating system         | Languages inc | Other languages available | Distributor                    | Comments                       |                            |
|-----------------------------|---------------|----------------|--------------|--------------|----------------------------------|--------------------------------|------------------------|-------------------|--------------------|------------------|----------------------|---------------------|--------------|-------------------|-----------------|---------------|------------------------|--------------------------|---------------|---------------------------|--------------------------------|--------------------------------|----------------------------|
|                             |               |                |              |              |                                  | Max characters columns x lines | Method (if extra cost) | Colour capability | Max dot resolution | Type of keyboard | No. of function keys | Numeric pad         | No. of RS232 | No. of Centronics | No. of IEEE 488 | No. of others | No. of expansion slots |                          |               |                           |                                |                                | Cassette facility          |
| <b>HARDWARE</b>             |               |                |              |              |                                  |                                |                        |                   |                    |                  |                      |                     |              |                   |                 |               |                        |                          |               |                           |                                |                                |                            |
| Commodore 8032              | £776          | 6502           | 1            | 32K          | 96K                              | 80x25                          | TvM                    |                   | 160x50             | W                | ●                    |                     |              | 1                 | 1               | ●             |                        | Commodore DOS            | Ba            | ●                         | C9                             | The 80-column PET              |                            |
| Commodore SX-64             | £895          | 6510           | 1            | 64K          |                                  | 40x25                          | M                      | ●                 | 320x200            | W                | 8                    |                     |              | 1                 | 4               |               | 1x170K5¼F              | CP/M                     | Ba            | ●                         | C9                             | Portable Commodore 64.         |                            |
| Commodore Super Pet 9000    | £1,719        | 6502           | 2            | 96K          |                                  | 80x25                          | TvM                    |                   |                    | W                | ●                    | 1                   |              | 1                 | 1               | 2             | ●                      | Cassette, PETDOS         | Ba            | ●                         | C9                             | Top of the range               |                            |
| Compustar                   | £5,837        | Z80A           | 4            | 64K          |                                  | 80x25                          | M                      |                   |                    | W                | ●                    | 2                   |              |                   |                 |               | 1x10Mb8H+1x350K5¼F     | CP/M                     | Ba            | ●                         | I10                            | Networking system              |                            |
| Comart Communicator CP100   | £1,595        | Z80            | 4            | 64K          | 512K                             | 80x24                          | M                      |                   |                    | W                | ●                    | 2                   | 1            |                   | 10              |               | 2x390K5¼F              | CP/M                     | ●             | C13                       | Business CP/M micro            |                                |                            |
| Corona PC2                  | £3,076        | 8088           | 5            | 256K         | 512K                             | 80x25                          | M                      | ●                 | 640x325            | W                | 10                   | ●                   | 1            | 1                 | 4               |               | 2x320K5¼F              | MS DOS                   | Ba            | M9                        | Price includes twin disk drive |                                |                            |
| Corvus Concept              | £3,594        | 68000          | 8            | 256K         | 1Mb                              | 120x60                         | M                      |                   | 720x560            | W                | 10                   | ●                   | 2            |                   | 1               | 4             |                        | Merlin                   | Pa            | ●                         | K1                             | A4 shaped screen               |                            |
| Country Computers C1000     | £4,542        | 6502           | 1            | 64K          | 128K                             | 80x24                          | M                      |                   | 280x192            | W                | 12                   | ●                   | 1            |                   | 3               |               | 1x10Mb5¼H+1x140K5¼F    | DOS, CP/M                | ●             | C16                       | Runs all Apple software        |                                |                            |
| Country Computers C3000     | £2,242        | Z80A           | 4            | 64K          | 256K                             |                                |                        |                   |                    |                  |                      |                     | 1            | 1                 |                 |               | 1x5Mb5¼H+1x500K5¼F     | CP/M                     | ●             | C16                       | 'Terminal own choice           |                                |                            |
| CP1100                      | £2,639        | 8086           | 6            | 128K         | 1Mb                              |                                | (M+)*                  |                   |                    |                  |                      | 2                   | 1            |                   | 7               |               | 2x390K5¼F              | CP/M 86                  | ●             | C13                       | Choose your own terminal       |                                |                            |
| Cromemco System 1           | £3,025        | Z80            | 4            | 64K          |                                  | 80x24                          | (M+)                   | ●                 | 450x735            | W                | 20                   | ●                   | 1            |                   | 8               |               | 2x390K5¼F              | CDOS, Crom               | ●             | C13                       | Upgrades available             |                                |                            |
| Cromemco C10                | £1,350        | Z80            | 4            | 64K          |                                  | 80x25                          | M                      |                   | 80x25              | W                |                      |                     | 2            | 1                 |                 |               | 1x390K5¼F              | CP/M                     | Ba            | ●                         | C18                            | Low cost CP/M machine          |                            |
| C-WP Cortex                 | £2,179        | Z80            |              | 64K          |                                  | 80x25                          | M                      |                   | 600x240            | W                | 10                   | ●                   | 1            | 1                 |                 |               | 2x360K5¼F              | CP/M                     | Ba            | ●                         | C20                            | Z80 plus 6502                  |                            |
| DAI PC                      | £684          | 8080           | 2            | 48K          |                                  | 60x24                          | Tv(M+)                 | ●                 | 255x335            | W                |                      |                     | 1            |                   |                 |               |                        | Cassette                 | Ba            | ●                         | D9                             | Optional maths chip            |                            |
| Datasc Micro Controller     | £431          | Z80            | 2            | 16K          |                                  | 40x24                          | Tv(M+)                 |                   | 80x60              | W                |                      |                     | 1            | 1                 | 1               | ●             |                        |                          | Ba            | ●                         | D1                             | Mainly used in labs            |                            |
| DEC Rainbow 100             | £2,714        | 8088           | N/A          | 64K          | 192K                             | 132x24                         | M                      | ●                 | 960x240            | W                | 20                   | ●                   | 2            |                   | 3               |               | 2x400K5¼F              | CP/M                     | ●             | D2                        | Versatile business machine     |                                |                            |
| DEC PC 325                  | £3,080        | PD11/23        | N/A          | 256K         |                                  | 132x24                         | M                      | ●                 | 960x240            | W                | 20                   | ●                   | 2            |                   | 1               |               | 2x400K5¼F              | P.OS                     | ●             | D2                        | Mini in micro clothing         |                                |                            |
| Decision-1 Computer MDC-011 | £2,869        | Z80A           | 4            | 64K          | 192K                             |                                | (M+)*                  |                   |                    |                  |                      |                     | 3            | 1                 | 1               |               | 2x400K5¼F              | CP/M                     | Ba            | ●                         | I2                             | 'Buy your own terminal         |                            |
| Digico Prince               | £3,392        | Z80A           | 4            | 64K          |                                  | 80x25                          | M                      |                   |                    | W                | 50                   | ●                   | 2            |                   | 7               |               | 2x400K5¼F              | CP/M                     | ●             | D3                        | Unusual keyboard               |                                |                            |
| Digital Microsystems DMS-3  | £3,576        | Z80A           | 4            | 64K          |                                  |                                | (M+)*                  |                   |                    |                  |                      |                     | 3            | 1                 |                 |               | 2x512K8F               | CP/M                     | ●             | D4                        | 'Choice of terminal            |                                |                            |
