40p EVERY WEEK · DEC 15 1984 · No 91

PERSONAL Computer NEWS

40p EVERY WEEK

COMMODORE EXPRESS

A super-fast tape drive for half the cost of a disk

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Put a little fizz in your bubble sorts - p12

COMMODORE + EPSON
Free machine code printer driver - p16

ONE FOR ALL
Is Data General's portable really The One? - p42

CREATIVE QL
Get serious with BCPL for your Sinclair - p63

GAMES COMPENDIUM

Pull-out guide to the best in computer entertainment

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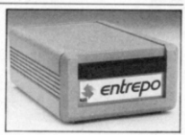
MENU

COVER STORY

Enter ENTREPO 26

If patience is a virtue, Commodore owners become more virtuous every time they load a program. The Entrepo Quick Data Drive, with its tape wafers, aims to fill the gap between tape and disk — we put it through some time trials.



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MONITOR

Enterprise hits the streets

The moment of truth has arrived for Enterprise, the longest-running soap opera never to be televised.

If you've been patiently saving up over the last 15 months to buy an Enterprise 64 you may be able to snap one up before Christmas as the machines are now available in limited quantities.

As of this week, 3,000 of the £249 machines should be in some shops, with four software packages selling at £5.95 each. The packages are Dictator, Five in a Row, and two games packs.

In addition, Quicksilva has produced a games designer and a sprite editor to sell at about £7.

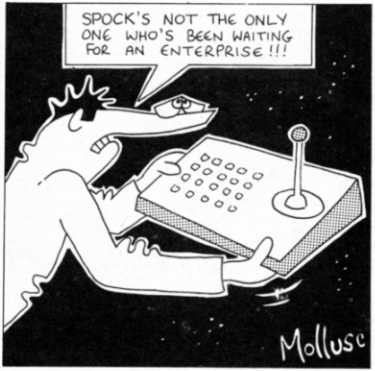
Mike Shirley, marketing manager of Enterprise Computer said: 'The reason we've produced only 3,000 machines before Christmas is for quality control purposes. We want to make sure that the Enterprise is reliable and good.

'By mid-February 1985 we shall be going into full scale production.'

Through the long months of non-production, when the marketing manager's job must have been the cushiest in the UK, Enterprise has been making plans. In addition to the UK market, it intends to hit the European market in a big way.

In the light of its track record, these and other plans are hostages to fortune. Here, for the record, is the Enterprise development schedule:

- The company is now geared up to launch its 128K follow-up machine in two months time; this will sell for £330. In addition it has a number of add-ons in the pipeline.
- By February 1985 it will unveil a printer and monitor.
- In June it will have a RAM pack and a base unit — which is an interface to hook up a disk.



Infocom takes a more serious role

The company that brought you Zork, Sorcerer, and a string of excellent mysteries has turned serious. Infocom has released Cornerstone, a relational database for the IBM PC.

Demonstrating a remarkable talent for comparing apples with pears Infocom claims that Zork has outsold 1-2-3. Perhaps this success has spurred it to take on 1-2-3 on its own terms. Cornerstone is for business users who have no programming experience — not as flashy as the integrated packages, it offers a style of data handling that has proved itself in the minicomputer field as being easy to use.

Infocom says that it can be used with packages like 1-2-3 and Wordstar, but there's no hint as to when you might be able to use it to juggle the clues from the interactive fiction games that made the company's name.

The ray of hope for Infocom fans is that the company isn't turning its back on fiction — The Hitchhiker's Guide to the Galaxy appeared in the US in November.

MONITOR

IN BRIEF

Budget software producer Atlantis, based in the lost continent of Islington, has launched eight new Spectrum games for Christmas, all costing £1.99. The titles include Marie Celeste, a science-fiction graphic adventure, The Thinker, a block puzzle, and a Spectrum version of Atlantis' Commodore game, Connect Four.

The final chapter of the Imagine story will be written this week when the remains of the software house's assets come under the hammer. Up for bids will be a formidable array of micros — including 15 Sage systems, a Mac and a Lisa — and no fewer than 48 screens.

Cottage industry sounds like an attractive way of making a living, but don't hand in your notice yet. According to a report from the Low Pay Unit home computer workers are better paid than others in jobs like tailoring or toymaking, but much worse off than if they worked in an office. Individual rates vary between 10p and £13.75 an hour.

Business software specialist Systematics has re-written its accounting packages for the BBC micro. Selling in pairs (Sales/purchase ledger, stock control/invoicing), the software costs £89.

WH Smith has opened two more Business Computer Centres. The new stores are in Hounslow and Reading. Three more are planned to open next spring, with the intention of having 40 or 50 within four years.

Micronet 800 has gone on the air in Hong Kong and Scandinavia, and the operators of the viewdata service plan eventually to expand to Australia and the US.

Database Software, producer of the mini-priced Mini Office software, has made its £5.95 suite available to Spectrum owners. The Mini Office system, a modest collection of word processing, data handling, calculation and graphics, is said by Database to be outselling games in some retailers' charts.

British technology companies have pierced the Bamboo curtain in a $50 million deal to help China develop its computer and electronics industries. According to a member of the UK negotiating team, British sensitivity won the day where US and Japanese high pressure approaches failed.

Electronic greetings from Mr MSX

Kay Nishi, the brains behind MSX, was in London changing planes ten days ago. He'd just come from seeing Philips in Eindhoven, and was batting off in the general direction of Anchorage/Seattle, presumably to see Boeing about MSX standard 747s, but his minders from Microsoft had allowed him an overnight stop, so he drew breath to give an interview.

It's difficult to overestimate Kay's importance to Japan Inc's microcomputer arm. If MSX was anybody's idea it was his, and if anyone can be said to be in control of how MSX is going to develop, then it's Kay Nishi.

The chip for the second generation MSX machines, for example, will have to be decided on fairly soon, and the flower of Japan's electronic industry, plus upwards of ten fellow-travellers, will be going with it. Tens of millions of dollars will be riding on the choice and, says Kay, 'I'll probably decide in January.' You couldn't be sure he was joking, either . . .

The current generation of MSX machines doesn't look like sweeping the country this Christmas and it's doubtful whether they'll get anywhere near the manufacturer's projected market share. But Kay professes to be happy with the response they're getting from customers, and reckons on a three to four year period before the standard's established. By 'established' he means the machines being accepted in the home in the same way that phones and TVs are accepted. But it's his thoughts about the next generation, and developments of the current generation, that are most interesting.

The machines currently in the shops are pricey, but although we're not liable to see reductions this Christmas they could work out a lot cheaper by Christmas '85. And one of the main engines that will drive down prices will be custom VLSI (Very Large Scale Integration) chips.

Today's MSX machines have more than 15 LSI (Large Scale Integration) chips inside them, and although the development costs are horrendous, putting all these on one VLSI will in the long run bring costs way down. From the MSX companies' point of view it's a shrewd move, because it allows them to use their financial muscle to leapfrog smaller companies — Sinclair Research, for example.

Development of the first of the VLSIs is now complete, and we should be seeing them in MSX machines next autumn. Prices won't be down to the $100 dollar mark that's becoming the vogue in Japan, but it shouldn't be too difficult to cut them to around £150.

Kay Nishi: Mr MSX in town with hints about the standard's future.

Custom chips will also play an important part in MSX 2. Kay won't talk about the next generation yet, but it's easy to see the way he's thinking. He defends MSX against the 'old technology' criticism by pointing at music — 'Hey! Mozart wrote symphonies over a hundred years ago, and I can still understand them'. He also offers the more relevant example of Intel.

Intel's success, he says, has been based on the fact that its chips are compatible, whether 8088, 8086, 80186 or 80286. So the next MSX machines will run the Zilog Z8000? Definitely not, he says — he'll be looking at Intel or Motorola, and by the dreamy look that comes into his eye when he says 68000 you can guess what it's going to be.

But that's not the whole story. MSX 2 may be going 16-bit, or it may jump straight to 32, and to maintain compatibility with the current generation of machines it will need some sort of Z80 chip built into it. Kay suggests that a custom chip involving a merger between the Z80 and 68000 is a solution.

In the medium term MSX will be following the example of phone and TV networks by getting itself wired. We'll be seeing a Prestel link some time next year, but the big difference between this and current systems will be the fact that it introduces graphics mail. The idea of people being able to send electronic Christmas cards plainly excites him.

Part and parcel of this will be videotex and light-pen circuitry integrated in MSX graphics, so an enhanced video chip is on the cards. And next year we should also be seeing the product of his visit to Eindhoven.

Philips and Sony are currently working on a compact disk interface for MSX, scheduled for September/October, and giving 550Mb of storage.

Straight disks are also on the cards — but then they would be with Sony and Hitachi involved. These two companies will probably battle it out over the rival 3in and 3.5in format, but it would appear MSX will be available on practically all disk formats.

One interesting idea involves integrating home MSX machines into businesses by allowing you to swap data disks between your office and your home machines. You could work on Wordstar in the office, for example, then pluck your disk out and carry on using your MSXDOS version of Wordstar at home.

The fascinating thing about this is that the MSX machines, being 8-bit, will have to be upgradeable in the direction of CP/M, which is of course a product of Digital Research, Microsoft's arch-rival. If Microsoft doesn't want to wind up paying DR licence fees it's going to have to think hard about making MSX 2 MSDOS compatible. When you add to this a range of home control systems (arriving in about six months), Kay's belief that MSX will be selling to a market untouched by today's micro manufacturers starts to look plausible.

Eventually, he says, people will be buying MSX micros and they won't even know they're micros. Back to that 747 interface?

John Lettice

MONITOR

Sharp makes a point with MZ800 launch

Sharp is ready to make its mark on 1985 with the launch of a follow-up to the MZ700 home micro.

The MZ800, to appear at the Which Computer? Show in January, takes Sharp into the area occupied by the Commodore Plus/4 and the Sinclair QL, straddling the borderline between business and home use. But unlike both those systems it will offer CP/M.

Sharp has included MZ700-compatibility through a simple switch. But according to a software developer using the machine not all MZ700 software will run, and joystick commands are particularly vulnerable.

But it is where the new machine advances from the MZ700 that it shows the most promise. The Basic is still loaded, but a 2.8in Quick Disk option has been added. The sound capacity is greatly enhanced, and the graphics are said to be much better. The machine will also support up to four 5.25in floppies.

This disk option includes Personal CP/M with extensions to permit the system to read and write various disk formats. These include IBM; the MZ800 isn't an IBM clone but Sharp offers the feature as typical of a business computer for use in the home.

The engine room, as with the MZ700, is a Z80 with 64K of RAM, 16K of video RAM, and 16K of ROM.

Sharp plans to have machines ready to demonstrate at the January show and is putting the finishing touches to applications software at the moment.

The company would not put a price on the MZ800 last week but a spokesman said that it would be possible to put together a business system with disks and monitor for well under £1,000.

Meanwhile Sharp is staying aloof from the MSX race. It has a licence but has so far shown no sign of using it. However, the Japanese micro-electronics industry is such that nobody stays completely on the sidelines — Sharp is making money out of MSX by supplying chips to the MSX machine manufacturers.

KEY FEATURE — The most distinctive of the MSX micros to arrive in the UK was launched last week by Yamaha. The CX5 combines the standard micro with an FM sound synthesiser, so that the array of ports at the back of the machine includes in and out sockets for Midi (musical instrument digital interface) devices. With a small keyboard the CX5 costs £534; the larger keyboard lifts it to £614. A 9K RAM expansion costs £65, and various items of ROM software for musicians cost £36 each.

We know we're tops — now you do too

Here at *PCN* we're staking our claim to the title 'Best magazine for computer hobbyists'. The grounds for this unusual lack of modesty are the recent computer magazine awards organised by Times Newspapers and Hewlett-Packard.

In the awards, for 'excellence in computer journalism', *Personal Computer News* picked up three nominations — more than any other magazine — for best magazine, best designed magazine, and feature writer of the year, the latter in the guise of John Lettice.

Not only did we have the most nominations, but in the best magazine category we were the only hobbyist magazine. The other two nominees were *Computing*, one of *PCN*'s sister magazines, and *Microscope*. Both are controlled circulation which means you read them by invitation only.

The winners were: best magazine, *Microscope*; best designed magazine, *PC*; feature writer, Caroline Berman of *Computing*; news writer, Lisa Israel of *Computer News* (no relation).

While we didn't exactly win anything, we're prepared to forgive the judges this remarkable oversight and put it down to a desire to be highbrow on their awards debut. Next year we hope for a victory for common sense . . .

VIEW FROM JAPAN

Putting a tax on high technology

Since my last column was about artificial intelligence it seems somehow fitting to lead this one off with a few words about lack of intelligence.

The Japanese Government, in its infinite wisdom, has seen fit to propose the imposition of a five per cent tax on office automation equipment — word processors, facsimile machines, personal computers and the like — whether purchased for commercial or private use.

It isn't so long ago that this same Government held back the proliferation (or at least, the meaningful proliferation) of personal computers by imposing a stiff tax on disk storage units. This in turn held back several other developments, notably of sensible software so that users were soon awash in games, cassette-loaded word processors, and simple home-budget programs. These were all clumsy to load and operate, and they made the storage and manipulation of data some kind of joke.

Now it looks like the Government will go out of its way to make all sorts of small businesses think twice about introducing the hardware they need to bring their offices into the twentieth century. And by inhibiting the growth of a good user base, it will also inhibit the development of decent software. The price of available software will probably be driven up, and those enterprising spirits that do automate may be forced to participate in a little clandestine piracy.

Naturally the proponents of lining the Government's coffers has got the manufacturers rather concerned. There were hopes that they would have sufficient clout to prevent the tax from being imposed — it is still at the proposal stage — but if they aren't successful, overseas markets will appear all the more attractive to the growing Japanese productive capacity.

Here's an example, if you needed one, of how domestic policies spread outwards until the ripples here turn into a tidal wave somewhere on the other side of the world. A five per cent tax on office automation equipment is just a revenue earner for the Japanese government — it doesn't seriously want to discourage automation. But the upshot in overseas markets could be an unwelcome increase in Japanese imports, something that most Western countries seem to have more than enough of as it is.

Not that the Japanese are putting their computers to their most productive use. From the new Seipa department store recently opened in the Ginza, rumours of computer-assisted shopping are spreading. For a month or so my wife and I managed to resist the temptation to see for ourselves, but you can't ignore the onward and irresistible march of technology for long.

What a disappointment . . .

The system consists of a touch-screen with a simple menu offering directions in a choice of Japanese, English, and French. Why French? Why not? It's a beautiful language.

The subsequent screen offers floor and wares information, followed by entertainment and establishment details. By now the novelty of touching the screen has worn off and you notice suddenly how slow the system is. By the time it searches its database and refreshes the screen you can forget what it was you were asking about.

Needless to say, a map would be more helpful and an information desk staffed by beautiful young things would be a great deal more pleasant, but the screen's final message had some redeeming charm: 'Please look above the wares with relaxation in this store.'

I saw no other information, nor directions to the other computer in use in the store. But an old nagging question was answered. In a previous column I mentioned that I'd love to have a colour printer but have no idea what I'd do with one. In Seipa some enterprising employee has implemented a graphics program on an anonymous personal computer with incredible colour graphics, a mouse, and a colour ink-jet printer. For ¥300 (about £1) you can select one from some 50 designs, compose a short message in Japanese or English to be integrated into the design, and then watch as your personalised Christmas card is printed out.

Somehow I resisted the temptation to buy, probably because there were a dozen or so people in the line before me. But at least now I know, if and when I get a colour printer, how I'm going to pay for it — even if I do have to charge an extra ¥15 apiece, if the geniuses in the Government get their way.

Serge Powell

MONITOR

Atari set to blossom under Tramiel touch

Jack Tramiel flew into London last week to put the finishing touches to the Great Atari Facelift. Through his skilled surgeon's art, the dowdy, frumpish and sickening corporation has been transformed into a vivacious debutante — all that remains is its coming-out party.

This is due to take place in January when Atari will flood the US Consumer Electronics Show with new machines and peripherals.

There will be four new families, covering games consoles, 8-bit micros, 16-bit systems for

Jack Tramiel: billion dollar brain.

about £300, and in April, 32-bit workstations for less than £1,000. The revamp of the company will be confirmed by the revamping of its products — even the 800XL is due for a facelift.

The 32-bit systems, built around Nat Semi's 32032, will be designed for professional users. 'We sell computers to people who know computers,' said Tramiel.

Tramiel spoke in detail about the 16-bit machines. They'll have a proprietary operating system developed jointly by Atari and Digital Research, with DR's GEM software (issue 89) in the forefront. 'I do not compete with IBM,' Tramiel declared. He dismissed Apple's Macintosh as a system suitable for boutique owners, but a £300 Mac-lookalike should bring Atari up against almost everybody.

The operating system won't be Apple or IBM-compatible, and Tramiel admitted that there won't be many applications immediately. That doesn't seem to worry him. Atari generally gives the impression that there isn't a cloud on the horizon these days.

Even the financial outlook is rosy. Tramiel expects Atari to turn over $1 billion next year. It is breaking even at the moment, he said, and was having no difficulty raising extra cash. 'You have to deal with investors who know the business,' he said.

To games console users he gave a commitment that Atari was staying in that business, and on the subject of Atarisoft he commented: 'It's healthy and alive, and we've added new products.' These include software and peripherals.

Acorn retreats from US market

Acorn has done a U-turn in the US, paring its operation there to the bone.

Competing with the big boys on their home ground proved too much. Fierce price-cutting and big money spending on advertising pushed Acorn out into the cold.

It was about a year ago that Chris Curry, Acorn's managing director, took his British-made computer across the Atlantic.

At the time Curry revealed that he expected to lose several million dollars in the first two years of operations, but thereafter reap substantial earnings.

Unfortunately things didn't go according to plan and the BBC micro just didn't take off. A spokesman for Acorn admitted: 'Sales were poor.

'Monthly sales weren't rising quickly enough to justify further investment in the venture. The company couldn't achieve the revenues and profits it wanted — so the operations have been reduced to 20 per cent.'

What this lower level of activity means is that the company has had to close its Boston warehouse and will make most of its 40 administrative and marketing staff redundant. However, it will maintain its small research facility in Palo Alto, California.

As it stands, the US operation is being reduced to about five staff who will service customers. But Acorn feels that there is still a chance it will return to the US market with a bit more confidence.

Dancing on the head of a pin

Imagine angels dancing on the head of a pin — that's how the computer market appears according to a survey from the National Computing Centre in Manchester.

There were 434 single user systems and 252 multi-user machines fighting for a share of the market in November. And in terms of add-ons users definitely wouldn't be starved of choice with 314 monitors, 205 matrix printers, 86 daisy-wheels and 109 others to choose from.

When it comes to single-user software, competition isn't so stiff. There were 1,545 packages available under CP/M-80, 1,006 for CP/M-86, 1,372 for MSDOS and 1,010 for PCDOS.

In comparison, the multi-user software market was empty. Only 317 packages were marketed in the UK under Unix, 324 under MP/M-80 and 258 under MP/M-86.

The NCC's census also took in training courses — there were a mere 1,353 short courses on offer at the beginning of November.

CARPET CRAWLER — Hero Jr is a new toy robot from Maplin. He/it has a built-in personality and will roam around the house singing songs, playing games, and muttering about his diodes. At £1,099 ready built, Hero Jr, the sibling of Hero I, is little more than an expensive toy. It is being sold by Harrods in a special package for £1,495 and by Maplin for £599 in kit form which includes some software.

Peace move brings further Advance

Advance Technology has made its peace with IBM and will include a new, inoffensive Bios ROM in future models of the 86b.

Ferranti, which builds the machine, has designed the new ROM and a spokesman said that the Advance 'is still compatible, in fact probably more so'. The earlier Advance went into retreat this summer when IBM objected to the extent of its IBM PC-compatibility.

WH Smith will continue to sell the 86b, but now at the reduced price of £1,086 (excluding VAT). A RAM expansion module of 128K is also on sale, for £70.

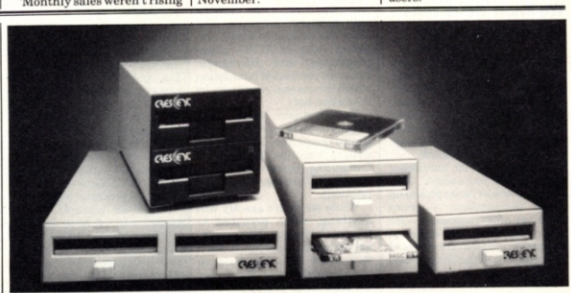
Ferranti, meanwhile, will increase its involvement with the Advance machine by moving into marketing on its own account. It is putting together a dealer network to handle sales to business and professional users.

Crescent drives disk prices down

Crescent is the name of a new range of 3in disk drives for the Beeb that come with their own DFS. Produced by a company called Servicon Dynamics (0242-528213), the 40/80 track Crescent 401 costs £149 and the dual head 40/80 track 402 is £228.

Both have 500K unformatted and 400K formatted. They will be available in January 1985.

If you buy a Crescent drive, you are also eligible to join its Inner Circle Club. Membership is £25 a year — in return you get a news bulletin and five games on disk every three months.



Crescent — disk drives for the BBC with their own DFS for less money.

HOMEFRONT

Wanted: One cheap Spanish language kit

One by one the walking wounded of the micro business are being wheeled out of the casualty ward — presumably to make room for next year's lot.

Osborne led the way, followed in the last two weeks by Victor. These are interesting in a distant sort of way — Osborne and Sirius users have had some anxious moments, but arrangements have been made to tide them over their suppliers' hard times.

The next computer to be rehabilitated could be the Dragon, one of this year's leading wingless wonders. Dragon Data, you may remember, passed its manufacturing rights into the hands of Eurohard of Spain in the summer (issue 74). The apes didn't leave the Rock.

At the time, we reported that there was a strong possibility that el Dragon home computer would become the BBC micro of Spain. The plan was to have it adopted by a Spanish TV company, so that the Dragon would be the accepted vehicle of computer literacy reigning in Spain. Eurohard, certain of government backing on a local level, expected to win central government support for the plan.

The implications for faithful UK Dragon users are clear. If their micro wins the backing of government and broadcasting organisations, with the further possibility of high education sales as a spin-off, they need never feel like poor relations (pobre tios) again. They may have to learn mucho Spanish fairly pronto, but software, hardware and periferales should flow back into the shops like vino corriente.

Faithful UK Dragon users should not count their chiquitas before they're hatched. Although Eurohard exudes confidence, and some UK Dragon specialists are today more perky than for several months, there are several rios to cross.

First: although Dragon machines have been seen at a recent Madrid exhibition, no Spanish keyboard was in evidence. Spanish has fewer peculiarities than many alphabets — a matter of a tilde (~) here and an upside-down question mark there — but the lack of a suitable keyboard won't endear the machine to the leaders of Spain's educational establishments.

Second: people who know the Spanish market hit at the possibility of Spanish TV hedging its bets by adopting more than one machine. This is reflected in the attitudes towards micros in schools; the Spanish education authorities, while recognising that 8-bit micros are reasonably cheap (though still not two a peseta), may try for more sophisticated IBM PC-like systems where they can.

Third: outside Eurohard, the Dragon is rarely seen as a home-grown micro, more as somebody else's cast-off.

Fourth: outside Eurohard, the Spanish market is well supplied by the likes of Sinclair, Acorn, Commodore and others. If el Dragon (probably a Dragon 64 with disk drives) took on the BBC micro's mantle in Spain, it would hardly have the advantages that the BBC micro had in this country some three years ago. Apart from the mutual benefits enjoyed by the BBC micro and the micro awareness schemes of the time, the BBC didn't have to take on well-established suppliers to a well-established games market. The Dragon has already been down this road once.

This is not to say that the outlook is bleak for faithful UK Dragon users — and it might be worthwhile for Newbrain owners to start lobbying the Dutch to make the Newbrain their TV micro. But you shouldn't expect an overnight transformation.

If the Dragon is taken on by Spanish television, Dragon support organisations all over Britain will get a shot in the arm. Users may find that the first evidence of the reborn Dragon will be tortilla recipes on cassette and 1,001 things to do with maracas, but eventually the machine should begin to carve out a future.

How far that will affect the Dragon 32 is open to question. It looks more likely at the moment that the 32 will gradually be phased out, and that an enhanced version of the 64 will appear to carry the range forward. It shouldn't make very much difference in the long run. If the name of Dragon undergoes a renaissance, Dragon owners of all shapes and sizes should benefit.

David Guest

CHARTS

As featured on Radio 1's Saturday morning Chip Shop.

