

PERSONAL COMPUTER

weekly

NEWS

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**EXCLUSIVE
INTERVIEW**

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Sir Clive answers his QL critics



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Cover photograph by Sandie Porter

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Launched to widespread acclaim the QL was quickly overshadowed by criticism of delivery delays, unfinished software and the question of mounting interest from customers' money. Now in an exclusive interview, Sir Clive Sinclair defends his company and answers the QL's critics.

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Amstrad has wisely produced a sturdy, reliable sort of a micro, says Max Phillips. Dated possibly, but certainly not out of place in your home.

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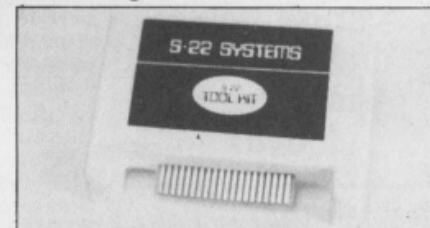
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Menu for the BBC contains a number of useful utilities that can be extracted for use elsewhere.

Sir Clive and the

Sir Clive Sinclair has broken his silence to speak out against his QL critics.

Claiming that his company was better than any other in meeting its promises, he attacked complaints about QL delivery delays as unfair and damaging. As the first machines with the final, debugged software, go out to customers, he contacted *PCN* in a bid to set the record straight.

And he made a pledge to his customers. 'We are not going to let people down. We will make sure of that.'

In response to a list of criticisms in *PCN* Issue 62, the man who launched Britain's micro industry said: 'Criticism is inevitable I suppose, it is just that sometimes it is a bit less fair than others.'

Why, he wondered, should Sinclair take all the stick when Acorn's Electron took a vast amount of time between announcement and volume production, but raised barely a grumble. The IBM PC was delivered three months after it was launched and Commodore still hasn't produced machines it announced last June. 'But we get all

'It doesn't crash now that the bugs have been found'

the flack,' he complained.

Unfair or not, he was not trying to shed the blame for failing to meet the promises that set the UK market buzzing back in mid-January.

'There has been a delay. We are now shipping and I think it has been unfair — or unbalanced — in that everyone is suggesting this is some colossal catastrophe. We are not proud of it and we don't like being in this position, but we are no worse and indeed are better than our competitors in the respect, despite the fact we are launching an enormously more radical machine.'

But however innovative the machine, public response to the time lag has been enormous and damning. It was three months after the launch that the first machines were delivered. These few thousand temporary versions had part of the operating system and SuperBasic programming language attached to the back of the machine is a cartridge, waiting for the software to be finalised and fitted on to ROMs. Last week Sir Clive told *PCN* that the software is finalised and finished versions would now be going out using

EPROMs until the ROMs arrive in six weeks or so. So it could be mid-July before final ROM versions are shipped — more than three months after the promised date.

So how did Britain's No 1 micro guru get it wrong?

Acknowledging fault, Sir Clive explains: 'A launch date has to be set quite a while ahead, and obviously you think you are going to get everything ready on time but you can't always. You can't afford to veer too much to the side of caution because otherwise you have got no orders to ship against.'

'But when we launched it we gave delivery dates to customers, not too far away from what we actually achieved. These are very complicated machines and the QL being such an enormous change from what was available previously in terms of the operating system, version of Basic, new version of Microdrives, that it would have been a miracle if there hadn't been hiccoughs.'

Sadly, there was no help from saintly hands, and the problems mounted as the queues lengthened until temporary versions went out. 'We have shipped them out in quite large numbers with intermediate software because we thought it better to do that than to wait until we got the final software, but from now on it will be the final software though still with the plug-in unit at the back.'

No-one is pretending these unfinished machines are entirely satisfactory.

'The whole point about the software was that it wasn't final, and it wasn't final in the sense that it was crashable,' said Sir Clive, while disagreeing with *PCN* that it was 'ludicrously easy to crash'.

'No new computer with new software is ever totally free of bugs. All you can hope is to be free of significant bugs. In a sense, by

The chips are down. Sinclair is challenging Acorn in a bid to take over the schools market.

'The time comes for something to be replaced and the BBC machine was an excellent machine in its time. It was designed some years ago and clearly we are able to offer an enormously more powerful machine, so it seems right for a change.'

But how is he going to uproot the BBC? No problem, he says. It's just a case of working from the top down.

'I don't think it is any more of a problem than replacing one text



'It has been done in something close to record time'

shipping the machines out to customers early, we are getting them to find those bugs for us, but we are not making any pretence that we are doing otherwise. We are telling them that by asking them to let us know if they find any bugs — we are not talking about major bugs here, but the detail.

'It doesn't crash now that the bugs have been found. We are not pleased it took us longer than we expected but even so it has been

done in something close to record time.'

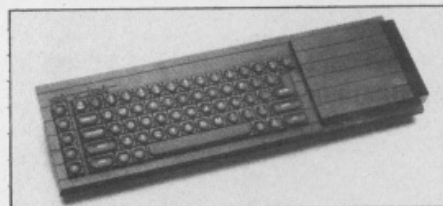
That time is 14 months from conception until the software was debugged.

Orders flooded in from day one and despite there being no advertisements since March, have now topped 14,000. Of these about 4,000 paid the £400 by cheque. This money was put into a trust fund which pays Sinclair interest, prompting a second wave of criticism. Again, Sir Clive attacks this as unfair.

'We wrote to everybody who sent in an order when they sent it and told them when they were going to get the machine. If this wasn't satisfactory we said we would refund their money at any time. Some people asked for their money back, but very, very few.'

'What else are we going to do with the money? We have got to put it

QL heads for a battle with



QL versus BBC: 'It was excellent in its time'.

book with another.

I think the QL will be used pretty swiftly and will become a standard in universities. They need the 68000 . . . they need a much more powerful machine.

It's a small step from that to see

how the QL will grow. Universities will need the hard disk already promised and a series of languages, among which Unix is certain to figure.

And once universities have amassed QLs, schools will follow.

QL question

Exclusive interview by Cyndy Miles



Sinclair says . . .

We are a wealthy company . . . we are not in it to seize people's money

We will provide unbeatable quality control and back-up service

There are things to criticise but it has to be seen in perspective

We are better at delivery dates than Acorn, IBM and Commodore

MSX spells danger

MSX is bad for you; it will restrict development and hamper the micro industry.

Worse than that, says Sir Clive, it is definitely not what you want. And he blames retailers for promoting this Japanese micro standard, based on the Z80 and Microsoft Basic.

'MSX machines are freezing technology. Standardisation is not in the consumer's interest.

'I am very concerned at the fairly stupid attitude from some British retailers about MSX. They say it's marvellous because there is standardisation, but that's not so marvellous when what they are standardising on is so badly out of date.

'MSX might succeed despite being inadequate because retailers choose to stock it. But they won't be giving the public the best product for their money.'

'There has been a delay . . . we are not proud of it'

somewhere. We do get interest on it . . . what else should we do? We are giving everybody a gift which more than compensates.

'We are not compelling anyone to tie the money up.'

The gift is an RS232C serial printer cable worth about £15 which could be more valuable than mere monetary value would suggest, since the massive demand from Sinclair Research could leave shops in short supply for some months.

But the trust fund dilemma prompted wider criticisms than those related to individual consum-

ers and Sir Clive took this opportunity to refute the suggestion that advance orders helped finance the machine's development.

'We can't afford to build thousands and thousands of machines and then launch six months later . . . on the other hand we are a wealthy company and we don't need to take the customers' money in advance. We are not in it to try and seize people's money.'

Speaking from his Knightsbridge office, Sir Clive gave the impression he was not only concerned on behalf of his company by attacks in the British press, but also hurt personally by the tone of them. He is immensely proud of the QL, so much so that he responds with vehemence to criticism of its design. Most notable was his anger at comments levelled by PCN, that the keyboard has classy keys but 'the same old membrane underneath.'

'The mechanism inside the keyboard is an immense investment in tooling and is a very precise system.

'We tested it on a lot of people without them knowing what was inside it, and it was very well accepted.

'We are very proud of the keyboard . . . there are all sorts of things to criticise at the moment, we don't deny that, but the thing has got to be seen in perspective.'

Which begs the question, how should it be seen? It's no secret he's battling for a stronghold in schools, but the amateur enthusiast and professional user are in his sights too.

QL takes on the world

Bouncing back from last year's failure to sell the Spectrum under the Timex tag in the US, he is confident the QL will make its mark there — and everywhere.

'We are very much concerned to be a worldwide supplier. We are going back into the US with the QL and we are selling in all European markets.'

With a presence in some 50 countries, Sinclair claims to be a major exporter, untouchable even by Japanese contenders with a record 40 per cent of his turnover in foreign markets. But America remains the plum.

'I think we are the only people who stand a hope in hell of getting into the American market. We are the only people outside America who have a lead over American technology.'

Mention Apple's Macintosh to Sir Clive and he has a very keen response, claiming it is similar to the QL, but with vastly different technology. 'Open up a QL and open up a Macintosh and they are just miles and miles apart . . . in the QL it's all in a few customer chips, whereas the Mac is vast tons of standard chips.'

Which is why he sees the QL as a world leader. With what he claims will be unbeatable quality control and customer back-up, he is confident he will not let people down, while keeping Britain ahead.

IBM to boost slow-moving jr

IBM has cut the price of the controversial PCjr in an attempt to boost its flagging sales.

The smallest model, previously costing \$669, comes down to \$599, and the 128K model is reduced by roughly 20 per cent to \$999 from \$1,269.

The move had been predicted by US analysts when IBM relaxed its usual terms for dealers, to ease their burdens in carrying stocks of unsold PCjrs.

IBM has also announced new versions of the PC, PC XT, and Portable, effectively lowering the price of the first two — but these developments are not to be echoed in the UK.

Atari looks to better times

Shrugging off its troubles (Issue 64) Atari is trying to rebuild confidence by revealing its plans for the last quarter of this year.

A system to be launched later this year will include a built-in modem and a speech synthesis chip. It is expected to have 64K of RAM and an integral disk drive. US pundits predict that it will cost about \$800.

Macintosh gets a hard disk

The Apple Mac bandwagon rolls on. Small Systems Engineering (01-328 7145) has added a hard disk subsystem to Apple's eye-catching micro.

SSE's Winchesterstons are available in capacities from 8Mb to 92Mb, with a packet-switched bus allowing a sub-system to be shared between as many as 32 devices. The package also includes a removable tape back-up system for storage security purposes.

Language link

Cable and Wireless has inaugurated an alternative to British Telecom and the Post Office for small business micro users.

Easylink uses the Telecom network to offer electronic mail and telex services with the bonus of translation into foreign languages for exporters. The subscription is £30 and messages after the first hundred will cost 15p each. There will be additional monthly rental charges and the connection charge levied by British Telecom.

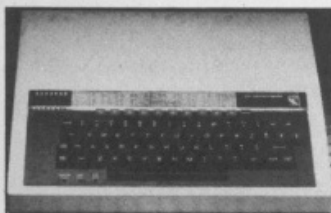
French and German translations (performed by people rather than machines) will be followed in two months by Spanish and Italian.

NCR cuts prices

The price of a Decision Mate V from NCR is pressing the £1,000 mark after a price cut last week.

The smallest configuration will now cost £1,199. The range of software available for the machine has also been changed to include such popular packages as Multiplan, Supercalc, and compilers from Digital Research, Microsoft, and Ryan-Macfarland.

the BBC



'They are not going to throw out the BBC machine overnight . . . but as they replace them, or buy new machines, they will go for the QL, partly because it will be the university standard and more so because it is so much better value.'

Dragon fire flickers



Dragon's 32 and 64 — £4 to £6 million's worth unsold.

By Ralph Bancroft

There was restrained optimism over the fate of Dragon Data last week following its announcement that it had called in a receiver.

Several companies, including Tandy, have expressed an interest in buying some or all of the company and it looks unlikely that users will end up unsupported.

'There is plenty to buy here, from fixtures and fittings to the whole company,' said Dragon's managing director Brian Moore. 'It is almost certain that somehow, somewhere, there is someone interested in providing 200,000 Dragon owners with continuing support.'

The receiver, Robert Ellis of accountant Touche Ross, refused

to comment on who the bidders were or how many of them there are.

He did indicate that he hoped to arrive at a decision on the future of the company in a relatively short time. 'But I cannot say whether it will be a week or weeks,' he said.

One company that has confirmed a positive interest is Tandy. 'We have always made it clear that we are interested in doing something, at least in terms of support for existing users,' said John Sayers, UK managing director of Tandy.

'We have phoned through our report and recommendations to the US but it would not be right for me to comment on what our recommendation was,' he said.

Mr Moore cited the continuing difficulty of meeting the demands of the volatile UK market as the main reason for Dragon's financial crisis.

'The 32 and 64 are still selling although not as well as we would like,' he said. 'We simply ran out of cash.'

Clear evidence of the failure to match supply and demand is to be

found in Dragon's warehouse where thousands of Dragons are piled up with a retail value estimated at between £4 and £6 million.

One of Mr Ellis's first acts as receiver was to make 81 of Dragon's 152 staff redundant. The company had 270 staff on its payroll during the pre-Christmas production peak.

Dragon's major difficulty has been in promoting a product that has looked increasingly dated. It is ironic that the receiver had to be called in at the end of the week in which it revealed its new product lines.

Apart from the Touchmaster graphics tablet and 64-based Dragon Professional (Issue 64) the company was also close to announcing a new up-market machine, code-named the Beta.

Mr Moore said last week that the Touchmaster will almost certainly continue.

A more uncertain fate awaits the Beta. The company had got as far as producing the first prototypes and manufacturing plans were well advanced.

Oric blesses user group

A third Oric user group is to be launched at this week's Earls Court Computer Fair, this time with official Oric approval.

The Oric Club is a national group being organised by Tansoft, and is intended to provide an eight-page monthly newsletter of information, letters and tips for £10 a year.

Discounts on equipment and insurance are also being negotiated, and a dubious substance referred to as 'Oric Club clothing' will also be sold. Rumours that it will take three attempts to get the clothes on are completely unfounded.

Tansoft's move is seen by Oric as fulfilling the need for a stable national Oric user group. The Oric Owners Users Group, organised by Bob Green, has in the past claimed official Oric approval, but an Oric spokesman told PCN that this approval had not been obtained. Colin Nowell, previously of the Tangerine Users Group (also started by Bob Green) set up his own independent group after a dispute with Mr Green. Meanwhile Oric Computing, the magazine of Mr Green's group, has not been published for some months.