| Direct 1000                 | £3,093        | Z80            | 4            | 64K          |                                  | 80x25                          | M                      |                   | 132x28             | W                |                      | 2                   |              |                   |                 |               | 2x300K5¼F              | CP/M                     | ●             | D5                        | Standard CP/M machine          |                                |                            |
| DMS Fox                     | £2,875        | Z80A           | 4            | 64K          |                                  | 80x24                          | M                      |                   |                    | W                | 16                   | ●                   | 3            | 1                 | 1               |               | 1.2Mb5¼F               | CP/M                     | ●             | D4                        | Portable machine               |                                |                            |
| Dragon 32                   | £174          | 6809E          | 1            | 32K          | 64K                              | 32x16                          | Tv(M+)                 | ●                 | 256x192            | W                |                      |                     | 1            | 4                 | 1               | ●             |                        | Cassette                 | Ba            | D6                        | Tandy colour lookalike         |                                |                            |
| Dragon 64                   | £225          | M6809          | 0.89         | 64K          |                                  | 32x16                          | Tv(M+)                 | ●                 | 256x192            | W                |                      |                     | 2            | 4                 |                 |               | 1x175K5¼F              | OS9                      | Ba            | ●                         | D                              | PCV issue 39                   |                            |
| Duet 16                     | £1,144        | 8086           | 8            | 128K         | 512K                             | 640x400                        | (M+)                   | ●                 | 640x400            | W                | 12                   | ●                   | 2            |                   | 4               |               | 1x720K5¼F              | MS, DOS, CP/M            | Ba 86         | ●                         | L7                             | Portable business              |                            |
| Drango F85                  | £5,744        | 8085A          | 5            | 64K          | 196K                             | 80x64                          | Tv(M+)                 |                   |                    | W                | ●                    |                     | 1            |                   | 1               | 12            | 2x1Mb5¼F               | Star Basic               | BaCo          | ●                         | C3                             | Built in printer               |                            |
| Eagle II                    | £2,702        | Z80A           | 4            | 64K          |                                  | 80x24                          | M                      |                   | 80x24              | W                | ●                    | 2                   | 1            | 1                 |                 |               | 2x500K5¼F              | CP/M                     | Ba            | ●                         | M3                             | Upgrades available             |                            |
| Electron                    | £199          | 6502           | 2            | 32K          |                                  | 80x32                          | Tv(M+)                 | ●                 | 640x256            | W                | 10                   |                     |              |                   |                 | ●             |                        | MOS                      | BaAs          | ●                         | A1                             | Excellent beginners' machine   |                            |
| Enterprise 1000             | £2,645        |                | 8            | 64K          |                                  |                                | M                      |                   |                    | W                | 10                   | ●                   | 2            |                   | 2               |               | 2x358K5¼F              | Enterprise               | ●             | D7                        | Micro Nova 16-bit              |                                |                            |
| Epson HX20                  | £472          | 6301           | 1            | 16K          | 32K                              | 20x4                           | LCD                    |                   | 120x32             | W                | 13                   | ●                   | 2            |                   | 2               |               |                        | Cassette                 | Ba            | ●                         | E2                             | Powerful portable              |                            |
| Epson QX10                  | £1,995        | Z80            | 4            | 192K         | 256K                             | 80x25                          | M                      |                   | 640x400            | W                | 18                   | ●                   | 1            | 1                 | 5               |               | 2x320K5¼F              | CP/M                     | Ba            | ●                         | E2                             | Expansion required for Valdocs |                            |
| Equator                     | £6,842        | Z80A           | 4            | 64K          | 448K                             | 80x24                          | M                      |                   | 255x560            | W                | 14                   | ●                   | 7            |                   | 1               | 8             | 1x5Mb5¼F+1x750K5¼F     | CP/M, MP/M, Turbo DOS    | ●             | E3                        | Two bigger models available    |                                |                            |
| Facit 6520                  | £2,645        | Z80            | 4            | 64K          | 128K                             | 80x24                          | M                      |                   | 80x24              | W                | 8                    | ●                   | 2            |                   |                 |               | 2x320K5¼F              | CP/M, Facit DOS          | Ba            | ●                         | F1                             | Concurrent printing            |                            |
| Fortune 32/16 System 2      | £5,204        | 68000          | 6            | 256K         | 1Mb                              | 80x24                          | M                      | ●                 | 1024x1024          | W                | 16                   | ●                   | 1            |                   | 20              |               | 2x800K5¼F              | Unix                     | ●             | I3                        | Genuine 16-bit                 |                                |                            |
| Franklin Ace 1000           | £914          | 6502           | 1            | 64K          | 128K                             | 40x24                          | M, Tv                  | ●                 | 256x192            | W                | ●                    |                     |              | 1                 | 4               | 1             |                        | 2x140K5¼F                | opt CP/M      | Ba                        | ●                              | C15                            | Apple IIe compatible       |
| Fujitsu FM8                 | £1,150        | 6809           | 1            | 64K          |                                  | 80x25                          | (M+)                   | ●                 | 640x200            | W                | 10                   | ●                   | 1            | 1                 | 4               | 1             | ●                      |                          | Flex          | Ba                        | ●                              | S2                             | Good for business graphics |
| Future Computers FX-20      | £2,156        | 8088           | 8            | 128K         | 1Mb                              | 80x25                          | M                      |                   | 800x400            | W                | 20                   | ●                   | 2            |                   | 2               |               | 2x800K5¼F              | CP/M 86, MS-DOS          | ●             | E1                        | Business micro, runs CP/M      |                                |                            |
| Future FX-30                | £3,220        | 8088           | 8            | 128K         | 1Mb                              | 80x25                          | M                      | ●                 | 1,280x500          | W                | 30                   | ●                   |              | 1                 | 3               | 2             | 1x8005¼F+1x5Mb5¼F      | CP/M86, CP/M80 emulation | ●             | E1                        |                                | Hard disk version              |                            |
| Genie II                    | £299          | Z80            | 1.7          | 16K          | 48K                              | 64x16                          | Tv(M+)                 |                   | 128x48             | W                | 4                    | ●                   | 1            |                   | 1               | ●             |                        | Cassette                 | Ba            | ●                         | L2                             | Speeded-up Genie I             |                            |
| Genie III                   | £1,897        | Z80A           | 3.2          | 64K          |                                  | 80x24                          | M                      |                   | 160x72             | W                | 8                    | ●                   | 1            | 1                 | 1               | 3             |                        | 2x700K5¼F                | New DOS       | Ba                        | ●                              | L2                             | CP/M costs extra           |
| Colour Genie                | £168          | Z80            | 2.2          | 32K          |                                  | 40x24                          | Tv(M+)                 | ●                 | 160x96             | W                | 8                    | ●                   | 1            | 1                 | 2               | 1             |                        | Cassette                 | Ba            | ●                         | L2                             | Home games machine             |                            |
| Gemini Galaxy 2             | £1,719        | Z80            | 4            | 64K          | 512K                             | 80x25                          | M                      |                   | 160x75             | W                | 10                   | ●                   | 1            | 1                 | 1               | 5             |                        | 2x400K5¼F                | CP/M          | ●                         | G1                             | Low cost British system        |                            |
| Globe 101                   | £1,850        | 8085           | 3            | 64K          |                                  | 80x24                          | M                      |                   |                    | W                | 20                   | ●                   | 3            |                   |                 |               | 2x325K5¼F              | CP/M                     | ●             | G4                        | Wordstar plus Mail Merge inc.  |                                |                            |
| Grundy 8200                 | £1,850        | Z80            | 4            | 64K          | 256K                             | 80x24                          | M                      |                   | 160x70             | W                | 10                   | ●                   | 1            |                   | 1               |               | 2x390K5¼F              | CP/M                     | ●             | C19                       | Software included              |                                |                            |