GAMES

TW	LW	TITLE	PUBLISHER	MACHINE	PRICE
1	2	Knight Lore	Ultimate	SP	£9.95
2	1	Ghost Busters	Activision	C64	£10.00
3	—	Staff of Karnath	Ultimate	C64	£9.95
4	9	Doomdark's Rev.	Beyond	SP	£9.95
5	6	D T's Decathlon	Ocean	SP, C64	£6.90
6	3	Underwurld	Ultimate	SP	£9.95
7	5	Elite	Acornsoft	AC	£15.00
8	13	Cyclone	Vortex	SP	£6.95
9	14	Skooldaze	Microprose	SP	£6.95
10	—	3D Star Strike	Real Time	SP	£5.95
11	4	Raid over Moscow	US Gold	C64	£9.95
12	10	Pyjamerama	Microgen	SP, C64	£6.95
13	12	Eureka	Domark	SP, C64	£14.95
14	—	Blue Max	US Gold	C64	£9.95
15	—	Booty	Firebird	SP, C64	£2.50
16	—	Fall Guy	Elite	SP	£6.95
17	16	Select 1	Comp. Records	SP, C64	£12.49
18	—	Match Day	Ocean	SP	£6.90
19	—	Sabre Wulf	Ultimate	SP, AC	£9.95
20	—	Return to Eden	Level 9	Various	£9.95

SPECTRUM

TW	TITLE	PRICE
1	Knight Lore	£9.95
2	Doomdarks Rev.	£9.95
3	Underwurld	£9.95
4	Cyclone	£6.95
5	DT's Decathlon	£6.90
6	Skooldaze	£6.95
7	3D Star Strike	£5.95
8	Fall Guy	£6.95
9	Booty	£2.50
10	Match Day	£6.90

COMMODORE

TW	TITLE	PRICE
1	Ghost Busters	£9.99
2	Staff of Karnath	£9.95
3	DT's Decathlon	£6.90
4	Blue Max	£9.95
5	Select 1	£12.49
6	Pyjamerama	£6.95
7	Suicide Express	£9.95
8	Int. Soccer	£9.95
9	Eureka	£14.95
10	Booty	£2.50

MICROS

BELOW £1,000

TW	MACHINE	PRICE
1	CBM 64	£199
2	Spectrum	£125
3	Electron	£199
4	Amstrad	£349
5	BBC B	£399
6	Spectrum Plus	£175
7	CBM 16	£140
8	Atari 800XL	£140
9	MSX (series)	£275
10	Memotech	£199

ABOVE £1,000

TW	MACHINE	PRICE
1	IBM PC/XT	£2,390
2	ACT Apricot	£1,760
3	Compaq	£1,795
4	Olivetti M24	£1,595
5	Televideo TS1603	£2,640
6	DEC Rainbow	£2,359
7	NCR Dec Mate V	£1,984
8	Apple III	£2,755
9	ACT Sirius	£2,525
10	Macintosh	£1,795

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets during the week up to **December 5**. The games chart is updated every week. The prices quoted are for the no-frills model and include VAT. Information for the top-selling micros is culled from retailers and dealers throughout the country and is updated every month. PCN Charts are compiled exclusively for us by RAM/C, who can be contacted on 01-892 6596.

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A note from the author...

When I began, the pathways were simple and safe, but soon the program was designing them itself. They became dark and frightening places. I set the computer add 'games' to the pathways, and with sinister efficiency it created thousands.

Survival was an impossibility, and my computer hated me for my weakness. I frantically programmed 30 'beacons' into the pathways, and survival became possible. A surprise at 30,000 points? I never found out - the pathways got me everytime. Someone, somewhere must make it to that 30th beacon, and the pathways shall then be conquered.

Andrew Moore, November, 1984.

FOR THE 48K ORIC-1 & ORIC ATMOS **£8.50**

DAMBUSTER

This superb flight simulator game challenges you to become the pilot of a Lancaster Bomber, whose mission is to destroy 3 dams with the famous 'bouncing bombs'.

The author, Pete Beckett, is a professional flight simulation programmer with an international aerospace company. His program, written in machine code for fantastic action and realism, represents the ultimate in real time interactive flight simulation games for the Oric range of micros.

Avoid the flak and navigate your bomber using the highly realistic three dimensional real time display. When your position,altitude,speed,and direction are correct, release the bomb - if you dare!

To help you on your way are navigational maps, comprehensive instrumentation and ILS, should you need them. Flight control is via keyboard, or joystick (with ORIC/UK Interface).

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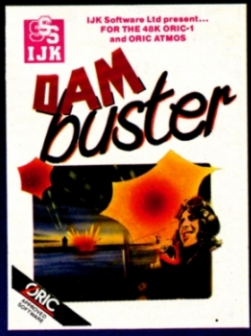

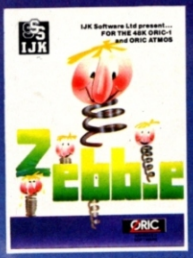

FOR THE 48K ORIC-1 & ORIC ATMOS **£7.50**

ZEBBLE

A tremendous new scrolling arcade style game in which you control Zebble by rolling up, hopping and bouncing him from level to level, collecting bonus points, spray cans, oil slicks, etc., etc. as you go. A new concept in game control, Zebble can be moved along the levels, and can also jump from level to level by pressing the jump button then releasing it when the required jump energy is achieved.

An original 100% machine code arcade game which presents a great challenge to even the seasoned campaigner with over 20 different stages and six bonus stages giving over 70 screens in total. Works with keyboard (or joystick using the ORIC/UK Interface).

CRIBBAGE

The very popular card game faithfully reproduced for your Oric computer. Full instructions are included in the program, which has several skill levels to match anyone from novice to champion.

Excellent programming combine with the computers superb high resolution graphics to present a first class representation of this all round favourite.

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Sir Clive — 'MSX won't beat us'

I found the Home Front article by Ralph Bancroft (issue 90) very interesting. He has a strong point about the need to make computers truly useful.

We have always insisted that the current generation of machines are excellent learning tools, as they are designed to be, and great for playing games, but that true functionality would depend on creative programming and possibly future generations of machine.

Why, though, does Ralph feel that the Japanese are going to grind us into the ground? MSX is only just appearing and is about where we were three years ago in technical terms. And there is certainly no MSX II next year because they would be working on it now. If anyone has got it wrong it is the Japanese.

It is worth remembering that we, Sinclair Research, make more computers than *all* the Japanese manufacturers put together, despite the fact that they have been trying to flog MSX machines to their enormous home market for two years.

Meanwhile we in Britain have been taking the next step. Our QL is an example of this and the labs are not exactly idle, not that I am going to tell you what they are up to, of course.

Please don't imagine that we are complacent. We realise that we have to run very fast to stay ahead, but equally we are determined to do so and confident that we shall succeed.

Clive Sinclair
Chairman, Sinclair Research

Memotech is its own worst enemy

I agree with your outline of the Memotech machine in *PCN*'s hardware buyers' guide (issue 89). Memotech is its own worst enemy. Its hardware is outstanding in construction and capabilities but the documentation, while attractively produced, is notable for its omissions rather than content or clarity. Many useful features have become apparent only by accident, or by reading Ian Sinclair's *Memotech Computing*.

As a beginner, attempting to learn enough programming to write my own accounts program, I have encountered a number of snags with no answer in either the manual or *Memotech Computing*. I know nobody else with a Memotech or even another Z80 based computer (plenty of Beebs and Sinclairs). I wrote to Memotech on a number of occasions with problems which were probably quite elementary, but which I could not resolve any other way, and I regret to have to say that I have had either no reply or an incomplete reply to each letter.

In the same issue, J Fuller seeks advice about a printer for a Memotech. The DMX80 price includes a cable, and installation is simply a matter of plugging into the computer, plugging into the mains and switching on. There is still the problem of sorting out all the printer control codes, but that all adds to the fun.

Ian Phillips
Broughton-in-Furness
Cumbria

Compatibility could bring MSX success

I cannot share Mr Gallacher's glee at the supposed failure of MSX in the UK (issue 87). I have seen a similar response to a Japanese product in the past; in that instance it was the supposed reluctance of the British to accept Japanese motorcycles. This 'head in the sand' attitude played a large part in the decline of the motorcycle industry in this country and its subsequent domination by the Japanese, who still make a consistently high-quality product at a competitive price.

Manufacturers, such as Sinclair and Commodore, seem to produce their systems to be incompatible with software from the previous machine, or in some cases, hardware too.

Would it not be nicer to be able to upgrade or change manufacture of your machine and still retain your expensive peripherals and/or software?

I, for one, would welcome this. I am stuck with a Commodore 64, printer, and disk drive and would like to change to the Amstrad machine, but the inability to use any of my existing hardware with the Amstrad deters me.

The Japanese manufacturers are astute and adept at exploiting weaknesses. These weaknesses that will put the British out of the home computer market.

Andy Anderson
Morden, Surrey

Compatibility is nice but it isn't the last word in computing. And why blame Commodore for the fact that you bought the wrong machine for your needs? — Ed.

Don't ignore the Sharp potential

I was disappointed that *PCN* (issue 89) was so factually inaccurate on the Sharp MZ-700 reviewed briefly along with 20 other machines. I would be grateful if you could put the record straight.

First, there are currently four disk drives for the MZ700. Two are Sharp products called FDOS and Quick Disk — the others are made by a company in Germany called Frank Kirsten. All four are sold in the UK, the most popular being Quick Disk.

Second, the statement that there is limited software and what there is comes mainly from Kuma is wildly inaccurate. As Solo Software is the main supplier for MZ700 software we resent the fact that we were excluded.

We currently have over 100 items of software for the MZ-700 and are just about to release 45 more. We publish four books for machine users and offer a dozen peripherals.

Nick Bewley
Solo Software
Unit 95B
Blackpole Trading Estate West
Worcester WR3 8TJ

I'm happy to correct the blunder on our part. Sharp owners will be interested in Solo's brochure which features a range of peripherals including speech synthesiser, modem and a number of interfaces — Ed.

I could manage the ZX81s, but they all wanted Amstrads, BBCs, QLs and MSX machines this year!

A warning note to buyers

Several of your issues in September and October carried an advertiesement for a Magarule perspex magnifying ruler from Mark Simon, Dealer Deals, 20 Orange Street, London WC2H 7ED, offered at £2.99.

My wife decided to purchase one of these as a Christmas present and several weeks ago sent a cheque for the required amount to the address above. Though the cheque has been presented, no ruler has arrived from Dealer Deals.

We have made a number of attempts to contact the advertiser by telephone and letter, but all have been fruitless. I bring this matter to your attention in the hope that you may be able to offer some help in my attempts to recover the money paid.

A W Johstone
Colchester, Essex

We haven't been able to contact Dealer Deals either. If any reader can throw some light on this we'd like to hear from you — Ed.

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Connecting an ICL monitor to the 64

Q I would like to use a monitor with my Commodore 64. I have access to an ICL green screen monitor and would like to know if it is possible to use this. If so, how do I connect the two?
B Miller
Widnes

A On the rear of the Commodore 64 are two DIN sockets. One has a composite video signal on it. If the monitor you wish to use with the 64 has a composite video interface you should be able to use this output with no problems.

If, on the other hand, the monitor has an RGB output I'm afraid you're out of luck.

We are not familiar with the monitor you mention but since it is a green screen monitor, and not colour, we assume it is a composite monitor. In that case you need to purchase a 5-pin DIN socket and the necessary connector for your monitor.

Pin 4 on the DIN connector should be connected to the video in on your monitor, and pin 2 should be connected to the earth. If your monitor has a sound input you can also wire pin 3 on the DIN connector to your monitor. If your monitor doesn't have a sound input you won't hear any sound at all from your 64.

If you want to know more about the DIN connector the pin out is covered at the back of the Commodore 64 manual and the Commodore 64 reference guide.

Do I have the right system for business?

Q I have a Commodore 64 computer, an Epson MX80 printer, a parallel interface and Centronics software from Audiogenic. My dad wants to do business computing so I would like to know if there are any programs compatible with my system.
H Tailor
Birmingham

A There is a large amount of business software available for the Commodore 64 including databases, word processors, mail merge packages, spreadsheets, accounting, sales and purchase ledgers, stock control and so on, ad infinitum.

There are two possible problems. The first is that you don't mention a disk drive, which is necessary for most serious software.

The second — more important but less expensive — is the question of printer interfaces. Your 'parallel interface' must be simply a Centronics compatible cable, or you wouldn't need Audiogenic's software driver.

The catch with software drivers is that they take up memory — more often than not, memory which your software packages also require. So, while your printer may be compatible with the software, the interface won't be.

The answer is to get a hardware interface which avoids any memory clashes. There are any number of these around — *PCN* has reviewed several in the last few months. Among the best are Interpod, now being marketed by Cheetahsoft, and the Tripler 64, produced by Microperipherals in Basingstoke.

Thoroughly modern modems in demand

Q I am interested in a modem that appeared in your magazine (issue 90) and would like details of the manufacturer. I have an Epson HX-20 with expansion port, disk drive, and printer. The modem in question is the Minor Miricles WS2000.
Norman Robson
Wadebridge, Cornwall

A If you've read our review then you already know just about everything we can tell you. It should work without trouble with your Epson but you could contact the manufacturer on 0473-50304. They should be able to answer any further queries.

Vic memory map maze unravelled

Q I have a few Vic 20 questions. When you add 8K or more memory where does the colour, screen and sound memory move to? Using a motherboard, can a Super Expander cartridge be used with 16K memory? Will the Super Expander work with the programmer's aid cartridge?

Finally, is the Vic to be replaced by the Commodore 16, and when will software and peripherals follow?
Stephen Pascoe
Lancing, Sussex

A The moving memory map is perhaps the biggest peculiarity of the Vic. Essentially there are two configurations — unexpanded and expanded. However, for memory mapping purposes, adding a 3K expansion still gives you an unexpanded Vic. With us so far? Good.

With up to 8K or RAM (the original 5K plus 3K expansion) everything stays in the same place — colour and screen memory and so on. By the way, the sound registers never move, nor do the graphics registers.

Adding 3K fills the empty memory area from 1024 to 4096. Screen memory stays at 7680 with colour at 38400.

When you add 8K or more, screen memory moves from the end of Basic memory to the beginning and colour memory moves down by ½K. So screen memory goes to 4096 and colour to 37888.

You can use the Super Expander commands with 16K memory expansion but you won't be able to use the 3K memory in the expander for Basic. You can only get to it in machine code or by PEEKing and POKEing data.

You can't use two program cartridges at a time since they use the same dedicated area in high memory.

On the question of the new Commodore 16, the company has said that it will support the Vic as long as demand continues but it seems likely that third party companies will concentrate on the new machines and the 64, so long term support for the Vic looks shakey.

BBC micro second processor query

Q I have some experience in programming in Cobol, and I am considering buying Acorn's Z80 second processor for the BBC micro.

Could you give me an approximation of the size of memory available under the CIS Cobol compiler that is included with this processor?
A Al-Ammar
Sheffield

A With the Acorn Z80 second processor, you get 64K of RAM. The size of the program that you will be able to run will depend to a certain extent on this, since the maximum data divisions allowed is 32K.

Procedure divisions, on the other hand, are limited to 32K, but it is possible to overlay other procedures and call subprograms from disk, at the expense of slowing it down.

Addressing graphics on the Spectrum

Q I have a 48K Spectrum. I know how to program it, but I don't know how to define graphics. I looked in the manual and found the three line program and BIN numbers, but now what? It doesn't tell you where to put the BIN numbers.
Jonathan Todd
Tyne and Wear

A Spectrum UDGs can be confusing to start with, but it's fairly easy to get them to fall into place. Start with this:

```
10 FOR N=0 TO 7
20 READ B
30 POKE USR "A"+N,B
40 DATA BIN 10101010,BIN
01010101,BIN 10101010,BIN
01010101, BIN 10101010,BIN
01010101,BIN 10101010,BIN 01010101
```

This sets up a loop to poke the data in line 40 into the eight addresses that make up USR "A", which is where the Spectrum stores its definition of the graphics character A.

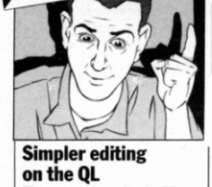
Now put the binary numbers in line 40 into an 8×8 grid, one on top of the other, and you'll see a patchwork pattern made up by the 1s and 0s. This is essentially what UDGs do, and if you go into graphics mode and press A you'll get the UDG representation of this.

You'll notice that hardly any listing you see in a magazine uses this method. The numbers in the data statements there are decimal, but you're actually doing the same thing. In the data statements above we're saying BIN because the Spectrum is expecting decimal numbers.

But what's meant by USR "A"? on the Spectrum, a machine code routine is called by pointing at a memory location with RANDOMIZE USR or LET A = USR, so by saying USR "A" you're specifying a memory location, which in this case is the first of the eight addresses that make up graphic A. So you could equally well poke the eight addresses directly.

Try PRINT USR "A" and you'll get this address, then try POKEing the data into it and the seven following it, and you'll get the same result.

MICROWAVES



Have you any good answers for Amstrad owners or brainwaves for the Beeb? Share them with fellow computer users by sending them to us. Not only will you get £10 for every tip published, but you could find a bonus of £50 comes your way if you are chosen as the Microwave of the month. Send them to *Microwaves, PCN, Evelyn House, 62 Oxford Street, London W1A 2HG.*

Simpler editing on the QL

These procedures for the QL are designed to be incorporated in a program to simplify the editing of a large number of variables. A full screen display of prompts and variable values is used to help you.

Procedure init: All variables should be initially declared. Dummy$ is used for exiting from the procedures and this is achieved by entering x in dummy$.

Procedure screen: Displays instructions at the bottom of the screen.

Procedure get vars: This will consist of a list of variables with the appropriate parameters to be passed to var$. Line 280 shows that numeric as well as string variables can be used. However, a non-numeric input will crash the program, so it is better to use a string variable which you should validate before assigning to the numeric variable.

Parameter pr-inp is a flag to indicate if input is required (pr inp=1). First time around this is 0 (line 120) so all the prompts and current variable values are displayed, without waiting for an input.

Pr-inp is then set to 1 (line 300) and the procedure calls itself (line 310). It will now step through each variable waiting for an input. The last is dummy$ and until X is entered, the program continues to loop around. Note — the use of = = is equivalent to IF dummy$="X" or IF dummy$="x" as it ignores cases.

Function vars$: Parameters are screen, line and row coordinates. Prompt$, :"s are inserted at each end of the space allowed for the variable. Var is the current value of the variable and var is the maximum length of the variable.

Line 410 allows Enter to be pressed to accept the displayed value.

Peter Edwards
Headington Quarry, Oxon

```
100 init
110 screen
120 get_vars @
130 STOP
140 :
150 DEFine PROCedure init
160 dummy$=" ":author$=" ":title$=" ":price=@
170 END DEFine init
180 :
190 DEFine PROCedure screen
200 REMark use in TV mode for this example
210 CLS:CLS#0:PRINT#0," Press ENTER for no change"
220 PRINT#0," To change: over-type new value and\"then Press ENTER"
230 END DEFine screen
240 :
250 DEFine PROCedure get_vars(pr_inp)
260 author$=var$(2,@,"author",author$,25,pr_inp)
270 title$=var$(4,@,"Title",title$,50,pr_inp)
280 price=var$(5,22,"Price £",price,5,pr_inp)
290 dummy$=var$(18,15,"Enter X to exit",dummy$,1,pr_inp)
300 IF pr_inp=@ THEN pr_inp=1
310 IF dummy$=="X" THEN RETurn :ELSE get_vars(1)
320 END DEFine get_vars
330 :
340 DEFine FuNction var$(lin,row,prompt$,var,var_width,pr_inp)
341  LOCal v_row,temp$
350  v_row=row+LEN(prompt$)+1
360  ISK 4:AT lin,row:PRINT prompt$ & ":";
370  PRINT FILL$(" ",var_width) & ":"
380  INK 7:AT lin,v_row:PRINT var;
390  IF pr_inp
400   AT lin,v_row:INPUT temp$
410   IF temp$="":temp$=var
420   temp$=temp$(1 TO var_width)
430   AT lin,v_row:PRINT temp$ & FILL$(" ",var_width-LEN(temp$))
440   RETurn temp$
450  ELSE
460   RETurn var
470  END IF
480 END DEFine var$
```

The remaining values are unused. To see the codes in action, try this routine.

```
10 REM ***************
20 INPUT J
30 POKE &178,J : POKE &179,32
40 IF J=255 THEN INPUT J : POKE &179,J : POKE &17A,32
50 LIST 10
```

The stars in line 10 are significant. Run the program, and answer the input prompts with values between 128 and 254 for one byte keywords or 255, (value between 1 and 127) for a two byte key word and you'll find a Basic keyword has been generated among the asterisks in line 10.

D Bright
The Hague
Holland

ROM/RAM dump on the Amstrad

The following is a ROM/RAM/ dump for the Amstrad CPC 464. The program is a simple means of displaying ROM or RAM contents.

When running the program you are asked to enter the start address and the end address of the area in memory you wish to examine and whether you want to look at the ROM or the RAM.

Pressing the cursor up key enables you to step up through memory at twice the normal rate.

The reverse happens with cursor down.

Pressing '.' on the numeric key pad results in a return being made so that you can enter new addresses.

Harry Pouney
New Arley, Warks

```
10 MODE 2
20 PRINT STRING$(79,"*")
30 PRINT STRING$(38,"*")" RAM & ROM DUMP "STRING$(38,"*")
40 PRINT STRING$(38,"*")" By: Harry Pouney "STRING$(38,"*")
50 PRINT STRING$(79,"*")
60 FOR t=1 TO 100:SOUND 1,RND*50,6 :NEXT
70 MEMORY &A4FF
80 FOR a=&A500 TO &ABBF-05
90 READ a$:POKE a,VAL("&"+a$)
100 NEXT
110 DATA 01,06,ab,21,ff,ab,c3,61,bc,00,00,00,00,15,ab,c3,1e,ab,c3,3a,ab,58,45,45
,4b,53,47,41,6f,00,cd,ff,b9,f5,cd,0e,b9,cd,4e,00,cd
,60,81,7e,cd,4e,02,cd,4e,00,f5,77,23,3e,00,f1,c3,0c,b9,cd,48,ab,cd,48,ab,1a,4e,77,79
,12,23,13,cf,cd,4e,00,cd,4e,01,cd,5e,02
120 DATA 4e,5e,03,c9,00
130 CALL &A500
140 '**********************************************************************

150 MODE 1
160 WINDOW #2,1,40,1,3
170 WINDOW #1,1,80,1,25
180 INK 0,0:INK 1,24:BORDER 0
190 INK 2,9
200 INK 1,24
210 KEY 138,""
220 PEN 1:PAPER #1CLS
230 PEN#2,1:PAPER#2,2
240 CLS#2
250 INPUT#2, " Start address      "!sadd
260 INPUT#2, " End address        "!eadd
270 INPUT#2, " ROM (1),  RAM (2)."!type
280 IF sadd>eadd!THEN eadd=sadd:! GOTO 280
290 PEN#2,1:PAPER#2,0
300 CLS#2
310 PEN#1,1:PAPER#1,0!CLS#1
320 LOCATE#1,1,5
330 a%=d!b%=0
340 FOR a%=sadd TO eadd STEP 8
350 PEN#1,1:PAPER#1,0
360 PRINT#1,CHR#(197)!(PEN#1,3)!PRINT#1, HEX#(a%,4)!CHR#(217)!CHR#(219)!;
370 IF type=1 THEN !PEEK,0a%,n% ELSE a%=PEEK(a%)
380 PEN#1,1:PAPER#1,0
390 FOR b%=1 TO 8
400 IF type=1 THEN !PEEK,0a%,n%=b% ELSE a%=PEEK(a%+b%)
410 PRINT#1, HEX#(a%,2)!" ";
420 NEXT
430 PEN#1,3!PRINT#1,CHR#(0)!CHR#(217)!CHR#(219)!
440 PEN#1,1:PAPER#1,2
450 FOR c%=1 TO 8
460 IF type=1 THEN !PEEK,0a%,n%=c% ELSE a%=PEEK(a%+c%)
470 IF a%<31 THEN PRINT#1, CHR#(a%)!ELSE PRINT#1,"."!
480 NEXT
490 IF INKEY(0)=@ THEN a%=a%-16
500 IF INKEY(2)=@ AND a%!@ THEN a%=a%-16
510 IF INKEY(7)=@ THEN GOTO 230
520 NEXT
530 CLS#2
540 GOTO 230
```

Amstrad Basic storage structure

Basic programs start at address &170, and each line carries a four byte prefix. The first two bytes are a count of the number of bytes in the line, stored in LSB/MSB format, (*ie* least significant byte first), and bytes three and four are the binary representation of the line number also in LSB/MSB format.

The text of the line follows and each line is terminated by a zero byte. The entire program is terminated by two null bytes, corresponding to a null line length.

Like most Basic implementations, the language keywords are not stored letter by letter. Instead a one or two byte compression code is used. For example, the keyword AFTER is not stored as five letters, but as the single code value 128. The code tokens form two series, one byte codes comprising values from 128 to 254, and two byte codes in which a byte with value 255 is immediately followed by a value from 1 to 127.

Not all the code values seem to be assigned — it appears that Locomotive could have made its rich dialect of Basic even more so. Of the single byte tokens, codes 128 to 220 are all assigned, but 221 to 226, 232, 233, and 238 to 249 appear to be free.

Similarly, the two byte keywords occur from 1 to 29, from 64 to 72 and from 113 to 127 (with 114 and 123 missing).

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BLOWING BUBBLES

Sorting arrays on the Spectrum can be time consuming, but try Stuart Nicholls' machine code program and you'll have put your foot on the accelerator.

Anyone who has written Spectrum programs which require sorting words or numbers will tell you Basic is extremely slow — especially if you are using a standard bubble sort.

I have produced a machine code routine that can give speed increases in the order of 100 times for word sorts and 12 times for number sorts. What's more, it is user friendly and intended for use by Basic programmers.

Listing 3

```
 10 INPUT "Start address?";a
 20 PRINT "Enter code one byte at
a time"
 30 PRINT "in upper case"
 40 PRINT "ADDRESS = ";i
 70 INPUT a$
 80 IF a$="XX" THEN STOP
 90 IF LEN a$<>2 THEN PRINT "err
or - retype": GO TO 70
100 LET b=CODE a$(1)-48
110 IF b>9 THEN LET b=b-7
120 LET d=b*16
130 LET c=CODE a$(2)-48
140 IF c>9 THEN LET c=c-7
150 LET d=d+c
160 PRINT a$
170 POKE a,d
180 GO TO 40
```

The machine code routine can be used to sort *any* one-dimensional numeric array and two dimensional string array. In other words you are not limited to using a specific letter for your array.