Tansoft, being to all intents and purposes a sister company of Oric, should be well placed to provide a stable and regular service to Oric owners. Anyone interested should contact the Oric Club, Units 1&2, Techno Park, Newmarket Road, Cambridge, or phone Teversham 2264.

Storm breaks over Computers

There were stormy exchanges at last week's creditors' meeting called to discuss the affairs of Computers Ltd, maker of the Lynx micros.

Stanley Charles, company chairman, repeatedly resisted attempts by the largest creditors to appoint an independent liquidator. Eventually it was agreed to appoint two, one chosen by Computers and the other — from accountancy firm Cork Gulley — chosen by the other

creditors.

In addition a committee of inspection was appointed to oversee the winding-up of the company.

Computers told creditors that its total debts amounted to £1.8 million. Of this £877,000 was due to the parent company, Computers PLC, and the remainder to a variety of trade creditors.

Total assets were estimated at £94,250.

Mac winners

The biggest competition yet from PCN has come to an end and Apple Macintoshes will soon be on their way to two lucky readers.

Out of nearly 2,000 entries the first two correct ones picked out of the hat came from Mark Bassett, of Blackheath, London SE3, and Alan Wharton, of Earlsdon, near Coventry. Congratulations to both of you. Look out next week for PCN's Amstrad competition.

City plugs Tycom gap

Tycom Corporation, the maker of the 'futureproof' Microframe, has been rescued just a week after the official receiver was called in.

The money is coming from a group of so far unidentified City of London businessmen. Part of Tycom's current management team — including managing director Alan Timpany — is likely to be retained but the prospects for the Microframe are less clear.

Mr Timpany said last week: 'The new owners will have to take a long hard look at the viability of the system.' But to reassure the 300 or 400 Microframe users he added that dealers continued to be enthusiastic about the machine, to the possible extent of taking on its manufacture.

The Tycom business has been sold as a going concern. Although the official receiver spoke of 'a major deficiency of assets' he pointed out that the fact that people were prepared to take on the

business augured well for its future.

The extent of Tycom's debts has not been disclosed. It aimed to sell 10,000 systems in its first year but despite successes with the Conservative Party these high hopes were never close to being realised.

Mr Timpany attributed Tycom's failure to intense competition and internal shortcomings. 'The IBM PC was a very strong contributory factor,' he said, repeating the now familiar lament of micro makers struggling to establish themselves. The elements of price competition, a hardening of attitudes among buyers, and the disturbing procession of ailing companies going to the wall all made an impact on Tycom's prospects, he said — but he also acknowledged that 'the standard of presentation and documentation' could have been better.

'Technically and concept-wise the Microframe is still a superb product,' he said. The new owners,

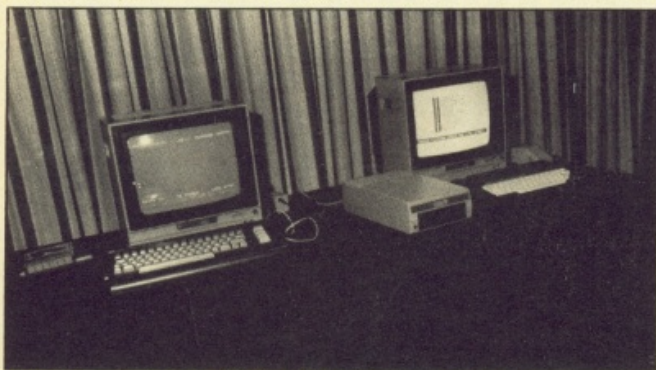
he predicted, would seek the advice of market analysts which would probably be to the effect that the market is moving towards small multi-user systems: 'which is what the Microframe is anyway, so it could be in the right place at the right time.'

Tycom management is preparing a statement of affairs with the receiver but the new owners will, it is anticipated, try to get the company back on an even keel as quickly as possible.

'It's business as usual next week as far as the systems market is concerned, and then they've got to do some brainstorming,' Mr Timpany said.

One possible course open to Tycom's new proprietors would be to move back towards the hotel systems business of Guestel, formerly another arm of the company but one that was sold off last year.

Duo make UK debut



Left, the Commodore 16 and to the right, its big brother the Plus/4.

By David Guest

This year promises to be a watershed for Commodore. New machines are being introduced but at least one is delayed, a new network service is starting up, and back at the US head office a prolonged management re-shuffle is still in progress.

At the Commodore User Show at London's Novotel Hotel it was business as usual on most of the stands, but the behind-the-scenes activity at Commodore was reflected elsewhere. Quicksilver, soon to become the property of a publishing company, was there; Oxford Computer Systems had branched out into games; and Audiogenic has finally brought Alice in Videoland to market.

There was so much Soccer being played around the halls of the Novotel that you might have thought you'd wandered into an FA training session, but the games are a reminder that corporate wheeling and dealing filters through to the high streets soon or later. One illustration of this is that the shiny new machines introduced at the show will not run Commodore 64 software.

They are the Commodore 16 and the Plus/4 (Issue 64). These systems were accompanied by several new

The C16 closely resembles existing Commodore systems with its beached-whale outer casing, but the Plus/4 looks more like an MSX machine. The C16 (16K RAM, Basic 3.5, full-size keyboard, 121 colours) will be sold in a starter pack with a cassette, recreational programs, and Introduction to Basic for £129.99 — exactly the price of the current Vic 20 starter pack. The Plus/4 (64K RAM, screen windows, and four applications) will cost £249.

To accompany the new systems Commodore demonstrated the 1531 cassette unit (£44.95), but the other new peripherals will run with the Vic-20, C64, and SX-64 models as well. The MCS 801 is a 38cps dot-matrix colour printer (£399.99); the DPS 1101, at the same price, is a bi-directional daisy-wheel unit that rattles along at 18cps; the MCS 802 is another dot-matrix device, capable of 60cps (£345); and the 1542 single disk drive (£229) is intended to replace the 1541.

Elsewhere in the hall Compunet boasted a separate stand, presumably to emphasise its status as a joint venture company that links Commodore to ADP Network Services. This network, which is widely expected to punch a hole in Micronet's market, aims to bring software sales, mailboxes, retail services, financial transactions and various information and advice into one box.

'The possibilities are endless,' says the Compunet brochure, but it adds: 'It will take time to develop a full range.' You have been warned.

The plans for Compunet don't end at the range of services — Commodore and ADP are working on interfaces to make it available to micro users outside the Commodore fold. This will also take time, but an immediately useful development would be the production of a simple price guide.

Annual subscription is £30 but it comes free to buyers of the Commodore Communications Modem. Connection charges vary according to the time of day and the line speed.

Storage charges are computed by 'frames' of information or 1024 bytes of a program. Either way, it costs 1p per unit, with a minimum charge of 5p.

Then there are commission charges on software and information, mailbox charges, and the usual British Telecom charges for the user's call from your micro to the Compunet access point dialled — these are in Andover, Birmingham, Bristol, Edinburgh, Glasgow, Leeds, two in London, Luton, Newcastle, Shephed (Leicester), and Warrington.

But not Milton Keynes. However, citizens of MK can claim local access to a facility of a different kind in the shape of Milton Keynes Music. This organisation (mysteriously based in Leighton Buzzard) was driving enormous keyboard instruments off an SX-64 through a MIDI (Musical Instrument Digital Interface) device.

The box in question, built in Italy, costs £29.95 and will also expand the musical range of Spectrum owners.

Oxford Computer Systems (OCS) is usually associated with systems software, utilities, and the black art of compiler generation



Aniorg catches them young and proves that the play's the thing.

response to the prices spiral. ASP represents security to at least some Quicksilver staff, who said at the show that the company and its day-to-day running aren't expected to change much.

To look around the hall you'd think that nothing changed much anyway — but the shape of next year's Commodore show will be determined by events that are taking place now, and who knows, perhaps Jack Tramiel's new com-



Turbo-charged Oxford Computer Systems tries the lighter side of programming.

(issue 64). But at the show it was as proud of Turbo-64, a racing game, as of any cross-compiler. The game grew out of a training program for OCS's machine code programmers and the company now feels that it has on its hands a product that will sell in the US as well as in this country.

OCS, justifiably proud of the 3D features of the game, will sell a tape version for £7.95 through UK chain stores; a disk version to come later may also be sold in the US.

Elsewhere in the games software business there are upheavals that contrast sharply with OCS's cheerful optimism. There wasn't much evidence at the show of the recent trend towards 'pocket-money' software but Quicksilver's move into the arms of Argus Specialist Publications for a reputed £1.8 million must be interpreted in part as a

pany will be holding a user show in competition next June.

Mr Tramiel left Commodore in January having taken it to the peak of the US and international micro market.

Since then the company has lost a number of senior executives and the conviction has grown that it was floundering, if only temporarily.

Mr Tramiel's new company, according to US reports, will design and manufacture desk-top machines, but these will not necessarily compete with Commodore head-on.

History may well be repeating itself: when Chuck Peddle left Commodore it wasn't long before he was back on the scene with a desk-top micro, the Victor/Sirius which has outlasted its parent company.

How many more such people can Commodore afford to lose?



Tinkling the ivories: a portable FX-64 wired through a MIDI interface.

peripherals but not by the Commodore PC (alias the Bytec Hyperion) which is currently being 'restyled' with a larger screen and, ominously, a redesigned processor.

VIEW FROM AMERICA



Commodore drinks some Haigspeak

By Chris Rowley

The US microcomputer industry has a way of letting you know when you've been away. After two weeks in Yurp I found a two-foot deep drift of mail and magazines on my desk. An awful lot has happened.

The top story is that IBM may slash prices on the PC and PCjr by 20 to 30 per cent within six weeks. This prediction by industry analysts sent IBM's stock plunging \$3 to its lowest point in a year at \$105.25. To blame? Slackening demand, Apple Computer, and 'inventory channels choking with PCs'.

Equally portentous was the news that General Alexander Haig had been appointed to the Commodore board of directors. In explanation chairman Irving Gould said that because of Commodore's international position General Haig's 'experience and reputation will be very helpful to us'.

Meanwhile Commodore watchers reported more Commodore top execs jumping ship. The latest defectors are said to include Sam Tramiel (son of Jack), Tony Tokai (Commodore Japan), and long-term veteran Greg Pratt, who set up Commodore's purchase of MOS Technology, maker of the 6502 in all those 64s. Rumour has it that Jack Tramiel is setting up a new company stocked with trusted staffers from Commodore.

Then there was the news from Atari. At first it was gloomy — Warner's president Steve Ross announced at the annual meeting that layers of Atari middle management 'and the resulting bureaucracy will be stripped away'. Job losses rise towards 1,000, and the lay-offs coincide with reports that the Dutch giant MV Philips is interested in a stake in Atari — but Philips is said to be insistent upon a substantial trimming of the Atari payroll.

While the pink slips (translator's note: P45s) were in the works Atari announced the 7800 \$150 video game machine. It also pledged a \$100 keyboard to extend the system into an introductory 4K RAM home computer, expandable to 20K.

From Apple came various rumours: that MacFactory isn't performing as it should, though the Mac is setting sales records; that the next generation Apple machine will be based on 32-bit RISC architecture (Reduced Instruction Set) on Apple's own VLSI chip; that when the 16-bit 6502-compatible chip is fully ready from Western Digital, Apple will bring out the IIx, the ultimate update of its venerable best seller.

And while we're talking about the Apple II, there is an update on Mike Caro, self-proclaimed Mad Genius of Poker who wrote a poker program in Pascal for his Apple II and took it to the World Series Poker tables in Las Vegas. Playing a variant of seven-card stud with \$100,000 or more on the table, Mad Mike's Apple was wiped out. Twice. The second time round it was routed by Doyle Brunson, the two-time World Poker Champion and the first man to win \$1 million in tournament play. Brunson put all his chips on his first hand. The Apple called and lost.

More ground-breaking news from Nevada came from the Gaming Control Board which approved for testing an advanced video gambling game called Gold Fever. It costs \$3 to play and to control the animated prospector in search of gold. Winnings can be as high as \$1,000.

This is the first game that Nevada has ever approved that doesn't feature the traditional gaming symbols of cards, dice, and fruit. If Gold Fever passes the test, it makes money and is cheat-proof, the gambling and casino worlds will doubtless resound to the hum of electronic gambling.

Which in the case of Vegas may come in the nick of time. Profits are way down due to the recession, the competition from Atlantic City, and the coming of age of the low-rolling 60s generation who have a negative attitude towards casino gambling and its attendant life-style. To survive, the casinos are trying to vault directly to the video game generation. George Drews, president of International Gaming Technology which makes Gold Fever, admits: 'We'd like something for the video game generation but we know it will take something a lot more interesting than just the ordinary reel-type one-armed bandit.'

Ant crawling into Catch-22

By Ralph Bancroft

Every once in a while someone makes an offer that sounds just too good to be true.

The Ant PC to be produced by MDR is just that. Its specification sounds remarkably good but as yet is not true.

The design is for a briefcase portable offering three processors (CMOS Z80, CMOS 8086, 68000), three operating systems (CP/M, Concurrent CP/M 3.1, MSDOS as an emulation under Concurrent), the option of a fourth (Unix), 512K RAM, 80 column by 25 line LCD display, single 420K Sony-format microfloppy, four channel sound, two serial and one parallel interface, and RGB output to a colour monitor.

And the price? Just £1,300 plus VAT.

The company claims that the machine already exists and it will be able to demonstrate it running within the next couple of weeks.

The only catch is that at the moment the system exists only as a desktop machine.

'We will be crunching it down to the size of a portable', says Steven Michael, assistant product manager.

This will take some time, as will getting hold of the 25 line LCD screen. These don't exist yet but 'we are confident, as of last week, of getting these', said Mr Michael.

As a result the machine will not be released until its worldwide launch next January, although the company says that it will start to be

produced in quantity in November.

In the meantime, MDR is inviting would-be purchasers to send off post-dated cheques to secure delivery of the Ant after January 1985.

MDR is buying in the design from the US where, it is claimed, the machine in its desktop format has existed for three months. MDR will have world-wide rights to the machine in its Ant-like form.

It does not intend to manufacture the machine itself, preferring instead to sub-contract out the assembly.

MDR advertises itself as 'consultants, suppliers and engineers to home and business computer users'. Its main activity appears to be selling home and business micros at a discount on mail-order.

It is not unusual for manufacturers to pre-announce products or invite mail-order customers to send orders in advance of the product being available. But inviting orders some six months in advance of the launch must be something of a record.

'We want the Ant to be a people's computer,' said Mr Michael. 'We want to see what the response is to the specification of the machine before we finalise the design.'