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| Make and model                | Price inc VAT | Processor type | Speed in MHz | Standard RAM | Max RAM — normally at extra cost | Max characters columns x lines | Method (at extra cost) | Colour capability | Max dot resolution | Display | Graphics | Keyboard         | Interfaces built-in  |              |                   |                 |               | Storage          | Operating system    | Languages inc   | Other languages available    | Distributor | Comments                     |                                |
|-------------------------------|---------------|----------------|--------------|--------------|----------------------------------|--------------------------------|------------------------|-------------------|--------------------|---------|----------|------------------|----------------------|--------------|-------------------|-----------------|---------------|------------------|---------------------|-----------------|------------------------------|-------------|------------------------------|--------------------------------|
|                               |               |                |              |              |                                  |                                |                        |                   |                    |         |          | Type of keyboard | No. of function keys | No. of RS232 | No. of Centronics | No. of IEEE 488 | No. of others |                  |                     |                 |                              |             |                              | No. of expansion slots         |
| <b>HARDWARE</b>               |               |                |              |              |                                  |                                |                        |                   |                    |         |          |                  |                      |              |                   |                 |               |                  |                     |                 |                              |             |                              |                                |
| Haywood 9000 Composite        | £2,064        | Z80A           | 4            | 64K          | 192K                             | 80x25                          | M                      |                   | 64x255             | W       | 34       | ●                | 2                    |              | 8                 | 2x320K5¼F       | CP/M          | As               | ●                   | H1              | Designed for network         |             |                              |                                |
| Hitachi PC1                   | £2,985        | 8088           | 5            | 320K         | 576K                             | 80x25                          | M                      | ●                 | 640x200            | W       | 10       | ●                | 1                    | 2            | 5                 | 2x320K5¼F       | MS DOS        | Ba, As           | ●                   | H6              | Will be Pro-Tested, Issue 44 |             |                              |                                |
| HP 75C                        | £883          | Cust.          | N/A          | 16K          | 24K                              | 32x1                           | (M+)                   |                   |                    | C       |          |                  |                      |              | 1                 | 4               | ●             | 1.3K card reader | HP                  | Ba              | ●                            | H6          | Will be Pro-Tested, Issue 44 |                                |
| HP 85                         | £2,360        | Cust.          | N/A          | 16K          | 32K                              | 32x20                          | M                      |                   | 255x191            | W       | 8        | ●                | 1                    |              | 4                 | ●               |               |                  | Cassette            | Ba              | ●                            | H2          | Engineers' machine           |                                |
| HP 86A                        | £1,570        | Cust.          | N/A          | 64K          | 512K                             | 80x24                          | M                      |                   | 544x240            | W       |          |                  | 1                    | 1            | 2                 |                 |               |                  | HP                  | Ba              | ●                            | H2          | CP/M optional                |                                |
| HP 87XM                       | £2,571        | Cust.          | N/A          | 128K         | 640K                             | 80x24                          | M                      |                   | 544x240            | W       | 14       | ●                | 1                    | 1            | 3                 | 4               |               |                  | HP DOS              | Ba              | ●                            | H2          | Special technical uses       |                                |
| HP Series 100, 120            | £2,362        | Z80A           | 3.68         | 64K          |                                  | 80x24                          | M                      |                   | 80x24              | W       | 8        | ●                | 2                    |              | 1                 |                 |               |                  | CP/M                | Ba              | ●                            | H2          | Top end HP business system   |                                |
| HP Series 200 Model 16A       | £3,212        | 68000          | 8            | 128K         | 750K                             | 80x25                          | M                      |                   |                    | W       | 5        |                  | 1                    | 1            | 2                 |                 |               |                  | HP                  |                 | ●                            | H2          | Genuine 16-bit               |                                |
| Husky Hunter                  | £997          | NSC800         | 4            | 80K          | 208K                             | 40x8                           | LCD                    |                   | 240x64             | C       | 8        |                  | 1                    |              |                   |                 |               |                  | CP/M                | Ba              | ●                            | D10         | Waterproof, with metal case  |                                |
| Hyperion                      | £3,100        | 8088           | 4.7          | 256K         |                                  | 80x25                          | M                      |                   | 320x200            | W       | 10       | ●                | 1                    | 1            | 1                 |                 |               |                  | MS, DOS, CP/M 86    | BaAs            | ●                            | G5          | Same as Ajile                |                                |
| Hytech H4500                  | £4,310        | Z80            | 4            | 64K          | 208K                             | 80x25                          | M                      |                   | 80x25              | W       | 26       | ●                |                      | 1            | 3                 |                 |               |                  | CP/M                | Ba              | ●                            | H3          | Standard CP/M micro          |                                |
| IBM PC                        | £2,392        | 8088           | 4.7          | 64K          | 576K                             | 80x25                          | (M+)                   | ●                 | 640x200            | W       | 10       | ●                | 1                    |              | 5                 |                 |               |                  | MS-DOS              | Ba              | ●                            | I9          | Slow but reliable            |                                |
| IBM PCXT                      | £4,258        | 8088           | 4.77         | 128K         | 640K                             | 80x25                          | (M+)                   | ●                 | 350x720            | W       | 12       | ●                |                      |              | 8                 |                 |               |                  | DOS 2               | Ba              | ●                            | I9          | 8087 co-processor possible   |                                |
| ICL PC Model 10               | £2,754        | 8085           | 3            | 64K          | 256K                             | 80x24                          | Tv(M+)                 |                   |                    | W       | 11       | ●                | 2                    |              | 8                 |                 |               |                  | CP/M                | Ba              | ●                            | I4          | Bottom of range              |                                |
| ICL PC Model 15               | £2,702        | 8085A          | 5            | 64K          | 512K                             | 80x25                          | M                      | ●                 |                    | W       |          | ●                | 8                    |              |                   |                 |               |                  | 1x13.3Mb5¼H         | CP/M, MP/M      | Ba                           | ●           | I4                           | Suitable for small business    |
| IDS Datamachine               | £1,995        | Z80            | 4            | 64K          | 1Mb                              |                                | Tv(M+)                 |                   |                    |         |          |                  | 2                    |              | 15                |                 |               |                  | 2x400K5¼F           | CP/M            | Ba                           | ●           | I8                           | *Depends on terminal           |
| IO Tech Iona                  | £2,539        | Z80            | 4            | 69K          | 960K                             | 80x24                          | M                      |                   | 160x75             | W       | 12       | ●                | 1                    | 1            | 8                 |                 |               |                  | 2x400K5¼F           | CP/M            |                              | ●           | I5                           | Good colour versatility        |
| Intellivision + micro adaptor | £189.90       | CP1610         | 2.4          | 5K           | 20x12                            | Tv                             |                        |                   | 160x96             | C       |          |                  |                      |              | 1                 | ●               |               |                  | Cassette            | Ba              | ●                            | M7          | Computer adaptor is £89.95   |                                |
| ITT 3030                      | £3,105        | Z80A           | 4            | 64K          | 256K                             | 80x24                          | Tv(M+)                 |                   | 80x24              | W       | 8        | ●                | 1                    | 1            | 1                 |                 |               |                  | 2x280K5¼F           | CP/M, BOS       |                              | ●           | I7                           | Top end business system        |
| Jupiter Ace                   | £90           | Z80            | 3.25         | 3K           | 51K                              | 32x24                          | Tv(M+)                 |                   | 64x46              | C       | ●        |                  |                      |              | 1                 | ●               |               |                  |                     |                 |                              | ●           | I7                           | Native Forth machine           |