Table 1

Array () Elements	Typical sort time (secs)		
	M/code	Shell	Bubble
10	0.2	1.8	1.2
20	0.45	4.5	5.0
50	2.5	14.5	31.0
100	8.0	34.0	120.0
300	80.0	145.0	1106.0

Indeed you may have several numeric and string arrays in your program and still sort each one in turn with the same

Table 2

Array$ () Elements	Typical sort time (secs)		
	M/code	Shell	Bubble
10,10	0.06	2.0	1.5
20,10	0.08	4.5	5.0
50,10	0.35	15.5	35.0
100,10	1.00	36.0	140.0
300,10	10.50	155.0	1240.0

routine. Any number of elements in the chosen array can be sorted in either ascending or descending order.

Defining the parameters of the required sort is extremely simple as the machine code routine uses Basic variables to hold this information. For example, if a string array X$(100,50) is to be sorted, but only the first 75 elements are required in ascending order, this would be set up with these two lines:

```
LET Q=75 : LET Q$="X$"
LET SORT=USR 64000
```

Similarly if all of a numeric array N(1000) is to be sorted in descending order, this would be set up as:

```
LET Q=-1000 : LET Q$="N"
LET SORT=USR 64000
```

The variable Q is used to hold the number of elements to be sorted; a positive value indicates an ascending sort whereas a negative value indicates that a descending sort is required. The string variable Q$ is used to hold the array to be sorted.

The routine is fully error-trapped and gives the normal error reports if Q or Q$ is not defined, is defined incorrectly or an array correctly defined has not been dimensioned. You may also exit the routine at any point by pressing space.

The value of Q must be at least 2, as any value between −1 and 1 gives a parameter error report. Decimal values, should they be set by mistake, are rounded up to the nearest whole number. Finally, if the value of Q is greater than the number of elements as defined by Q$, it is assumed that the whole array is to be sorted.

The hexdump (Listing 1) is for the 48K Spectrum and starts at address 64000, the routine being 532 bytes long. The checksum given at the end of each line is the sum of the previous eight bytes mod 256.

Should anyone wish to assemble the code elsewhere I have included my assembly listing (Listing 2). Machine language programmers should note that the code is self-modifying to reduce the length of the routine and ascending and descending sorts share the same subroutines.

Tables 1 and 2 compare the speed of the machine code routine with a Basic shell sort and bubble sort for random number and word arrays of various dimensions. The timings are an average taken over four different 'random' arrays and were obtained using the system variable 'frames' to give values before and after the sort.

Listing 1

```
ZX Spectrum 48K HEXDUMP
BUBBLE SORT : CODE 64000,532
FA00  F3 18 3C 2A 4B 5C 7E FE = 94
FA08  00 28 2B 3A B0 5C BE C8 = 9F
FA10  CB 6E 20 08 23 5E 23 56 = 5B
FA18  19 23 18 EA CB 76 20 0C = AB
FA20  23 7E CB 7F 28 F5 11 06 = 24
FA28  00 19 18 DA CB 7E 28 F6 = 72
FA30  11 13 00 19 18 D0 FB CF = EF
FA38  01 FB CF 19 FB CF 14 3E = 00
FA40  20 32 11 FB 3E 38 32 BC = C2
FA48  FB 3E 71 32 B0 5C CD 03 = B0
FA50  FA 23 ED 5B 65 5C 01 05 = 2C
FA58  00 ED B0 ED 53 65 5C CD = 6B
FA60  A2 2D F5 21 01 00 ED 42 = 15
FA68  38 CF ED 43 00 5B F1 28 = A3
FA70  0A 3E 28 32 11 FB 3E 30 = 1C
FA78  32 BC FB 3E 51 32 B0 5C = B6
FA80  CD 03 FA 23 23 7E A7 20 = 55
FA88  B0 2B 7E FE 01 28 20 FE = 9E
FA90  02 20 A6 23 23 23 7E FE = AD
FA98  24 20 9E 2B 7E CD 0D 2C = 11
FAA0  30 97 E6 1F F6 C0 32 B0 = 64
FAA8  5C CD 03 FA C3 66 FB 23 = 6D
FAB0  23 7E CD 0D 2C 30 02 E6 = BF
FAB8  1F F6 00 32 B0 5C CD 03 = A3
FAC0  FA 23 23 23 7E FE 01 C2 = A2
FAC8  39 FA 23 5E 23 56 E5 2A = 3C
FAD0  00 5B A7 ED 52 30 04 ED = 6A
FAD8  53 00 5B 21 01 00 22 02 = F4
FAE0  5B E1 23 22 04 5B 22 06 = 00
FAE8  5B ED 4B 02 5B C5 01 FE = B4
FAF0  7F ED 78 CB 47 CA 3C FA = F6
FAF8  01 0A 00 ED B0 65 5C ED = 01
FB00  B0 ED 53 65 5C EF 03 38 = DB
FB08  23 CB 7E 2B F5 CD A2 2D = 28
FB10  F1 20 28 2A 06 5B 54 5D = 75
FB18  06 05 7E F5 23 10 FB 01 = AD
FB20  05 00 ED B0 06 05 F1 2B = C9
FB28  77 10 FB 11 09 00 ED 52 = DB
FB30  22 06 5B C1 0B 78 B1 20 = 98
FB38  B4 18 01 C1 ED 5B 00 5B = 31
FB40  2A 02 5B 23 22 02 5B A7 = D0
FB48  ED 52 28 10 2A 04 5B 23 = 23
FB50  23 23 23 23 22 04 5B 22 = 2F
FB58  06 5B 18 0D 21 64 00 11 = 9C
FB60  32 00 CD B5 03 C9 23 23 = C6
FB68  23 7E FE 02 C2 39 FA 23 = B9
FB70  5E 23 56 E5 2A 00 5B A7 = EB
FB78  ED 52 38 04 ED 53 00 5B = 16
FB80  21 01 00 22 02 5B E1 23 = A5
FB88  11 00 5B 01 02 00 ED B0 = 14
FB90  22 04 5B 22 06 5B ED 4B = 3C
FB98  02 5B C5 01 FE 7F ED 78 = 05
FBA0  CB 47 CA 3C FA ED 5B 00 = 62
FBA8  5B 42 4B EB 19 A7 1A BE = 6B
FBB0  20 09 13 23 0B 78 B1 20 = B3
FBB8  F4 18 37 96 38 34 2A 06 = 75
FBC0  5B 54 5D ED 4B 00 5B 7E = 25
FBC8  F5 23 0B 78 B1 20 F8 ED = 51
FBD0  4B 00 5B C5 ED B0 C1 F1 = C2
FBD8  2B 77 0B 78 B1 20 F8 ED = DB
FBE0  5B 00 5B ED 52 ED 52 22 = 5E
FBE8  06 5B C1 0B 78 B1 20 AA = 20
FBF0  18 01 C1 ED 5B 00 5B 2A = A7
FBF8  02 5B 23 22 02 5B A7 ED = 93
FC00  52 CA 5C FB 2A 04 5B ED = E9
FC08  5B 00 5B 19 22 04 5B 22 = 7A
FC10  06 5B 18 02 = FB
```

Listing 2: Assembly listing

```
FA00          0010          ORG   64000
FA00 F3       0020          DI
FA01 183C     0030          JR    RUN
FA03 2A4B5C   0040 FIND      LD    HL,(23627)
FA06 7E       0050 START     LD    A,(HL)
FA07 FE00     0060          CP    128
FA09 282B     0070          JR    Z,ERR1
FA0B 3AB05C   0080          LD    A,(23728)
FA0E BE       0090          CP    (HL)
FA0F C8       0100          RET   Z
FA10 CB6E     0110          BIT   5,(HL)
FA12 2008     0120          JR    NZ,NEXT
FA14 23       0130          INC   HL
FA15 5E       0140          LD    E,(HL)
FA16 23       0150          INC   HL
FA17 56       0160          LD    D,(HL)
FA18 19       0170          ADD   HL,DE
FA19 23       0180          INC   HL
FA1A 18EA     0190          JR    START
FA1C CB76     0200 NEXT      BIT   6,(HL)
FA1E 200C     0210          JR    NZ,NEXT1
FA20 23       0220 LOOP5     INC   HL
FA21 7E       0230          LD    A,(HL)
FA22 CB7F     0240          BIT   7,A
FA24 28FA     0250          JR    Z,LOOP5
FA26 110600   0260 LOOP6     LD    DE,6
FA29 19       0270          ADD   HL,DE
FA2A 18DA     0280          JR    START
FA2C CB7E     0290 NEXT1     BIT   7,(HL)
FA2E 28F6     0300          JR    Z,LOOP6
FA30 111300   0310          LD    DE,19
FA33 19       0320          ADD   HL,DE
FA34 18D0     0330          JR    START
FA36 FB       0340 ERR1      EI
FA37 CF       0350          RST   8
FA38 01       0360          DEFB  1
FA39 FB       0370 ERR2      EI
FA3A CF       0380          RST   8
FA3B 19       0390          DEFB  25
FA3C FB       0400 ERR3      EI
FA3D CF       0410          RST   8
FA3E 14       0420          DEFB  20
FA3F 3E20     0430 RUN       LD    A,20H
FA41 3211FB   0440          LD    (SETN),A
FA44 3E38     0450          LD    A,38H
FA46 32BCFB   0460          LD    (SETL),A
FA49 3E71     0465          LD    A,113
FA4B 32B05C   0470          LD    (23728),A
FA4E CD03FA   0480          CALL  FIND
FA51 23       0490          INC   HL
FA52 ED5B655C 0500          LD    DE,(23653)
FA56 010500   0510          LD    BC,5
FA59 EDB0     0520          LDIR
FA5B ED53655C 0530          LD    (23653),DE
FA5F CDA22D   0540          CALL  2DA2H
FA62 F5       0550          PUSH  AF
FA63 210100   0560          LD    HL,1
FA66 ED42     0570          SBC   HL,BC
FA68 30CF     0580          JR    NC,ERR2
FA6A ED43005B 0590          LD    (23296),BC
FA6E F1       0600          POP   AF
FA6F 280A     0610          JR    Z,0$
FA71 3E28     0620          LD    A,28H
FA73 3211FB   0630          LD    (SETN),A
FA76 3E30     0640          LD    A,30H
FA78 32BCFB   0650          LD    (SETL),A
FA7B 3E51     0660 0$        LD    A,81
FA7D 32B05C   0670          LD    (23728),A
FA80 CD03FA   0680          CALL  FIND
FA83 23       0690          INC   HL
FA84 23       0700          INC   HL
FA85 7E       0710          LD    A,(HL)
FA86 A7       0720          AND   A
FA87 20B0     0730          JR    NZ,ERR2
FA89 2B       0740          DEC   HL
FA8A 7E       0750          LD    A,(HL)
FA8B FE01     0760          CP    1
FA8D 2820     0770          JR    Z,NUM
FA8F FE02     0780          CP    2
FA91 20A6     0790          JR    NZ,ERR2
FA93 23       0800          INC   HL
FA94 23       0810          INC   HL
FA95 23       0820          INC   HL
FA96 7E       0830          LD    A,(HL)
FA97 FE24     0840          CP    36
FA99 209E     0850          JR    NZ,ERR2
FA9B 2B       0860          DEC   HL
FA9C 7E       0870          LD    A,(HL)
FA9D CD0D2C   0880          CALL  2C0DH
FAA0 3097     0890          JR    NC,ERR2
FAA2 E61F     0900          AND   31
FAA4 F6C0     0910          OR    192
FAA6 32B05C   0920          LD    (23728),A
FAA9 CD03FA   0930          CALL  FIND
FAAC C366FB   0940          JP    LSORT
FAAF 23       0950 NUM       INC   HL
FAB0 23       0960          INC   HL
FAB1 7E       0970          LD    A,(HL)
FAB2 CD0D2C   0980          CALL  2C0DH
FAB5 3082     0990          JR    NC,ERR2
FAB7 E61F     1000          AND   31
FAB9 F680     1010          OR    128
FABB 32B05C   1020          LD    (23728),A
FABE CD03FA   1030          CALL  FIND
FAC1 23       1040 NSORT     INC   HL
FAC2 23       1050          INC   HL
FAC3 23       1060          INC   HL
FAC4 7E       1070          LD    A,(HL)
FAC5 FE01     1080          CP    1
FAC7 C239FA   1090          JP    NZ,ERR2
FACA 23       1100          INC   HL
FACB 5E       1110          LD    E,(HL)
FACC 23       1120          INC   HL
FACD 56       1130          LD    D,(HL)
FACE E5       1140          PUSH  HL
FACF 2A005B   1150          LD    HL,(23296)
FAD2 A7       1160          AND   A
FAD3 ED52     1170          SBC   HL,DE
FAD5 3004     1180          JR    C,OK1
FAD7 ED53005B 1190          LD    (23296),DE
FADB 210100   1200 OK1       LD    HL,1
FADE 22025B   1210          LD    (23298),HL
FAE1 E1       1220          POP   HL
FAE2 23       1230          INC   HL
FAE3 22045B   1240          LD    (23300),HL
FAE6 22065B   1250          LD    (23302),HL
FAE9 ED4B025B 1260 SORTN     LD    BC,(23298)
FAED C5       1270 L1        PUSH  BC
FAEE 01FE7F   1280          LD    BC,32766
FAF1 ED78     1290          IN    A,(C)
FAF3 CB47     1300          BIT   0,A
```

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Listing 2 (cont)

◀13

```
FAF5 CA3CFA   1310          JP   Z,ERR3
FAF8 010A00   1320          LD   BC,10
FAFB ED5B655C 1330          LD   DE,(23653)
FAFF EDB0     1340          LDIR
FB01 ED53655C 1350          LD   (23653),DE
FB05 EF       1360          RST  40
FB06 03       1370          DEFB 3
FB07 38       1380          DEFB 56
FB08 23       1390          INC  HL
FB09 CB7E     1400          BIT  7,(HL)
FB0B 2B       1410          DEC  HL
FB0C F5       1420          PUSH AF
FB0D CDA22D   1430          CALL 2DA2H
FB10 F1       1440          POP  AF
FB11 2028     1450 SETN     JR   NZ,LEAVE
FB13 2A065B   1460 EXCH1    LD   HL,(23302)
FB16 54       1470          LD   D,H
FB17 5D       1480          LD   E,L
FB18 0605     1490          LD   B,5
FB1A 7E       1500 L2       LD   A,(HL)
FB1B F5       1510          PUSH AF
FB1C 23       1520          INC  HL
FB1D 10FB     1530          DJNZ L2
FB1F 010500   1540          LD   BC,5
FB22 EDB0     1550          LDIR
FB24 0605     1560          LD   B,5
FB26 F1       1570 L3       POP  AF
FB27 2B       1580          DEC  HL
FB28 77       1590          LD   (HL),A
FB29 10FB     1600          DJNZ L3
FB2B 110900   1610          LD   DE,9
FB2E ED52     1620          SBC  HL,DE
FB30 22065B   1630          LD   (23302),HL
FB33 C1       1640          POP  BC
FB34 0B       1650          DEC  BC
FB35 78       1660          LD   A,B
FB36 B1       1670          OR   C
FB37 20B4     1680          JR   NZ,L1
FB39 1801     1690          JR   L4
FB3B C1       1700 LEAVE    POP  BC
FB3C ED5B005B 1710 L4       LD   DE,(23296)
FB40 2A025B   1720          LD   HL,(23298)
FB43 23       1730          INC  HL
FB44 22025B   1740          LD   (23298),HL
FB47 A7       1750          AND  A
FB48 ED52     1760          SBC  HL,DE
FB4A 2810     1770          JR   Z,END
FB4C 2A045B   1780          LD   HL,(23300)
FB4F 23       1790          INC  HL
FB50 23       1800          INC  HL
FB51 23       1810          INC  HL
FB52 23       1820          INC  HL
FB53 23       1830          INC  HL
FB54 22045B   1840          LD   (23300),HL
FB57 22065B   1850          LD   (23302),HL
FB5A 188D     1860          JR   SORTN
FB5C 214400   1870 END      LD   HL,100
FB5F 113200   1880          LD   DE,50
FB62 CDB503   1890          CALL 03B5H
FB65 C9       1900          RET
FB66 23       1910 LSORT    INC  HL
FB67 23       1920          INC  HL
FB68 23       1930          INC  HL
FB69 7E       1940          LD   A,(HL)
FB6A FE02     1950          CP   2
FB6C C239FA   1960          JP   NZ,ERR2
FB6F 23       1970          INC  HL
FB70 5E       1980          LD   E,(HL)
FB71 23       1990          INC  HL
FB72 56       2000          LD   D,(HL)
FB73 E5       2010          PUSH HL
FB74 2A085B   2020          LD   HL,(23296)
FB77 A7       2030          AND  A
FB78 ED52     2040          SBC  HL,DE
FB7A 3804     2050          JR   C,OK2
FB7C ED53005B 2060          LD   (23296),DE
FB80 210100   2070 OK2      LD   HL,1
FB83 22025B   2080          LD   (23298),HL
FB86 E1       2090          POP  HL
FB87 23       2100          INC  HL
FB88 11085B   2110          LD   DE,23304
FB8B 010200   2120          LD   BC,2
FB8E EDB0     2130          LDIR
FB90 22045B   2140          LD   (23300),HL
FB93 22065B   2150          LD   (23302),HL
FB96 ED4B025B 2160 SORTL    LD   BC,(23298)
FB9A C5       2170 L5       PUSH BC
FB9B 01FE7F   2180          LD   BC,32766
FB9E ED78     2190          IN   A,(C)
FBA0 CB47     2200          BIT  0,A
FBA2 CA3CFA   2210          JP   Z,ERR3
FBA5 ED5B085B 2220          LD   DE,(23304)
FBA9 42       2230          LD   B,D
FBAA 4B       2240          LD   C,E
FBAB EB       2250          EX   DE,HL
FBAC 19       2260          ADD  HL,DE
FBAD A7       2270 L6       AND  A
FBAE 1A       2280          LD   A,(DE)
FBAF BE       2290          CP   (HL)
FBB0 2009     2300          JR   NZ,SKIP
FBB2 13       2310          INC  DE
FBB3 23       2320          INC  HL
FBB4 0B       2330          DEC  BC
FBB5 78       2340          LD   A,B
FBB6 B1       2350          OR   C
FBB7 20F4     2360          JR   NZ,L6
FBB9 1837     2370          JR   EXIT
FBBB 9A       2380 SKIP     SUB  (HL)
FBBC 3034     2390 SETL     JR   C,EXIT
FBBE 2A065B   2400 EXCH2    LD   HL,(23302)
FBC1 54       2410          LD   D,H
FBC2 5D       2420          LD   E,L
FBC3 ED4B085B 2430          LD   BC,(23304)
FBC7 7E       2440 L7       LD   A,(HL)
FBC8 F5       2450          PUSH AF
FBC9 23       2460          INC  HL
FBCA 0B       2470          DEC  BC
FBCB 78       2480          LD   A,B
FBCC B1       2490          OR   C
FBCD 20F8     2500          JR   NZ,L7
FBCF ED4B085B 2510          LD   BC,(23304)
FBD3 C5       2520          PUSH BC
FBD4 EDB0     2530          LDIR
FBD6 C1       2540          POP  BC
FBD7 F1       2550 L8       POP  AF
FBD8 2B       2560          DEC  HL
FBD9 77       2570          LD   (HL),A
FBDA 0B       2580          DEC  BC
FBDB 78       2590          LD   A,B
FBDC B1       2600          OR   C
FBDD 20F8     2610          JR   NZ,L8
FBDF ED5B085B 2620          LD   DE,(23304)
FBE3 ED52     2630          SBC  HL,DE
FBE5 ED52     2640          SBC  HL,DE
FBE7 22065B   2650          LD   (23302),HL
FBEA C1       2660          POP  BC
FBEB 0B       2670          DEC  BC
FBEC 78       2680          LD   A,B
FBED B1       2690          OR   C
FBEE 20AA     2700          JR   NZ,L5
FBF0 1801     2710          JR   L9
FBF2 C1       2720 EXIT     POP  BC
FBF3 ED5B005B 2730 L9       LD   DE,(23296)
FBF7 2A025B   2740          LD   HL,(23298)
FBFA 23       2750          INC  HL
FBFB 22025B   2760          LD   (23298),HL
FBFE A7       2770          AND  A
FBFF ED52     2780          SBC  HL,DE
FC01 CA5CFB   2790          JP   Z,END
FC04 2A045B   2800          LD   HL,(23300)
FC07 ED5B085B 2810          LD   DE,(23304)
FC0B 19       2820          ADD  HL,DE
FC0C 22045B   2830          LD   (23300),HL
FC0F 22065B   2840          LD   (23302),HL
FC12 1882     2850          JR   SORTL
              2860          END
```

```
L9      FBF3
EXIT    FBF2
L8      FBD7
L7      FBC7
EXCH2   FBBE
SETL    FBBC
SKIP    FBBB
L6      FBAD
L5      FB9A
SORTL   FB96
OK2     FB80
LSORT   FB66
END     FB5C
L4      FB3C
LEAVE   FB3B
L3      FB26
L2      FB1A
EXCH1   FB13
SETN    FB11
L1      FAED
SORTN   FAE9
OK1     FADB
NSORT   FAC1
NUM     FAAF
@$      FA7B
RUN     FA3F
ERR3    FA3C
ERR2    FA39
ERR1    FA36
NEXT1   FA2C
LOOP6   FA26
LOOP5   FA20
NEXT    FA1C
START   FA06
FIND    FA03
#       5FA4
```

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THE EPSON CONNECTION

Adapt your 64 to run with an Epson printer thanks to Simon Taylor.

Not many people want to use the Commodore printers on their Commodore 64, but are forced to by the lack of a Centronics or RS232 standard interface on the machine. This article describes the use of an Epson or similar printer with a Commodore 64 by using the user port as a Centronics interface.

When using an Epson standard printer, all of the program control codes such as clear screen or cursor controls are printed as if the Epson was a CBM 1515 or one of the other Commodore printers.

The program allows the use of the normal CBM printer syntax, *ie:*

```
OPEN 4,4 : CMD 4 : LIST
```

to list a program, and

```
PRINT £4 : CLOSE 4
```

when the program has listed.

All output is in lower case, and unlike other Centronics interfaces for the Commodore 64, graphics characters such as the reverse heart symbol for clear screen are supported. The hash sign (Shifted 3) is depicted as a pound sign on UK printers, but the Epson user manual will show you how to change the printer to print US ASCII.

Listing 1

```
   5 POKE 50427,169 : POKE 50429,76 : POKE 50430,187 : POKE
50431,197
  10 DATA 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,32,48,64,128
  20 OPEN 4,4
  30 A$=CHR$(27)+CHR$(75)+CHR$(20)+CHR$(0)
  40 GOSUB1000
  50 FOR J = 1 TO 20
  60 READ A
  70 A$ = CHR$(A)
  80 GOSUB 1000
  90 NEXT J
 100 PRINT £4
 110 CLOSE 4
 120 END
1000 FOR I = 1 TO LEN(A$)
1010 POKE 50428,ASC(MID$(A$,I,1))
1020 SYS 50427
1030 NEXT I
1040 RETURN
```

Line 5 sets up a small machine code routine that allows the character output section of the interface program to be accessed directly.

Listing 2

```
10 print"[CLR]reading data..."
12 print"please wait."
20 for i=50432to51141:reada:poke i,a:t=t+a:next i
30 if t<>82420then print"typing error somewhere in data statements":end
35 print"[DOWN]interface ready for use - type [RVS] sys 50722 [OFF]to re-initialise."
40 sys50722
50 end
100 data141,12,3,165,154,201,4,240,6,173,12,3,100,52,3,152,72,138,72,173,12
110 data3,162,0,221,110,198,240,62,232,224,3,208,246,41,255,48,29,201,13,240
120 data42,201,32,48,51,201,65,48,41,201,91,48,7,201,96,48,35,76,97,197,24
130 data105,32,76,91,197,201,160,240,8,201,193,48,22,201,219,16,18,41,127,76
140 data91,197,169,10,32,187,197,169,13,32,187,197,76,12,198,162,0,221,115
150 data198,240,8,232,224,34,208,246,76,12,198,169,198,133,252,169,138,133
160 data251,134,254,160,255,24,169,9,101,251,133,251,169,0,101,252,133,252
170 data200,196,254,208,238,169,27,32,187,197,169,76,32,187,197,169,12,32,187
180 data197,169,0,32,187,197,160,0,177,251,32,187,197,200,192,9,208,246,160
190 data3,169,0,32,187,197,136,208,248,76,12,198,141,1,221,173,0,221,170,41
200 data251,141,0,221,173,13,221,41,16,201,16,208,247,138,141,0,221,96,224
210 data3,208,7,173,255,168,255,132,185,208,108,254,3,224,4,240,3,108,252,3
220 data169,0,133,144,138,166,152,202,48,5,221,09,2,208,248,189,89,2,133,184
230 data189,99,2,133,186,133,154,189,189,2,133,185,24,96,184,170,104,168,169
240 data3,133,154,169,0,32,202,241,165,4,133,154,173,12,3,24,96,175,38,3,201
250 data0,240,60,141,52,3,173,39,3,141,53,3,169,0,141,38,3,169,197,141,39,3
260 data173,26,3,141,254,3,173,27,3,141,255,3,169,213,141,26,3,169,197,141
270 data27,3,173,32,3,141,252,3,173,33,3,141,253,3,169,227,141,32,3,169,197
280 data141,33,3,169,255,141,3,221,96,10,15,27,135,167,154,138,135,139,136
290 data140,147,19,148,20,17,145,29,157,18,146,144,5,28,159,156,30,31,158,129
300 data149,150,151,152,153,154,155,222,0,222,0,222,0,222,0,222,0,222,246,0,246,0
310 data246,0,246,0,246,254,0,0,0,254,0,254,0,254,254,254,0,254,0,0,0,0,254
320 data238,0,238,0,240,0,254,0,254,254,254,0,254,0,30,0,238,0,238,236,0,238,0
330 data30,0,254,0,254,254,0,2,0,250,0,250,0,250,254,20,138,4,194,4,138,20
340 data234,254,0,154,0,186,0,178,0,254,0,0,254,0,254,0,254,0,254,254,0,194,0,190
350 data0,130,0,178,0,190,0,254,0,134,0,122,0,138,0,252,254,0,178,0,190,0,178
360 data0,254,254,0,186,0,186,0,130,0,254,254,0,254,0,0,0,254,0,254,254,0,130
370 data0,166,0,210,0,254,230,0,238,0,238,0,238,0,238,0,230,0,190,0,190,0,190,0,128
380 data0,254,254,0,130,0,178,0,170,0,186,254,0,130,0,186,0,186,0,250,62,0
390 data30,0,14,0,0,0,2,84,0,170,0,254,0,254,0,254,254,0,222,0,130,0,222,0
400 data254,238,0,198,0,238,0,238,0,238,0,238,0,194,0,222,0,194,0,198,0,210,0,138
410 data0,2,0,178,0,218,254,0,254,0,248,0,238,0,238,0,238,186,0,214,0,238,0,214,0
420 data166,254,0,198,0,214,0,198,0,254,254,0,140,0,160,0,140,0,254,254,0,254
430 data0,254,0,254,0,0,238,0,198,0,130,0,198,0,238,0,238,0,238,0,0,0,238,0,238
440 data255,0,255,0,255,0,255,0,255,0,255,0,255,0,255,0,255,0,255,0,255,0,255
```

Connection details

You will need a connector for the user port and one for the Centronics end. The connections are as follows:

User port	Signal	Centronics
A	Gnd	16
B	Acknowledge	10
C	Data 0	2
D	Data 1	3
E	Data 2	4
F	Data 3	5
H	Data 4	6
J	Data 5	7
K	Data 6	8
L	Data 7	9
M	Strobe	1

Some careful soldering is needed on the Centronics connector, but if you ask your local computer shop nicely, they may even have a cable of this configuration. Even if they don't you should be able to get the bits.