If it is not unusual to pre-announce products it is also not unusual to fail to meet promised delivery dates.

PCN has been promised a demonstration of the desktop prototype. We'll keep you posted — ante-dated, of course.

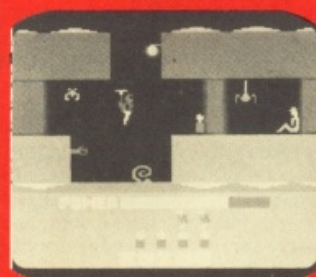
Microsoft in on Mac trend

Microsoft's first batch of Macintosh software was launched last week with promises of more to come. Microsoft File and Microsoft Chart are both new, while Word and Multiplan were previously available on MSDOS machines.

All are priced at £170.40 except Chart. This costs £113.85 and is a graphics routine which takes data from a spreadsheet to produce bar, pie and other charts.

But deliveries to IBM and Apple dealers are slightly haphazard with Chart currently being shipped from the US, Word arriving at the end of June and File in August. The spreadsheet is available now.

Microsoft denies that it is changing horses from IBM to Apple. A spokeswoman said the company would continue to make products for the IBM PC and Apple's Macintosh and 'will be going for Apple and IBM dealers in a major way.'



HIS AND HERO — Fort Apocalypse by any other name, the new game from Activision for Atari and Commodore systems would barely be worth mentioning if it wasn't for the hero's name. The game itself is called Hero which is partly explained by the presence in it of the Helicopter Emergency Rescue Operation squad and partly because it is the surname of one Roderick Hero. This post-Cuthbert man-of-many-parts rescues miners trapped between layers of lava, rockslides, almost anything except large numbers of policemen. It costs £9.99 for the Commodore 64, and the Atari price has yet to be announced.

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Printing System	: 96 spoke daisy wheel (QUME WP compatible)	Copy Capability	: Original + 5 copies (max.)
Printing Speed	: 20 characters per second	Impression Control	: Automatic 7 levels
	Bi-directional, logic seeking	Ribbon	: Multi strike type ribbon cartridge (QUME MULTI-STRIKE IV, FABRIC IV compatible)
Character Pitch	: 1/10 inch, 1/12 inch, 1/15 inch, proportional spacing	Ribbon Life	: 400000 characters
	Shadow and bold	Interface	: 8 bits parallel (CENTRONICS compatible)
Print Length	: 12 inches		Optional RS-232C serial interface.
Horizontal Min. Pitch	: 1/120 inch	Memory Buffer	: 256 characters
Platen Length	: 13 inches		
Paper Feed System	: Friction feed (Option: Tractor feed or Auto sheet feed)		

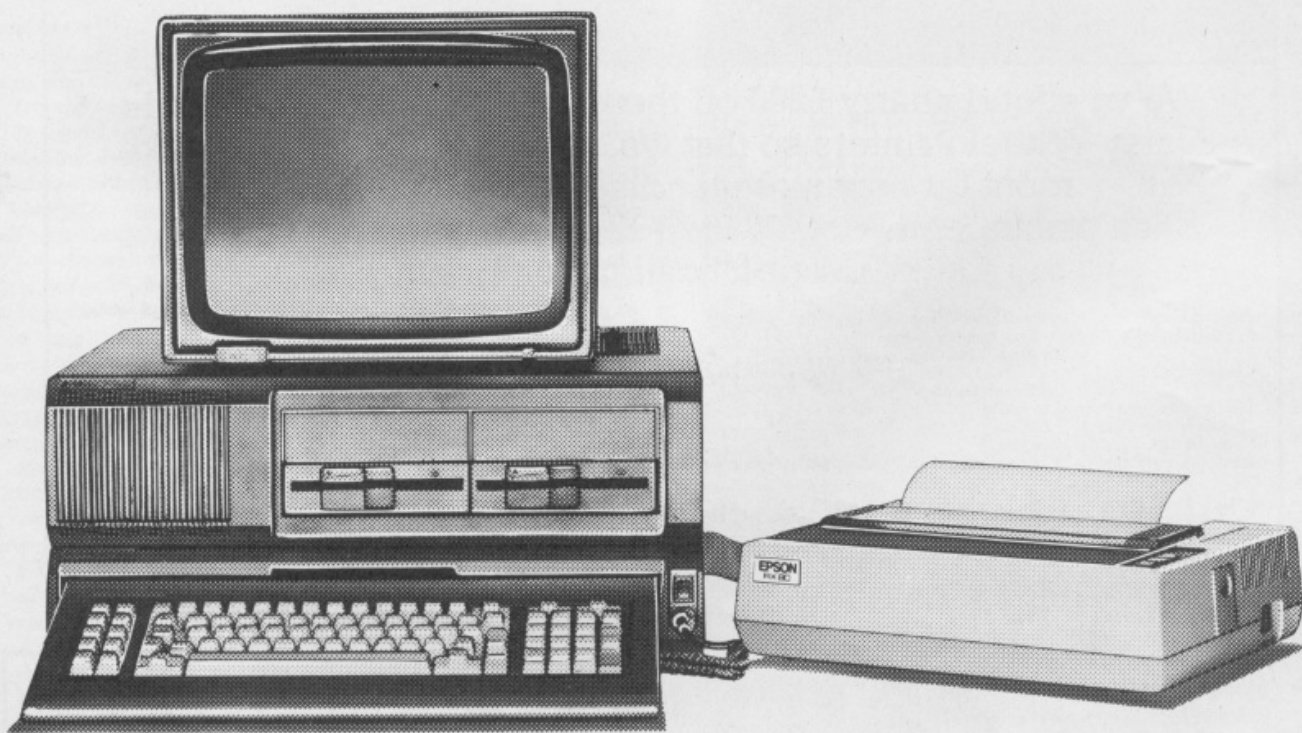
Cash with order only to include carriage by Securicor at £10.93 per printer.
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Why you should buy a computer you've never heard of, when you know you want an IBM PC.



Advance 86b specification. Intel 8086 CPU. MS DOS operating system. Twin-disk drives. 128K RAM expandable to 640K. Interfaces for light pen, printer/plotter, joystick, monitor and RS232C. Capacity for 4 expansion boards, plus a further 2 true 16 bit slots. Graphics - 16 colours, 80/40 columns x 25 row text, 640 x 200 pixels. Package illustrated Epson RX80 F/T Printer (£325 inc. VAT) and Microvitex monitor (£249 inc. VAT).

 * Excluding N. Ireland. Subject to availability. Prices correct at time of going to press. 

You've probably never heard of the Ferranti Advance 86b. But then, once upon a time you'd probably never heard of the Sinclair ZX81 either.

In 1981, we became the exclusive stockists of this computer, which has since gone on to become the best selling personal computer ever.

In 1982, we were the first High Street retailer to make the Sinclair Spectrum available to the general public. Again, most people at first knew nothing of its existence, and again we've sold thousands.

In 1983, we were the first national High Street retailer to stock Acorn's domestic version of the highly successful BBC Micro, the Electron. And now, in 1984, we're continuing the story by stocking a new, advanced, business computer.

The Advance 86b Personal Computer, made by Ferranti.

So far, of course, few people have heard of it. The Advance 86b, based on a true 16-bit micro-processor, has a user memory of up to 640k, and dual 360k disk drives. It runs IBM software, and runs it faster than any equivalent IBM PC. Simply because the microchip it uses is more advanced.

The Advance 86b costs £1,499 (inc. VAT) and comes complete with four free software programs – spreadsheet, wordchecker, word processor and database.

The package shown includes a monitor and printer and at £2,073 (inc. VAT) costs less than half of the equivalent IBM PC package.

What's more, your Advance 86b will be backed up by a full 12 month warranty.

Which means that, should it develop a fault it will be serviced free of charge, anywhere in the U.K.*

Of course, it goes without saying that such a computer is exclusive to us at W. H. Smith.

WHSMITH



Birmingham, Bradford (Broadway), Bristol, Cambridge, Cardiff, Edinburgh, Exeter, Glasgow, Kingston-upon-Hull, Leeds, Leicester, Liverpool, London: Brent Cross, Bromley, Croydon, Ealing, Hammersmith, Heathrow Airport, Holborn Circus, Kensington High Street, Kingston-upon-Thames, Sloane Square, Wood Green, Manchester, Newcastle-upon-Tyne, Northampton, Nottingham, Plymouth, Reading, Sheffield, Southampton, Swansea, Wolverhampton.

Don't ignore my user group

We have heard it said, yet again, that there is no international organisation dedicated to Sinclair computers. We would like to point out that this is definitely not the case.

The International Sinclair User Group was formed in August 1983 following the closure of Tim Hartnell's National ZX User Group. The group has grown steadily since then, and now boasts members in the UK, Eire, Holland, Germany, Spain, Malta, Saudi Arabia, Malaysia, Singapore and Australia.

Membership of ISUG brings a monthly newsletter entitled 'ZX PRESS' and software discounts, as well as contact with other Sinclair users around the world.

New members are always welcome, whether accomplished programmers or complete beginners.

If you would like further details drop a line (with a stamp to cover postage where possible) to me.

Vic Webber, ISUG,
189 Rosehill Road,
Burnley, Lancs BB11 2QZ.

Commodore upsets Scots

All Scottish readers take note that the flag of St Andrew has undergone a change of colour. I discovered this on page 19 of Commodore's *Introduction to Basic Part I* for the Vic 20.

It seems the flag should now be drawn as a red cross on a white background, as opposed to the previously accepted white cross on blue background.

I noticed that the Basic *Introduction* had been printed in England...
J S Lamont,
Edinburgh EH16.

Different kettles of Pascal

After reading of Mr Yuill's interest in Pascal for the Commodore 64 (Issue 63), I feel I should write. I have both the Pascals that he talks about and they have various advantages and disadvantages which I feel I should point out.

Zoom Pascal from Adamsoft is a bit messy to use and difficult to get to grips with because of its various compiler commands which tend to be letters and symbols instead of meaningful words. It does away with line numbers (Pascal has no need for them anyway) and compiles and runs fairly quickly.

You will find that you will be constantly glancing down at your instruction booklet, which is fairly comprehensive.

Oxford Pascal is a different kettle of fish. You enter the source program as in Basic with the full screen editor that the 64 provides. This method is by far the easiest method and if you're used to Basic it can be done with great speed. When



Would you like to see your name in print?
Here is your chance on PCN's letters page.

it comes to compiling you can have the source program listed on screen or printer or neither while the various error messages are generated.

Compilation is very slow either way and the compiled program is extremely slow.

A simple FOR/NEXT loop in Basic which does nothing 3200 times runs only about 15 seconds slower than an equivalent compiled Pascal program.

Comparing Oxford Pascal and Zoom Pascal, the latter runs a good deal faster: so much so that I wonder if the Oxford Pascal is compiled at all.

Benchtests proved the point. I compared three Pascals, two for the 64 (the ones mentioned) and one for the Spectrum (Hisoft Pascal 4). The Hisoft was, on most tests, about 20 times as fast as Oxford and about ten times as fast as Zoom.

Oxford's times were embarrassingly slow, Zoom's were above average and Hisoft's for the Spectrum, were remarkably fast considering that the machine runs more slowly than the 64.

My advice to Mr Yuill is that if he wants to learn Pascal, get Oxford's version and if he wants to use the benefits that Pascal offers, get Zoom's version.

Nigel Shore,
Billingshurst, West Sussex.

No go on Atmos for some titles

May I warn unsuspecting Oric/Atmos owners regarding commercial software.

When I bought my Atmos, my dealer told me most existing Oric 1 software would run on it. However, I am beginning to get very tired and frustrated at the number of times I have had to return software, because it simply does not work. The tape recorder I use works perfectly well when loading the Atmos demo tape.

The following titles will not work on my Atmos, although they do not state this on the cassettes: Harrier Attack (Durell); Dig Dog (Taskset); Oric Flight (Tansoft); Dinky Kong (Severn); and Hunch Back (Ocean).

Why don't these companies state on their cassettes whether the Oric 1 software also works on the Atmos? Even my local dealer could not tell me which software would work and which would not.

Andrew Barr,
Withernsea, North Humberside.

Oric will send you a list of compatible software, if you ask. In fact, a great deal of it is transferable but we agree there shouldn't be any room for doubt.
Ed.

Sorry state of school computing

Many years ago Sinclair Research released the ZX81. It was largely due to this machine that home computing in Britain became widespread.

It seems, also, that the government woke up to the existence of micros and made an attempt to place one in every school. It is now time to look at what this aim has and has not achieved. Are we now producing more computer literates than before? Sadly, due to the organisation of these new resources, I fear not. The scenario below may help explain why not.

A 380Z, supplied by government and local council funds, and three or four ZX81s, supplied by school funds, are likely to be the computers available to a school initially, stashed away for the use of pupils under the supervision of a teacher.

It is highly unlikely this teacher will be able to stay late every day so pupils may use the computers after school hours. This means the five available computers may only be used at lunch times, about an hour a day, thus servicing adequately

approximately 25 pupils a week.

Suppose the pupil population of a school is 900, from this 25 pupils mentioned above represent only about 0.03 per cent.

If more than 50 pupils wish to use the computers the time each pupil may spend on one becomes so ludicrously short that they become virtually inaccessible to all, and in a school of 900 pupils this may well happen.

In an attempt to make the computers of some use, teachers may place artificial restrictions upon the number of pupils using the machines by, say, limiting their use to members of the fourth and fifth years or in extreme cases, imposing fees to join a 'computer club'.

On admittance to this élite after-dinner club more problems arise. An almost natural result of sitting in front of a computer for the first time seems to be an incorrigible urge to play games. This is fine, they are an excellent introduction to computers and an incentive to develop further computing skills. Unfortunately, the teachers may consider them a complete waste of time and try to ban them, making it harder for pupils to cultivate a healthy interest in these machines.

The remaining members of the

PCN £10 Star Letter



'computer club' must settle down to learning programming. But the teachers are themselves just learning programming and so do not have the knowledge to teach this subject. Thus pupils are left to their own devices, which leads to inefficient, badly structured programs.

Thus the poor organisation of school computer resources has meant many pupils who may have wished to use computers have not been able to, pupils who may have become interested in computers have been discouraged, and, most seriously, pupils who have gone on to use school computers have been turned into scrappy, inefficient programmers.

Although this scenario may depict an extreme example, the problems mentioned have been experienced by schools and perhaps explain why many computer-related jobs cannot be filled by people who have been through the British educational system.