| Kalamazoo 1050                | £3,450        | 8085           | 6            | 64K          |                                  | 80x24                          | Tv(M+)                 |                   | 80x24              | W       | 10       |                  | 1                    |              |                   |                 |               |                  | 2x250K5¼F           | Kalamazoo       |                              | ●           | K3                           | Only Kabol language            |
| Kaypro II                     | £1,949        | Z80            | 4            | 64K          |                                  | 80x24                          | M                      |                   |                    | W       |          | ●                | 1                    | 1            |                   |                 |               |                  | 2x200K5¼F           | CP/M            | Ba                           | ●           | C15                          | PCN issue 35                   |
| Kaypro 10                     | £2,595        | Z80A           | 4            | 64K          |                                  | 80x24                          | M                      |                   | 100x160            | W       |          | ●                | 1                    |              | 2                 |                 |               |                  | 1x10Mb5¼H           | CP/M            | Ba                           | ●           | C15                          | PCN issue 35                   |
| Kemtron K2000E                | £2,242        | Z80            | 4            | 64K          |                                  | 80x24                          | (M+)                   |                   | 80x24              | W       |          | 2                | 1                    | 11           |                   |                 |               |                  | 1x300K5¼F           | CP/M            |                              | ●           | K4                           | Scientific Keyboard            |
| Kemtron K3000                 | £3,795        | Z80            | 4            | 64K          | 256K                             | 80x24                          | (M+)                   |                   | 80x24              | W       |          | ●                | 2                    |              | 14                |                 |               |                  | 2x1Mb8F             | CP/M, MP/M      |                              | ●           | K4                           | For scientific use             |
| Kenilworth 83G                | £1,953        | Z80A           | 4            | 64K          |                                  | 80x25                          | TvM                    |                   | 160x75             | W       | 10       | ●                | 1                    | 1            | 5                 |                 |               |                  | 2x350K5¼F           | CP/M            |                              | ●           | K5                           | British portable               |
| Kontron RSI 80                | £3,306        | Z80            | 4            | 64K          | 128K                             | 80x25                          | M                      |                   | 256x512            | W       | 16       | ●                | 2                    | 1            | 8                 |                 |               |                  | 2x303K5¼F           | Kontron         | Ba                           | ●           | K6                           | O/S CP/M based                 |
| Krypton 800 range             | £1,949        | Z80A           | 4            | 64K          | 256K                             | 80x24                          | M                      |                   | 80x24              | W       | 13       | ●                | 2                    | 1            | 8                 |                 |               |                  | 2x386K5¼F           | CP/M            |                              | ●           | T8                           | Fully definable characters     |
| Laser 200                     | £70           | Z80A           | 3.6          | 4K           | 64K                              | 32x16                          | TV                     | ●                 | 32x16              | C       |          | 1                |                      | 1            | 1                 | ●               |               |                  |                     |                 | Ba                           | ●           | C14                          | Cheap colour computer          |
| LSI M3                        | £2,064        | Z80            | 2.5          | 64K          |                                  | 80x24                          | M                      |                   | 80x24              | W       | 31       | ●                | 1                    | 1            |                   |                 |               |                  | 2x200K5¼F           | CP/M            |                              | ●           | L3                           | Big, British and CP/M          |
| LSI M4                        | £2,472        | 8088           | 5            | 128K         | 256K                             | 80x24                          | M                      |                   | 160x72             | W       | 31       | ●                | 2                    | 1            | 1                 |                 |               |                  | 2x400K5¼F           | CP/M 86, CP/M80 |                              | ●           | L3                           | Z80 for 8-bit software         |
| LSI Octopus                   | £2,353        | Z808, 8088     | 6.8          | 128K         | 768K                             | 132x29                         | M                      |                   | 720x340            | W       | 32       | ●                | 2                    | 1            | 1                 |                 |               |                  | 2x400K5¼F           | CP/M 86/80 Plus | Ba                           | ●           | L3                           | 20Mb model with 256K is £5,129 |
| Logica VTS Vitesse            | £2,863        | 8086           | 5            | 64K          | 256K                             | 80x24                          | M                      | ●                 | 640x288            | W       | 12       | ●                | 1                    | 1            | 4                 |                 |               |                  | 2x1Mb5¼F            | CP/M, MS-DOS    | Ba                           | ●           | L4                           | High-res colour graphics       |
| Magnum                        | £1,489        | Z80            | 4            | 64K          |                                  | 80x25                          | M                      |                   |                    | W       |          | ●                | 2                    |              |                   |                 |               |                  | 2x400K5¼F           | CP/M            |                              | ●           | I6                           | Inexpensive CP/M machine       |
| Memotech MTX 500              | £275          | Z80A           | 4            | 32K          | 512K                             | 24x40                          | TV                     | ●                 | 256x192            | W       | 16       | ●                | 2                    |              | ●                 |                 |               |                  | 2x500K5¼F           | MOS             | Ba, Noddy                    | ●           | M10                          | Nitty is Memotech's own lang.  |
| Merlin M2215                  | £2,742        | 8085           | 5            | 64K          |                                  | 80x24                          | M                      |                   | 24x80              | W       | 22       | ●                | 2                    |              | 2                 |                 |               |                  | 2x780K5¼F           | CP/M            | Ba                           | ●           | B7                           | Business computer              |
| Micro Five 1000               | £5,175        | 8088           | 8            | 128K         | 512K                             | 25x80                          | TvM                    |                   | 512x512            | W       | 20       | ●                | 10                   |              | 2                 |                 |               |                  | 2x1Mb5¼F+2x6.3Mb5¼H |                 |                              | ●           | F2                           | *Choose your own O/S           |
| Microdecision                 | £1,144        | Z80            | 4            | 64K          |                                  | 80x24                          | (M+)                   |                   |                    | *       |          | 2                |                      |              |                   |                 |               |                  | 1x200K5¼F           | CP/M            | Ba, Pilot                    | ●           | M9                           | *Terminal extra                |
| Microsolution British Genius  | £1,840        | Z80            | 4            | 64K          |                                  | 80x24                          | TvM                    |                   | 80x24              | W       | 21       | ●                | 1                    | 1            |                   |                 |               |                  | 2x160K5¼F           | CP/M            |                              | ●           | M4                           | *Genius by nature?             |
| Microtan 65                   | £389          | 6502           | 1            | 8K           | 48K                              | 25x64                          | (TvM+)                 |                   |                    | W       |          | ●                | 1                    | 2            |                   | ●               |               |                  |                     | Tanbug          | Ba                           | ●           | M8                           | PCN issue 26                   |
| Millbank SX10                 | £2,754        | Z80A           | 4            | 65K          | 256K                             | 80x25                          | M                      |                   | 80x25              | W       | 10       | ●                | 2                    |              | 1                 |                 |               |                  | 2x350K5¼F           | CP/M            | As                           | ●           | M5                           | Scientific applications        |
| Minstrel                      | £2,059        | Z80            | 4            | 64K          | 352K                             |                                |                        |                   |                    |         |          |                  | 2                    | 1            |                   |                 |               |                  | 2x400K5¼F           | CP/M opt        |                              | ●           | H4                           | Choose your terminal           |
| Monroe EC8800                 | £2,990        | Z80A           | 3            | 128K         |                                  | 40x24                          | M                      |                   | 240x240            | W       | 32       | ●                | 3                    | 3            |                   |                 |               |                  | 1x320K5¼F           | Monroe          | BaPaPilot                    | ●           | F3                           | Only 40-character screen       |
| Mupid 320-GB                  | £978          | Z80A           | 4            | 64K          | 128K                             | 40x24                          | Tv(M+)                 | ●                 | 320x240            | W       | 55       | ●                |                      | 1            | 2                 | 1               |               |                  | CP/M+               |                 | BaAs                         | ●           | P6                           | PCN issue 22                   |
| Nascom 2/3                    | £327          | Z80A           | 4            | 2K           | 64K                              | 16x48                          | Tv(M+)                 |                   | 48x96              | W       |          |                  | 1                    |              | 4                 | ●               |               |                  | NAS, SYS            |                 | BaAs                         | ●           | L5                           | Old reliable                   |