Entering the program

There are two methods for entering the program into your Commodore 64 — with assembler utilities if you have a disk (I use the Commodore development package) or with the Basic loader listed here. You will need to use the Basic loader if you do not have a disk system.

The assembler program is in several parts including a one-time copier to make a working copy of the program (more on this later), the lines of Basic used in the final program, an up-copier, the interface itself and the data tables used by the interface.

If you are using the assembler, enter the program in the normal manner using the text editor or something like Easyscript and assemble the program.

Then, using the low-loader, load the program into the $C000 memory area. Call the one-time loader by SYS 49152, this copies the whole program into pages $08 to $0B. The program can be saved onto disk by using the following:

```
POKE 45, 255: POKE 46,11: SAVE "FILE-
NAME",8
```

The pokes set the Basic text pointers to make the computer able to save the whole program as if it were a normal Basic program. When you wish to use the

loader simply load this file and run it. The program first copies the interface into its working area and then deletes itself.

Those wishing to use the Basic loader or using a cassette only, type in the Basic loader, save it for future use, and simply run it.

If you have made any typing errors in the DATA statements the program should let us know.

Non-standard use of printer

Not all CHR$ codes will be printed. Allowable codes are:
5, 10, 13, 15, 17, — 20, 27 — 95, 133 — 140, 144 — 160
Codes 5, 7 — 20, 28 — 31, 129, 133 — 140 and 144 — 159 are not true printable codes as these are the ASCII values of the graphics characters. If an Escape sequence uses either these codes or non-printable codes then something like Program 1 will need to be used. The example shown is to print high-resolution graphics which may send out values to the printer such as 0, 1, 128.

A byte's-eye view of the output.

Listing 3

```
1000 .opt list
1010 ;this is the one time copier
1020 ;copies down into basic area
1030 *=$c000
1040 pha
1050 txa
1060 pha
1070 ldx #$00
1080 ;copy lda $c400,x
1090 sta $0800,x
1100 lda $c500,x
1110 sta $0900,x
1120 lda $c600,x
1130 sta $0a00,x
1140 lda $c700,x
1150 sta $0b00,x
1160 inx
1170 bne ;copy
1180 pla
1190 tax
1200 pla
1210 rts
1220 *=$c400
1230 ;these are the lines of basic
1240 .byte $00,$32,$00,$01,$00,$99,$27,$28
1250 .byte $31,$34,$29,$22,$9[illegible],$11,$1d,$1d
1260 .byte $1d,$20,$20,$20,$20,$20,$20,$20
1270 .byte $20,$20,$d3,$2e,$d4,$41,$59,$4c
1280 .byte $4f,$52,$20,$20,$45,$29,$20,$31
1290 .byte $39,$38,$34,$20,$20,$20,$20,$20
1300 .byte $22,$00,$60,$00,$02,$00,$99,$22
1310 .byte $11,$11,$1d,$1d,$1d,$1d,$1d,$c5
1320 .byte $50,$53,$4f,$4e,$20,$d0,$52,$49
1330 .byte $4e,$54,$45,$52,$20,$c9,$4e,$54
1340 .byte $45,$52,$46,$41,$43,$45,$20,$d0
1350 .byte $52,$4f,$47,$52,$41,$4d,$22,$00
1360 .byte $09,$00,$03,$00,$99,$22,$11,$11
1370 .byte $11,$d4,$59,$50,$45,$20,$53,$59
1380 .byte $53,$35,$30,$37,$32,$32,$20,$54
1390 .byte $4f,$20,$52,$45,$20,$49,$4e,$49
1400 .byte $54,$49,$41,$4c,$49,$5a,$45,$22
1410 .byte $00,$9a,$00,$04,$00,$9e,$32,$32
1420 .byte $34,$30,$3a,$9e,$35,$30,$37,$32
1430 ;this line contains
1440 ;sys 2240 (#08c0)
1450 ;sys 50722 (#c500)
1460 .byte $32,$00,$a0,$00,$05,$00,$a2,$00
1470 .byte $b7,$00,$06,$00
1480 ;
1490 *=$c4c0
1500 ;when copied this will appear
1510 ;at #08c0 !
1520 pha
1530 txa
1540 pha
1550 ldx #$00
1560 copy lda $0900,x
1570 sta $c500,x
1580 lda $0a00,x
1590 sta $c600,x
1600 lda $0b00,x
1610 sta $c700,x
1620 inx
1630 bne copy
1640 pla
1650 tax
1660 pla
1670 rts
1680 ;
1690 ;commodore 64 - epson
1700 ;centronics interface software
1710 ;(c) 1984 simon n taylor
1720 ;
1730 ;
1740 ;          cbm char set version
1750 ;          ------------------
1760 ;
1770             *=$c500
1780 ;
1790 prta        = $dd00
1800 prtb        = prta+$0001
1810 flagl       = prta+$0004
1820 ctch        = $f1ca
1830 olf         = $f34a
1840 oco         = $f250
1850 opcvec      = $03fc
1860 opfvec      = $03fe
1870 saveit      = $030c
1880 ;
1890 ;
1900 ;          test if device to send to is
1910 ;          4, if not then jump to
1920 ;          kernel chrout routine
1930 ;
1940 start       sta saveit ;save data
1950             lda $9a
1960             cmp #$04 ;is it forprinter ?
1970             beq prcchr
1980             lda saveit ;restore data
1990             jmp ($0334) ;kernal
                 will handle it
2000 ;
```

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Listing 3 (cont)

```
2010 ;       process character to ascii
2020 ;
2030 prcchr  tya
2040         pha
2050         txa
2060         pha
2070         lda saveit
2080         ldx #$00
2090 ploop   cmp accdc,x
2100         beq ascok
2110         inx
2120         cpx #$03
2130         bne ploop
2140 prschr  and #$ff
2150         bmi hitest
2160         cmp #$0d
2170         beq if
2180         cmp #$20
2190         bmi fail
2200         cmp #$41
2210         bmi ascok
2220         cmp #$5b
2230         bmi lotest
2240         cmp #$60
2250         bmi ascok
2260         jmp fail
2270 lotest  clc
2280         adc #$20
2290         jmp ascok
2300 hitest  cmp #$a0
2310         beq sp
2320         cmp #$c1
2330         bmi fail
2340         cmp #$db
2350         bpl fail
2360 sp      and #$7f
2370         jmp ascok
2380 ;
2390 ;
2400 ;       perform auto linefeed
2410 ;
2420 if      lda $d0a
2430         jsr chrout
2440         lda $d0d
2450 ;
2460 ;
2470 ;       send standard ascii char
2480 ;
2490 ascok   jsr chrout
2500         jmp finito
2510 ;
2520 ;
2530 ;       now test if graphic
2540 ;
2550 fail    ldx $d00
2560 floop   cmp grcod,x
2570         beq sendgr
2580         inx
2590         cpx #$22
2600         bne floop
2610         jmp finito
2620 ;
2630 ;
2640 ;       now we send graphic
2650 ;
2660 sendgr  lda $codcal
2670         sta $fb
2680         lda $codcal
2690         sta $fb ;address - $09
2700         sta $fe
2710         ldy $fb
2720 add     clc          ;calc address in table
2730         lda $d09
2740         adc $fb
2750         sta $fb
2760         lda $d00
2770         adc $fc
2780         sta $fc
2790         iny
2800         cpy $fe
2810         bne add
2820         lda $d1b
2830         jsr chrout
2840         lda $d4c
2850         jsr chrout
2860         lda $d0c
2870         jsr chrout
2880         lda $d00
2890         jsr chrout
2900         ldy $d00
2910 sgloop  lda ($fb),y
2920         jsr chrout
2930         iny
2940         cpy $d09
2950         bne sgloop
2960         jmp finito
2970 zrloop  lda $d00
2980         jsr chrout
2990         dey
3000         bne zrloop
3010         jmp finito
3020 ;
3030 ;
3040 ;
3050 ;       send data out of port
3060 ;
3070 chrout  sta prtb
3080         lda prta
3090         tax
3100         and #$fb
3110         sta prta
3120 wait    lda flag1
3130         and #$10
3140         cmp #$10
3150         bne wait
3160         txa
3170         sta prta
3180         rts
3190 ;
3200 ;
3210 ;       open file
3220 ;
3230 openfl  cpx #$04
3240         bne nmaopn
3250         sty #$ff
3260         ldy #$ff
3270         sty $b9
3280         iny
3290 nmaopn  jmp (opfvec)
3300 ;
3310 ;
3320 ;       open channel for output
3330 ;
3340 opench  cpx #$04
3350         beq spopen
3360         jmp (opcvec)
3370 spopen  lda $d00
3380         sta $90
3390         txa
3400         ldx #$0
3410 spoplp  dex
3420         bmi spend
3430         cmp $0259,x
3440         bne spoplp
3450 spend   lda $0259,x
3460         sta $b0
3470         lda $0263,x
3480         sta $ba
3490         sta $9a
3500         lda $026d,x
3510         sta $b9
3520         clc
3530         rts
3540 ;
3550 ;
3560 ;       finish section
3570 ;
3580 finito  pla
3590         tax
3600         pla
3610         tay
3620         lda $d03
3630         sta $9a
3640         lda $d00
3650         jsr ctch
3660         lda $d04
3670         sta $9a
3680         lda saveit
3690         clc
3700         rts
3710 ;
3720 ;
3730 ;       setup vectors and port
3740 ;
3750 init    lda #$0326
3760         cmp $d00
3770         beq abort
3780         sta $0324
3790         lda #$027
3800         sta $0335
3810         lda $start
3820         sta $0326
3830         lda $start
3840         sta $0327
3850         lda #$31a
3860         sta opfvec
3870         lda #$31b
3880         sta opfvec+1
3890         lda $openfl
3900         sta #$31a
3910         lda $openfl
3920         sta #$31b
3930         lda #$320
3940         sta opcvec
3950         lda #$321
3960         sta opcvec+1
3970         lda $opench
3980         sta #$320
3990         lda $opench
4000         sta #$321
4010         lda $fff
4020         sta #$d03
4030 abort   rts
4040 ;
4050 ;
4060 ;       ********************
4070 ;       start of data block
4080 ;
4090 ;
4100 ;       acceptable direct codes
4110 ;
4120 accdc   .byte $0a,$0f,$1b
4130 ;
4140 ;
4150 ;                          special graphics codes
4160 ;
4170 ;                          function key codes
4180 ;
4190 grcod   .byte $85,$89,$86,$8a
4200         .byte $87,$8b,$88,$8c
4210 ;
4220 ;       cursor codes
4230 ;
4240         .byte $93,$13,$94,$14
4250         .byte $11,$91,$1d,$9d
4260         .byte $12,$92
4270 ;
4280 ;       colour codes
4290 ;
4300         .byte $90,$05,$1c,$9f
4310         .byte $9c,$1e,$1f
4320 codcal  .byte $9e ;this is
              used for graphic index
4330         .byte $81,$95,$96,$97
4340         .byte $98,$99,$9a,$9b
4350 ;
4360 ;
4370 ;       hi-res codes for above chars
4380 ;
4390 ;       function keys
4400 ;
4410 codes   .byte $de,$00,$de,$00,$de
4420         .byte $00,$ce,$00,$de
4430         .byte $f6,$00,$f6,$00,$f6
4440         .byte $00,$f6,$00,$f6
4450         .byte $fe,$00,$00,$00,$fe
4460         .byte $00,$fe,$00,$fe
4470         .byte $fe,$00,$fe,$00,$fe
4480         .byte $00,$00,$00,$fe
4490         .byte $ee,$00,$ee,$00,$f0
4500         .byte $00,$fe,$00,$fe
4510         .byte $fe,$00,$fe,$00,$fe
4520         .byte $ee,$00,$ee,$00,$fe
4530         .byte $00,$fe,$00,$fe
4540         .byte $fe,$00,$f0,$00,$fa
4550         .byte $00,$fe,$00,$fa
4560         .byte $00,$fa,$00,$fa
4570 ;
4580 ;       cursor keys
4590 ;
4600         .byte $ea,$14,$8a,$04,$c2
4610         .byte $04,$8a,$14,$ea
4620         .byte $fe,$00,$f9,$00,$f6
4630         .byte $00,$b2,$00,$fe
4640         .byte $00,$00,$fe,$00,$fe
4650         .byte $00,$fe,$00,$fe
4660         .byte $be,$00,$be,$00,$02
4670         .byte $00,$be,$00,$be
4680         .byte $fe,$00,$06,$00,$7a
4690         .byte $00,$82,$00,$fc
4700         .byte $fe,$00,$c6,$00,$c6
4710         .byte $00,$c6,$00,$fe
4720         .byte $fe,$00,$ba,$00,$ba
4730         .byte $00,$82,$00,$fe
4740         .byte $fe,$00,$fe,$00,$00
4750         .byte $00,$fe,$00,$fe
4760         .byte $fe,$00,$82,$00,$a6
4770         .byte $00,$da,$00,$fe
4780         .byte $fe,$00,$ee,$00,$ee
4790         .byte $00,$ee,$00,$ee
4800 ;
4810 ;       colour keys
4820 ;
4830         .byte $be,$00,$be,$00,$be
4840         .byte $00,$00,$00,$fe
4850         .byte $fe,$00,$82,$00,$aa
4860         .byte $00,$aa,$00,$ba
4870         .byte $ee,$00,$82,$00,$6a
4880         .byte $00,$8a,$00,$fa
4890         .byte $3e,$00,$1e,$00,$de
4900         .byte $00,$00,$00,$02
4910         .byte $54,$00,$aa,$00,$fe
4920         .byte $00,$fe,$00,$fe
4930         .byte $fe,$00,$de,$00,$02
4940         .byte $00,$ee,$00,$fe
4950         .byte $ee,$00,$c6,$00,$ee
4960         .byte $00,$ee,$00,$ee
4970         .byte $ee,$00,$c2,$00,$de
4980         .byte $00,$c2,$00,$be
4990         .byte $da,$00,$0a,$00,$02
5000         .byte $00,$fe,$00,$fe
5010         .byte $fe,$00,$fe,$00,$f0
5020         .byte $00,$ee,$00,$ee
5030         .byte $ba,$00,$de,$00,$ee
5040         .byte $00,$d6,$00,$0a
5050         .byte $fe,$00,$c6,$00,$d6
5060         .byte $00,$fc,$00,$fe
5070         .byte $fe,$00,$8c,$00,$a0
5080         .byte $00,$8c,$00,$fe
5090         .byte $fe,$00,$fe,$00,$fe
5100         .byte $00,$fe,$00,$00
5110         .byte $ee,$00,$c6,$00,$82
5120         .byte $00,$c6,$00,$ee
5130         .byte $ee,$00,$ee,$00,$00
5140         .byte $00,$ee,$00,$ee
5150 ;
5160 ;
5170         .end
```

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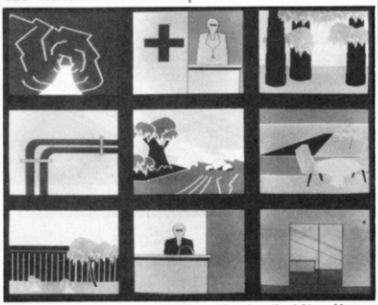
SNOWBALL EFFECT

Mike Gerrard tangles with software parrots and threats of death in the latest Level 9 adventure, the sequel to Snowball.

It's a sign of the number of excellent adventures appearing in the build-up to Christmas that even Level 9 has to queue for review space, but at least it gives you a chance to try to get to grips with the complexities of *Return to Eden*, the follow-up to *Snowball*, and available at £9.95 on tape for the Amstrad, BBC, CBM 64, Spectrum, Atari and Memotech. There's an £11.95 disk version for BBC and Commodore only.

The Amstrad, Commodore and Spectrum have graphics, for the first time in a Level 9 game, about 240 pictures in all, while all those poor old BBC owners with their failing memories get only a glimpse of the pictures by using a separate demo program. Mind you, good as the pictures are they do take ages to draw, so Commodore owners will be pleased to know that their version includes two additional commands that don't need explaining: WORDS and PICTURES.



***Return to Eden* has 240 screens altogether — if you have the right machine.**

Pretty pictures

The picture takes up roughly the top two-thirds of the screen, and with the bottom line flickering it suggests that the picture is being constantly redrawn. This seems to be confirmed if you switch to text-only, in which the bottom nine lines scroll up through the area where the picture would have been.

The adventure places you once more in the male or female role of Kim Kimberley, who has escaped from the Snowball in the stratoglider and landed on the planet Eden, which is in orbit round the yellow star, Eridani A. Unfortunately the Snowball has just entered orbit around Eden, and on board there is visual evidence that you tried to destroy the ship. In your absence you have been found guilty and condemned to death. It's no good sitting there in the stratoglider's control room muttering — you have a limited number of moves to make your escape.

There are only two other rooms on the stratoglider, a padded room and a walk-in cupboard, which contains six interesting items. Sadly, you can carry only four, and while the radsuit and compass seem to be obvious choices, will the tent prove more useful than the geiger counter? While you're busy thinking a message comes through: 'Kim Kimberley, you are guilty of murder. Your sentence will now be carried out. Prepare to die.' In fact, you still have a few more moves.

Of course surviving a nuclear explosion is nothing compared to what follows, *ie* surviving the Level 9 sense of humour. Would you believe a thieving parrot (must be one of these software parrots we're always hearing about) that turns up at random, squawks 'Har, Har,' steals your goodies and hides them in the maize? Yes, there's a maize maze in this one, and if that doesn't make you groan just wait till you wander into the Keystone Coppice.

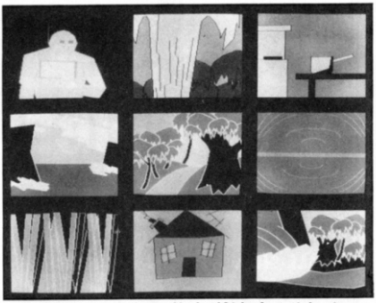
As you roam the parts of the Eden landscape unaffected by the blast from the Snowball (why isn't there a second attempt? Do they assume they've killed you?) you glean evidence of other beings — a low droning noise, a helicopter gunship clattering past — as well as the plants and wildlife on this strange planet. You are heading for the robot city of Enoch, and all that you know is that it is on an equatorial shore where four rivers meet. And all that you know about the adventure is that you must solve it. The adventure is thorough and professional and a must for every adventurer.

It's a shame to see an otherwise promising adventure from a new company, Sterling Software, marred by a sloppy and confusing screen layout. The game is *Assignment East Berlin* and is for the 48K Spectrum at only £5.95. The main problem is that after the location description and visible objects are printed, and you respond to the prompt, you must wait while the description and objects are listed again beneath your input and the computer's response, the whole lot scrolling upwards. This usually results in two location descriptions on screen at the same time, one at the top and one at the bottom. Also, you enter commands and objects in full. No problem most of the time, but it can result in some hair-tearing frustrating exchanges.

You begin at Checkpoint Charlie intent on returning from East Berlin with the new Russian cypher machine, its code book, a list of Russian agents in the west, and so on. Trying Help at any point only confirms that 'HMG does not recognise any agent in difficulty and you are on your own'. While it has some intriguing problems, I'm afraid *Assignment East Berlin* is amateurish compared to many other excellent Spectrum adventures.

A brief mention for a new release for Commodore owners, *The Search for King Solomon's Mines* from Severn Software at £9.95. It's a two-part graphics adventure from the company behind *The Mystery of Munro Manor*, and an excellent example of the recent trend for adapting books.

A reader with a pressing problem is Eve Lear of Torquay, Devon. Eve claims she's being driven mad, to the extent of now seeing her analyst twice a week. Her difficulty lies in *Twin Kingdom Valley*. You must kill the dragon to get the Master Key, and Eve says she's tried everything including HIT DRAGON WITH SWORD. What she can't have tried, as it's the only solution is (reading backwards): FFAT SNED OOWG NOLH TIWN OGAR DTIH. Just send the analyst's fees to me.



A clear screen presentation is something Level 9 takes for granted.

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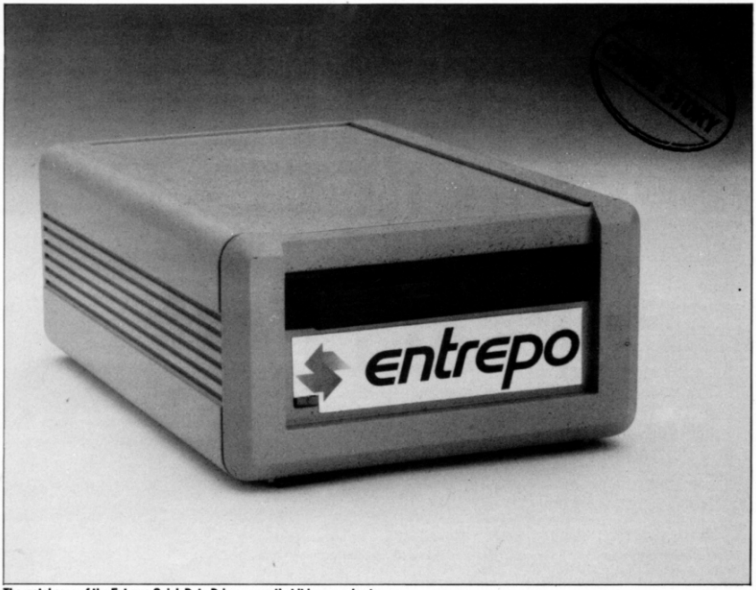
FAST DRIVER

The Entrepo Quick Data Drive uses tape wafers instead of cassettes, speeding up loading times considerably. But, asks Stuart Cooke, is it a good buy?



The metal case of the Entrepo Quick Data Drive means that it is very robust.

Commodore computers are not renowned for their tape operating system. Although a Commodore disk drive will increase the loading speed it's at quite a large expense. This is where the Entrepo Quick Data Drive tries to bridge the gap, acting the same as the Commodore C2N cassette unit, but about three to four times faster.

First impressions

The Quick Data Drive is slightly smaller than a standard cassette and has a cream coloured metal casing. At the front of the case is the single wafer drive — normal cassettes aren't used for storage, instead, there is a small wafer. Unlike a standard cassette, the wafer has a continuous loop of tape inside, rather like a Sinclair Microdrive cartridge. However, the wafers appear to be much more robust than their Sinclair counterparts, even if they are slightly larger.

A small sliding door covers the tape when not in use — it slides out of the way when a wafer is inserted. These have to be formatted before use in exactly the same way as a floppy disk. Different lengths of tape are available; obviously the greater the length of the tape, the greater the amount of storage available.

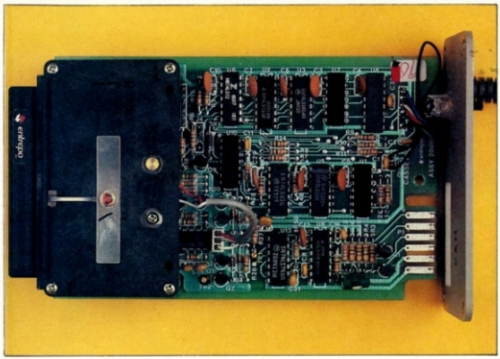
Out of the rear of the machine comes the lead which connects the drive to the Commodore 64 or Vic 20, plugging into the cassette port on the rear of the machine. A connector is provided on the rear to connect your Commodore cassette recorder to the drive or to connect another Quick Data Drive. There is also a small push button which is used when booting up the system.