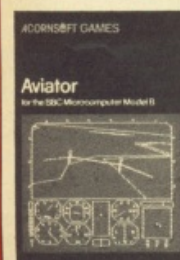
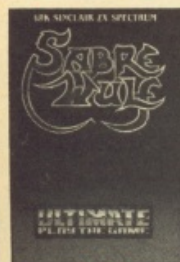
If the government had spent its money more wisely these problems might have been avoided.

Antony Smith,
Huddersfield.

On the other hand, at least the government took this initiative and put Britain well ahead of other countries. Unfortunately, as you point out, this is only a start.
Ed.

PCN CHARTS

GAMES



GAME TITLE			PUBLISHER	MACHINE	PRICE
1	3	Jet Set Willy	Soft Projects	SP	£5.95
2	4	Code Name Mat	Micromega	SP	£6.95
3	—	Beach head	US Gold Access	C64	£8.95
4	2	Pystron	Beyond	SP	£7.95
5	—	Sabre Wulf	Ultimate	SP	£5.50
6	1	Trashman	New Generation	SP	£5.95
7	5	Fighter Pilot	Digital Integ	SP	£7.95
8	6	Space Pilot	Anirog	C64	£7.95
9	9	Atic Atac	Ultimate	SP	£5.50
10	18	Solo Flight	Microprose	C64,AT	£14.95
11	8	Flight Path 737	Anirog	C64,VIC	£7.95
12	12	Hunchback	Ocean	C64,SP,DR	£6.90
13	17	Night Gunner	Digital Integ	SP	£7.95
14	24	Internat. Football	Commodore	C64	£8.95
15	—	Mugsy	Melbourne House	SP	£6.95
16	7	Blade Alley	PSS	SP	£5.95
17	11	Blue Thunder	Wilcox	SP,AT	£5.95
18	16	Blagger	Alligata	C64,AC	£5.95
19	—	Ad Astra	Gargoyle	SP	£5.95
20	28	Sheep In Space	Llamasoft	C64	£5.95
21	—	3D Lunar Attack	Hewson	SP	£7.95
22	13	Forbidden Forest	Cosmi	C64,AT	£8.95
23	15	Scuba Dive	Direll/Martech	SP, C64,OR	£6.95
24	19	Chequered Flag	Psion	SP	£6.95
25	—	Jack & The B'stalk	Thor	SP	£5.95
26	20	Zodiac	Anirog	C64	£7.95
27	—	Aviator	Acornsoft	BBC	£14.95
28	10	Manic Miner	Soft Projects	SP,C64	£5.95
29	14	The Boss	Peaksoft	C64	£8.95
30	25	Aztec Challenge	Cosmi	C64,AT	£8.95

MICROS

Top Ten over £1,000

TW	LW	MACHINE	PRICE	DISTRIBUTOR
▲1	2	IBM PC	£2,390	IBM
▼2	1	APPLE III	£2,755	AP
▶3	3	ACT Sirius	£2,525	ACT
▲4	9	DEC Rainbow	£2,359	DEC
▼5	4	ACT Apricot	£1,760	ACT
▲6	8	Televideo TS1603	£2,640	TH
▼7	6	Kaypro	£1,604	CKC
▼8	5	Wang Professional	£3,076	WANG
▲9	—	Philips P2000	£1,484	MD,KDS
▶10	10	NCR Decision Mate V	£1,984	NCR

Top Ten up to £1,000

TW	LW	MACHINE	PRICE	DISTRIBUTOR
▲1	2	Spectrum	£99	SI
▼2	1	CBM64	£199	CBM
▲3	5	Vic 20	£100	CBM
▶4	4	Electron	£199	AC
▲5	7	Oric Atmos	£175	OR
▼6	3	BBC B	£399	AC
▼7	6	Memotech 500	£275	MTX
▶8	8	Dragon 32	£175	DD
▲9	—	Atari 800XL	£250	AT
▲10	—	Oric 1	£100	OR

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets during the fortnight up to **June 7**. The games chart is updated every other week.

Neither mail order nor deposit-only orders are included in these listings. The prices quoted are for the no-frills models and include VAT.

Information for the top-selling micros is culled from retailers and dealers throughout the country and is updated every month.

PCN Charts are compiled exclusively for us by RAM/C, who can be contacted on 01-892 6596.

Unicorn. Five new channels Here's the full



The new UNICORN range from TORCH Computers gives the enthusiast and professional user a choice of upgrades which takes the BBC Model B Micro to the ultimate height of performance.

The result of TORCH'S total commitment to the BBC Micro is the only complete range of high performance hardware available. Offering every BBC Micro owner five new upgrade channels, UNICORN will transform your BBC into a fully communicating workstation, a CP/M[®] compatible business machine or the ultimate in high powered 32-bit data processing.

At the top of the range, THE UNICORN, offers the power and sophistication of System III UNIX[®] whilst other channels make available the flexibility of languages such as FORTRAN, PASCAL, BCPL and COBOL. All models, with the exception of the HDP240, provide BBCBASIC (Z80) on the Z80 rather than the Model B's 6502.

Tune in to the Channel that most suits your requirements. Whichever level you choose you can be sure of a system with infinitely expandable potential for a confident future in the world of computing.

The ZEP 100

- Z80 Extension Processor
- 4MHz Z80A
- 64K RAM
- 24K ROM

The object of any upgrade kit is to improve processing ability and to increase data storage capacity. The UNICORN ZEP100 is the first stage upgrade which opens channels into the world of serious computing.

The ZEP100 is the proven 8 bit second processor for the BBC Model B micro. A Z80 extension processor which enables the use of the well established CPN operating system, giving access to the vast range of applications programs and languages available for all CP/M[®] micros. When fitted to a BBC model B microcomputer with compatible high quality disc drives it provides a complete business or scientific computer which can run large applications programs or use advanced languages, with the ability to switch back to standard BBC programs at any time.

Any ZEP100 can be linked, via the Econet[®] option on the BBC, to a network of other TORCH computers to provide a workstation running on TORCHNET. Full TORCHNET operating systems software is provided to allow access to information anywhere on the network, or to communicate with other computers.

The 64K ZEP100 is supplied with full software support including word processing, spreadsheet, database and utilities. The ZEP100 - around £299 (ex. VAT).



Channels for the BBC. All programme.



The ZDP 240

- 4MHz Z80A ● 64K RAM
- 24K ROM
- Twin, double sided 400K floppy discs
- Independent integral power supply



The UNICORN ZDP240 (Torch Z80 Disc Pack) is the proven upgrade for the BBC Model B micro-computer. Offering the use of more powerful and flexible languages such as Fortran, Pascal, BCPL and Cobol, it provides 800K of disc storage plus a Z80 second processor with 64K RAM running TORCH's own CP/M[®] compatible operating system based in ROM.

This advanced design means that almost all of the 64K RAM provided by the Z80 board is available for CP/M[®] programming use—an advantage no other BBC micro upgrade can offer.

If your BBC micro has the Econet[®] option, there is a further benefit the ZDP240 can offer. TORCHNET can link together up to 254 upgraded Model B's on a local area network, so for enthusiasts, Clubs and Schools it is a simple and low-cost way to achieve networking facilities.

The discs can be used for storage under the Acorn DFS system or for CP/M[®] programs and data.

A comprehensive software package is provided with the disc pack. It includes word and data processing and a spreadsheet program, along with utility programs and manuals.

The TORCH Z80 Disc pack is recommended by the CCTA for government use. **The ZDP 240—around £699 (ex. VAT).**



The HDP 240

- 20Mbyte hard disc Winchester
- Double sided 400K floppy disc
- Integral power supply

For users who need much more storage capacity than is available on floppy discs and who require the large speed gains that a Winchester hard disc provides, the third new channel is now available.

The UNICORN HDP240 combines a 400K floppy disc drive with a 20Mb hard disc and its associated controller. The pack connects directly to the disc and 1MHz bus sockets on the BBC Model B.

In conjunction with a ZEP100, it provides a powerful business computer for running CP/M[®] programs with large amounts of data. The floppy disc can be used for storage with the Acorn DFS system, and both discs can be used by other TORCH systems on the TORCHNET local area network. **The HDP240—around £1995 (ex. VAT).**



The HDP68K

- 8MHz MC68000 ● 6MHz Z80B
- 256K RAM (68000)
- 64K RAM (Z80)
- 20 Mbyte hard disc Winchester
- Double sided 400K floppy disc
- Integral power supply

The fourth channel in the UNICORN range is for users who need the extra processing power of a 68000 32 bit processor, as well as the Z80 running standard software. The UNICORN HDP68K provides the ultimate in performance, offering an extra 256K RAM and a 68000 processor running at 8 million cycles per second. It also contains a Z80 processor to allow the running of existing TORCH software.

The HDP68K—around £2495 (ex. VAT).



The Unicorn

Spec. as HDP68K PLUS UNIX[®] operating system.

UNIX[®] System III is the recognised operating system of the '80's. A very powerful and sophisticated multi-tasking system, it includes a vast library of utility programmes.

The fifth channel and top of the range, THE UNICORN, puts UNIX[®] within reach of the individual user, at a price unmatched by any other UNIX[®] systems, by combining the reliability of the BBC micro with advanced technology from TORCH Computers.

TORCH UNIX operates under the network operating system. Using UNICORN products, a low-cost network of BBC Micros can be configured to offer the most complete range of educational computing facilities available anywhere.

Other facilities available include UCSDp-System, LISP, FORTH, PILOT and PROLOG. **The UNICORN—around £2895 (ex. VAT).**

UNICORN

Open channels for the BBC micro.

To: Torch Computers Ltd., Abberley House,
Great Shelford, Cambridge CB2 5LQ.
Telephone: Cambridge (0223) 841000.

Please send further information on the UNICORN range plus your FREE 1984 Software Catalogue.

Name _____

Address _____

Tel _____

Post Code _____

PCN 136

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COMPUTERS



CP/M is a registered trademark of Digital Research Inc.
Econet is a registered trademark of Acorn Computers Ltd.
Unix is a registered trademark of Bell Telephone Laboratories Inc.

UK version Model B necessary.
Disc interfaces are necessary for use with the Unicorn range.

Text and Graphics provided by BBC Model B.
Keyboard provided by BBC Model B.

Lost in a maze of bits and bytes, trapped in a forest of errors, bugged by Basic? Whatever the problem, CALL on us. Our panel of experts is at your command.

Write to: Routine Inquiries,
Personal Computer News,
VNU. Evelyn House, 62
Oxford Street, London W1A
2HG.

Dragon claim proves mistaken

Q Routine Inquiries recently replied to a reader who had bought a computer under what subsequently turned out to be false or misleading advertisements.

I purchased a Dragon 32 some 18 months ago under the mistaken belief that it would later be possible to expand it to 64K. Time has shown that this is not possible, and the opportunity to trade it in against a new improved version with lots of extras which I do not want or need is, in my view, unacceptable.

While I am quite prepared to take action through the courts, I would first like to ask you if you think that by doing so I am acting in a fair and reasonable way.

Peter Dootson,
North Devon

A We at PCN weren't familiar with the small print of early Dragon Data advertisements, so the initial reaction to your query was fairly sceptical. However, a little research did in fact clinch it. When Dragon Data launched the Dragon 32 it was indeed advertised as 32K RAM standard, expandable to 64K RAM.

The advertisement in question, incidentally, was also grossly sexist, and we'd reckon that was a much more serious crime.

Despite the existence of printed evidence, we don't think you have all that much of a case. Technically you can't upgrade a Dragon 32, but as a Dragon 64 can be supplied instead, and the original advertisement didn't say anything about the cost of the upgrade, it's likely you'd be wasting your time going to law.

The other case to which you refer is more clear-cut than your own, and you'll probably recognise that although a lot of micro products do not perform in accordance with their original specs, it's not totally clear that yours is in this position.

Take the position of Oric 1 owners, for example. The Oric 1 clearly doesn't perform in the way its initial advertising led buyers to believe, and the Modem, OricSpeedprinter and disk drives never appeared for it, never mind the new ROM. However, even in what seems a relatively clear-cut case we don't know of anyone who has successfully demanded compensation for this.

Your case is more flimsy. While we don't think you'd be unreasonable to go to law, you'd probably be foolish. If you're set on seeing it through, bear in mind that your contract of sale is with the shop, not with Dragon Data.

Is my Spectrum a bit dim?

Q I am writing a program on my 48K ZX Spectrum and have come across a small problem. I belong to a video company and was asked to write a program in Basic which would hold in its memory such things as accounts and film titles. The problem is that I can't program the computer to change accounts without going into the program.

It asks if I would like to change an account, but when I reply 'yes', although it changes it, it goes back to normal when I go back to the menu. I looked in the manual but it only keeps on about DIM. Do I use DIM?

David Scott,
Littlehampton, West Sussex.

A We assume what you want to do is to design a system that will allow you to update figures, hold them in memory, and save them to tape but it's not exactly clear what you're doing at the moment.

It sounds suspiciously like you're inputting numbers, and then you've got a routine for printing them on screen without organising the actual storage of them in memory. If this is what you're doing, it's a bit . . . um . . . dim.

The manual does indeed go on about DIM, but not a form that beginners can automatically understand. The basic principle is simple — if you say DIM a(30,30) you're reserving a space in memory for 30 rows by 30 columns of numbers. This means that you're drawing up a large sheet of squared paper in

the computer's memory, and you're labelling it 'a'. Now you can write numbers into the boxes in your squared paper by saying LET a(x,y)=z. This will fill the number z into the box in the yth row of the xth column in your notional table, just as it would on the screen if you tapped in PRINT AT x,y;z.

So the obvious way of dealing with this is to write the data to the screen at the same time as you're writing it to the array in memory. It's handy to use the same coordinates, but if you want to insert headings for the companies involved at the top or the left margin you'll have to bear in mind you'll be displacing the screen coordinates.

The companies' names are best stored in a separate string array, which would be dimensioned as the largest plausible number of companies by the longest company name, so you'd have a representation of two arrays on the screen.

Stepping up into the Atmosphere

Q I am considering upgrading my Oric to an Atmos, but four questions are holding me back: Does the Atmos suffer from cassette loading problems? How does the Atmos handle tape files? When can I send my Oric for upgrading, and where should I send it?

Alistair Johnstone,
Westbury-on-Trym, Bristol.

A The Atmos has an error-checking facility which sometimes reports data errors when there aren't any. This doesn't cause problems with Basic programs, but means the machine won't run a machine code program which it thinks has loaded with errors.

However, Oric International supplies a program with the Atmos which prevents the error trapping and should be loaded before any other program.