| Make and model              | Price inc. VAT | Processor type | Speed in MHz | Standard RAM | Max RAM - normally at extra cost | Display                        |                        | Graphics | Keyboard | Interfaces built-in |                    |                  |                      |             | Storage      |                   | Operating system | Languages inc        | Other languages available | Distributor | Comments |                                |                              |                               |
|-----------------------------|----------------|----------------|--------------|--------------|----------------------------------|--------------------------------|------------------------|----------|----------|---------------------|--------------------|------------------|----------------------|-------------|--------------|-------------------|------------------|----------------------|---------------------------|-------------|----------|--------------------------------|------------------------------|-------------------------------|
|                             |                |                |              |              |                                  | Max characters columns x lines | Method (at extra cost) |          |          | Colour capability   | Max dot resolution | Type of keyboard | No. of function keys | Numeric pad | No. of RS232 | No. of Centronics |                  |                      |                           |             |          | No. of IEEE 488                | No. of others                | No. of expansion slots        |
| NCR Decision Mate V         | £1,983         | Z80A           | 4            | 64K          | 512K                             | 24x80                          | M                      | ●        | 640x400  | W                   | 20                 | ●                |                      |             |              | 7                 |                  | 2x320K5¼F            | CP/M 80                   | Ba          | ●        | N3                             | PCV issue 8                  |                               |
| NEC PC8000                  | £1,454         | Z80            | 4            | 32K          | 64K                              | 80x25                          | M                      | ●        | 160x100  | W                   | 10                 | ●                | 2                    | 1           |              |                   |                  | 2x300K5¼F            | CP/M, NEC, DOS            | Ba          | ●        | N1                             | Superb colour graphics       |                               |
| NEC PC8001                  | £1,375         | Z80A           | 4            | 64K          |                                  | 80x24                          | M                      | ●        | 100x200  | W                   | 10                 | ●                |                      |             |              |                   | ●                | 2x144K5¼F            | CP/M                      | Ba          | N1       | Price includes twin disk drive |                              |                               |
| NEC-8201 A                  | £546           | 80C85          | 2.4          | 16K          | 64K                              | 40x8                           | LCD                    |          | 240x62   | W                   | 5                  | 1                | 1                    | 2           | 1            |                   |                  |                      |                           | Ba          | N1       | Portable PC, PCV issue 45      |                              |                               |
| Newbrain A                  | £269           | Z80A           | 4            | 32K          | 512K                             | 80x30                          | Tv(M++)                |          | 640x220  | C                   |                    |                  | 2                    | 1           |              | 1                 | ●                |                      | Cassette                  | Ba          | G3       | A lot of promise               |                              |                               |
| North Star Advantage        | £2,766         | Z80            | 4            | 64K          |                                  | 80x24                          | M                      |          | 640x240  | W                   | 15                 | 1                |                      |             |              |                   | 6                | 2x360K5¼F            | CP/M                      |             | ●        | T9                             | 16-bit option                |                               |
| OEM Orion                   | £3,392         | 8086           | 8            | 128K         | 896K                             | 80x25                          | TvM                    |          | 800x400  | W                   | 13                 | ●                | 11                   |             |              |                   | 6                | 2x500K5¼F            | CP/M 86                   | BaCo        | ●        | O5                             | *Full communications machine |                               |
| Olivetti M20                | £2,869         | Z8000          | 3            | 160K         | 512K                             | 80x25                          | M                      | ●        | 512x256  | W                   |                    | ●                | 1                    | 1           |              |                   | 5                | 2x320K5¼F            | PCOS                      | Ba          | ●        | B6                             | Real 16-bitter               |                               |
| Olivetti M10                | £494.50        | 80C85          | 2.4          | 8K           | 24K                              | 40x8                           | LCD                    |          | 240x64   | W                   | 12                 | ●                | 1                    | 1           |              | 2                 | 1                | ●                    |                           | Ba          |          |                                | B6                           | Portable PC, 24K version £544 |
| Olympia Boss Model A        | £2,645         | Z80A           | 4            | 64K          |                                  | 80x28                          | M                      | ●        | 80x28    | W                   | 10                 | ●                | 1                    |             |              |                   |                  | 2x140K5¼F            | CP/M                      |             | ●        | O1                             | Useful 28 lines on screen    |                               |
| Oric 1                      | £80            | 6502A          | 1            | 16K          | 48K                              | 40x28                          | Tv(M++)                | ●        | 240x200  | C                   |                    |                  |                      |             | 1            | 4                 |                  |                      | Cassette                  | Ba          | O2       | 4-colour printer opt           |                              |                               |
| Osborne 1                   | £1,581         | Z80            | 4            | 64K          |                                  | 104x24                         | M                      |          | 104x24   | W                   | 10                 | ●                | 1                    | 1           |              |                   |                  | 2x185K5¼F            | CP/M                      | Ba          | ●        | O3                             | Portable, includes software  |                               |
| Panasonic JD 800M           | £3,795         | 8085A          | 4            | 60K          |                                  | 80x24                          | M                      |          | 80x24    | W                   | 21                 | ●                | 3                    |             |              |                   |                  | 2x250K8F             | CP/M                      | Ba          | ●        | P1                             | Larger model costs £5,002    |                               |
| Pasca 640                   | £1,437         | Z80A           | 4            | 64K          |                                  | 80x24                          | M                      |          |          | W                   |                    | ●                | 1                    | 1           |              |                   |                  | 2x250K8F             | CP/M                      |             | ●        | W1                             | Regular CP/M micro           |                               |
| Pied Piper                  | £1,226         | Z80A           | 4            | 64K          |                                  | 80x24                          | Tv(M++)                |          |          | W                   | 36                 | 1                |                      |             |              |                   | 1                | 1x780K5¼F            | CP/M                      |             |          | S11                            | PCV issue 4                  |                               |
| Philips P3500               | £3,000         | Z80A           | 4            | 64K          | 320K                             | 80x25                          | M                      |          |          | W                   | 11                 | ●                | 2                    |             |              |                   |                  | 2x0.6Mb5¼F           | Turbo-DOS                 | Co          | ●        | P3                             | Fast O/S as standard         |                               |
| Powstron 900                | £1,259         | 6809           | 1            | 64K          | 256K                             |                                | (M++)                  |          |          |                     |                    |                  | 4                    | 1           |              |                   | 3                |                      | O/S 9                     | Ba          | ●        | P4                             | *You choose your terminal    |                               |
| Powertan Cortex             | £454           | 9995           | 12           | 64K          | 1Mb                              | 40x24                          | Tv(M++)                | ●        | 256x192  | W                   | 12                 | ●                | 1                    |             |              |                   |                  | ●                    |                           | BaAs        |          |                                | M2                           | Mainly sold as £340 kit       |
| Quantum 2000                | £2,587         | Z80A           | 4            | 64K          | 192K                             | 80x25                          | M                      |          | 160x75   | W                   | 18                 | ●                | 1                    | 1           |              |                   |                  | 3x860K5¼F            | CP/M                      |             | ●        | Q1                             | Mono, low-res graphics       |                               |
| Rair Black Box Model 3/20S  | £2,242         | 8085           | 5            | 64K          | 256K                             | 80x24                          | (M++)                  |          |          |                     |                    |                  | 2                    |             |              |                   | 8                | 2x1Mb5¼F             | CP/M                      | Ba          | ●        | R1                             | *VDU extra; many versions    |                               |
| Racal 6000                  | £6,327         | Z80            | 5            | 64K          | 256K                             | 80x26                          | M                      |          | 80x26    | W                   | 21                 | ●                | 1                    | 1           |              |                   |                  | 1x600K8F             | CP/M                      |             | ●        | R2                             | CP/M languages available     |                               |