Documentation

A 37 page manual is supplied with the data drive containing everything that you need to know. There are pictures showing how to connect the unit to your Vic or Commodore 64. Also shown are all of the different methods of expansion, such as using more than one drive, or a drive and cassette.

As with business computers, an operating system needs to be loaded before you can use the drive. In the case of the Quick Data Drive it is called QOS and all of the commands are fully documented. A File Management Utility (FMU) is also available, which allows you to copy files or load in a wafer directory.

At the back of the manual is a list of helpful hints such as 'Don't leave microwafers in very hot places, such as the top of a stove' or 'Don't leave microwafers in a very humid place, such as a hot shower'. The number of people that are likely to take a shower with their wafers, or to try cooking them on a stove must be very small, but now you know not to do it anyway.



Standard components are used for the construction of the data drive.

A memory map is also included and this should be looked at extremely carefully if you intend to store any data or use machine code. Make sure that you don't overwrite the QOS.

In use

First attempts at using the Quick Data Drive failed miserably. Firstly you must boot up the QOS by hitting the shift and run/stop keys on the Commodore as if you were loading a program from cassette. The normal 'Press play' message will then appear and this is when you press the button on the rear of the drive to start the loading of QOS.

It seemed to do this perfectly, but once it had loaded any further commands directed to the drive returned the error message 'Wafer Not Present'. It appears that the 64 I was using caused the problems since when tried with another, the data drive worked perfectly. It is worth noting that the Commodore 64 I used was a new one which works with everything else. Commodore does keep making so-called 'improvements' to the 64 and I can only assume that the initial problems with the drive must be due to a change within the machine. Entrepo said that although the Quick Data Drive was pre-production, it should work with all machines when it becomes generally available.

Once the QOS is loaded it sits in memory from location C000 and the FMU sits beneath the Basic ROM on the 64. On the Vic 20 the QOS sits at 6FFF and the FMU sits at 57FF.

Unfortunately C000 is an area of memory which a number of programs on the 64 use already. This meant that I couldn't run my favourite word processing program and a few games programs.

Another problem associated with the QOS is that you quite often have to reload it. The only way to exit a lot of Commodore programs is to turn the machine off. This obviously means that you lose the QOS. It would have been so much nicer if the unit didn't use up any memory for its operating system.

Through QOS the Quick Data Drive can handle sequential and program files in exactly the same way as a cassette drive. OPEN# is used to open a file and PRINT# is used to send data to it. The main advantage of the Quick Data Drive is the speed at which it can handle data files, making it much more useful than a cassette, which forces you to wait hours before your program reads in the last record of the file.

One of the most disappointing features of the QOS is that it doesn't include the facility to get a directory of what is held on tape. The only way to do this is to use one of the options that the File Management Utility gives you. Fortunately this is loaded together with QOS and on typing LOAD "FMU" it will appear. As some programs also use the area of memory under the Basic ROM for data storage, you may have to wave bye-bye to the FMU. Any further attempts to load it will result in the message 'Insert QOS wafer'.

FMU must also be used if you wish to format a new wafer or create a new QOS wafer. There are also a number of options that allow you to copy files from tape or disk to a wafer and vice versa. This is extremely useful and enabled me to transfer programs with no trouble at all.

I used it to transfer a program from disk to wafer and then on to tape. All three versions were then loaded back in so that the time differences could be checked. To load the program from tape took one minute 30 seconds, from disk it took 15 seconds and from wafer it took 20 seconds, a vast improvement over cassette. Obviously, the longer the length of tape in the cartridge, the longer it will take to find a program. It is therefore wise to use as short a tape possible for each application to speed up loading.

While performing the test above, another problem came to light. Even though you can plug the cassette recorder into the rear of the drive, you can only transfer programs between the data drive and cassette; it is not possible to load a program from cassette. So if you wished to use both cassette and a data drive you would have to resign yourself to a lot of plugging in and out of sockets.

Verdict

The Entrepo Quick Data Drive is a good replacement for a cassette recorder. Even though the metal case makes it more robust, I can't help feeling that a plastic case would have done just as well and would have made it a little cheaper.

In addition it has a few bad points — primarily it would be extremely difficult to use with existing software. But if you are more interested in developing your own programs, would like a quicker method of storage than tape, and can't afford a disk drive, the Quick Data Drive could certainly save you a lot of time, providing you keep the memory problems in mind.

The push-button is used to boot up the system.

Table

TAPE LENGTHS (FEET)	CAPACITY (1 FILE)	AVG. ACCESS TIME (seconds)
10	15K	8
20	35K	15
35	65K	25
50	96K	34
62	120K	43

Longer cassettes: more storage, less speed.

REPORT CARD: 1 TO 5

Features	●●●
Documentation	●●●●
Performance	●●●
Overall value	●●●

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MULTI-TASKING ON THE CHEAP

It's now possible to have 4Mb of RAM added to your Spectrum. But you'll have to be a wizard with a soldering iron to install the XK expansion, says John Lettice.

It may come as a surprise to you, but it's now perfectly feasible to have 4Mb of RAM fitted and working on a Spectrum. This would probably have come as a shock to Stephen Adams, who is responsible for the hardware that's made it possible, when he soldered his first ZX81 RAMpack years ago. We've all grown a bit since then, and the Spectrum is no exception.

Features

The XK expansion system is a simple idea — or to be more precise, it's two simple ideas. And the beauty of it is that the entry level modification costs only £15.95 for, if you're lucky, an extra 16K of memory. 'If you're lucky' because some Spectrum aren't 48K at all — they're 64K, and this is a consequence of an early piece of cost-cutting on Sinclair's part.

But the failure rate of 64K chips has dropped recently, so you may find you have extra memory you can't use. The XK is intended to give you access to this, and to RAM up to 4Mb, in banks of 32K.

In use

Stephen Adams says fitting the modification is dead easy. I reckon it would be a nightmare. Look at the picture and judge for yourself, but if you're not much cop at soldering, it'd make much more sense to pay the extra to have Television Services do it for you. Once the system's installed you still have a normal Spectrum, so there shouldn't be any problem loading commercial software. The clever bit, actually getting the XK working, is dealt with by the software.

This has been written for the system by Andrew Pennell, and is called XP Basic — calling it a Basic may be a little overblown at the moment, but the idea was to get a working system out now, and develop the operating system later.

The extended Basic adds a number of functions, but the system's core is its ability to handle extra pages of memory. These are basically 32K banks of RAM that can be switched in and out, and that can run separate programs, *ie* multi-task, through interrupts.

Think of it this way. Say you want to run a program that ordinarily wouldn't fit in a Spectrum. You can divide it up into subroutines placed on different pages of your expanded memory, and instead of using GOSUB you'd RANDOMIZE USR 26003: PRINT XXX, where XXX is the page number. The program on that page is executed, then you return to the main program. Multi-tasking is controlled simply by chaining the pages to be multi-tasked together in command line.

But wait, you say, if the pages are operating independently how can you update the values of parameters on a page when they may be changed by another page? This is allowed for. The area of RAM from 29000 to 32000 is for transferring data between programs, and it can be used simply by poking the value into this area then peeking it when you need it.

Windowing is the other major feature of the new operating system. These scroll automatically, without asking you the Spectrum owner's favourite silly question, 'scroll?' Obviously windows are important if you're going to be using a multi-tasking system, and these are perfectly usable, although limited. If you move a window over another, the data won't be refreshed when you take it away, but more expensive machines than the Spectrum lack this facility.

The multi-tasking also has the odd rough edge, most notably the way that when one of your programs finishes, the others all suspend operation as well. This is fairly easy to deal with, however, and considering the system's low price you'd expect the odd cost-cutting fudge.

True, the commands are a little unwieldy, but if you have Interface 1 you have the option to use shortened commands prefixed by '*'. As far as software is concerned, initially the system looks like being catered for by the small but thriving Spectrum business software houses. Andrew Pennell is looking at modifications of *Tasword 2* (4Mb RAM disk? All this could be yours) and generally the business programs with a modifiable Basic attached shouldn't present too many problems.

To use the system to best advantage, of course, you'll need RAMpacks. These come in 64K batches, and are a bit pricey at £100. If the system takes off, the RAMpack price may come down a little, but think of it this way — for £250 you can get a Spectrum with more user-memory than the QL.

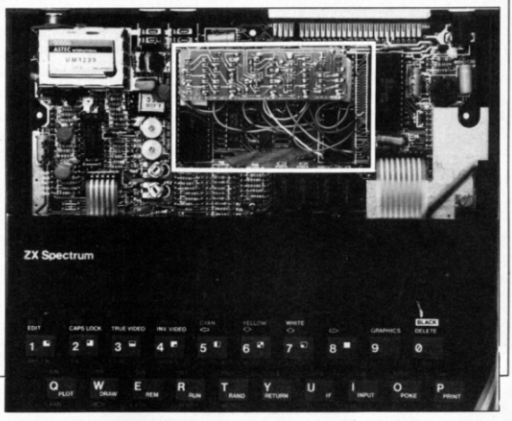
Verdict

I'm not going to start complaining about anything useful that costs only £20. The XK is a neat little system with great potential. With such a low price you don't have to find excuses for buying. That said, if a bit of work could bring considerable rewards and if it takes off sufficiently we should be seeing enhanced versions. Television Services was a bit cagey about my suggestion that they give me a custom-built 4Mb Rampack though . . .

REPORT CARD: 1 TO 5

Features	●●●●●
Documentation	●●●●●
Performance	●●●●●
Overall value	●●●●●

Product XK Expansion System **Price** £15.95 kit, £20.95 built **Availability** Television Services of Cambridge, 0223-311371.



The board fits snugly into the Spectrum — note the soldering to individual pins.

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PERSONAL
Computer
NEWS
Your eight-page games guide for Christmas
Sinclair/Acorn/Commodore
Top games for top micros
Arcade surveyed
Adventures afoot

SEARCHING FOR SOFTWARE SOLUTIONS

The roots of computer games are buried in a mire of wrangle and myth. The real 'first' might have been a simple text adventure such as *Hunt The Wumpus* — output to a printer of course. Or perhaps it was an early version of *Star Trek*, again with printed results of each move.

The modern moving character type game is far more immediate, requiring fast reflexes. It rapidly split into shoot-'em-ups, mazes and platforms. The movements are simple, shoot or be shot, avoid the prowling creatures and leap gaping chasms. An interesting question is why some game types rapidly became identified with space, defence of Earth etc. Perhaps it's easier to imagine pale, vague shapes as alien ships, bent on your destruction. Certainly, space is more exotic and romantic.

Moving games are at their best in the arcades, and software producers have spent hours converting such favourites as *Space Invaders, Phoenix, Frogger* and so on. Many new games are still 'versions' of arcade favourites — some licensed, some not. More recently, software houses have produced the 'official' computer versions of games by Atari and Konami among others. Only very recently have we seen a reversal, where the computer version is launched almost at the same time as the arcade machine.

As perspective projection became fashionable wire-frame drawings of space ships meant they could appear to rotate, approach and retreat. The method has even been used in games like Bug-Byte's *Kung-Fu*, where two players slug it out in oriental surroundings.

Another important development has been simulation, particularly in flight. Some programs don't offer much at all — displays and controls are sparse, response to controls is slow, and worse, you may simulate the physically impossible. Among the best are Microsoft's *Flight Simulator* for the IBM, *Solo Flight* (Commodore 64), *Interdictor Pilot* (64), *Aviator* (BBC) and *Fighter Pilot* (Spectrum). The machines range from Spitfires to fighter jets, and the programs often include some battle element. Some games incorporate flight simulation as part of a larger scenario, *eg Elite* (BBC, Acornsoft) or *Star Trader* (Spectrum, Bug-Byte).

Ideas

Programmers have combed many fields for novel games ideas, and the plundering of other media has started in earnest. Everyone likes a good story and programmers have borrowed from Norse and Celtic legend (*Valhalla, The Saga of Erik the Viking, Tir-na-Nog*), Greek myth (*Pegasis*) and more recent folk-tales such as *The Hobbit*.

The borrowing often takes little more than a scenario, characters and/or some background story, and all too often the game has little to do with the original.

Books are an ideal source of ideas, scenarios and characters. Some games have borrowed from Dante (*Inferno*, Richard Shepherd), *The Bible* (*Jericho Road, Gallilee*, Shards), but more recently science fiction/fantasy has been a major source. Mosaic publishes book/game packages such as a game based on Harry Harrison's *The Stainless Steel Rat Saves the World*. There's *War of the Worlds* (CRL) and some of Anne McCaffrey's science fantasy works have been 'translated' for computer.

Joining the prize-giving bandwagon created by Kit Peddler's Golden Hare is *Hare Raiser*, from Haresoft. The prize is — the original golden hare (yes, again — its finder sold it). And Commodore has taken up the puzzle/prize book, *Spirit of the Stones*. Clues are provided in the arcade-style games about where jewels and a talisman have been stashed on the Isle of Wight.

Sport is a popular theme and there are games where you manage a football team (*Football Manager, American Football*), play golf, cricket, tennis, and water-ski or sail. The dominant competitive theme of games, and the Olympics conspired to produce a burst of sports simulations this summer. They were a breath of fresh air as the animators rose to the challenge. *Daley Thompson's Decathlon, Decathlon, Micro-Olympics, Summer Games, Olym-pi-mania* and others proved popular.

There are some half-dozen racing games, including *Pole Position* (Atari, the standard-setter), *Full Throttle* (Micromega), *Enduro* (Activision) and *Turbo-64* (Limbic Systems). BMX-based games have hit the scene too.

Whether or not *Donkey Kong* was the earliest film-inspired game, it sets a standard for games of its sort though like skateboards or a hit record, its popularity soon faded. Variations on the 'fly down the tunnel theme' followed shortly on *Star Wars*. Palace Software released *The Evil Dead*, and variations from scenes from *Tron* were rampant. Bruce Lee has lived again on computers and Sinclair has licensed the rights to visual sequences from one of the *Star Wars* films. Activision's *Ghostbusters*, based on the latest American cult film, is due for a UK release this month, and Mind Games has brought out *Alien*.

Now you can summon up favourite TV programs on the screen as often and whenever you like. To date there are *Dallas*, a graphics adventure and *The Magic Roundabout*, which uses recognisable cartoon characters from the series, though the music is less clear. A version of *The Fall Guy* is scheduled for release by Elite Systems before Christmas.

Roland Rat lovers should know that negotiations between Ocean and TV-AM, are taking place and another game will focus on the *Air Wolf* programmes, (an A-Team variation due for screening shortly).

Board games

Chess on a computer is well established. As with the first versions of *Star Trek*, these initially produced results only on paper, but the advent of high-resolution graphics led to rapid developments. *My Chess II*, for instance, features a 3D view. Noughts and crosses, draughts, 3D draughts, and other games of strategy such as *GO* are all available. *Cluedo, Scrabble* and *Monopoly* have not been ignored. Spectrum *Scrabble* has always sold steadily. Last but not least there's *MUD* — an interactive adventure running on a mainframe at Essex University which has several players at once.

Christmas will introduce hordes of novices to the micro scene, all the target of software sales and promotion teams. Software will be pushed like pop music, furniture and food. It looks like software is the next consumer industry.

FAMILY

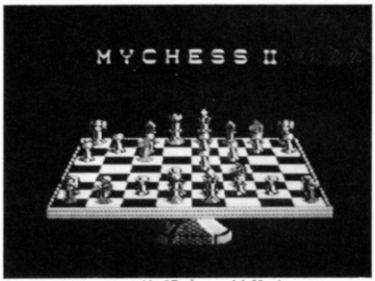
FAYRE

Picture the scene if you will. Long shot through snow storm of warmly lit house. Steadily zoom through the ground floor window. Pan across sitting room to where family are sitting miserably around spanking new home computer. The TV screen is glowing but blank. Mother gently weeps, Father quietly curses, Grandad gnashes his gums, Grandma snaps a knitting needle in frustration. The children sob uncontrollably.

The reason for their total despair, dear reader, is this: they failed to read this article. And just what magical key to domestic bliss and contentment does this piece of journalism hold, I hear you snarl.

Quite simply this, Oh ye of little faith and cynical lip: it brings tidings of software most eminently suitable for that great British tradition, what's more, the clever-clogs in the family can be challenged to pit their wits against the computer itself. What fun to hear the excuses when the brain of Acacia Avenue goes down 566-12 to a mere collection of silicon chips.

Moving along to a more cerebral area, why not let Grandad, Grandmaster of Guildford, pit his wits against one of the many superb chess programs? Among the very best are *Mychess* (Beyond Software), *White Knight* (BBC), *Spectrum* Chess II (Artic), *Cyrus Chess* (Sinclair) and *Grandmaster* (Audiogenic). One program — *Voice Chess* (Artic) — even speaks to you!



Get grandpa interested in 3D chess with Mychess.

Lighter mood

Most have a host of fun features such as giving you a hint as to what to do next (ban Grandad from using it), varying skill levels, problem solving and action replays. How jolly to get the whole street in and show them how Grandad was mated in ten moves!

If chess is not your thing, there's always other board games, such as *Backgammon* (Sinclair) or, if you like Othello, *Renaissance* (Audiogenic).

After all that brain power, perhaps you're in the mood for something lighter. Adults, would you like to know what kind of lover you are? Are you compatible with your present partner or would you be better off with someone else? How are your dating skills? What kind of relationship would suit you best? If you would like to find out the answers to these and other related matters, you could try *The Dating Game* (Acornsoft). This asks you a lot of questions and comes up with a diagnosis. There's even a section that will let you see who best matches who, a sort of miniature matrimonial agency — a giggle at parties, perhaps.

Married couples could have a go at *I Do* (Acornsoft), an analytical guide to a happy marriage. If you do decide to play any of these, make sure you do so only in a spirit of fun — this sort of diagnosis is a far from perfect science. Wouldn't do to have a bust-up over a program, would it?

If you like answering questions of a less personal kind, there's bags of quiz programs on the market, ranging from general knowledge to more specialised ones on such things as science fiction, theatre, opera, detective novels, etc.

On a more rigorous plane is *Cattel IQ Test* (Sinclair) which will give your grey matter a thorough workout and tell you whether it's worth your while applying for Mensa membership.

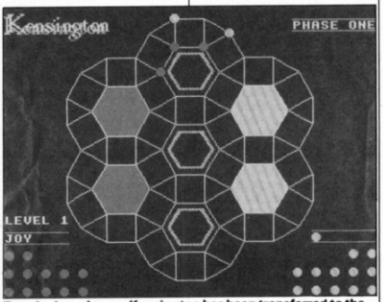
The more physical family may prefer a bit of armchair athleticism. There's plenty of sport simulation around.

For the football fanatic, there's the excellent *International Soccer* (Commodore) where you'll really believe a goalie can fly, *Football Manager* (Addictive Games) or *World Cup* (Arctic). Leather and willow watchers may opt for *Test Match* (CRL) while those wishing to leave the nineteenth hole for a while could go for *Royal Birkdale* (Ocean). Tennis aces could try their service out in *Tennis* (Atari) or *Matchpoint* (Psion).

It doesn't matter whether or not you've ever been orienteering or even know what is (I didn't). If you can read a map then the marvellous *The Forest* (Phipps) will provide countless hours of pleasure. You may even end up having a go at the real thing — I did and it's great.

Fancy playing the role of a dictator in a banana republic for a few hours? If so *Dictator* (Dk'tronics) is just the answer. If governing Britain is more your style, *1984* (Incentive) will give you the chance. It's great fun and should help sober everyone up.

If accumulating rather than dispensing money seems more attractive, *Millionaire* (Incentive) should reveal just what business acumen you really do have.



Popular board game Kensington has been transferred to the computer screen.

the gathering of the clans at Christmas.

Classic games

What better way to start the festivities than with a computerised version of one of the classic board games? Take *Scrabble* (Leisure Genius) for instance. No longer will Dad be able to 'accidentally' kick the board over just as you're about to blow everyone out of sight with a triple-value seven-letter humdinger. (There's also *Cluedo*, *Kensington* and *Mastermind*, all popular games and just the thing to shake off the after-effects of eating too much Christmas pudding).

Twists and turns

Playing an adventure is akin to reading an exciting book where you are the central character. Full of twists and turns, puzzles and mysteries, adventures are wonderful entertainment — even more so when there are several people all trying to offer advice about what to do next: 'Break the door with your axe'... 'No, look through the keyhole first.

Best of a massive bunch are the *Zork* trilogy (Infocom/CBM), *Colossal Adventure* (Level 9 — though all of its are brill), *Macbeth* (Creative Sparks), *Sorcerer Of Claymorgue Castle* (Adventure International), the *Ket Trilogy* (Incentive) and *Philosopher's Quest* (Acornsoft).

Finally, for relaxation, why not use your micro for a spot of creativity with *Print* (Atari) or *The Designer's Pencil* (Activision). Happy Christmas. **Bob Chappell**

ADVENTURE SPECIAL

In days gone by people told stories to pass the long winter evenings, lit up by flickering firelight. Now you're more likely to find them huddled over a keyboard and bathed in the greenish glow of a VDU as they battle with dragons, negotiate with Norse Gods, escape dungeons or pretend to be Denis Thatcher.

Since *PCN*'s first sortie into the adventure world with the Dungeon page, we've been spoilt for choice of adventures to review. There's never been a better time for the adventure player.

The last few months have seen such masterpieces as *Sherlock, Macbeth, Return to Eden, The Saga of Erik the Viking, Doomdark's Revenge* and *Hampstead,* not to mention two Scott Adams titles: *Spider-Man* and *The Sorcerer of Claymorgue Castle.* To buy all of them for your collection would set you back just under £100, so where does the newcomer to micros or just to adventures begin? It could be a bigger challenge than the adventures.

Way with words

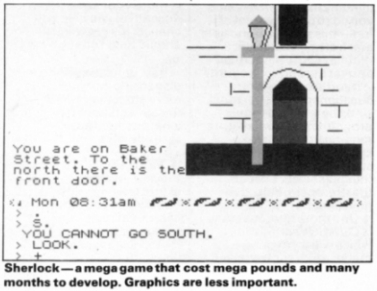
You can always begin where adventures themselves began and buy a copy of *Colossal Adventure* (Level 9), which is available on almost every machine. This is the home version of the first ever adventure, in those dark days of long ago, the mid-1970s, when micros and flashy graphics were almost unheard of.

There's only so much fun you can have on the number-crunching mainframes, so turning to the computers for entertainment was bound to happen. That's just what two Americans, Willie Crowther and Don Woods did and created the original *Adventures,* though it's often referred to as *Colossal Cave Adventure* and similar names.

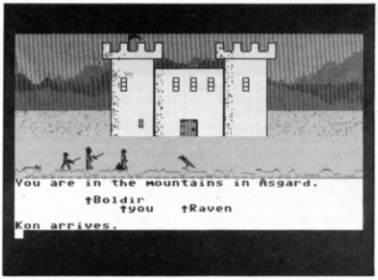
The first adventures were text-only. They placed the player in a challenging and obviously adventurous situation, just like a book, except you're frequently not allowed to 'turn the page' till you've solved a problem. *Adventures,* for instance, at one point describes your surroundings as the Hall of the Mountain Kings, a huge room decorated with majestic statues.

There are trophies, the mounted heads of elves and monsters, a carved granite throne, and the tattered remains of rich tapestries. Large doorways are on all sides, and a huge green snake hisses fiercely at you.

If you type in an instruction to try to take you past the snake, you discover that it won't let you by. Your problem is sneaking past the snake using some of the objects you may have found along the way. In fact, you should have accumulated a black rod, some food, a bottle, some keys, a singing bird and a cage for it. If you give the snake some food will it allow you to go past, or should you maybe try hitting it with the rod? Will that kill the snake, or will the snake kill you?



Sherlock — a mega game that cost mega pounds and many months to develop. Graphics are less important.



Valhalla took adventures in a completely new direction by concentrating heavily on graphics.

Adventures has remained successful because it covered so much. Programmers can ensure that you only get past the snake if you do a certain thing. Or they can create a pirate which will appear at random and steal one of the treasures you've laboured for hours to find. Or they can dump you in tortuous mazes that make Hampton Court look like someone's front hedge. So, no matter what your machine, Level 9's *Colossal Cave* is an essential purchase at some stage.

Equally seminal would be an adventure by Scott Adams who is the super-star of the adventure world.

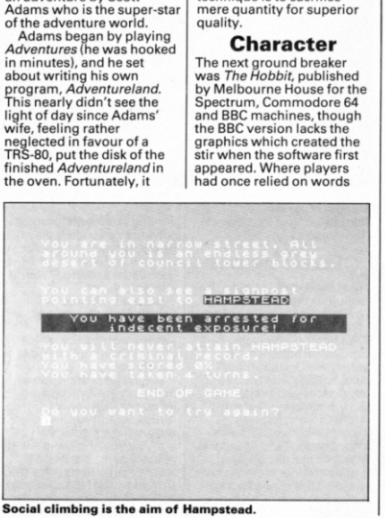
Adams began by playing *Adventures* (he was hooked in minutes), and he set about writing his own program, *Adventureland.* This nearly didn't see the light of day since Adams' wife, feeling rather neglected in favour of a TRS-80, put the disk of the finished *Adventureland* in the oven. Fortunately, it wasn't switched on at the time.

She realised she wasn't going to beat him so she joined him and wrote her own adventure. Between them they have produced a series stretching to 13 for their company, Adventure International, and these are available for many home micros.

Try one, but don't expect it to be easy, and you may decide it's too irritating. Where many adventure writers go for a hundred and even two hundred locations, to explore the Scott Adams technique is to sacrifice mere quantity for superior quality.