The Atmos doesn't support sequential data files. You can save and load programs, blocks of memory and arrays, but you cannot open a file then write ASCII strings or numbers to it.

Upgrades are available now. Just send your cheque for £60 together with your machine (but not parts such as the mains adaptor) to PO 23, Feltham, Middlesex. Contact Oric on 0990 27641 for further details.

Matching up my Microvitec

Q I am thinking of buying a Spectrum. As I already have a Microvitec colour monitor, would it be possible to connect the Spectrum to this or will it have to be modified?

S Dunsdon,
Dulwich, London SE21.

A Microvitec actually produces a special monitor set up to use with the Spectrum — the bad news is it probably isn't the one you've got. The Spectrum produces a composite video signal from the edge connector, and to use it all you've got to do is take one lead from the video line and one from 0 volts to your monitor, should your monitor have composite video input. See the manual for where these are.

The most convenient way of doing this is to get yourself an extension edge connector and solder the wires to the right lines, but you could also open the Spectrum's case and solder it carefully on the inside, then run the wire through a hole drilled in the case, but this would of course void your warranty.

You could also just short out the modulator, but you wouldn't be able to use a TV if you did. If you want to do this it's just a matter of soldering two short wires to the wires going into the modulator (marked Astech on the top left of the circuit board) and running them to the current TV output.

The video line, by the way, should be connected to the centre pin of the monitor plug. As you haven't bought your Spectrum yet, you'll get an issue three and there's nothing else you need do. On an issue 1 or 2 you'd also have to bridge the gap between TC1 and TC2 on the circuit board with a blob of solder. If you're faced with this problem it's probably best to take advice from someone who's done it before, or consult The Complete Sinclair Database, by Adams, Beardsmore and Gilbert. This estimable work includes a sketch map on the subject.

If you're unsure what kind of monitor you've got, phone Microvitec on 0274 390011 for advice, or consult your dealer.

Oxon TI users group ensures that the blind or partially sighted will benefit from Texas Instruments.

Speech machines bring help

The TI 99/4A User Group newly started up in Oxfordshire should have special appeal for the blind or partially sighted.

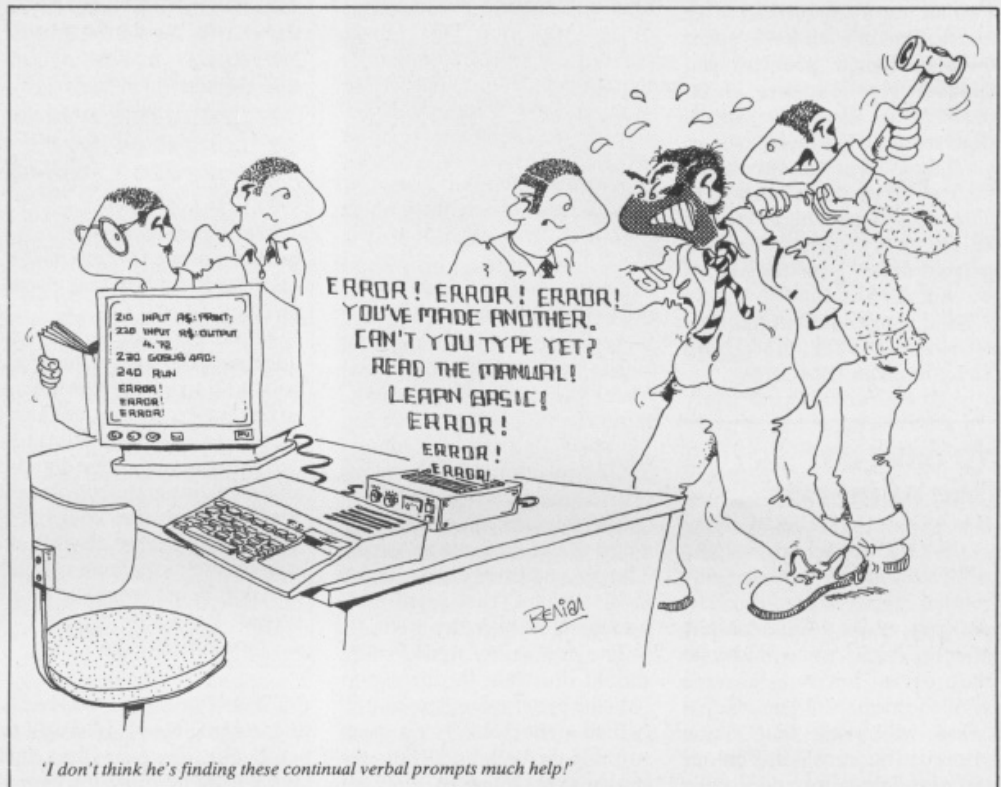
Using a 99/4A speech synthesiser and Terminal Emulator 11 module, blind users can communicate with databases. The system will give verbal prompts during program execution and will also speak a program listing aloud.

'The Terminal Emulator 11 module has a text to speech facility,' said organiser Peter Brooks, who will also be taking an interest in TI's production of a speech recognition unit to be made by the Milton Bradley company.

Blind members can get the monthly newsletter on cassette as long as they supply Peter with a blank cassette each time they want one, but as yet no actual meetings have been organised.

Wendie Pearson

Name Oxon TI Users Meetings None
as yet **Contact** Peter Brooks, 0865
64811 ext 335.



'I don't think he's finding these continual verbal prompts much help!'

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MICROWAVES

More hints and tips from our readers to make programming a little easier.

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Send your contributions to:
Microwaves, PCN, 62 Oxford Street, London W1A 2HG.

No envy on Oric numerals

If you want to plot numbers on to the Oric text screen, STR\$(N) will result in the number being printed in green. Avoid this by plotting a space immediately after the STR\$(N), PLOT is used in the program, but using the same X,Y co-ordinates. The routine below will result in 5 being printed in the current ink colour rather than green.

```
10 N=5
20 PLOT 20, 10, STR$(N)
30 PLOT 20, 10, STR$(N)
D Harrison,
Wirral, Merseyside.
```

Truth behind the bubble sort

```
10 MODE 7:KEYS RUN:
20 VDU23,1,0:0:0:0:
30 REM BY M M HOFFMAN
40 PRINTTAB(5,3)CHR$(130);"IN-MEMORY BUBBLE SORT"
50 ON ERROR REPORT:PRINT"IN LINE"ERL:END
60 INPUTTAB(0,5)"Enter a message"AS
70 PRINTTAB(5,10)CHR$(131);"Press SPACE for full speed."
80 PRINTTAB(5,20)CHR$(129);"Press f0 to rerun"
90 PRINTTAB(0,5)STRING$(70," ")
100 M=7:DE0
110 FOR char=1 TO LENAS
120 ?(M+2*char-1)=ASCID$(AS,char,1)
130 NEXTchar
140 swap=FALSE
150 FOR L=M TO M+2*char
160 IF ?L>?(L+1) PROCswap
170 NEXT L
180 IF swap = TRUE THEN 140:REM repeat until sorted
190 END
200 :::
210 DEFPROCswap
220 swap = TRUE
230 M=?L
240 ?L=?L+1:?(L+1)=M
250 IF NOT INKEY(-99) PROCdelay
260 ENDPROC
270 :::
280 DEFPROCdelay
290 TIME=0:REPEAT UNTIL TIME =30
300 ENDPROC
```

I've written the short listing above for the BBC A/B micro to illustrate in the most graphic way I could think of how a bubble sort works.

The contents of a selected part of the screen memory is sorted, enabling memory exchanges to be viewed as they happen. While the space bar is pressed the delay routine is bypassed.

The user could experiment by including teletext control characters (shift function keys, OS 1.2) as well as upper/lower case letters and numerals.

● Would this reader please send in their address as the original letter has gone missing.

Error-handling with the Beeb

One unfortunate consequence of the way that BBC Basic performs its error handling is that global values of procedure parameters — their values outside the procedure — may be affected after an error has been trapped.

Note that procedure parameters are normally local to the procedure. When a procedure call with parameters is made, the external values of the parameters are copied onto the Basic stack so that the parameter variables may be used as temporary local variables from the stack and the parameters are restored to their values prior to the procedure call.

This does not appear to occur when Basic detects an error. The parameters are left with the local values they had immediately prior to the error.

The following short listing should illustrate the problem. Run the program, delete line 80 (which generates a 'no such variable error') and then re-run.

The difference will be readily apparent. User defined functions behave exactly the same.

No doubt the enterprising reader will find ways of putting

Memory move routine already there

```
10 CLS
15 REM FILL FIRST THREE LINES WITH A'S
20 FOR I=48040 TO 48040+119
30 POKE I,65
40 NEXT
50 DOKE#200,48040: REM START ADDRESS
60 DOKE#204,120: REM MOVE 120 BYTES
70 DOKE#202,48440: REM MOVE TO HERE
80 CALL#EC0C
```

After spending a couple of hours writing a general purpose memory move routine in 6502 machine code for the Oric 1, I discovered that there is already one in existence in the ROM at #EC0C.

Three parameters are needed to use it. First comes the address of the start of the source (the memory to be moved); this is DOKED to #200. Next the address to which it is to be moved, which is DOKED to #202. Then the number of bytes to move is DOKED to #204. Now a CALL#EC0C will move the memory.

The program above demonstrates this by moving three lines of As starting at the top of the screen down to the tenth line of the screen. The routine could be used to move the normal character set and put in one of your choice and then with the help of a subroutine move from one set to the other.

Another use would be for moving objects rapidly around the screen.

C Hamilton, Belfast.

this defect in Basic error handling to some use. It is as well to point out however that this could lead to more problems than it solves and would certainly never qualify as good programming practice.

```
10 ON ERROR GOTO 40
20 A=10:B=20:C=30
30 PROCmistake(A,B,C)
40 PRINT A,B,C
50 END
60 DEF PROCmistake(A,B,C)
70 A=1:B=2:C=2
80 DELIBERATE MISTAKE!
90 ENDPROC
```

*WJ Birtwistle,
Blackpool, Lancashire.*

6845 chip shows its variety

```
100 CLS
110 FOR X=0 TO 255
120 INK X
130 MOVE X,0
140 DRAW 255-X,255
150 NEXT X
160 FOR Y=0 TO 255
170 INK Y
180 MOVE 0,Y
190 DRAW 255,255-Y
200 NEXT Y
210 OUT&86,6
220 OUT&87,63
230 OUT&86,8
240 OUT &87,0
250 PAUSE 10000
260 OUT&86,6
270 OUT&87,32
280 OUT&86,8
290 OUT&87,3
300 PAUSE 10000
310 GOTO 210
```

The above program for the 48K Lynx demonstrates the versatility of the 6845 chip. The command &87,3 will crush everything up into the top half of the screen.

The other commands choose the registers and alter the horizontal screen size, while the command OUT&87,3 displays everything twice.

*G D Holland,
Eastbourne,
Sussex.*

Keep up with the flashing

Anyone tired of the Spectrum's FLASH command may like to try this routine in their programs:

```
100 PRINT AT X,Y; OVER 1;"PRESS
A KEY": PAUSE: IF INKEYS =""
THEN GOTO 100
```

Where X and Y are the co-ordinates of the position you want the text printed at.

The flashing will continue until a key is pressed.

If you use this as part of a menu routine, for example, make sure that it is the last line to be executed before a key needs to be pressed.

You can alter the pause value to give different flashing rates.
*Campbell Black,
Juniper Green,
Midlothian.*

PCN's regular look at the new books — which are worth your money?



'Hot programs to feed your Dragon & Tandy Color computer' by Peter Robinson, Mark Smith and Neil Blacow, published by Sigma Technical Press at £6.95 (paperback, 154 pages).

This is a rare treat: a book that tries to be a Jack of all trades, and succeeds. In one thin volume there are games, utilities, a word processor and a turtle graphics package. The programs are easy to type since they are explained thoroughly, line by line.

Although the listings have

been typeset they appear to be bug-free.

But there are flaws. The games and graphics sections require the use of two joysticks, though this is not stated explicitly, which could add considerable cost to the unprepared. Also, the omission of an index is shameful.

Of the two games, I found one interesting (Sub-hunt); the other, Blocks, is like a two-dimensional Rubik's cube. But both are useful since they have been programmed with skill and annotated fully.

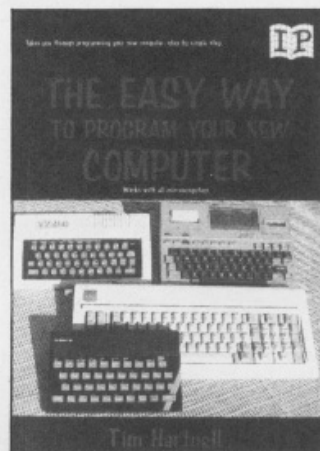
The graphics section comprises three programs. The drawing package and a 3-D wire frame drawing routine are not special, but the third, Logo, is an impressive turtle graphics package.

In the third section, a word processing program makes the Dragon behave like a respectable word-processor. This is followed by a rather predictable phone bill reckoner and directory, neither of which add much to the book.

At the end come a handful of useful utilities, including a Tan-

dy-to-Dragon converter (and vice versa), a tape catalogue routine and a machine code monitor.

PL



'The easy way to program your new computer' by Tim Hartnell, published by Interface Publications at £3.95 (paperback 202 pages).

For any recruit to computing the choice of books is most confusing.

Tim Hartnell's latest offering is clear, concise and will take you through programming step by step. In simple stages, you

are gently led through the way the computer works and onto programming.

Some programs supplied are old favourites like Life and Dice, accompanied by explanation notes. The programs — which should work with most micros — are written in Basic, and in order to cope with various machines, a very basic Basic.

I was rather disappointed that more than 30 pages of the book were devoted to the history of computing. The information was useful but it didn't fit the general theme.

From a beginner's point of view, the book seems to stop when I was keen to continue. But the author's style was an example to manual writers, who could do worse than follow his plain English approach and ability to make the topic appealing.

The 'further reading' section was a disappointment since the emphasis is on American publishers.

Despite all this, the book would make a good starting point, though most beginners will soon outgrow it.

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PCN 16/6/84

How can you avoid buying an IBM-compatible that isn't compatible? asks David Guest.

Keeping up with the clones

Outside the computer industry 'compatibility' is usually something that troubles love-sick damsels. Will their suitors be suitable? In the US, cuckoo's nest of the computer industry, they have a typically pragmatic answer — blood tests.

Where computers are concerned compatibility means a system behaves like another. Not any old other — but usually one with greater marketing potential, or more ancillary equipment. The target is usually IBM. Variety may be the spice of life but the prospect of lonely bankruptcy forces manufacturers into conformity.