| Research Machines 380Z      | £2,147         | Z80A           | 4            | 32K          | 56K                              | 40x24                          | Tv(M++)                |          |          | W                   | 1                  | 1                |                      |             |              | 4                 | ●                | 2x144K5¼F            | CP/M                      | Ba          | ●        | R3                             | Widely used in schools       |                               |
| Research Machines Link 480Z | £650           | Z80A           | 4            | 32K          | 256K                             | 40x24                          | 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            |                   |                  | 2x640K5¼F            | UCSD-P System             | BaAsPaFn    | ●        | T10                            | *Terminal extra              |                               |
| Sage IV                     | £5,962         | 68000          | 8            | 128K         | 1Mb                              |                                | (M++)                  | ●        |          |                     |                    |                  | 6                    | 1           | 1            |                   |                  | 2x640K5¼F + 1x6MbH5¼ | UCSD-P System             | PaBaFn      | ●        | T10                            | *Terminal own choice         |                               |
| Samurai                     | £2,754         | 8086           | 4.6          | 128K         | 768K                             | 80x25                          | M                      | ●        | 720x400  | W                   | 12                 | ●                | 3                    | 1           |              |                   | 3                | 2x1.2Mb8F            | MS DOS, CP/M 86           |             | ●        | M6                             | High-res colour graphics     |                               |
| Sanyo MBC 1000              | £1,195         | Z80A           | 4            | 64K          |                                  | 80x25                          | M                      |          | 80x25    | W                   | 17                 | ●                | 1                    | 1           |              |                   |                  | 1x320K5¼F            | CP/M                      | Ba          | ●        | L1                             | Standard CP/M model          |                               |
| Sanyo MBC 1250              | £2,294         | Z80            | 4            | 64K          |                                  | 80x40                          | M                      |          | 640x400  | W                   |                    | ●                | 1                    | 1           |              |                   |                  | 2x640K5¼F            | CP/M                      | Ba          | ●        | L1                             | High-res graphics            |                               |
| Sanyo MBC 2000              | £2,242         | 8085A          | 5            | 64K          |                                  | 80x24                          | M                      |          | 80x24    | W                   | 24                 | ●                | 2                    | 1           |              |                   | 2                | 2x328K5¼F            | CP/M                      | Ba          | ●        | L1                             | Big disk model costs £3,622  |                               |
| Sanyo MBC 4050              | £2,817         | 8086           | 5            | 128K         | 512K                             | 80x24                          | M                      |          | 80x24    | W                   |                    | ●                | 1                    | 1           |              |                   |                  | 2x640K5¼F            | CP/M 86                   | Ba          | ●        | L1                             | Pseudo 16-bit                |                               |
| Seed System 1               | £2,300         | 6800           | 2            | 32K          | 64K                              | 80x24                          | M                      |          | 80x24    | W                   | 3                  | ●                | 2                    |             |              |                   | 8                | 2x160K5¼F            | DOS 68 Flex               | Ba          | ●        | S3                             | Ageing business machine      |                               |
| Seed System 19              | £2,600         | 6809           | 2            | 48K          | 1Mb                              | 80x24                          | M                      |          |          | W                   | 3                  | ●                | 2                    |             |              |                   | 8                | 2x160K5¼F            | OS-9                      |             | ●        | S3                             | Latest from Seed             |                               |
| Sharp MZ80A                 | £347           | Z80            | 2            | 48K          |                                  | 40x25                          | M                      |          | 80x50    | W                   |                    | ●                |                      |             |              |                   |                  | ●                    | Sharp Basic               | Ba          | ●        | S4                             | CP/M facility extra          |                               |
| Sharp MZ80B                 | £900           | Z80A           | 4            | 64K          |                                  | 80x25                          | M                      |          | 320x200  | C                   | 10                 | ●                |                      |             |              |                   |                  | ●                    | Sharp Basic               | Ba          | ●        | S4                             | Unusual keyboard             |                               |
| Sharp MZ700                 | £250           | Z80A           | 4            | 64K          |                                  | 40x25                          | Tv(M++)                | ●        | 80x50    | W                   | 5                  | ●                |                      | 1           | 2            | 1                 |                  |                      | Sharp                     | Ba          | ●        | S4                             | PCV issue 27                 |                               |
| Sharp PC1251                | £79.95         | Cust.          | .58          | 4.2K         |                                  | LCD                            |                        |          | 24x1     | C                   | 18                 | ●                |                      |             |              |                   |                  | 1                    | ●                         | Sharp Basic | Ba       | S4                             | Pocket computer              |                               |
| Sharp PC1500                | £169           | Cust.          | 1.3          | 3.5K         | 11.5K                            | 26x1                           | LCD                    |          | 156x7    | C                   | 6                  | ●                | 1                    | 1           |              |                   | 2                | ●                    |                           | Cassette    | Ba       | S4                             | Optional 4-pen plotter       |                               |
| Sharp PC3201                | £2,300         | Z80A           | 2.6          | 64K          | 112K                             | 80x25                          | M                      |          | 160x50   | W                   | 10                 | ●                |                      |             |              |                   | 5                | 2x500K5¼F            | Sharp Basic               | Ba          | ●        | S4                             | Powerful Sharp Basic         |                               |
| Signet 10025                | £1,599         | Z80B           | 6            | 64K          |                                  | 80x24                          | M                      | ●        | 512x512  | W                   |                    | ●                | 2                    | 1           |              |                   |                  | 2x200K5¼F            | CP/M, Macnos              |             | ●        | S9                             | Choice of keyboards          |                               |
| Signet 2                    | £1,483         | Z80            | 4            | 64K          |                                  | 80x24                          | (M++)                  | ●        | 512x256  | W                   | 18                 | ●                | 2                    |             |              |                   |                  | 2x200K5¼F            | CP/M                      |             |          | S9                             | Multi-user system            |                               |
| Sinclair ZX81               | £40            | Z80A           | 1K           | 16K          |                                  | 32x24                          | Tv                     |          | 64x44    | C                   |                    |                  |                      |             |              |                   | 1                | ●                    |                           | Cassette    | Ba       | S5                             | Sold a million               |                               |
| Sinclair Spectrum           | £99            | Z80A           | 3.5          | 16K          | 48K                              | 32x24                          | Tv                     | ●        | 256x192  | C                   |                    |                  |                      |             |              |                   |                  | 1                    | ●                         | Cassette    | Ba       | ●                              | S5                           | PCV issue 14                  |
| Sinclair QL                 | £399           | 68000          | 7.5          | 128K         | 640K                             | 80x25                          | (M++) TV               | ●        | 512x256  | W                   | 5                  | ●                | 2                    |             |              | 4                 | 1                | 2x100K Microdrives   | QDOS                      | Sinclair S8 | ●        | S5                             | Micro that can be networked  |                               |
| Sirius I                    | £2,525         | 8088           | 5            | 128K         | 896K                             | 80x25                          | M                      |          | 800x400  | W                   | 7                  | ●                | 2                    | 1           |              |                   | 4                | 2x600K5¼F            | CP/M 86, MS-DOS           | Ba          | ●        | A7                             | IBM style                    |                               |
| Sord M5                     | £150           | Z80A           | 4            | 4K           | 16K                              | 40x24                          | Tv(M++)                | ●        | 256x196  | C                   |                    |                  |                      | 1           | 2            |                   |                  | ●                    |                           | Cassette    | Ba       | S6                             | PCV issue 12                 |                               |
| Sord M23                    | £1,932         | Z80A           | 4            | 128K         |                                  | 80x25                          | M                      | ●        |          | W                   | 14                 | ●                | 2                    | 1           |              | 2                 | 3                | 2x330K5¼F            | Sord O/S, SB80            | BaPips      | ●        | S6                             | CP/M compatible              |                               |
| Sord M23P                   | £2,369         | Z80A           | 4            | 128K         |                                  | 80x25                          | Tv(M++)                | ●        | 640x200  | W                   | 14                 | ●                | 2                    | 1           |              | 2                 | 2                | 2x290K3¼F            | Sord O/S, SB80            | BaPips      | ●        | S6                             | Complete with suitcase       |                               |