Character

The next ground breaker was *The Hobbit,* published by Melbourne House for the Spectrum, Commodore 64 and BBC machines, though the BBC version lacks the graphics which created the stir when the software first appeared. Where players had once relied on words



Social climbing is the aim of Hampstead.

for scene-setting, *The Hobbit* drew pictures. It was revolutionary in other ways too. First, it was adapted from a book read by millions; second, it developed the idea of other characters at large in the adventure, *ie* not just the player.

This occurred to a limited extent in *Adventures*, but when you take the part of hobbit Bilbo Baggins there is much more activity from other characters who have been programmed with a certain level of independent existence.

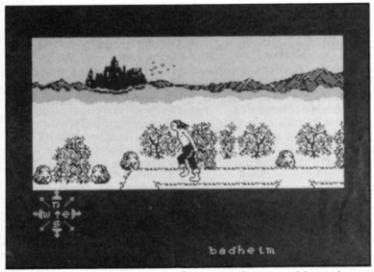
The main figures are Thorin and Gandalf, who appear and disappear from locations, and who you converse with and instruct. There are lesser characters such as elves and goblins whom you avoid — but again, this was an element of *Adventures*, where a dwarf would pop up at random to throw a none-too friendly knife in your direction.

Words win out

Sherlock, however, is a recognisable successor to *The Hobbit*. The long-awaited new Melbourne House adventure, for the Spectrum and Commodore 64, took 18 months and a reputed quarter of a million pounds to develop. Graphics have become less important, but the level of artificial intelligence for other characters has increased, so you get a greater variety of options and responses. The adventure is also a tough nut to crack, as you would expect from a Sherlock Holmes storyline. You play the detective, and adopt disguises, read newspapers, talk to Watson, question suspects, send notes to other characters, and so on.

Another essential purchase, for Commodore 64, is *Macbeth* (Creative Sparks) — from a team of seven who have produced four adventures based on Shakespeare's play. It is undoubtedly the adventure of the year. In two of the adventures you play Macbeth, in one you play Lady Macbeth, and in the other adventure you aid the witches as they gather eye of newt and toe of dog etc. There are four 'psychoanalysis' programs too — they are question and answer sessions which probe Macbeth's motives at different stages. It might seem to some a little heavy-going and (heavens above) educational — but it's great fun and anything you learn about the play is simply because the play makes for excellent adventure storylines.

Macbeth is also a pointer to the future for adventures, where increasing memory capacity on home machines will enable people to explore many other avenues of a story — whether an original one or an existing text. What might have happened if Macbeth had not killed Duncan, or had been discovered in the act? How many children had Lady Macbeth? You can take these possibilities to any lengths, possibly ridiculous, and allow the player to see a story through the eyes of different characters.



Tir Na Nog, from Gargoyle Games, takes graphics adventures one step further.

Graphic chance

The next big commercial success was *Valhalla* (Legend, for Spectrum and Commodore 64), which took adventures in a new direction and almost eliminated the text to concentrate instead on the graphics. You see a cartoon-like screen where matchstick characters respond to your commands and the text occupies a few lines.

Tell a character to get a bottle. The price of this is a restriction on the adventure elements and, for many, the novelty soon wore off, making *Valhalla* an optional rather than essential for an adventure collector.

Facing up to Sue Ellen in Dallas Quest. But who shot JR?

Best of the rest

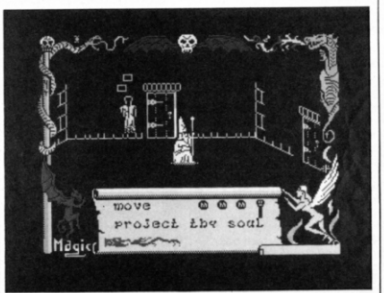
There are plenty more adventures that may not make the highest standards, but still present difficult and intriguing challenges. Sci-fi fans should tackle *Snowball* (Level 9, most machines), and if you're game for a laugh, try *Urban Upstart* (Richard Shepherd, Spectrum and Commodore 64) or *Denis Through the Drinking Glass* (Applications, Spectrum and Commodore 64). BBC owners, who are rather badly served, should tackle two adventures that are as yet available only to them, *Philosopher's Quest* and *Castle of Riddles* (Acornsoft).

Amstrad owners are still short of adventures, but if you've a penchant for the difficult and bizarre, take a look at the *Arnold* series from Nemesis (also available on the Dragon).

Valkyrie 17 (Ram Jam, Spectrum) is very well presented, taking you into a fantasy world of fascist organisations. The booklet contains transcripts of interviews. There are also recorded messages on cassette.

Atari owners have access to the Level 9 adventures, and also have the privilege of *Dallas Quest*. Who shot JR? I'm willing to bet that it was an Atari adventure player.

Mike Gerrard



Newson's Avalon adds a third dimension to graphics adventures.

ARCADE ACTION

One of the main problems with the computer games market is the vast number of companies that are trying to get in on the scene. Trying to buy a piece of software is a very risky business — all you have to go on is the blurb the manufacturer puts on the cover. All too often this means you buy what promises to be a really exciting game only to get it home and find it's extremely poor. So how can you be sure of buying a good product?

First you can examine the charts in computer magazines. If a game gets into the charts it should be fairly good. Secondly, read the reviews in the computer press to see what other people think about the game.

For anyone new to buying computer software here are a few established and respected software companies.

Spectrum

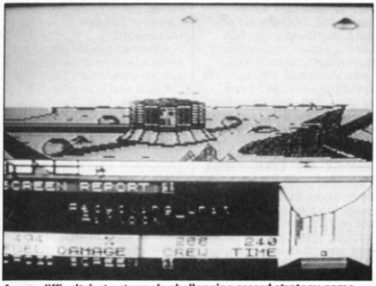
Spectrum owners are the ones who really suffer, as there is simply so much software to choose from. The company which really set the standard for Spectrum software is Ultimate. Its first release for the 16K Spectrum took the machine to its limit. Ultimate has kept up its standard and is still launching good games.

Software Projects is another company that has produced consistently good programs, the best known being *Manic Miner* and *Jet Set Willy*.

Hewson Consultants, whose first games received some bad reviews, is now producing some excellent games — *Avalon* definitely deserves a look.

Gargoyle Games is a new company which seems to be producing very high quality software. *Tir Na Nog*, an arcade venture, is particularly impressive.

Another of the 'old boys' in the software industry is Ocean. This company is now converting a number of the top American programs onto the Spectrum. Finally, Micromega consistently produces software of high quality. Its program *Death Chase* on the 16K Spectrum raised quite a few eyebrows when it was launched. Many shops sold out within a couple of days of receiving stock.



A very difficult, but extremely challenging arcard strategy game — Psytron, from Beyond.

Commodore 64

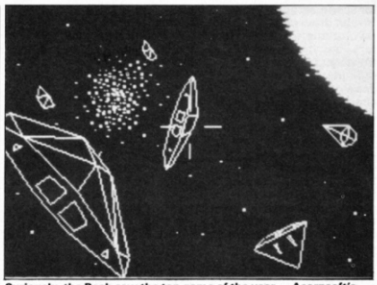
Commodore 64 owners are a little less fortunate when it comes to naming companies which maintain standards. Many produce a couple of top games and then let the quality fall.

Alligata produces some excellent games — *Blagger, Son of Blagger* and *Loco* all held places in the software charts for quite a while, while one of its latest releases, *Rocket Roger*, should do very well. Novagen has only ever released one game, called *Encounter*, which was a very fast, 3D shoot-'em-up. If its next program is as good, Novagen should go a long way.

Beyond is starting to produce some very high quality programs. *Psi Warrior*, although difficult to play, has some attractive graphics.

Most of the really good 64 software is imported from the US, and a number of companies have been set up to produce American software under licence in Great Britain.

US Gold, CBS and Ariolasoft all have some exceptional titles.



Curiously, the Beeb saw the top game of the year — Acornsoft's Elite, which hooked everybody.

BBC

There aren't as many games around for the BBC as other machines but there are still a few notable companies. Acornsoft produces some good software and not just good games. *Elite* shot straight to the top of the charts when launched. Alligata also publishes excellent BBC games.

Micro Power is another company which produces software for BBC. Although not all of its titles are brilliant, most are well worth a look.

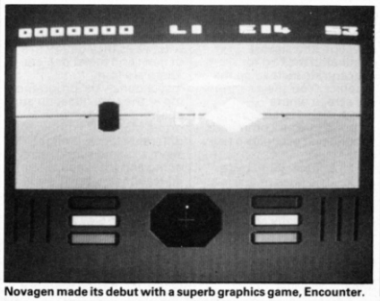
Many games are so similar to one another that it's often very difficult to distinguish between them. Here's a run-down of just some of the 'types'.

Platform goals

Spectrum owners looking for a platform game could do worse than buy a copy of Software Projects' *Manic Miner*. This is the one that started the flood of so-called platform games. The aim is to guide miner Willy through numerous caverns, collecting all the objects while avoiding the monsters and collapsing floors that are scattered around. *Jet Set Willy*, the sequel to *Manic Miner*, proved to be as popular as its predecessor. In *JSW* you don't have to collect all the objects before moving onto the next room, but all of them must be collected before you can finish.

Commodore owners are lucky, Software Projects has converted both games to the 64. No attempt has been made to use the additional facilities of the 64 and the games look identical to their Spectrum parents.

Alligata Software has produced numerous platform games for the 64, its first being *Blagger*. More use is made of the machine in this game with larger graphics



Novagen made its debut with a superb graphics game, Encounter.

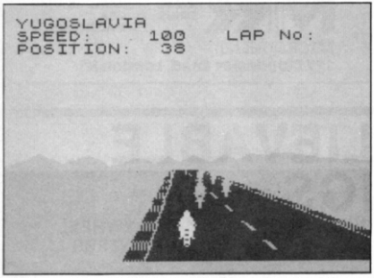
than the Software Project games. *Son of Blagger* is the follow-up to *Blagger* and a new idea was introduced here. Instead of your man moving around, the rooms scroll smoothly past in eight directions.

Alligata also caters for BBC owners, and both these games have been converted for this machine — and extremely well. In fact, they have more screens than any other BBC platform game.

Arcade favourites

For those of you with tendencies to spend time in the arcades there are plenty of programs which have been converted on to home micros. Versions of *Defender* are available for most machines. Design Design calls its version *Invasion of the Body Snatchers*. This is an extremely fast game and will challenge even the most hardened arcade player. Acornsoft's *Plantoids* is very similar to the arcade version, probably slightly faster, making it a tough one to play. Anirog produces a competent version for the 64 called *Skramble*, but there are others. *Pacman* started the maze game craze but is one game that hasn't translated well onto micros. Acornsoft's *Snapper* for the BBC is probably the best version available for any micro. Atarisoft (the game originates from Atari) has launched a Spectrum version that strongly resembles the arcade game. It's fun to play, but lacks the polish of its parent. Mr Chip produces a version of *Pacman* on the 64 called *Pacmania*, but again there are many others.

Guzzler on the 64 from Interceptor Micros is a prime example of how the Pacman idea has been adapted. In this game you must dash around a maze eating fruit from food stores. Once you've eaten fruit, you become rather fat and have to meet up with Denis the Deflator before you can carry on with playing the game.



Micromega's Full Throttle — 100mph but still second from the last in the race.

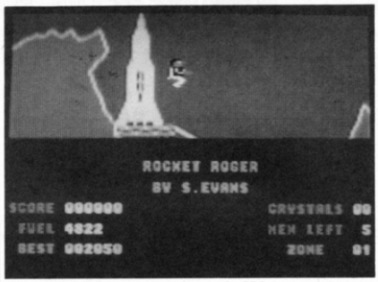
as the graphics and sound have been superbly done. Alligata's version for the 64 is rumoured to be so close to the original that if you know the tricks in the arcade version you can use them to advantage here.

Followers of *Scramble* are catered for with *Cavern Fighter* from C Tech, and *Penetrator* from Melbourne House. The Melbourne House version was one of the first games to become available on the Spectrum. Even so, it remains extremely popular. *Cavern Fighter* has larger graphics than the version from Melbourne House, and offers an extremely challenging game. Acornsoft comes to the rescue for owners of the BBC with *Rocket Raid*.

This is near identical to the version in the arcades and is

Most of the popular arcade games that are converted for micros come from the US and so are available on the Commodore 64 long before any other micro. *Up and Down*, *Star Wars*, *Buck Rogers*, and *Zaxxon* are all extremely popular in the arcades and extremely good versions are available on the 64.

Obviously not all arcade-type games are clones of arcade originals. One very good example is the latest release from Microsphere, called *Skooldaze*. In this you play the part of a school-boy who is trying to get his school report before it's seen by the headmaster. Probably one of the funniest games this year, and a real treat for Spectrum owners.



Alligata's Rocket Roger — a winner on the BBC.

Adventure games

A new type of arcade game that is only just starting to appear is the arcade adventure. The goal in these is to complete a set task, exactly the same as in a more traditional text adventure, except that the description of a traditional adventure is put into picture form. Your character can run around rooms collecting objects and fighting monsters, all under keyboard or joystick control.

Ultimate's latest, *Knight Lore*, takes the Spectrum to its limit, with rooms pictured in true 3D perspective and extremely smooth animation.

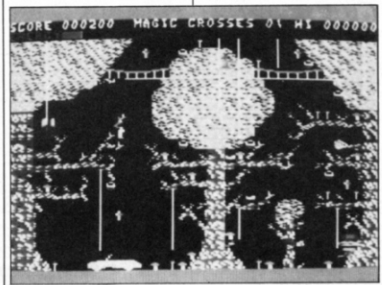
Ant Attack from Quicksilva is available on both the Commodore 64 and the Spectrum. In this arcade adventure you find yourself in a town which is depicted in beautiful 3D. The aim of the game is to rescue the girl or boy who has been trapped by the giant ants which roam the city.

Quo Vadis is one of the few arcade adventures available on the 64 and is supposed to have more screens than any other.

Simulations are another type of very popular game and a particularly varied selection of offerings is available. Best without doubt is the excellent *Flight Simulator II* on the Commodore 64. The only problem is that it weighs in at a pricey £40. Acornsoft, as usual, does a superb Spitfire simulation on the BBC — *Aviator*. Spectrum owners are catered for by *Fighter Pilot* from Digital Integration and *Flight Simulator* from Psion.

Even though we haven't really got into the age of space travel, it's already possible to purchase so-called simulations for home micros. By far the most outstanding package is *Elite* from Acornsoft on the BBC. The 3D effects in this game have to be seen to be believed. *Code Name Mat* on the Spectrum has some very clever 3D effects, proved extremely popular when it was first released and still has a good following. *Interdictor Pilot* from Supersoft is available on the 64, and Activision has released a space shuttle simulator.

Stuart Cooke



Chiller was Mastertronic's top budget game for the 64.

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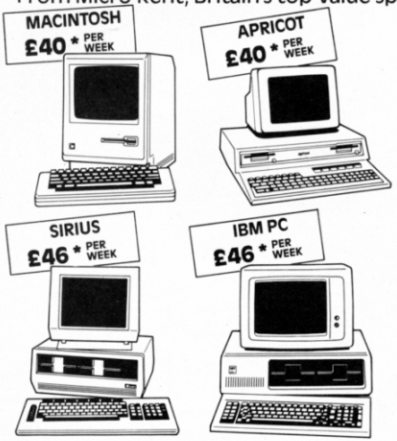

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THE PC THAT PACKS A PUNCH

No computer is perfect — or is it? Simon Craven, who tested the Date General One, argues that this one is pretty close to perfection on several counts.

Most personal computers are a compromise. Usually, a machine which excels in one area falls down in another. Maybe it's pretty heavy, but look at the disk capacity! I know the quality of construction leaves something to be desired, but it's so cheap!

The Data General One is almost free from such compromises. It is by no means perfect, but what it does, it does well. Comparing it to the competition is difficult, not because there is none, but because it compares with so many classes of computer.

First impressions

Perhaps the most striking characteristic of the DG1 is its size, so that makes a good place to start. The machine is actually smaller than it looks in photographs, with about the same footprint as a Dragon 32 but thinner. The initial impression is one of mild incredulity — can Data General be serious? £3,675 for *this*?

The DG1 is one of the first machines to use a full-size LCD display. Even though the keys appear smaller than usual, the keyboard is still high-quality.

A closer look brings the price back into perspective. The DG1 might look like a toy computer — a sort of up-to-date Petite typewriter — but it packs a heavyweight's punch. Inside that little box are crammed up to 512K of RAM, a CMOS 8088 processor, a moderately decent keyboard, a huge LCD panel, which is the outsize thing about the whole machine, and almost incredibly, 1.4Mb of mass storage in the shape of two 720K Sony 3.5in floppy disk drives. Oh, and by the way, there's a built-in rechargeable battery pack which will run the whole thing, disks and all, for about eight hours.

Give any journalist a computer and the first thing they'll do is criticise the keyboard. It's a natural reflex. The DG1 version looks straightforward enough, but it has a number of quirks. The most obvious — if it is supposed to be an IBMulator — is a distinct shortage of keys, but a little probing reveals that all functions are present and correct, even if they do take a bit of ferreting out.

The numeric personality of the IBM's schizophrenic right-hand keyboard cluster is replaced by the combination of the NUM LOCK key and a block of keys in the main typing area. Separate cursor keys are also fitted. The function keys move from their familiar vertical stacks to the top row of the keyboard. This can be a bit of a pain, as many programs *eg Flight Simulator*, use keys 1,3,5,7 and 9 for one lot of associated functions and the other stack for the other. The instinctive feel is lost when the keys are arranged in along string from one to ten. Another oddity is the actual size of the keyboard. The whole thing is scaled down by about ten per cent across the lateral axis — at least compared to all other 'proper keyboard' computers I have measured. Suprisingly, this did not turn out to be a problem.

That hurdle overcome, the DG keyboard impresses. The tactile feedback is a delicious velvety click, without the loud audio accompaniment which characterises the IBM keyboard.

Screen

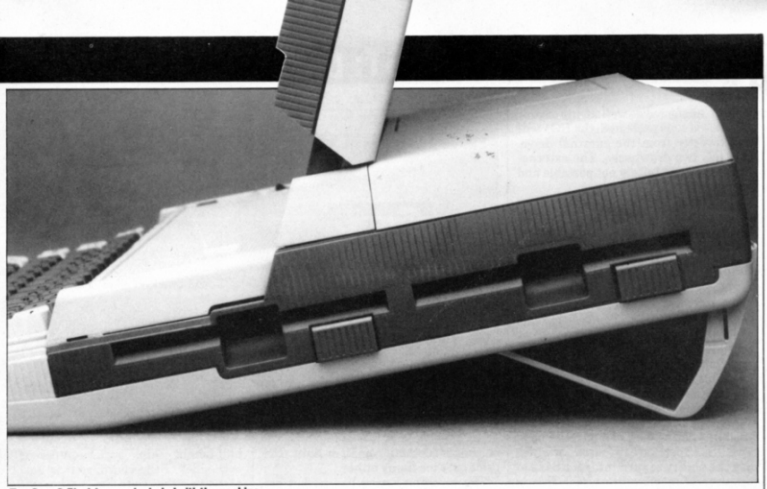
The biggest technical surprise on the DG1 is its enormous LCD screen. It isn't the first 80 × 25 liquid crystal unit to see the light of day — that honour goes to the ACT Apricot — but whereas the ACT device is rather compressed in the vertical plane, making circles oval, the DG gives the same viewing area as a conventional CRT monitor. The characters are the beautifully formed ones we know and love on the IBM PC.

Fortunately, the DG's display is much easier to read than that of the Apricot. The contrast is better, with a cool light grey background replacing the murky green of the Apricot.

The display also operates faster. LCD screens are usually slow to respond to fast-changing display requirements, and this is most noticeable when graphics are being moved or text is scrolling rapidly. To my surprise, the DG1 could cope with all the Microsoft *Flight Simulator* threw at it, without any perceptible lag.

The effort which has gone into speeding up the screen's responses is considerable. To reduce the amount of time between refresh cycles for each individual pixel (the bigger the screen the greater this problem becomes), the large panel is divided into four, all of which are updated simultaneously. The jiggery-pokery required to handle moving graphics from one logical panel to another must be substantial, but I was unable to disembowel the machine for a closer look.

Reading the LCD in poor lighting



Two Sony 3.5in drives are included with the machine.

conditions is still a problem, despite DG's best efforts, and there seems to be little that can be done to improve matters with a basic screen design which relies on reflected light instead of the radiated light of a CRT.

The other traditional bugbear of LCD technology is screen reflections. In some conditions, by the time you have enough light falling on to the screen you are dazzled by pictures of yourself, the window, the furniture — anything but the text you want to see. ACT exacerbates this problem by making the clear external cover absolutely glassy. Score ten for artistic impression, but zero for practicality.

The DG's protective window is slightly rough to the touch, and is slightly frosted. This does wonders for the reflection problem, at the cost of a small amount of contrast. If you find the mythical 'ideal lighting conditions', removing the protective screen makes things clearer still.

Being able to get underneath this screen lets the user deal with a problem which can drive strong men to drink — bits of junk mysteriously appearing in the narrow cavity between the two layers of glazing. No matter what kind of sealing is carried out during manufacture, these specks invariably appear when an LCD is in regular use. Normally it's like having an itch you can't scratch, but with the DG1 relief is no further away than the nearest duster.

Disk drives

The two disk drives lurking in the right-hand edge of the machine are familiar enough beasts — Sony 3.5in drives used by Apple, Hewlett-Packard and ACT. Unfortunately, all four machines use completely different disk formats to achieve broadly similar results, so a major opportunity for standardisation has been ignored. Data General has at least responded in the right spirit, though, adopting the 'standard' format proposed by Microsoft. DG sets great store by standardisation in computers, and I know of no other machine currently available which uses this disk format. Maybe the Microsoft name will ensure that the Oriental hordes of MSX disk drives will follow.

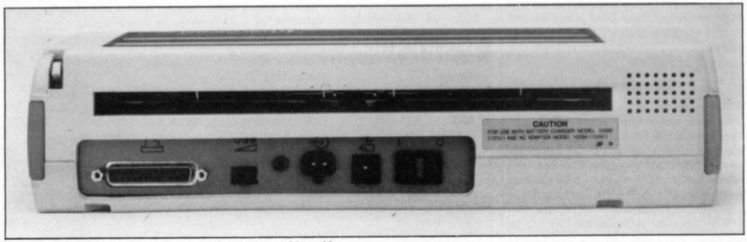
Another of my niggles concerns the disk drives. The machine is set up to boot from the front drive — fair enough, as this is the location of the default unit on machines which are fitted with only one drive. However, ACT has a system on twin-floppy Apricots which lets the machine boot off the number two drive if number one does not contain a system disk or is unserviceable in any way.

The optional 5.25in external disk drive is bootable, so why not the second on-board floppy?

Software

IBM software compatibility is always nice to have, and from our tests the DG1 must be regarded as one of the nearest clones. The primary problem is obvious — those miniature disk drives.

There are three ways round this snag. The easiest is to buy the external 5.25in drive and copy files directly on to 3.25in disks. While you are about it, data files



The rear of the machine holds all the connections to the outside world.

44 ►

can be transferred as well. If any of your software is copy protected, the DG1 will boot directly from the external drive. This has two drawbacks. The external disk drive is definitely not portable and it is expensive.

The second approach is to copy files over an RS232 link from an IBM to the DG. This doesn't solve the problem of protected disks, though, and it has the disadvantage of requiring a spare IBM PC.

The third way out is simply to buy your software on 3.5in disks. Data General has hired Tamsys in this country to ensure that as much as possible can be supplied on Sony disks, and there is a list of several hundred available titles including *Lotus 1-2-3*, the Infocom adventure range, *dBase II* and *Wordstar* among many others.

Another possible area of IBM incompatibility is the lack of a parallel port. Two RS232 ports are fitted, one of which has the ability to turn into an RS422 at the drop of a software switch. This is rather annoying, especially as Centronics-type parallel printers are the rule in this country, and serial interfaces usually have to be bolted on at extra cost. It is not a major worry, though, as a BIOS patch has been added. Parallel printer calls are headed off at the pass and diverted via one of the RS232 interfaces.

Some IBM PC software is being tidied up to run on the Data General, as anything which does not use 'legal' BIOS entry points is not likely to work. This is less of a problem than it used to be — these days, software suppliers tend to write with one eye on the ever-increasing number of PC lookalikes, making their programs as portable as possible.

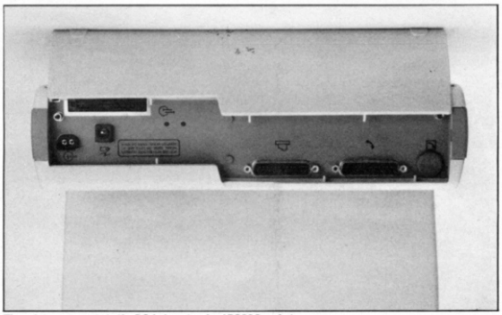
Built into a left-over bit of ROM are a few simple utility programs — a text editor, a dumb terminal emulator and a configuration program. None of these is much to write home about, but they're free.

The biggest drawback is that to get these programs, you have to reset the machine without a system disk in place. After a few seconds' desperate scrabbling while it tries to boot, the computer comes up with the opening menu for the ROM utilities. Since DOS is not loaded at this stage, you can't save anything you produce. You can beam it down the phone or print it out, though.

Drawbacks

If the story so far seems to be rather eulogistic, never fear. There are things wrong with the DG1, but they do seem like splitting hairs when the performance of the basic machine is taken into consideration. However, journalistic scepticism screwed to the limit, here are a few points to ponder.

Why does the AC adaptor have to be separate from the battery recharger? They perform very similar functions and neither is especially small or light. The price isn't too funny either.