As with romance, the course of true micro compatibility doesn't always run smoothly. Thanks to another American habit — a cavalier imprecision over the meaning of words — compatibility can mean many things. Here be dragons . . . or more to the point, here be no adequate substitutes for blood tests.

Consequently anybody who opts for IBM standards has to deal with degrees of compatibility — unless they go for the real thing.

A number of features are wheeled out as evidence of compatibility. Machine A has an Intel 8088, Machine B runs MSDOS 2.0, Machine C has been seen running the Microsoft Flight Simulator — an essential business tool — while Machines D, E and F have IBM-compatible price tags.

Some claims of compatibility are brazen attempts to pull the wool over consumers' eyes, but as the art has advanced and commonly attained levels of compatibility have risen the more blatant deceptions are now rare.

And if it's any consolation, if you've bought an MSDOS system on the understanding that it's PC-compatible you aren't the first to be taken in by the latitude the term permits. In the mainframe arena IBM imitation is an industry so well developed that its participants have their own abbreviation — the PCMs (Plug-Compatible Manufacturers).

For a micro user the problem is

pronounced. Seven times out of ten it's not a corporate budget meeting the cost of the system, and the price of failure (of a computer system) is at least as great in a small business. How can you avoid buying a 'compatible' that isn't compatible?

There are different ways of defining compatibility with the IBM PC. In the US IBM clones are commonly categorised as *operationally compatible*, *data compatible* or *MSDOS compatible*. Software is said to exhibit degrees of misbehaviour, ranging from docile to downright unruly in the way it makes contact with the operating environment.

An operationally compatible machine runs almost any IBM software and accepts peripherals or expansion units designed for the PC. A data compatible machine can use IBM disks but rejects some of the software, like a body that won't accept a transplanted heart. An MSDOS compatible system will run software written for the MSDOS environment but with disk formats peculiar to the system.

IBM has been unusually open in the way the PC has been constructed — certain features remain proprietary but, by and

large, it has encouraged independent suppliers to produce PC equipment. On its future plans IBM is less than forthcoming.

A particularly popular belief has it that MSDOS compatibility will soon become about as valuable as narrow-gauge rolling-stock on an Inter-City line. The speculation, idle as it may be, indicates that IBM's PCDOS will gradually move away from its roots in MSDOS, leaving this level of compatibility high and dry.



Future's PC: compatibility in any colour you like.

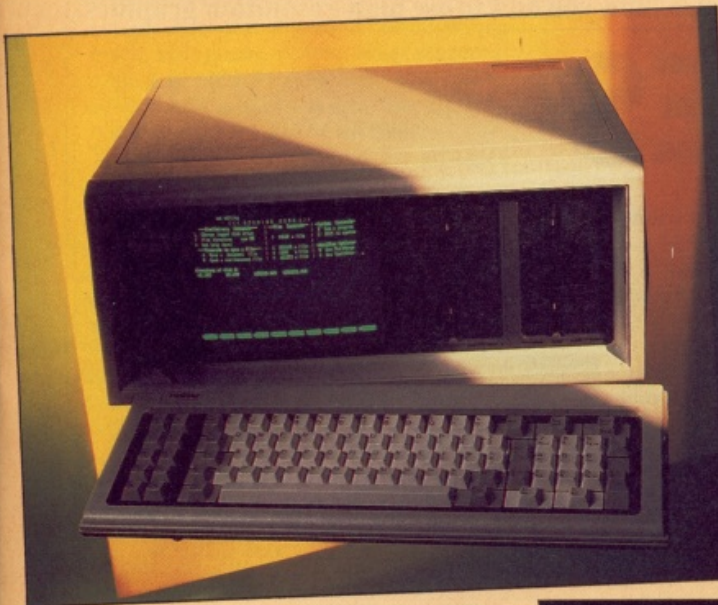
This is the horse Digital Research is backing. The producer of CP/M was left out in the cold when IBM chose Microsoft's MSDOS to grace the PC, but now it intends to stage a comeback with the PCDOS-compatible element of Concurrent CP/M

Table 1

System	Degree of Compatibility	Processor
Advance 86b	operational	8086
AM Stearns	operational	8086
Bytec Hyperion	operational	8088
Compaq	operational	8088
Columbia 1600	operational	8088
Corona PC-2	operational	8088
DEC Rainbow 100	data	8088/Z80
Eagle PC	operational	8088
Ericson Step One	MSDOS	8088
Fujitsu FM-16S	MSDOS	8086/Z80A/6809
Future PCi	operational	8086
Gavilan	MSDOS	8088
Hitachi PC1	MSDOS	8088
ITT (STC) Xtra	operational	8088
NEC APC	MSDOS	8086
Olivetti M21/24	operational	8086
Osborne PC	operational	8088
Panasonic	MSDOS	8088
Sanyo MBC-555	MSDOS	8088
Seequa Chameleon	operational	8088/Z80
Sperry PC	operational	8088-2
Tandy 2000	MSDOS	80186
Tava (Compushack)	operational	8088
Televideo PC	MSDOS	8088
TI Professional	data	8088
Toshiba T300	data	8088
Wang Professional	data	8086
Zenith PC	operational	8088
Zita-PC	operational	8086



The Bytec-built Ajile, alias the Hyperion, Passport, and Commodore PC.



Compaq: trend-setter among mobile PC-compatible users.



NEC APC: MSDOS but little chance of taking an IBM floppy in its 8in drives.

3.1. So far this relates to PCDOS 1.1; it handles the file format, and some system-dependent functions of PCDOS are implemented, so applications that by-pass the basic disk operating system will also run. It also leads to multi-user applications, no small consideration for future expansion.

With this in mind (the possibility that today's hand-in-glove compatibility might be chalk and cheese tomorrow) means rating the degree to which various systems live up to their makers' claims would have limited uses. But it may become possible through Standard Telephones and Cable (STC), which launched its Xtra with an attention-grabbing scheme to test the degree of its competitors' compatibility.

'The buyer doesn't understand the difference between functional and operational compatibility and the rest,' said STC's Stewart Goldberg, commenting on research by ITT in the US. 'He understands compatibility as meaning that software will run.'

'The challenge is to highlight what people should be looking for,' he said.

STC will concentrate on software, looking at what will and won't run. 'We'll publish a list of what won't run,' said Mr Goldberg. 'It's likely to be in the games area, where people are writing down to the chips all the time.' He said: 'Where people go down to the ROM Basic you've got a



Texas Instruments' Professional: a half-way house from an experienced challenger to IBM.

problem — not if it calls Basic in certain ways, but if it goes below to something that is absolutely IBM-proprietary.' It may be for this reason that such software is called 'naughty'. You can call it what you like, there are no standards in this area yet.

The question of software interaction is what compatibility boils down to. PCN covered this in the context of Compact Accounting Services' conversion program (Issue 5) — but the game has moved on and the number of players has grown enormously.

ITT's US survey put the IBM PC's share of the new software at 85 per cent of the total. Some of this vast output will become available for other machines, but a manufacturer with genuine operational compatibility has a head start. ITT had originally aimed lower than this with what became the Xtra, and Mr Goldberg acknowledged that it wasn't enough: 'On a monochrome display we'd implemented a more efficient mapping technique. Certain programs, like Multiplan, would need porting (they go below the BIOS to the

screen driver). We were also in difficulty with a diskette adaptor.'

Eventually, the Xtra will live up to its name more fully by incorporating the kind of features that ITT, primarily a communications company, specialises in. 'You don't remove compatibility by adding a telephone, and that's the kind of thing we'll be developing,' said Mr Goldberg. Other manufacturers are also going beyond IBM: Tandy's Model 2000 uses the Intel 80186 processor, a true 16-bit device that's faster than the IBM PC's 8088; Televideo's PC has twice the graphics resolution; Sperry's can display 256 colours.

Among the rest the most notable is perhaps Compaq's portable machine, which anticipated an IBM development and set a separate trend.

Additional features are usually combined with a 10 to 15 per cent price advantage to lure you from the security of IBM to the world of the PCMs. In the mainframe market there are many users of Amdahl, National Advanced and other systems who are perfectly happy with their machines and will probably continue so for years.

There's no reason why the pattern shouldn't be repeated with micros — but let the buyer beware that he and the salesman mean the same thing when using the word 'compatibility'.

PCN



Comportability: where some compatibles beat IBM to the punch.



STC's Xtra: like two peas in a pod with the IBM PC? STC aims to prove it.

Oric for HIRES

The Oric micros are economical in their use of memory, but the trade-off is that they can be difficult to program. This is particularly obvious when you're creating graphics. Here you face a struggle against PLOTS, POINTS, serial attributes, and their confederates. But with a little thought the basics of high-resolution displays can still be mastered.

Two graphic resolutions, low and high, are provided on the Oric 1 and the Atmos. The famous (or notorious) teletext-style graphics are handled in low-resolution. This mode is ideal for displaying text or for the kind of block drawings used by Ceefax and Oracle. High-resolution is designed for more detailed drawing.

The instruction HIRES invokes this mode, causing the top part of the screen to clear to black. The bottom three lines stay in the previous background colour. This base area is for text messages — the programmer cannot use PRINT @ or PLOT on the high-resolution screen, and any messages from PRINT or INPUT instructions will appear in this text area.

HIRES utilises a grid of picture elements, or pixels. The grid size is 240 by 200 with x values ranging between 0 to 239 and y values between 0 to 199 increasing downwards. There is no top line for system messages and all columns are accessible.

The high-resolution display area takes up more memory than the equivalent low-resolution version. If the GRAB instruction has previously been used to claim the memory area normally holding the high-resolution screen for use by a Basic program and data then RELEASE must reallocate this to the HIRES screen. This area lies between addresses 40960 and 49119. There are 40 memory locations for each of the 200 y-positions or lines, and patterns are drawn on the high-resolution display by using the last six bits of each location. A binary 1 indicates a pixel in foreground colour while 0 indicates a background pixel.

But the high-resolution area also needs to hold colours and other display attributes. As with low-resolution, these serial attributes take up one byte, but there must be some way of distinguishing a pattern byte from an attribute byte. The second and third bits of a memory location give a non-zero value if its contents are a pattern. If both bits are zero the contents are an attribute.

Listing 1 demonstrates the difference between patterns and attributes placed in the HIRES memory area.

Numbers 15 and 22 are attributes, while 115 and 127 are patterns (in binary 01110011 and 01111111 respectively).

The overall colour of the high-resolution display is set by PAPER and INK. PAPER sets the background colour of the screen and

INK the foreground or writing colour, according to the values:

0: black	4: blue
1: red	5: magenta
2: green	6: cyan
3: yellow	7: white

The instructions take effect immediately — the screen does not need to be cleared first. Both result in an attribute byte being placed in the first two column positions of all screen lines.

Listing 2 illustrates PAPER colours.

A variety of instructions can be used to draw on the high-resolution screen. All use a parameter known as the 'FB' value. This determines how points are drawn according to:

FB=0	drawn in background colour
1	drawn in foreground colour
2	drawn inversely
3	not drawn but the drawing position is moved

Drawing instructions

Drawing instructions may operate within the absolute coordinates of the display area, namely x values ranging between 0 and 239 and y values between 0 and 199. Alternatively, they may operate relative to the current drawing position.

CURSET sets the drawing position or cursor to an absolute coordinate. When HIRES is entered the cursor is automatically set to (0,0). Many high-resolution programs do not require drawing to start at this point, so CURSET is used to position the cursor initially. Subsequently, the instruction is used whenever an absolute cursor setting is needed.

Once the right starting position is achieved the DRAW instruction can be used to plot a figure. DRAW X,Y,FB draws a line from the current cursor position to a position X away on the x-axis and Y away on the y-axis, with a given FB code: thus relative coordinates are used.

Listing 3 employs CURSET and DRAW to plot 'snowflakes' randomly on the screen until the S key is pressed.

DRAW normally draws solid lines but the PATTERN instruction can be used to give a different layout to the lines drawn. PATTERN is followed by a value between 0 and 255 which determines the level of solidity, giving, for example, dotted or dashed lines. The pattern of lines is determined by the binary layout of the integer in the PATTERN instruction. For example, lines with long dashes may be achieved by PATTERN 231 (binary is 11100111). Listing 4 shows the effect of any given pattern value. Sometimes you may want to move the cursor relative to its current placing. This is done by CURMOV. The instruction's format resembles CURSET, but coordinates are not absolute. The difference is illustrated in

the following example, which also introduces the CIRCLE instruction. This command has a format of CIRCLE R,FB where R is the radius of the circle drawn, its centre being at the current drawing position. Listing 5 fills the screen with circles.

CIRCLE is also affected by the current PATTERN setting, so normally we reset a PATTERN of 255 if dashed lines have previously been used.

Although HIRES is designed for drawing rather than printing, text can be displayed, using the CHAR instruction. This has three parameters. The first defines the character to be plotted as an ASCII value; the second determines whether it is to be in the standard (0) or alternate (1) character set, and the third is the FB code. The character is plotted at the current cursor position, so CURMOV or CURSET should accompany CHAR. For example, to place a text message M\$ on the HIRES screen starting at the current position, the following routine could be used:

```
FOR C=1 TO LEN(M$): CHAR ASC
(MID$(M$,C,1)),0,1: CURMOV 6,0,0:
NEXT
```

As well as printing text, CHAR can also plot attributes. However the FILL instruction is generally better equipped for this task. This command has the form FILL L,B,N: it fills L lines of B bytes with the value N, starting at the current cursor position. Oric 1 owners should be a little wary here since FILL does not necessarily update the cursor position correctly.

Listing 6 places random foreground colour attributes in byte 1 of all lines, and then draws a solid circle to show the colours.

Another keyword that gets down to the byte level is POINT. POINT (X,Y) examines the pixel (X,Y) and returns a value 0 if it is in background colour or -1 if in foreground. The POINT function actually examines one of the bits in a pattern byte, returning 0 if the bit is 0, and -1 if the bit is 1. In Listing 7 the cursor moves in a random way inside a circle and the POINT function is used to test when it hits the circle border. Notice that in line 80, POINT is used as a logical value: Oric Basic takes -1 as True and 0 as False.

Using the instructions

We can now integrate some of these features into a more substantial program. The Bottle program draws bottles at varied positions, and in different sizes and colours. The user enters the coordinates of the top left-hand corner of each bottle, within the limits of the 200 x 240 high-resolution screen. The size of the bottle must also be allowed for: this is about 30 x 10 in size one, increasing proportionately up to 150 x 50 in size five. The colour of the bottle is input as an

ORIC GRAPHICS

integer between 0 and 7, representing black, red, green, yellow, blue, magenta, cyan and white respectively. The screen background is set to red by line 10, so a bottle of colour 1 will be invisible.