|                              |        |       |     |      |       |        |      |          |         |    |    |    |   |   |                       |                |                       |     |                         |                               |                            |
|------------------------------|--------|-------|-----|------|-------|--------|------|----------|---------|----|----|----|---|---|-----------------------|----------------|-----------------------|-----|-------------------------|-------------------------------|----------------------------|
| Sord M223                    | £3,277 | Z80   | 4   | 64K  | 80x25 | M      | ●    | 640x400  | W       | 15 | ●  | 2  | 1 | 4 | 2x350K5/4F            | Sord O.S. SB80 | BaPips                | ●   | S6                      | Standard business machine     |                            |
| Sord M243                    | £5,842 | Z80   | 4   | 192K | 80x25 | M      | ●    | 640x400  | W       | 15 | ●  | 4  | 1 | 4 | 2x1Mb8F               | Sord O.S. SB80 | BaPips                | ●   | S6                      | Large and powerful            |                            |
| SWTP SO9                     | £5,750 | 6809  | 2   | 256K | 1.2Mb | 80x24  | M    |          | W       | 15 | ●  | 1  | 1 |   | 2x1.5Mb5/4F           | Flex, Uniflex  | ●                     | S7  | Top end SWTP            |                               |                            |
| Sundance I                   | £6,969 | Z80A  | 4   | 64K  | 256K  | 132x24 | M    |          | W       | 4  | ●  | 1  | 1 | 1 | 1x7Mb5/4H             | CP/M           | Ba                    | ●   | S2                      | Ordinary CP/M machine         |                            |
| Superbrain JR                | £2,127 | Z80A  | 4   | 64K  | 80x24 | M      | ●    | 560x240  | W       | 2  | ●  | 2  |   | 1 | 2x160K5/4F            | CP/M           | Ba                    | ●   | I10                     | Bigger models available       |                            |
| Superstar                    | £6,296 | Z80   | 4   | 64K  | 80x24 | Tv(M+) | ●    | 80x24    | W       | 1  | ●  | 1  | 1 | 1 | 1x10Mb5/4H+1x400K5/4F | CP/M 80        | Ba                    | ●   | B7                      | Includes hard disk            |                            |
| Tandberg EC10                | £3,000 | 8080A | 2   | 64K  | 80x25 | M      | ●    |          | W       | ●  | 7  |    |   |   | 1x250K8F              | CP/M, TOS      | Ba                    | ●   | T3                      | Very early machine            |                            |
| Tandy TRS-80 Model III       | £1,299 | Z80A  | 2   | 48K  | 64x16 | M      | ●    | 128x48   | W       | ●  | 1  | 1  | 1 | 1 | 2x184K5/4F            | TRS-DOS        | Ba                    | ●   | T4                      | Standard TRS 80               |                            |
| Tandy TRS-80 Model 16        | £4,199 | 68000 | 8   | 128K | 512K  | 80x24  | M    |          | W       | 2  | ●  | 2  | 1 | 1 | 2x1.2Mb8F             | TRS-DOS        | BaAs                  | ●   | T4                      | True 16-bit                   |                            |
| Tandy TRS-80 Colour Computer | £1,180 | 6809E | 1   | 16K  | 32K   | 32x16  | Tv   | ●        | 256x192 | W  | 2  | ●  | 1 |   |                       | Cassette       | Ba                    | ●   | T4                      | Related to Dragon 32          |                            |
| Tandy TRS-80 PC4             | £50    | Cust. | N/A | 1/8K | 12x1  | LCD    | 12x1 |          | C       | 9  | ●  |    |   |   |                       | Cassette       | Ba                    | ●   | T4                      | Low-cost pocket computer      |                            |
| Tandy Model 4                | £861   | Z80A  | 2   | 16K  | 128K  | 80x24  | M    | ●        | 80x24   | W  | 10 | ●  | 1 | 1 | 1x187K5/4F            | TRS DOS        | Ba                    | ●   | T4                      | Floppies versions available   |                            |
| Tandy Model 100              | £499   | 8085  | 2.4 | 8K   | 32K   | 40x8   | LCD  | 240x62   | W       | 1  | ●  |    |   |   |                       |                | Ba                    | ●   | T4                      | Software built in             |                            |
| Tandy TRS-80 PC2             | £130   | Cust. | 1.3 | 2.6K | 16K   | 26x1   | LCD  | 156x7    | C       | 6  | ●  |    |   |   |                       | Cassette       | Ba                    | ●   | T4                      | Plotter available             |                            |
| Televideo TS-800 Series      | £1,495 | Z80A  | 4   | 64K  | 80x24 | M      | ●    | 80x24    | W       | 15 | ●  | 2  | 1 | 1 | 2x256K5/4F            | CP/M           | ●                     | C11 | Standard CP/M machine   |                               |                            |
| Televideo TS 1602-C          | £1,323 | 8088  | 5   | 128K | 256K  | 80x24  | M    | ●        | 576x424 | W  | 15 | ●  | 2 | 1 | 2x256K5/4F            | CP/M-86        | ●                     | C11 | Graphics, but no colour |                               |                            |
| Televideo TelePorta 1        | £1,955 | Z80A  | 4   | 64K  | 128K  | 24x80  | M    | ●        | 640x240 | W  | 10 | ●  | 1 | 1 | 2x500K5/4F            | CP/M2.2        | GSX 80                | M9  |                         | Networking capacity           |                            |
| Televideo TS 803H            | £3,478 | Z80A  | 4   | 64K  | 128K  | 24x80  | M    | ●        | 640x240 | W  | 16 | ●  | 2 | 1 | 1x10Mb5/4H+1x500K5/4F | CP/M 2.2       | GSX 80                | M9  |                         | Networking capacity           |                            |
| Televideo Morrow MD11        | £2,530 | Z80A  | 4   | 128K | 24x80 | M      | ●    | 9x12     | W       | 9  | ●  | 3  | 1 | 1 | 1x11Mb5/4H+400K5/4F   | CP/M+          | Ba, BaZ, Pi           | M9  |                         | Six software packages incl.   |                            |
| Tiger                        | £3,214 | Z80   | 4   | 62K  | 256K  | 80x24  | M    | ●        | 512x512 | W  | 10 | ●  | 1 | 1 | 3                     | 2x1Mb5/4F      | CP/M-86               | ●   | H5                      | PCV issue 36                  |                            |
| Ti Professional Computer     | £2,386 | 8088  | 5   | 64K  | 256K  | 80x25  | M    | ●        |         | W  | 12 | ●  |   |   | 1x320K5/4F            |                | ●                     | T5  | PCV issue 3             |                               |                            |
| Texas CC40                   | £180   | Cust. | 6K  | 18K  | 31x1  | LCD    | 31x1 |          | C       | 4  | ●  |    |   |   |                       |                | Ba                    | ●   | T5                      | Cartridge software available  |                            |
| TMK 332                      | £2,242 | 8085A | 5   | 64K  | 80x24 | M      | ●    | 190x96   | W       | 22 | ●  | 2  | 1 | 1 | 2x320K5/4F            | CP/M           | Ba                    | ●   | P5                      | '6502 I/O processor           |                            |
| Torch                        | £3,214 | Z80*  | 4/2 | 96K  | 80x30 | TvM    | ●    | 640x256  | W       | 15 | ●  | 1  | 1 | 4 | 2x400K5/4F            | CPN            | Ba                    | ●   | T6                      | CP/M compatible               |                            |
| Toshiba T-100                | £1,900 | Z80A  | 4   | 64K  | 96K   | 80x25  | TvM  | ●        | 640x200 | W  | 8  | ●  | 1 | 1 | 2                     | 2x256K5/4F     | CP/M                  | Ba  | ●                       | O4                            | Pro test issue 2           |
| Toshiba T-200                | £2,242 | 8085  | 2.6 | 64K  | 80x24 | M      | ●    | 80x24    | W       | 15 | ●  | 1  | 1 | 1 | 2x256K5/4F            | CP/M           | Ba                    | ●   | O4                      | Standard CP/M machine         |                            |
| Transam Truscan              | £1,983 | Z80A  | 4   | 64K  | 80x24 | TvM    | ●    | 640x288  | W       | ●  | 2  | 1  | 1 | 5 | 2x190K5/4F            | CP/M           | Ba                    | ●   | T7                      | S-100 machine                 |                            |
| Trifon 4                     | £5,744 | Z80A  | 4   | 64K  | 160K  | 80x24  | M    | ●        |         | W  | 8  | ●  | 1 | 1 | 3                     | 2x1.2Mb8F      | MPSL-BOS              | ●   | I11                     | Upgradable to Winchester disk |                            |
| Tulip 1                      | £1,150 | 8086  | 8   | 128K | 896K  | 80x24  | M    | ●        | 760x288 | W  | 16 | ●  | 1 | 1 | 6                     | 1x5.25K5/4F    | CP/M                  | Ba  | ●                       | N2                            | IBM PC software compatible |
| Vector 4                     | £3,852 | 8088  | 5   | 128K | 256K  | 80x24  | M    | ●        | 640x312 | W  | 15 | ●  | 1 | 1 | 2                     | 2x630K5/4F     | CP/M, CP/M 86         | Ba  | ●                       | A4                            | 8-bit and pseudo 16-bit    |
| Victor 9000                  | £2,754 | 8088  | 5   | 128K | 896K  | 80x25  | M    | ●        | 800x400 | W  | 7  | ●  | 2 | 1 | 4                     | 2x600K5/4F     | CP/M 86, MS-DOS       | Ba  | ●                       | D8                            | Same as Sirius 1           |
| Wang Professional            | £3,076 | 8086  | 8   | 128K | 256K  | 80x25  | M    | ●        | 800x300 | W  | 16 | ●  | 1 | 1 | 6                     | 2x360K5/4F     | MSDOS, CP/M80, USCDP  | Ba  | ●                       | W4                            | 8087 co-processor optional |
| Wilkes YD8110                | £4,025 | 8086  | 5   | 128K | 896K  | 80x24  | M    | ●        | 960x624 | W  | 21 | ●  |   | 6 | 2x1.2Mb8F             | CP/M 86        | Ba                    | ●   | W2                      | Standard CP/M machine         |                            |
| Xerox 820 Model II           | £2,415 | Z80A  | 4   | 64K  | 80x24 | M      | ●    | 1024x512 | W       | ●  | 2  | 2  | 2 | 2 | 2x160K5/4F            | CP/M           | ●                     | R4  | Powerful graphics       |                               |                            |
| Zenith ZF-120-22             | £2,978 | 8088  | 5   | 128K | 192K  | 80x25  | M    | ●        | 640x225 | W  | 18 | ●  | 2 | 1 | 5                     | 2x320K5/4F     | CP/M, MS-DOS, Z Basic | ●   | Z1                      | PCV issue 28                  |                            |
| Zeus 4                       | £5,400 | Z80   | 4   | 64K  | 320K  | 80x25  | (M+) | 80x25    | W       | 11 | ●  | 10 |   |   | 1x6Mb5/4H+1x250K5/4F  | CP/M, Muse     | As                    | ●   | M5                      | Designed as multi-user        |                            |