The printer connects to the DG 1 via a standard RS232 socket.

The machine I used had no battery back-up to the system clock. This seems a little careless, especially considering the date and time-stamping function built into MSDOS which comes into operation whenever a file is saved. If travelling some distance, you'll pack it up, but crossing the office could prove expensive. It's one thing to trip up with a £400 Tandy or NEC, and another to drop this sort of money.

There is no carrying handle, and at about 12lbs, the DG1 is a bit too heavy to tuck securely under one arm.

Internally, the DG1 reveals why it costs so much to buy. The whole machine is CMOS for a start, and CMOS architecture is expensive. Chosen because it consumes much less power than conventional NMOS technology, it has a useful side effect — it runs much cooler. The importance of this should not be underestimated — a 512K NMOS machine in a box this size, with no fan or ventilation, would probably melt down if you left it switched on for more than five minutes. The Apricot portable, which is a little more bulky and uses NMOS, makes the disk in its single drive very hot. I didn't notice this effect with the DG1.

Most of the machine consists of half-height chips surface-soldered to both sides of the board, so it is hardly surprising that Data General has designated the interior of the case a no-go area for unqualified personnel. If you think a BBC micro has a crowded circuit board, you've got another think coming.

The LCD panel is also an expensive piece of kit — it was invented specifically for this machine — and bumps up the price considerably. Finally, imagine the investment required to make this machine in a fully automated plant with only 12 workers, and you can see why the bottom line is so high. You don't get ripped off for this computer — the pricing is reasonable, considering what you get. However, the cost of one or two individual items seems rather steep. The memory expansion from 128K to 256K will be essential for many users, and £2 per kilobyte is a lot to pay. The batteries and charger, as well as the AC adaptor, all seem too expensive.

Verdict

The price of the DG1 could come down quite quickly as component costs fall and DG pays off its plant investment. Even as it stands, however, the Data General One is a fine product. It does things most people didn't expect to see for at least another year, and it has no major flaws. It deserves to do well.

SPECIFICATIONS

System	Data General One
Processor	80C88
RAM	128K expandable to 512K internally
ROM	32K including diagnostics and terminal emulation.
Storage	720K Sony 3.5in floppy disk drive, one or two internally.
Display	80×25 LCD, 640 × 200 resolution graphics
Operating system	MSDOS 2.11
Power supply	240V or 110V AC, optional battery pack with eight or ten hours life, six hour recharge time
Dimensions	13.7 × 11.7 × 2.8in
Prices (excluding VAT)	£2,490 (basic system), £3,675 (enhanced system)

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FOR MORE INFORMATION ON THE TOSHIBA HX10 CONTACT TOSHIBA (UK) LTD., TOSHIBA HOUSE, FRIMLEY ROAD, FRIMLEY, SURREY GU16 5JJ. TEL: (0276) 681691.

MICRO BRITISH COMPUTING AWARDS

1985

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Here's your chance to contribute to the most important event of the microcomputing calendar – The British Microcomputing Awards 1985.
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The BMA 1985 is looking for technological excellence and value for money. Who do you think deserves to win these highest of accolades? Fill in the nomination form and let us know. Your nominations will be carefully considered by a team of experts from this magazine who will then forward a shortlist to two independent panels of judges.

The winners of the eleven categories will be announced at the Awards Ceremony next June and they will each receive the unique BMA trophy. The ceremony will also make a series of special commendations for computer projects of social importance. There will be a major presentation to Concerned Micros in Education and Training (COMET), the charity established by the BMA 1984, to aid disabled young people.

Complete the nomination form opposite and you could join the top names of the industry at the prestigious Awards Ceremony in London next June

The judges will be looking for a number of important qualities in all the products nominated. These include value for money, ease of use, flexibility and innovation. Colour, sound and speed, as well as software support will be other key considerations in judging the hardware, and use of the machine in the software categories. The judges will also be looking at the consumer support service offered. There are however, certain specific requirements:

1. Business Microcomputer & Business Microcomputer of the Year. The machine must cost less than MRP £5000 including operating systems, CPU, keyboard, disks and monitor. It must be disk based, come with at least a 90-day guarantee and have a wide range of business software.

2. Business Software & Business Software of the Year. Software should be disk based with a MRP of less than £1000 per package or module.

3. Home Microcomputer & Home Microcomputer of the Year. The machine must not cost more than MRP £500

4. Home Software & Home Software of the Year. Software must not cost more than MRP £50.

RULES 1. Categories 1-5. Manufacturers may nominate their own products which need not have been made in Britain but all products must have been available for purchase from retail outlets in the UK by January 31st 1985.

2. Categories 6-9, ii. Manufacturers may nominate their own products which need not have been made in Britain, but all products must have been available for purchase from retail outlets in the UK between 1st November 1983 and January 31st 1985.

3. Employees of VNU Business Publications BV, The Organisers, The Sponsors or any individuals associated with the British Microcomputer Awards are not eligible to place a nomination with the exception of the six VNU title judging panels which may each nominate up to six entries.

4. The decision of the judges is final and no correspondence will be entered into.

5. All nominations must be received by noon February 15th 1985.

Enter your nomination for each category and explain, in not more than 30 words, the reasons for your choice, using another sheet of paper if necessary. You should consider carefully the guidelines given for each category.

Category 1: Business Microcomputer_____

Category 2: Business Software_____

Category 3: Home Microcomputer_____

Category 4: Home Software_____

Category 5: Educational Software_____

Category 6: Game of the Year_____

Category 7: Peripheral of the Year_____

Category 8: (i) Home Software of the Year_____

(ii) Business Software of the Year_____

Category 9: (i) Home Microcomputer of the Year

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BRITISH MICRO COMPUTING AWARDS 1985

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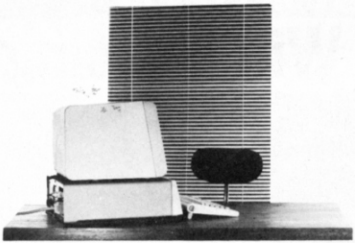

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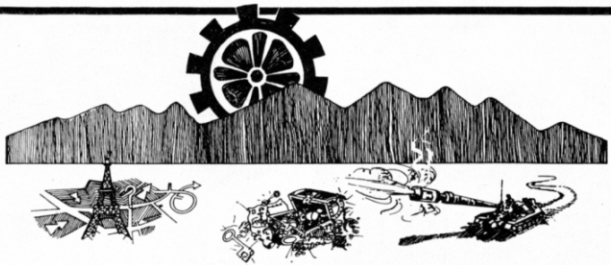

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GAMEPLAY

SPECTRUM

COMBAT LYNX

How do people cram quite so much programming into the Spectrum?

There's enough in *Combat Lynx* to take you hours just to master the controls, let alone the strategic planning.

The game is a real-time battle simulation, so there's something for nearly all tastes — shoot-em-up, flight navigation and strategy. The game is fairly straightforward — you pilot a helicopter, the only air support for your bases. There are four skill levels; at the highest you must maintain and defend six bases and enemy pressure is much higher.

On arrival at a base, fuel and ammo can be picked up, personnel delivered and injured combatants collected for treatment at Base zero. When arming the chopper you can select from cannon, mines, rockets etc, up to your maximum payload. But the more heavily armed you are, the less fuel you can carry.

There are so many different keys to press that it's very confusing at first. Flying the whirlybird is easy enough, though the display shifts alarmingly between the compass quarters. There's plenty to keep you occupied in the cockpit. You have to keep an eye on the compass, your coordinates, an

altimeter, flight control instrument gauges, weapons and message screen.

The best part is the main view which shows the Lynx in the centre, above a 3D scrolling landscape. The Lynx is rather small, and there are attribute problems, but it's very nicely done, twisting and turning convincingly.

The background is also very good. There are green fields with white contour outlines against a blue sky. Enemy forces like gun emplacements are wire frame, and it's quite something to hunt down and pursue a tank. The hilly landscape is dotted with trees and houses which drift past underneath the copter as you search for the enemy. The perspective isn't perfect, but the effect is very good, all the same.

Pressing M takes you to the navigation map. This is a window on the battlefield, with the Lynx in the middle. You can scroll the window to check for enemy movements. Symbols show the bases, tanks, lorries etc, which are circled if they belong to allied forces. These are a bit indistinct and it's difficult to tell what's what.

Another M and you're back in the pilot's seat. If you're lost you can always request base coordinates via the micro screen, but you'll have to be quick writing them down. It's through the micro-screen, which flashes when a message has been received, that information about attacks on bases is relayed.

Once Base zero has been knocked out you're in trouble, as that's the only place personnel can be regenerated.

Enemy troops can be destroyed by the advanced weaponry system on board the Lynx. There are rockets, cannon, machine guns, tanks missiles, Sidewinders and mines. A good ploy to kick off with is to make a few trial sorties from Base zero, laying a heavy minefield and getting in some flying practice. Then you can pick up some personnel and head off for the nearest base. Weapons systems have to be primed before you can use them, and some have sights to help your aim.

It's not just a quesion of knocking out a few tanks or guns. The enemy has substantial air power and fast jets are likely to make mincemeat out of you. Flying too high, particularly at the higher skill levels makes you open to missile attack, while flying low demands the utmost attention.

There are a few quibbles; the sound gets monotonous, the regular beat of the blades never changes and is only interrupted by rather poor firing noises or the sound of your demise. Another chance was missed here — there's no crash, no flames, just a disappointing sort of hiss and a broken-up shape. The graphics are a bit jerky; a smoother scroll would improve matters.

But these are minor points and don't really detract from the addiction of the game. *Combat Lynx* is one of the new breed of games that really gets you working hard, grabs your attention and gets harder as you get better. A winner.

Bryan Skinner

Price £7.95
Publisher Durrell Software, 0323-768456

COMMODORE 64

JET-BOOT JACK

This platform game was originally a big hit for Atari owners. English Software has done a good job of the conversion.

Jack is a cute little space-age jogger, fully kitted out with golfer's cap and rocket-powered boots. He has a passion for collecting musical notes and must zoom around the record pressing factory grabbing a crotchet here, a minim there.

The fiery boots enable Jack to zoom around at an impressive speed, even allowing him to whizz across lift shafts with impunity. The lifts move and stop at regular intervals. When one is level, Jack can step on to it and guide it to another platform. As well as lifts, there are sliders (travelators).

The fuel in Jack's boots must be topped up by colliding with one of the overhanging vinyl pods. Also dangling from the platform ceilings are assorted nasties whose contact is fatal. Jack can dislodge them by jumping up and down immediately above them.

Quite the most dangerous of the various hazards and gremlins are the Flappers, ornery little beasts which move around under the slider supports and cannot be killed.

The game has ten screens,

any of which can be skipped over next time provided you've completed it at least once. There's a two-player option and six skill levels, each increasing the number of nasties and reducing the refill pods. A demo mode lets you preview it all.

A thick coloured bar indicates Jack's fuel level, bleepers going off when it begins to run down and when Jack stands around for too long.

Instructions, sound effects and graphics are all first-rate. Although platform games are now thick on the ground, this is one of the best.

Bob Chappell

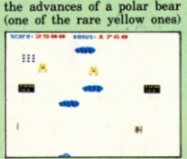
Rating 8/10
Price £7.95
Publisher English Software 061-835 1358

BBC

POLAR PERILS

Squirrel Software has taken the interesting step of marketing its BBC software with a version of the same program for the Electron on the flip side. Unfortunately, if *Polar Perils* is an example of the games, it is about the only clever marketing decision it has made.

There are several good points about the game — the scenario is original with a nicely animated little eskimo warding off the advances of a polar bear (one of the rare yellow ones)



across the ice floes. The sound is fine without being inspiring.

The trouble is that at least the first two games are unplayable. I never have been one of the world's computer game million scores, but have usually been able to amass a respectable few thousand. Not so with this one.

The first screen shows a strip of land across the top of the display, two small islands to left and right and a further slightly larger one at the bottom.

Your task is to skip across the bergs to one of the side islands, pick up a spear and stick the bear with it before hopping across to the bottom island. All very well, except that the icebergs move completely randomly and you're left standing there like a frozen lemon.

The second screen, should you ever reach it, has you wandering around on thin ice trying to discover where the ice is thin by dropping rocks on it. The third screen, well . . .

Simon Williams

Rating 4/10
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COMMODORE 64

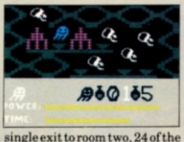
GOGO THE GHOST

If you fancy being fjupped, then this is the game for you, fjup being the Swedish for zap according to the insert for this latest budget release from Firebird, which is proving that just because software is cheap, it doesn't mean that it's cheap software.

This arcade adventure offers you 150 rooms for your 250 pence, and while they're not as detailed and as complicated as the likes of *Manic Miner*, they're every bit as hard to get through.

Gogo is the ghost who was last seen hurtling round the *Pac-man* maze, or perhaps his twin brother. Here he's in deeper trouble, as the 150 rooms connect together in a complex manner, with Gogo's dream princess locked away and awaiting a heroic rescue in room 150. For some reason room 49 doesn't exist, which suggests a Swedish foul-up somewhere along the way.

Though initially you can only start in room one, which has a



single exit to room two, 24 of the rooms have passwords. Once you have reached one of these you can type in the password at the start of the game and go straight to that room in the maze and take up your journey from there.

You need a joystick to manoeuvre Gogo through each room, and in best tradition there are objects moving up and down, or side to side, or both, with niches to hide in, dashes to make, timing to judge and strategy to work out with a generous helping of the pause feature.

Some of the room names are of the Matthew Smith/Jeff Minter variety, such as Turbo Tortoises, Mad Towels and Wear a Beard, to name but three, and others are filled with flying floppy disks, malevolent micros, gnashing skulls, stars, bats, hairy Pac-men, submarines and a million more.

The graphics are not the best you're ever going to see on your 64, but they're not bad and there's enough variety in the rooms to ensure that only occasionally do you notice some are built along the same lines.

You're collecting objects on each screen, of course, to add to your reserves of power (allowing you temporary invisibility), time or points. While some rooms have keys or copyright symbols which have to be reached in order to open doors to other rooms, others merely open internal doors leading to another key or copyright symbol. It sounds a bit confusing, doesn't it?

The sound is rather forgettable, with a few nice eerie squeaks and howling winds in places, and the only major complaint is the lengthy wait at the end of reach screen.

But at half the price of many games in the same category, *Gogo* will keep you going for twice as long as most. Buying this game is money well spent.

Mike Gerrard

Rating 8/10
Price £2.50 **Publisher** Firebird Software
01-357 3814

BBC

OSPREY

This is definitely not a 'zap the aliens' game. It is, rather, a 'stop anyone zapping the ospreys' program, and is as much an education as a game.

The package contains a cassette and a 32-page booklet. Also enclosed is an application form to join the RSPB, who have joined with Bourne in marketing the program.

The booklet is excellent. Printed in full colour, it includes many fine photos of ospreys in the wild, well-written text including current statistics on breeding pairs and a history of the near extinction and subsequent recovery of the birds. It also includes several screen shots from the game and full instructions on playing it.

Osprey is really a variant of *Hamerburai*, in which the player has to balance various factors in order to achieve a desired result.

In *Osprey* your three problems are egg stealers who climb to the nest at night, tourists parking to watch the birds who can frighten them by sounding their horns, and hunters who drive too close to the nest.

You have a limited number of wardens you may assign to prevent each of these attacks. You start the game in any year

prior to 1981, and the further back you go the fewer wardens you have and the harder the game becomes.

Having set your wardens to their task, a nicely drawn panorama fills the screen and an animated sequence shows how you fared. You then also receive a written report and can set about redistributing your wardens for the next season.

If you reach 1981 with any ospreys left, you've won.

The game itself is not exciting, but I am now more aware of the plight of ospreys.

Simon Williams

Rating 6/10
Price £9.95
Publisher Bourne Educational Software 0794-523301

SPECTRUM

ASTRONUT

Astronut is yet another variation on the platform theme. Mind you, it took me a while to find out just what the game was about since it comes with one of those colour-grid protection cards.

On loading, you are given a grid reference and must enter four colours from the card. Make two mistakes and the Spectrum resets.

Is it worth this hassle? Emphatically yes — *Astronut* is a very good game with excellent animation.

You have to move a bomb-planting astronaut around a series of platforms trying to push blocks from one ledge to another and down into a receptacle.

To get to the higher ledges, you must position the astronaut over a belching volcano. At the next eruption, the astronaut is catapulted up to a higher ledge. The only thing that can hurt him are the wild assortment of weirdies.

And what a collection they are: snapping clams, pulsating jellyfish, dancing flowers, nippy snails, bespectacled frogs, dangling spiders, and some of the largest, most impressive fire-ball spitting dragons ever to appear on your Spectrum.

For me though, the best beasties were those bearing no resemblance to anything seen this side of sanity. An enormous bulbous head with boots on was one of the many loony creatures.

Nutty stuff — imaginative, funny and addictive.

Bob Chappell

Rating 9/10
Price £7.95
Publisher Software Projects 051-428 9393

COMMODORE 64

BOULDER DASH

Boulder Dash, that jewel of Commodore 64 games, has now been converted for the Spectrum. If you've ever played the 64 version you'll be a mite disappointed, but if not, well what the eye hasn't seen . . .

The objective is to collect as many jewels as possible from the 16 caverns in as short a time as possible. There are five skill levels, just to keep you on your toes. Up to two players can join in and other options include Q to quit, S to re-start and Space to pause.

You can use joystick or keyboard — as far as I was concerned the latter was better, not because I prefer sticks, but because of the weird choice of keys which you can't alter; E, F, M, C for up, down, left and right.

With three lives, I set off in cave A, level one. The screen scrolled back and out popped Rockford, the hero of the piece. One of the nice touches about this game is Rockford's character. If you don't move him pretty quickly he just stands there, tapping his foot impatiently. I sent him off shunting boulders

and collecting jewels — level one's a piece of cake.

Onto the next level. It's easy here to get buried by falling boulders, brained by tumbling jewels, or if you're too cautious, run out of time.

The graphics are colourful, but the scrolling's a bit jerky. The sound is a bit limited, no crashes here when the boulders tumble. Even if the translation isn't quite all it might have been, *Boulder Dash* is agreat game.

Sandra Grandison

Rating 9/10
Price £7.95 **Publisher** Front Runner
01-992 8055

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GAMEPLAY

COMMODORE 64

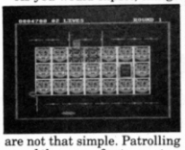
DRELBS

Another US import, *Drelbs* is a rather strange affair. It's faintly similar to the old Pencil and Paper game where you must join up the four sides of a box to claim it for your own. Here the dots are replaced with a series of gates which turn through 90 degrees when you bump into them.

The aim is the same: close up four gates to create a square. When you have, a pulsating box appears and up goes your score.

The creature doing all this gate-crashing is a Drelb, a sort of winking-eye on legs which you control with joystick only.

As you would expect, things



are not that simple. Patrolling round the maze of gates are two nasties, both of which are graphically simple. One is a fat, snake-like whatsit and the other is a box with a face. Stunningly imaginative, eh?

Contact with either of the nasties is fatal to your Drelb — though he does have several lives. He has no weapon and can defend himself by dodging or trapping the enemy temporarily by closing a box around it.

Any box containing a tapped nasty is represented by a large-size, immobile version of the nasty's face. Your own boxes may stop glowing and change to represent a leering Phizzog. Bashing into a box which is in this condition is bad for the Drelb's health.

And that's about it really. Dodge the meanies and join up the boxes. There may be better things on the higher levels but boredom sets in early and you may not feel inclined to persist.

Movement is smooth but the graphics are pretty mundane and make the game look almost prehistoric by today's standards. Not one of US Gold's better imports compared to some of its winners.

Bob Chappell

Rating 5/10
Price £9.95
Publisher US Gold
021-359 3020

AMSTRAD

QUACK A JACK

This game seems to have undergone something of an identity crisis. It's a bit like *Pengo* and its derivatives, it has a level system and screen titles à la *Manic Miner* claims on the cassette sleeve to star one Red Jack, but in fact sports a white duck as hero.

To round it all off, there's a lot about this game that's quite original. It starts with the usual Amsoft fairly boring header but, later in the loading sequence, livens this up a bit with a jumbo character set, which is then used throughout the rest of the game.

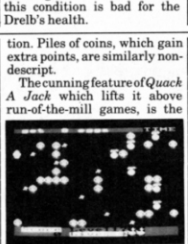
The game is idiosyncratic in more ways than one. The duck hero, who is neatly animated and accompanied by a quack on each move, spends his time hunting out and crushing terra-ductile eggs. (Amsoft's spelling, although I wouldn't have thought pterodactyl was a copyright word.)

These provide the time element to each screen, and if Quacker doesn't reach each one within a given time limit, the egg hatches and its contents eat you.

To start with there are five eggs per screen and one vampire rabbit who makes vague attempts to impede your progress.

Stationary obstacles are described as cooking pots, but were beyond my powers of recognition. Piles of coins, which gain extra points, are similarly non-descript.

The cunning feature of *Quack A Jack* which lifts it above run-of-the-mill games, is the



fact that as you travel about the screen hunting eggs, the flagstones that you walk across are irrevocably damaged.

This means that, not only do you have to work out a strategy so as not to run out of flags to reach a given egg, but also that it's possible to cut off your pursuers (there are more of them in later screens) by tracing out an island.

To help you out, you can shift rows of flagstones left or right to try to fill in the gaps you create. Later levels feature prawns, spacehoppers, Sue's Nose (poor Sue!) and no doubt other Minteresque nasties.

Definitely a game to be tried. It won't keep you going for months, but you may get some pleasure from it for a week or two.

Simon Williams

Rating 7/10
Price £8.95 **Publisher** Amsoft 0277 230222

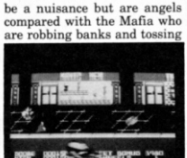
COMMODORE 64

PC FUZZ

Evening all. You're on the beat down the local high street in this game. The boys in blue have been equipped with the very latest technology in their battle against villains and sore feet *ie* unicycles.

Petty misdemeanours are rife in this part of town. There are persons behaving in a drunk and disorderly manner.

The punks and drunks may be a nuisance but are angels compared with the Mafia who are robbing banks and tossing



gas bombs to assist their getaway. Your only weapon is the policeman's friend, a large truncheon. You defend yourself against bombs and burglars by hurling the truncheon in their direction, aiming for a direct hit. Floating skywards from the bank are balloons to which moneybags are attached.

The street scene scrolls slowly to the left while PC Fuzz trundles ever-so-slowly around on his unicycle. Control of the truncheon takes a bit of getting used to — a combination of fire button and joystick movement guides the boomeranging sausage-like stick. A further limitation is that Fuzz always faces right and can not fire at any burglar or bomb behind him.

The graphics are fair only and the music depressingly monotonous. A good concept for a game but this implementation doesn't have enough challenge or variety to keep my interest.

Bob Chappell

Rating 5/10 **Price** £6.95 Publisher Anirog 0322-92513

SPECTRUM

LODE RUNNER

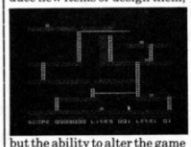
Some of the best games around are American, and for the Commodore 64, so it's good to see British software houses producing conversions for the Spectrum.

As a highly-trained galactic UDG, sorry Commando, you must recover gold from the Bungeling Empire. The ingots look like hot dogs and it's basically a levels and ladders game. The most unusual aspect is that you can edit any of the screens to suit your taste, and save them to tape.

However, the screens are much of a muchness — plenty of red brickwork and white ladders on a black background. The Bungelers are tiny purple figures which tend to come after you a bit sharpish, so you might like to edit them out of the first screen altogether to let you suss out the controls and how best to get at the ingots.

There are 75 screens. Not only can you add ladders, walls and pursuers (or take them away), but screens can be moved so you could make the last screen the first. Editing is dead easy with single key presses, and the way the screen dissolves instead of being wiped clear is a neat touch.

Lode Runner isn't a games designer. All you can do is twiddle about with what's already there. You can't introduce new items or design them,



but the ability to alter the game has to be an attraction.

You can configure keys to taste and there's a wide range of joysticks on offer. Apart from up, down, left and right there's dig, which simply removes part of the brick floor immediately in front of you. This is needed to slow up the Bungelers.

You might also get the spade (laser drill pistol) out so you can fall through the floor, connecting with an ingot on the way down. It doesn't matter how far you fall, the only way you end a life is when a Bungeler gets you. It's a pity that you can't give yourself more than five lives.

Good fun for a few minutes, but I got tired of it rather quickly.

Bryan Skinner

Rating 7/10
Price £9.95
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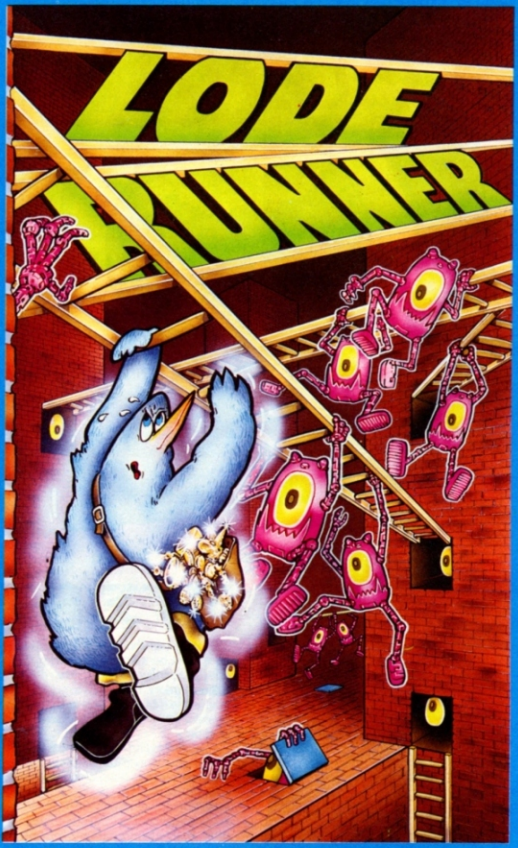

You are a highly trained Galactic Commando deep in enemy territory. Power hungry leaders of the repressive Bungeling Empire have stolen a fortune in gold from the peace loving people, and you have just discovered their secret underground treasury. Your goal? To recover every last ingot of Bungeling booty. You'll be running, jumping and climbing heroically, solving perplexing puzzles and drilling passageways through stone floors and barriers using your laser drill pistol. You'll need more than fleet feet and good looks to get through this mission alive. You'll need quick wits and brains!