The modules of the program are arranged in the following way:

Lines 10-140: Main section. Repeated drawing of a bottle according to user in-

Subroutine
450:

Subroutine
600:

puts, until the 'S' key is pressed.

Reads coordinates of the bottle shape; x coordinates are stored in array A, y coordinates in array B.

Draws a bottle with its origin at (OX,OY).
Lines 640-680 display

Subroutine
700:

Subroutine
800:

the bottle's contents at a random level.

Scales the A and B coordinate arrays by S, storing the resulting arrays in X and Y.

Places attribute characters in front of the bottle to give the required colour COL.

LISTING 1

```
10 HIRES
20 FOR C=1 TO 10:READ D:POKE 45450+C,D:N
EXT C
30 DATA 22,127,127,115,115,17,115,127,12
7,127
```

LISTING 3

```
10 HIRES:PAPER 4:INK 7
20 REPEAT
30 X=RND(1)*200+20:Y=RND(1)*160+20:R=RND
(1)*15+5
40 FOR A=0 TO 2*PI STEP 0.2
50 CURSET X,Y,0
60 DRAW R*SIN(A),R*COS(A),1
70 NEXT A
80 UNTIL KEY$="S"
```

LISTING 4

```
10 REPEAT
20 :HIRES
30 :INPUT "Pattern value ";P
40 :PATTERN P
50 :CURMOV 0,100,0:DRAW 235,0,1
60 :WAIT 100
70 UNTIL P=0
```

LISTING 5

```
10 HIRES:PAPER 6:INK 0
20 FOR Y=10 TO 190 STEP 10
30 CURSET 10,Y,3
40 FOR C=1 TO 22:CIRCLE 9,1:CURMOV 10,0,1
:NEXT C
50 NEXT Y
```

LISTING 6

```
10 HIRES:PAPER 0
20 FOR Y=0 TO 199
30 CURSET 0,Y,0:FILL 1,1,INT(RND(1)*7+1)
40 NEXT
50 CURSET 120,100,0
60 FOR R=1 TO 39:CIRCLE R,1:NEXT R
```

LISTING 7

```
10 HIRES
20 CURSET 100,100,3
30 FOR R=95 TO 99:CIRCLE R,1:NEXT
40 X=10:Y=100
50 REPEAT
60 :CURSET X,Y,1
70 :X=X+1:Y=Y+5-10*RND(1)
80 UNTIL POINT(X,Y)
90 PING
```

LISTING 2

```
10 TEXT: FOR C=0 TO 7
20 :CLS:PAPER C:INK ABS(C-7)
30 :PRINT SPC(15);"PAPER ";C
40 :WAIT 100
50 NEXT
```

BOTTLE PROGRAM

```
1 REM gottalottabottle
10 HIRES:PAPER 1: INK 7
20 DIM A(11),B(11),X(11),Y(11)
30 GOSUB 450
40 REPEAT
50 :PRINT "Enter coords of top left:"
60 :INPUT "X,Y";OX,OY
70 :INPUT "Size (1-5)";S:S=INT(S)
80 :INPUT "Colour (0-7)";COL
90 :GOSUB 700:GOSUB 600
100 :PRINT "    Press S to stop, any key
    for more"
110 :GET K$:FINISH=(K$="S")
120 :PRINT
130 UNTIL FINISH
140 STOP
450 REM ----- Set up coord arrays
460 FOR C=0 TO 11
470 READ A(C),B(C)
480 NEXT
490 RETURN
500 DATA 3,0, 3,8, 0,13, 0,27
510 DATA 9,27,9,13, 6,8, 6,2
520 DATA 3,2, 6,2, 6,0, 3,0
599 REM ----- draw at (OX,OY)
600 GOSUB 800:CURSET OX,OY,0:CURMOV X(0),
Y(0),0
610 FOR C=1 TO 11
620 DRAW X(C)-X(C-1),Y(C)-Y(C-1),1
630 NEXT
640 R=INT(S*13*(1+RND(1)))
650 CURSET OX,OY+R,1
660 FOR C=R TO 27*S-1
670 DRAW S*9,0,1:CURMOV -9*S,1,1
680 NEXT
690 RETURN
699 REM ----- scaling
700 FOR C=0 TO 11
710 X(C)=S*A(C):Y(C)=S*B(C)
720 NEXT
730 RETURN
799 REM ----- colouring
800 CURSET OX-8,OY,0
810 FILL 28*S,1,COL
820 RETURN
```


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What you should send

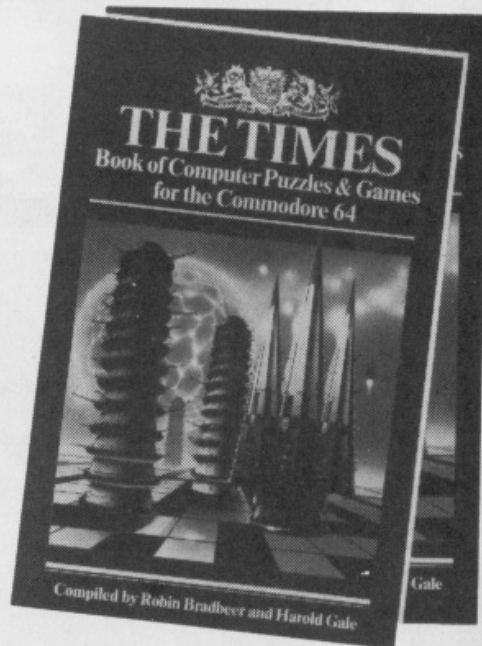
Send us the program listing, written in BASIC (not machine code), preferably on a cassette.

Include a short synopsis of the object of the game or puzzle, a brief description of what should happen when the program is run and an indication of the level of difficulty.

All entries will be acknowledged, and must be received by July 30th. Those entries included in the books will carry the names of the authors and remain their copyright.

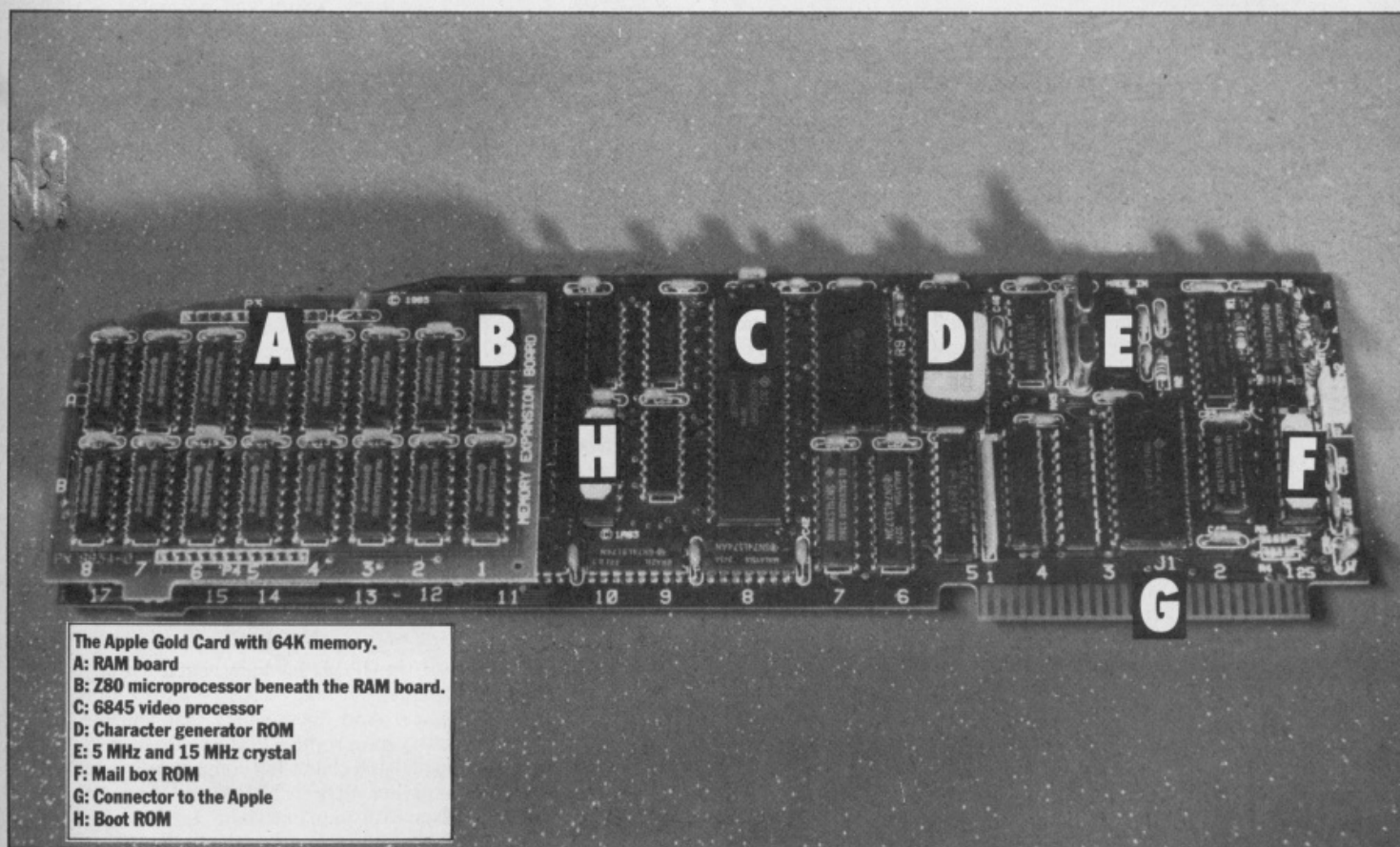
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Camberley, Surrey GU17 7RX.



These two books will be published by Times Books and Sidgwick & Jackson on 31st October 1984.

Golden Opportunity



The Apple Gold Card with 64K memory.

- A: RAM board
- B: Z80 microprocessor beneath the RAM board.
- C: 6845 video processor
- D: Character generator ROM
- E: 5 MHz and 15 MHz crystal
- F: Mail box ROM
- G: Connector to the Apple
- H: Boot ROM

Built-in commands

Command	Function
DIR	Displays filenames of all files in directory except those marked SYS.
DIRSYS	Displays filenames of files marked SYS.
ERASE	Erase a filename from the disk directory.
RENAME	Renames a disk file.
TYPE	Displays contents of an ASCII file.
USER	Changes to a different user number.

Transient utility commands

Command	Function
COPYSYS	Creates a new boot disk.
DATE	Sets or displays the date and time.
DEVICE	Assigns logical devices to physical devices.
DUMP	Displays a file in ASCII and hexadecimal format.
ED	Creates and alters character files.
GET	Gets console input from disk rather than the keyboard.

HELP	Displays info on CP/M 3 commands.
HEXCOM	Uses output from MAC to produce a program file.
INITDIR	Initialises a directory for date and time stamping.
LINK	Links program modules from the macro assembler and produces program files.
MAC	Invokes the macro assembler.
PIP	Copies and combines files.
PUT	Directs console or printer output to a disk file.
RMAC	Invokes the relocatable macro assembler.
SET	Sets file options.
SETDEF	Sets the system options.
SHOW	Displays disk and drive statistics.
SID	Invokes the interactive debugger.
SUBMIT	Automatically executes multiple commands.
XREF	Produces a cross reference list of variables from an assembly program.

Full list of the commands for CP/M plus

Geof Wheelwright unpacks the CP/M Gold Card for Apple II and hits paydirt.

One big headache for Apple II owners has always been in trying to easily turn the machine into something halfway usable as a business system.

Because the Apple is an 'open-plan' machine, it doesn't come with many of the features that owners of other micros would consider as standard. The unexpanded Apple still comes only with 64K, doesn't have true upper and lower case text generation, displays only in 40-columns and uses the now non-standard S100 bus to connect itself to the outside world.

The traditional fix for this problem has been to buy an 80-column card, upper and lower case adaptor, extra memory, a Z80 processor and the CP/M business operating system to bring the machine up to something approaching a full business specification. Not only did this require a good deal of cash, but also lots of fiddling to insert two or three more cards inside a machine already populated by at least two cards (the disk controller and printer interface) and at least a modicum of good luck.

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PCN PRO-TEST PERIPHERALS

◀23 Digital Research, the company which developed the original CP/M, has now come up with a solution combining all these elements on a single plug-in card. The company has also developed a go-faster version of CP/M to add lots of new commands to the traditional stable.

This package, the CP/M Gold Card, comes with either 64K (at a price of £299) or 192K (at £399), and fits in either Slot 4 or Slot 7 on the Apple IIe, Apple II Plus or Apple II. And you'll need two disk drives to make use of the system.

Presentation

The package's box is big enough to fit any small micro — which is not surprising as that's pretty much what it is. The Gold Card includes 64K (minimum) of RAM, its own Z80b processor and 80-column video circuitry — almost all the components needed to turn this card into a micro in its own right.

Once you get the box open, you'll immediately encounter a long, cardboard tray containing the card. Because it's longer than most standard cards, it's bevelled at one end to fit under the sloping front part of the Apple. Two large IBM-style boxes contain a thick ring-binder each.

The first binder offers a short user's guide to installing the card, a thick CP/M Plus reference manual and a CBasic reference manual of almost equal thickness and four disks containing CP/M Plus, CBasic and Assembler Plus Tools.

The second box, the programmer's kit, comprises a lengthy programmer's guide, a programmer's utilities guide and a short reference manual for the symbolic instruction debugger (known to friends as SID).

Installation

Installation is a far simpler matter than with traditional Apple expansion cards. You don't have to unsocket the character set ROM or pull out a RAM chip to patch into the memory or invent careful town planning to make sure the village of spaghetti inside most Apples has no unfortunate intersections.

The card slots in either slot four or seven. I recommend slot four to give you the maximum amount of room between cards. The Apple disk controller tends to sit in slot six, and anything in slot seven may jam up against it and put undue pressure on the cards in both slots.

Once the card is slotted, you need only to stick one end of the supplied y-shaped

Example of the full directory of a CP/M plus disk

video cable on the card and each of the other two ends in the Apple's video socket and your monitor socket.

Your Apple is now ready to perform as a full-spec CP/M Plus machine. Just fit the CP/M Plus system disk in Drive 1 (known under CP/M as Drive A) and turn on.