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## Laughline

Even in the chill grip of an icy winter the ink still flows through your pens and the ideas come pouring out of wherever it is that ideas come from. Thanks to everybody who entered the last Laughline competition. The short list that we eventually

assembled contained one reference to pists that couldn't be printed, a number of entries inspired by the Winter Olympics, and the winner, Jeremy Goodman of Derby, who possibly watches too much commercial television: "Sorry, sirs, but Milk Tray's out of stock."



## Loony lapses

It looks as though Prussian militarism is going through a rebirth — either that or the Guardian (February 21) has come up with a misprint.

And then there's the IBM-compatible version of Lisa that appeared to be in line for an award at the RITA ceremony at Birmingham last month. This Lisa, although it must have been a one-off, won the award against the odds. Shouldn't the IBM-memory be 1Mb?

The computer firm's move comes as a growing number of West German companies try to end their dependence on tanks for most of their funds.

## SANTAX ERRORS

Those who have tried the Reward routine for Arcade Games in issue 50's Microwaves, will not have found it very rewarding. Line 5 of the program should have read:

S COUNT = 025A - 49150

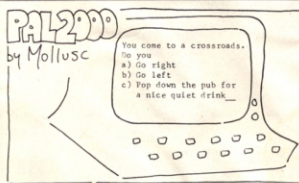
In our story last week about the Jupiter Ace we printed the wrong company name. Boldfield Ltd Computing are at Sussex House, Hobson Street, Cambridge.

## Next week

A malfunction in PCN's scheduling system caused this week's Next Week trailer to appear last week.

In English this means that we looked forward to issue 52 in last week's issue (50). Hence the magazine that you have in front of you, issue 51, went unheralded. We hope that you find it up to standard even without a few words in last week's issue to serve as an appetiser.

Next week, for those of you who still haven't adjusted your sets, is PCN's first birthday issue. That makes it PCN's readers' first birthday as well — happy birthday to you.



## 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                            |
|---|------------------|---|---------------------------------------|
| Educational Software Fair                 | March 2-3        | Dautsey's School, West Lavington, Devizes, Wilts                | P. Harris, Lavington 2446             |
| OEM Only Conference                       | March 7          | Hilton Hotel, London W1   | Tom Lewis, 01-994 6477                |
| Computer Trade Show                       | March 13-15      | Wembley Conference Centre, Middlesex                            | Reed Exhibitions, 01-643 8040         |
| Scottish Computer Conference              | March 13-15      | Holiday Inn, Glasgow  | Quadrilect, 01-242 8697               |
| Electron & BBC Micro User Show            | March 29-April 1 | New Horticultural Hall, Westminster, London                     | Susie Lipman 061-456 8383             |
| Computer Aided Design                     | April 3-5        | Met. Exhibition Hall  | Reed Exhibitions, 01-643 8040         |
| Artificial Intelligence Seminar           | April 7-8        | City University, London   | Warm Boot Ltd, 01-368 7561            |
| Sir Frederick Osborn School Computer Fair | April 8          | Sir Frederick Osborn School, Welwyn Garden City                 | Alan Henderson, Welwyn Garden 23367/8 |
| COMPEC WALES                              | April 10-12      | Cardiff University  | Reed Exhibitions, 01-643 8040         |
| Computers for Builders Exhibition         | April 12         | Cavendish Conference Centre, 82 New Cavendish Street, London W1 | A4 Publications Ltd., 088-385 2051    |
| Computers in Instrumentation Exhibition   | April 16-18      | Earls Court   | Reed Exhibitions, 01-864 8040         |

## OVERSEAS EVENTS

| Event  | Dates               | Venue             | Organisers  |
|--|---------------------|-------------------|---|
| Personal Business Computer Show                  | February 29-March 3 | Hong Kong         | Overseas Exhibition Services Ltd., 01-486 1951  |
| Personal Computer Show                           | March 14-17         | Sydney, Australia | ECL Ltd, 01-486 1951  |
| International Business Equipment & Computer Show | March 13-17         | Singapore         | International Business Centre Co. Ltd., 8F Hosoi Building, 15-7, 5-chome Honmachi, Higashi-ku, Osaka, Japan |

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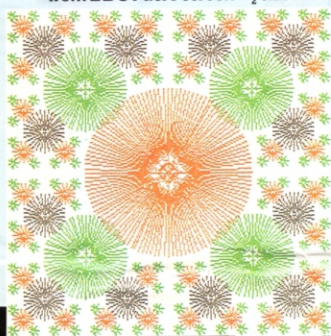
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