CREATE YOUR OWN GAMES!
Lode Runner is more than a fast action game. It's a game generator that lets you design your own puzzles and scenes. You can move, add and take away countless ladders, floors, trap doors, crossbars, gold chests and Bungeling enemies. It's easy and there's no end to the variations, challenge and fun.

Available on the 48K Spectrum

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Can Thor save Cute Chick from the hungry dinosaur? Only you can help. At first he only has to jump rocks and holes. Then he must jump and duck, almost simultaneously, to avoid the logs and low hanging tree limbs in the Petrified Forest. The only way Thor can get across the river is to hop on the turtles' backs. These turtles sometimes get tired and submerge at the wrong moment, much to Thor's dismay! To add to Thor's difficulties, his arch-enemy Fat Broad is waiting on the other side to ambush him. If Thor's timing is good, the Dooky Bird is overhead, the prehistoric bird will pick him up and carry him across!

Thor must build up plenty of speed during his downhill run before the cliff. Timing is crucial, too. If Thor's balance is off or he is too slow he will crash into the ravine or the face of the cliff. Once over the cliff, Thor faces his most difficult challenge: the volcanic eruption. In addition to the obstacles on the ground, he is showered with boulders from the sky.

Once again Thor must cross the river on the turtles' backs. Then, at last, he must face the dinosaur! If Thor can get past the dinosaur and into the cave, he has only a short way to go to rescue Cute Chick. On his way, Thor must duck under stalagtites and jump over stalagmites to avoid crashing.

If Thor does crash, don't worry: he has five wheels. But True Love is calling him, so use all your agility and cunning to help him rescue Cute Chick!

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QL KIT

Leon Heller, chairman of the Independent QL Users Group looks at a BCPL package from Metacomco.

While several implementations of BCPL for 8-bit and 16-bit micros are available, the language is ideally suited to a 32-bit architecture such as that provided by the MC68008 processor in the QL. Metacomco has now released its BCPL developed kit for just under £60.

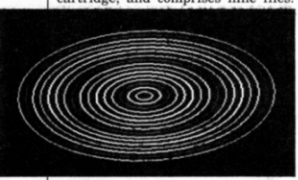
Readers interested in BCPL should get hold of a copy of *BCPL — The Language and its Compiler* by Martin Richards and Colin Whitby-Strevens. This is the BCPL user's bible.

Here is an example of a trivial BCPL program for the QL that first clears the screen and then prints "Hello sailor!":

```
GET "LIBHDR"
LET START () BE $(
SCREEN (SCREEN.CLEAR)
WRITES ("Hello sailor!") $)
```

Presentation

Metacomco's BCPL Development Kit (this review is based on a beta test copy) comes on a single Microdrive cartridge, and comprises nine files:



Concentric ellipses produced by a small BCPL program.

text editor, linker, library header and the BCPL compiler itself. Because the compiler is too big to fit in RAM, an overlay technique is used. The compiler consists of six files which are loaded as required, and this is transparent to the programmer.

The screen-based text editor (also written in BCPL) is identical to that provided with the Metacomco assembler and is easy to use. The editor can handle only relatively small files, but this does not matter as BCPL programmers tend to write their programs in small, linked modules to produce a single runtime module. The documentation mentions a program called INSTALL which allows the user to change the default window used by the editor and compiler. This was not included with the beta test copy, but will be available when the package is released.

Features

When using the BCPL Development Kit, you first use the editor to write your program, and save it as a text file. This is translated by the compiler into a binary file, which is then input to the linker with any other binary files that contain modules referenced by your program. This allows the user to make use of a library of modules. These can be built up gradually and incorporated in the user's own programs or those of other programmers.

Basic Combined Programming Language was designed in 1967 by Martin Richards of the computing laboratory, Cambridge University. Although it is not a popular language (unlike C, which is based largely upon BCPL) it has many devotees, especially among those who learned their programming at Cambridge.

Like C, BCPL is a compiled language which makes it considerably harder to learn than an interpretive language like Basic.

BCPL is a relatively small, highly expressive and efficient block-structured language, ideal for systems programming: writing operating systems, editors, compilers, etc. BCPL compilers are usually written in BCPL which helps to make the language portable, *ie* easily moved from one machine to another, even if the processor is different.

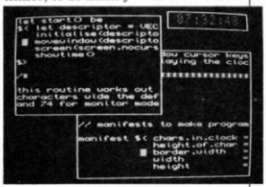
The speed of compilation is excellent, considering the limitations of the Microdrives, and the linker is very fast. Compiler error messages are quite informative and it is usually easy to see where you have gone wrong. The code produced is not particularly compact, as the linker cannot just select the modules required, and the entire runtime system (about 9K) is always included in the resulting object code file, which can be run using EXEC or EXEC-W in the usual manner.

Programs produced with this package can make use of the QL's multitasking capability. The library supplied with the package provides access to most of the QDOS routines, including graphics, file handling (sequential and random), the character font and screen handling. One omission from the library is a function corresponding to INKEY$ in Basic, which is essential for games programs and terminal emulators. Anyone requiring this function will have to code it in assembler.

Since the compiler uses the QL ROM routines for all arithmetic operations, the precision of the floating point (seven digits) is inadequate for serious applications programming, such as accounting packages, but double precision arithmetic functions could be written — in BCPL, of course — and incorporated in any programs that needed them. BCPL is not really suitable for business programming.

Facilities for linking in assembly language modules are provided, and an example of this is provided in the documentation.

The beta test copy reviewed had a few minor bugs in the compiler and linker, to do mainly with error detection which will hopefully be corrected.



Two BCPL source code files being edited concurrently, with the clock running.

Documentation

About a hundred pages of documentation are provided, and these contain sufficient information to use the package, provided a copy of the Richards and Whitby-Strevens book is to hand. The book is all the more necessary because the draft documentation had neither BCPL examples nor index.

Verdict

This is a very attractive package, and well worth the £59.95 Metacomco will be asking for it. BCPL is a difficult language to use, however, so this package is not for beginners.

REPORT CARD: 1 TO 5

Features	●●●●
Documentation	●●●
Performance	●●●●
Overall value	●●●●

Name QL BCPL Development Kit
Application Progamming language
Price £59.95 **Publisher** Metacomco, 26 Portland Square, Bristol BS2 8RZ. 0272 428781 **Other versions** None.
Format Cartridge **Outlets** Mail order

READOUT

'An Introduction to Computers and Information Processing' by R & N Stern, published by John Wiley at £31.15 (hardback, 877 pages).

At this time of year you might be looking around for coffee-table books. Be warned: this is a stout-oak-dining-table book at the very least. Rig up a block and tackle in case you ever want to put it on a high book shelf.

Expert opinion varies on the best way to learn about computers. Some hesitate 'tween certitude and doubt.

Many have it that buying a micro and getting on with it is the best course, and when the price of a book approaches the price of a micro they have a good case.

Of course, your megabuck purchase of a ZX81 won't immediately give you a grasp of computerised multiphasic screening, holographic disks, and time-division multiplexors, but you'll probably find something to do with it.

Nor will it give you a lavishly illustrated encyclopaedia of computing — although the ZX81's documentation was very good for its era. But the book flatters to deceive. Well laid out, sensibly ordered, and full of colour, it is superficial throughout. Perhaps 877 pages aren't enough. The book aims to cover so much ground, with so many subjects whisked in and out like a time-sharing mainframe, that it becomes taxing — like the party game where you have to memorise a dozen objects on a briefly exposed tray.

On top of this, there is the unbending American-ness of the authors. This means that the style is irritating and the approach to the subject less critical than it should be. The authors claim that they aren't interested in glorifying the computer, but when they move on to future uses, their brief mention of computers as 'law enforcement' tools makes no reference to the abuses possible in this increasingly controversial field.

If you really think you need this book, join a public library and wait for it to turn up there.

DG

'Using your Vic 20 as a Music Synthesizer' by Paul Copeland, published by Interface Publications at £5.95 (paperback, 216 pages).

This book had me completely baffled. For a start, the contents, although very detailed, give no page numbers, and there is no index, making it impossible to find anything in the book.

To make matters worse, the listings are not always located near the program notes, making it next to impossible to sort out which line 150 Mr Copeland is referring to.

This is a great pity, because he has included detailed descriptions of the programs to enable you to change them to suit your needs. His notes are clear and informative — it's just trying to discover what they refer to that's the problem.

Topics covered include creating sound envelopes, using glissandi in your programs and even creating avant garde music.

The blurb on the back promises 'full, mind-blowing output. If the programs don't blow your mind, the layout will.

LT

'The Creative Computer' by Donald Michie and Rory Johnston, published by Viking at £12.95 (hardback, 263 pages).

Professor Michie has long been one of the UK's most respected experts on artifical intelligence; Rory Johnston has risen through the ranks of technical journalism to reach the coveted status of pundit. Between them they seek to answer a question that has tormented man since the dawn of the computer age.

No, not Can Accrington Stanley ever get back into the Canon League. Rather, can computers ever output more than the sum of what they take in? Can they be creative?

Outside Accrington this is probably the more momentous question, and messrs Michie and Johnston treat it with due gravity. From the first three pages you might deduce it is more a manifesto for the survival of mankind than a treatise on artificial intelligence; the authors take the position that intelligent machines could be the foundation stone of our continuation as a species.

They also repeat the chilling credo of twentieth-century science — 'But it is important that ... philosophical considerations ... do not confuse our commitment urgently to seek to exploit the beneficial potential of the new technology.'

Blinkered, they embark on a fascinating study that takes in much more than a direct review of artifical intelligence techniques. This is a well-written book with the scope to fascinate most general readers. The text is broken up by sub-headings and liberally illustrated, in black and white and colour.

And eventually the authors build a convincing case for artificial intelligence as an answer to the world's woes. But they aren't too certain about how many of the world's woes can be ascribed to scientists who jettisoned philosophical considerations.

DG

'Impossible Routines for the Commodore 64' by Kevin Bergin, published by Duckworth at £6.95 (paperback, 212 pages).

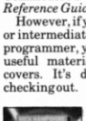
Stupid title for what is really a handy book. Collections of routines are arguably of more use than collections of finished programs — most of us are capable of writing the bulk of a program's code but those tricky little problems defeat the whole exercise. General and specific routines provide many of the answers.

In this collection you'll find a lot of useful ideas and one or two gems. There are tips on program protection, including auto-run routines, several graphics utilities, and more general purpose programs covering printers, disk drives, keyboard and joysticks.

The only criticism of the book is on value for money. While 200 pages may look reasonable, nearly 80 are devoted to memory maps and Kernal routines that are well documented in Commodore's *Programmer's Reference Guide* and others.

However, if you're a beginner or intermediate Commodore 64 programmer, you'll find a lot of useful material between the covers. It's definitely worth checking out.

PW



'The Commodore 64 ROMs Revealed' by Nick Hampshire with Richard Franklin and Carl Graham, published by Collins at £8.95 (paperback, 215 pages).

Quite a few books have already appeared on the market that attempt to disassemble the two ROMs inside the Commodore 64. However, *The Commodore 64 ROMs Revealed* is the first book to do it properly.

The book was produced in several stages. First, the ROMs were disassembled, and all branches were labelled. All the system variables have been named throughout the disassembly and the look-up tables have been separated from the code. Finally, the listing has been fully documented. So, what appears in the book is an actual assembly of the finished file.

The whole system variable area is detailed. It would have been even better if the function of each variable had also been given, as some of the names don't mean a lot.

Another five pages give the entry points inside the ROMs for all routines — for example, where the NEW routine and CLR routines are held. This saves you having to roam round what is a rather large book trying to find the correct routine.

The comments given by the authors are long and clear. If you wish to use the 64's ROM in your own programs, or figure out how other programs work, then this book is for you. If you already own a ROM disassembly, then throw it away and buy this book instead, you won't regret it.

SC

'The Memotech MTX Program Book' by Peter Goode, published by Phoenix at £5.95 (paperback, 125 pages).

Books of programs are a boom industry of the decade so why should Memotech owners be left out? This one is as good as most and better than many on the market.

There are 23 listings here, most of them games but there are a few good practical routines too. Some are time-honoured favourites, including versions of *Lunar Landar*, *Star Trek*, *Missile Command* and a couple of long adventures. In the utility section are a sprite designer and a machine code screen dump driver for printing graphics screens.

That's the good side; the bad includes a few makeweights such as *Dice* and *Biorhythms*. The book also loses points for failing to explain any of the techniques used, so if you want to advance your own programming abilities you're on your own.

However, even if you want only some of the programs on offer it looks like value for money.

PW

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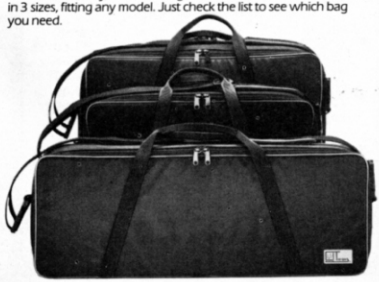

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48K Spectrum for sale mint condition only £90. Tel: 061-881 3651, Tony.

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48K Spectrum, with interface 1, Microdrive, printer, recorder, portable TV, programs, books, mags, faultless, cost £450, £275 ono. Tel: 01-673 3802 after 7pm.

48K Spectrum, recently serviced, 150 games, will accept £175 ono. Tel: Jason on 01-866 0438 after 4.30pm.

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48K Spectrum, interface 1, interface 2, Microdrive + 2 cart, ZX printer, cassette recorder, Beep Amp, 17 original software, books + magazines, £310 ono. Tel: Amit on 01-202 8602 after 6.pm.

48K Spectrum, Kempston joystick/interface, sound amplifier, 56 way connector, software including White Lightning, all for £240. Write to: 102 Darwin CC, Gloucester Ave, London N.W.1.

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QL for sale, £350 ono. Also parallel interface, £40 ono. Tel: Tony on 01-578-7704 after 7pm.

Wanted: any ZX80's, old or broken computers for amateur hobbyist. Tel: Brighton (0273) 517381.

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48K Spectrum, over 150 games, Kempston interface and Quickshot joystick. Computer still under guarantee, well looked after, good price, £150. tel: 455 1042 after 4.00pm.

QL for sale, includes 8 Microdrives cartridges, 4 software packs, RS232-C looked after, good price, £150. Tel: 01-445 1042 after 4pm.

48K Spectrum software, tape recorder, (needs attention), interface, mags. Total value £500, sell for £200 ono, or swap for CBM64 printer. Tel: Andy on 051-420 7661.

Spectrum 48K and cassette recorder and £250 worth of software like Beachhead, Sherlock, Decathlon, Lords of Midnight, Full Throttle etc, £150. Tel: 01-460 0794.

Spectrum Software for sale or swap. All originals including Valhalla, Snowman, Zig-Zag, Blade Alley, Pedro etc. Currah Speech, £19 ono. Tel: Matthew on 0622 842823.

48K Spectrum interface 1, 2 Microdrives and 5 cartridges, RS232C cable, Fuller FDS keyboard, lightpen, some tapes and magazines, £230 ono. Tel: 01-504 0565 bus hours.

Spectrum Stonechip programmable joystick interface for sale, boxed as new, £16. Also Quickshot joystick boxed as new, £7. Both for £20. Tel: Fyfield 291.

48K Spectrum all boxed with leads, 6 months guarantee, Kempston interface, Quickshot Joystick, carry case, mags, games tape recorder, £200. Tel: Plumtree 4245 after 7pm.

48K Spectrum four months old with tape recorder and five games, plus a couple of mags, only £100. Tel: Bognor Regis 829856 ask for Gary.

48K Spectrum, tape recorder, programmable joystick and interface, Currah box, loads of software, books, mags, £225 ono. Tel: Ruislip 74186, Graham.

Spectrum 48K and software worth over £400 (White Lightning, etc), with cassette recorder, 18 months old. Will sell for £240. Tel: 0977 46589 after 4.30pm.

Spectrum 48K, DK Tronics keyboard, ZX printer, software, books and tape recorder, £129. Tel: Bath (0225) 337990.

Currah Micro Speech, £22, Downsway joystick interface (programmable), £19, ZX printer and 10 rolls paper, £38. All three items, £70. Tel: Tiptree (0621) 816589.

ZX Spectrum 48K and software including Scrabble, Tasword Two, VU3D, Sabre Wulf; graphics drawing pad, mags, excellent condition in original box, £150 ono. Tel: 051-652 4832 evenings.

48K Spectrum + printer, 3 rolls, Chess, Hobbit, Scrabble, picturesque assembler, monitor, Vu-Calc, Beta-Basic, £80 the lot. Also Kempston Centronics interface + Tasword 2, £20. Tel: 01-992 2281.

Spectrum software for sale, Psion scrabble—£9 Cyrus IS Chess—£5, Fighter Pilot — £3.50, Micro-Gen — Chess — £3.50, or the lot — £18. tel: 051-430 6504.

Wanted QL monitor and Qume printer. Also QLUB newsletters. Tel: Mendlesham 7130 evenings.

Currah Microspeech unit for Spectrum, gives unlimited vocabulary and Spectrum sound through TV loudspeaker. Includes manual, £20. Tel: 0501 41520 (Scotland).

Spectrum Peripherals: Alphacom 32 printer, £55; Currah speech synthesiser, £20; AGF programmable interface + joystick, £30; £50 of original software, £10. Tel: 041 427 3054 after 5:45pm, before 10:30pm, all guaranteed.

Spectrum software sale, Hobbit, Zaxxan, Set Willy, Atic Atac, Timegate, Minded Out. All offers considered. R. Shah, 84 Spring Grove Cres, Isleworth, Middlesex, London.

Spectrum pen-pal wanted to swap games, hints and tips on games, adventrues etc. Write to: R. Shah, 84 Spring Grove Cresent, Hounslow, London TW3 4DB.

48K Spectrum, Joystick + interface, tape recorder, brand new interface 1, loads of books and software worth over £650. Quick sale, only £350. Tel: 01-458 6865.

ZX81 16K with £85 of software and magazines. Still Guaranteed, swap for Spectrum printer or sell for £45. Ideal Xmas present. Tel: Bexhill 211184.

Wanted ZX printer and paper, must be in working condition and cheap. Will offer £23, please help me. Tel: 01-303 1463 after 4pm, ask for Ian.

Sherlock, Lords of Midnight, Scrabble, for Spectrum, all £7, Football manager, Test Match, Hustler, Chequerd Flag, all £3.50. P Thornley, 24 Hough Lane, Tyldesley M29 8NW.

Sinclair interface one plus one Microdrive, three cartridges, manual and leads, boxed, unused, £65. Tel: 01-272 5375.

ZX-81 + 16K RAM, 6 cassettes worth £31, books, many magazines, manual, leads, green screen, cost £125, will sell for £50. Tel: Alcester (0604) 493034.

48K Spectrum Monicron amplifier save/load, Currah microspeech, printer and paper, books, magazines, light pen, programs all for only £140. Tel: 061 962 0524.

48K Spectrum, ZX printer, data recorder, Hisoft Pascal, Hisoft Devpack 3, Spectrum M/C Made Easy 2 books. Worth over £250 plus many games and utilities £150. Tel: 031-663 8178.

One Interface 1, £40; eight Microdrives £40 each, ten blank cartridges £4 each. All new but unwanted. Tel: Nick on St Albans 26272.

Texas

TI 99/4A starter pack: cassette recorder, B/W portable, joysticks, Extended Basic, cartridges including PARSEC, games cassettes, manuals, books plus many listings. £110. D Hymas, 8 Douglas Close, Galleywood, Chelmsford, Essex. Tel: Chelmsford 74694.

Texas TI 99/4A plus cassette leads. Space Invader cartridge and tape as new. Excellent condition, £70 ono. Tel: 0553 840620.

TI 99/4A cassette leads, books, system diagrams, extended Basic, 4 cartridges, 19 cassettes boxed, good condition. Cost £400, sell for £150. Tel: 01-861 0154.

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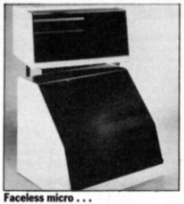
QUIT

Can we look forward to an MSX machine from Oric? It's heartening to see ex-Imagine people in work again, and they turn up unexpectedly all over the place. Most of them, as far as we know, have found gainful employment in the software circuit. But some, using Imagine as a stepping stone, have risen higher. Bruce Everiss, for example, was out and about last week. Everiss, newly appointed managing director of Tansoft, was singing the praises of MSX, consumer electronics, and inscrutable Japanese quality control to the rafters at Yamaha's Milton Keynes pied-à-terre last week.

The reason he was singing praises to the rafters was that there were so few journalists at Yamaha's CX-5 demo to sing to. But how come he was there in the first place? Alas, it isn't evidence of a joint venture between le popular micro maker and the Japanese manufacturer of 750cc four-stroke synthesisers. Everiss accepted an invitation to assist Yamaha in a consultancy capacity some months ago, and was fulfilling his commitment with Oric's assent.

Later the same day Jack Tramiel was growling to the rafters as the hype behind Atari



Faceless micro . . .

grows to avalanche proportions. He spoke of billion dollar turnover for next year, more new machines than you could shake a stick at, and success beckoning at every turn. It was hard to believe that Atari (thanks largely to Tramiel's activities at Commodore) almost went under earlier in the year, when it was losing (by his estimate) $10 million a month.

In gravelly tones he warmly damned MSX with faint praise — 'I think it's a very nice machine,' he intoned carefully; Tramiel's speech is difficult to reproduce on the page, particularly when a recent Atari press release still lurks in the back of your mind. This attributed a comment 'in broken English' to Tramiel's top man in Europe, Massimo Ruosi. it comes as a shock to learn that Tramiel also speaks in slightly fractured English, and in broken sentences to boot.

Finally this week, two contenders for the Most Enterprising Micro Facelift of the Year. The first picture shows Total Business Systems' remarkable acoustic covers — you need never be ashamed of a grubby micro again. Below is Versapak's clamp for illegally parked BBC systems, which doubles as an anti-theft device. Some day all micros will look like these.

. . . and micro fascia.

SYNTAX ERRORS

One of our reviewers can't tell left from right. In his Philips 2000C review (issue 90) he claimed the disk drives are to the left of the machine. The camera never lies, and our photograph showed that they are really on the right. The reviewer maintains it is due to watching Mad Lizzie every morning on TV. It appears she suffers from a similar problem . . .

We missed out most of line 8510 in the listing for Pascal's Triangle (issue 89). The line reads:

```
8510 IF M% (C%, R%) MOD D%=0
PRINTCHR$(Y%);      "*";      ELSE
PRINTCHR$(X%);"*";
```

NEXT WEEK

Turkey Shoot
Stand by for the Turkey of the Year Awards, as *PCN* picks out the year's wooden spoon candidates.

Brain of Britain
We put Powertran's souped-up Cortex through its paces — with a little help from a soldering iron.

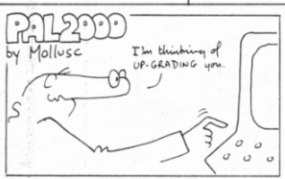
Draft printer
CPA's 80-column workhorse works out in this full Pro-Test.

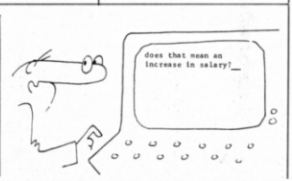
BBC 3D
Add another dimension to your BBC's soft copy with our free listing.

Animated Spectrum
Be your own Walt Disney with a routine to create animated sequences.

Poker-faced 64
Try your hand at Solitaire Poker on the Commodore 64.

Atari stars
Two of the Atari's distinctive features come into focus in this program.





PCN DATELINES

Event	Dates	Venue	Organisers
CADCAM Intl Show	Jan 8-10	NEC, Birmingham	EMAP Intl Exhibitions, 01-837 3699
Mini/Micro Computer Exhbn Conf	Jan 13-16	Stockholm, Sweden	Sollentuna Massan, Box 174, S — 191 23 Sollentuna, Stockholm
Which Computer?	Jan 15-18	NEC, Birmingham	Clapp & Poliak 01-891 5051
High Technology & Computers Education	Jan 23-26	Barbican, London	Computer Marketplace Exhibitions, 01-930 1612
Computer Exhbn — Computer Thai	January 23-26	Bangkok, Thailand	Conf & Exhbn Management Services, Ltd, 61/5 Langsuan Soi 2, Ploenduit Road, Bangkok 10500
Intl Microcomputer Fair	Jan 29-Feb 3	Frankfurt, Germany	Collins & Endres, 01-734 0543
Apricot & Sirius Computer Show	Feb 5-7	Kensington Town Hall, London	Paradox Group, 01-241 2354
Intl trade show for home comps, software, etc — LET	Feb 17-19	Olympia, London	Turret-Wheatland, 0923-777000
Intl Computer Graphics User Show and Conference	Feb 19-21	Barbican, London	Mountbuild, 01-486 1951
MEXCOM	Feb 25-28	Mexico City, Mexico	AESI Ltd, 01-379 7628

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