In Use

If you've installed the Gold Card properly and have the system disk in drive A, you should be greeted by this message: CP/M Gold Card, Digital Research, Inc., CP/M Plus Ver. 3.0, 64K nonbanked version. You're now ready to plumb the depths of the old operating system in its new clothes.

Aside from combining all the components needed for an Apple CP/M system, the most interesting aspect of the Gold Card is the operating system. But there are several differences between the old and new versions of CP/M and also between the non-banked minimum configuration of the Gold Card and the full bells-and-whistles banked 192 job.

CP/M plus seems to have brought the war of operating systems full circle. After Microsoft developed MSDOS as a sort of upmarket answer to CP/M and brought it to great fame and popularity in the form of PCDOS and its equivalents, Digital struck back with both its concurrent systems on the upmarket micros and now this new CP/M Plus on the good old 8-bit Apple II. Here are just a few new features of CP/M Plus:

- Date-stamping — like the directory on an MSDOS machine, CP/M Plus now offers the time and date display facility. In addition to the time and date facility showing when a file was created, CP/M Plus also supports a date stamp update to show the last time any given file was accessed.

- Better overall filing system information — CP/M Plus supports directory information such as the size of a file in both bytes and records, the attributes of a file (whether it has read/write access) and what if any protections the file has. The DIR (FULL) option tells you pretty well everything you'd want to quickly know about your directory.

- Passwords — this function is limited to the 192K version of the Gold Card, so cannot be properly tested with the 64K non-banked version of the system. Although I could set passwords and

protection by booting up with the 192K system disk, the Gold Card figured out that I wasn't a bona fide 192K user when I tried to access a password-protected file. The documentation mentions that the 192K card enables you to set passwords for disks, different users and different files.

- An extensive disk-based help facility — this took a while to find, being hidden away on disk 3 of the four disks. A COM file sets up the help facility and document files contain all the help information. On using the datestamp, setting user numbers, renaming files, copy disks, and so on.

You type HELP with the help disk in drive A and a HELP prompt with a list of topics. You can get help on main topics and then on subtopics which lead off from them. To get information on the passwords command, for example, type SET at the HELP prompt. This will then lead you to information about SET and then below a list of subtopics, further information is offered about the kinds of things you can SET: PASSWORDS is one of these topics. You then type .PASSWORDS (the full stop is required as a prefix because PASSWORDS is a sub-topic) and get information on each of the types of password protections.

- Non-Disk Input-Output commands — sending information to the printer is made easier in CP/M Plus by a Control-P toggle: pressing Control-P once sends all output to the printer, hitting it again cuts off output to the printer.

Verdict

In all, the CP/M Plus does seem to live up to its name as it really is CP/M with a lot of plusses. And don't worry that you may already have some CP/M 2.2 programs or files. Digital claims full compatibility with this earlier version of CP/M and I found no reason to dispute that claim. I tried several CP/M 2.2 programs — including an old CP/M 2.2 Apple II Plus version of Wordstar that had previously refused to run on an Apple IIe. I found they all worked faultlessly under CP/M Plus.

The CP/M Gold Card would be a worthwhile and welcome addition to any Apple II or IIe, although I can't help but shake the feeling that its high price (about £300 for the minimum 64K configuration) and the declining pre-eminence of CP/M make it perhaps worse value for money than it should be.

The appearance of the new £175 Appleworks integrated software suite — including word-processor, database and spreadsheet — could make the need for CP/M slightly irrelevant. All you would need to get Appleworks running is a simple 80-column card — an investment of under £100.

Despite those objections, I still found CP/M Plus to be a real joy of an operating system to work with and the Gold Card was the simplest Apple add-on to install since I bought my first joystick.

The real question of whether or not you really need or want CP/M is one that only you can answer.

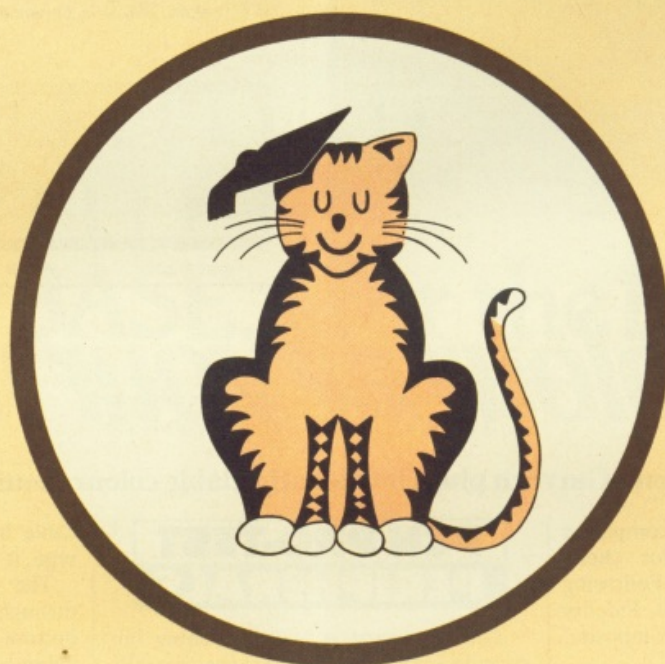
PCN

Product CP/M Gold Card **Price** 64K version £299, 192K version £399 **Distributor** P&P Micro Distributors Ltd, 1 Glencastle Road, London SW16 6AY, Tel: 01-677 7631.

Directory for Drive C: User 0							
Name	Bytes	Recs	Attributes	Prot	Update	Access	
DITS	BAK	1k	1 Dir RW	Read	09/01/82 13:04	09/01/82 13:07	
DITS	TES	1k	1 Dir RD	None	09/01/82 13:07	09/01/82 13:09	
DITS	Y	1k	1 Dir RW	None	08/25/82 03:33	08/25/82 03:33	
DITS	ZZ	1k	1 Dir RW	None	08/25/82 03:36	08/25/82 03:36	
SETDEF	COM	4k	29 Dir RD	None		08/25/82 03:36	
SUBMIT	TX2	1k	1 Dir RD	None			
SUBMIT	TX1	5k	43 Dir RD	None			

Total Bytes	=	14k	Total Records	=	77	Files Found	= 7
Total 1k Blocks	=	14	Used/Max Dir Entries for Drive C: 11/ 64				

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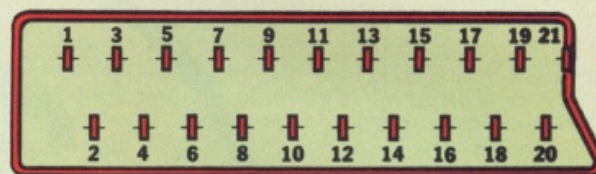


Pin Number	Function
2,6	Audio in (500mV/1k ohm)
1,3	Audio out (500mV/1k ohm)
4	Audio ground
20	Composite video in (1V/75 ohm neg sync)
19	Composite video out (1V/75 ohm neg sync)
17	Video ground
15	Red in (700mV/75 ohm)
13	Red ground
11	Green in (700mV/75 ohm)
9	Green ground
7	Blue in (700mV/75 ohm)
5	Blue ground
16	Status RGB input 1 to +3V video input
8	Status composite video input
	ou = TV
	+12V(max) = composite video input/output

Outer case is classed as pin 21.

Cables are available for:

VCR, Dragon, BBC, Oric, Commodore 64 and Atari



The colour of your money

Kenn Garroch plugs into an affordable colour monitor.

As the number of home computers increases, the market for cheap colour monitors grows. Following JVC's lead with its ECM range, Fidelity has entered with its CM14 14in composite/RGB colour monitor at £228.

The monitor comes packaged in the usual square cardboard box and is easily repacked allowing it to be taken elsewhere if needed. On opening the box, the monitor appears with its silver grey case and inset carrying handle. This is extracted by pressing on one end, causing the other to pop up, allowing the monitor to be lugged about. On the front is a little flap-down hatch, behind which are the controls for volume, brightness, contrast and colour.

Installation

The monitor can be used with nearly all of the currently-available home micros, if the connecting lead is correctly wired up. It can also be used with a video recorder to produce quality pictures and sound.

The signal input connector, situated at the back of the monitor, is a fairly unusual SCART connector. This 21-way plug and socket arrangement was originally developed by the French Post Office. But, due to its flexibility, it has been adopted by a number of manufacturers, Fidelity included.

Pre-made cables and plugs are available from a London firm, Tape Recorder Spares. The power switch is located at the bottom right front, with the power indicator just above it.

PCN PRO-TEST PERIPHERALS

The connector is a little wobbly but considering that monitors are not generally moved around very much, this shouldn't really matter.

In use

The monitor was tried with a number of machines and gave a reasonable colour picture with most of them. On the BBC, the 80-column high-resolution modes were a little blurred but this was no surprise, since the monitor's video bandwidth is only 12MHz. In the lower resolution modes the picture was fine if a little unstable. This faint flickering became noticeable, out of the corner of the eye, after using the monitor for a while.

The picture as a whole was a little distorted, especially with circles. When playing the kind of game in which the screen scrolls horizontally, this distortion was noticeable as a slight wavering of the lines as they moved across the screen.

When used with the Oric, the picture was very impressive. It was solid and much more stable than on the BBC. The colours were bright and clear and, since the monitor distorted vertically, the Oric's oval circles became a little more true although they were still not quite there.

The picture on the Dragon was not at all good. There was no colour from the composite port and faint lines ran across the border. This may have been due to the

cable but, since we used a professional type, it should not have been at fault.

The sound from the Dragon was fed through the CM14's internal speaker at the bottom front left and adjusted with the volume control next to the other controls behind the hatch. The sound quality was not particularly good.

With the Commodore 64 and the Vic 20, the picture was again not particularly striking, though it did have colour. Both of these machines showed problems with printing dark coloured characters on a light background. The characters tended to gain horizontal stripes making them unreadable.

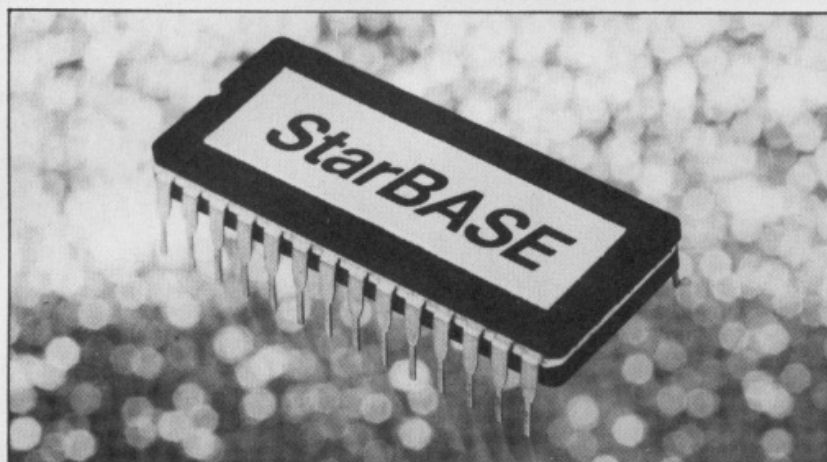
Verdict

The CM14 gave a very good picture when used with the Oric. For some other machines, its flexibility offers advantages over other monitors at similar prices. Its ability to be able to feed more than one type of signal, whether composite or RGB, may not be of much use to single machine owners but those who might like to use it with a video recorder as well as a computer may find it useful.

PCN

Product Fidelity CM14 Colour Monitor **Price** £228 inc VAT **Connection** Composite video, RGB and Audio (200mV RMS into 1k Ohm) **Video band width** 12MHz **Audio output power** 2W **Weight** 12kg **Distributor** Micro Peripherals Ltd, 69 The Street, Basing, Basingstoke, Hampshire, (0256) 3232 **Cables distributor** Tape Recorder Spares Ltd, 206-210 Ilderton Road, London SE15 1NS, 01-639 7844.

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Amstrad's hi-fi micro

Old fashioned perhaps, but Amstrad's micro is a very attractive machine, says Max Phillips.



The Amstrad is a fashionably long and slender machine, though it hasn't followed the trend towards diminution. Its design is mature, sharing features with the best of the rest, and few of their mistakes.

Amstrad is the latest in a long line of electronics big boys to notice that micros are slightly more substantial than skateboards and hula hoops. It started thinking about putting its undoubted manufacturing and design talents towards a home machine (for the record a 6502-based 'improved Vic') over a year ago. This project was replaced with discussions of the great MSX stitch-up but Amstrad was worried about the MSX spec, the ridiculous hassle of getting an MSX system together and the fact that, if it made it, it would only be competing with 20 or so

nearly identical products.

So, it was only last September that the Amstrad micro really got off the ground. The machine, code-name Arnold, is more-or-less a traditional Z80-based home micro. But Amstrad has learned a lot from everyone else and the machine is a very mature design with many of the best features of rivals and almost none of their mistakes. In short, as you might guess, Amstrad has done a very professional job.

Sadly, the name Arnold has been left behind. It's a Colour Personal Computer with 64K RAM and would have been called

a CPC64. But, the story goes, following the announcement of Commodore's 264 and 364 machines, Amstrad decided to go one better and have a 464. Hence the name CPC464. At least the story is more interesting than the name.

The CPC464 will be available in limited quantities as you read this. This is not, unlike some companies we could name, because Amstrad can't build the machine but a deliberate policy to give the software houses and add-ons firms a head-start before the company really starts selling the product in September. This preview is

based on a day's play with the machine rather than weeks of constant use and you would do well to be wary of the product until Amstrad is shipping it in quantity. Even so, the machine is all but ready and it's well worth knowing about . . .

Of course, Amstrad is all about what's rather indelicately called cheap hi-fi. With Amstrad, you get tremendous value but you accept that the equipment is not perhaps of the quality of bigger names such as Sony and JVC. The same is true for the new machine—it offers dramatic value for money. However, the twist is that, compared to the shoddy standards of some micro manufacturers, the Amstrad micro is beautifully designed and engineered.

The value is obvious. For £200, you get a 64K, Z80-based micro with a full keyboard, a built-in high-speed cassette recorder and you get a 12in green screen monitor. For £300, the machine comes with a medium-resolution RGB monitor. The 464 doesn't connect to a TV like every other home micro—the idea sensibly being to give you a trouble-free quality display that can do 80 columns and to leave the TV free for more humble jobs such as Channel 4 and video recorders.

It's harder to assess the quality of engineering. You should really wait until the machines are in the shops and try one for yourself but the 464 feels solid and reliable. Minor points of design, such as the copious venting and a printed circuit board that is mounted with an inch of air either side of it, suggest that you are getting a lot for your money. Whether or not the machines can stand up to long term use remains to be seen; but the signs are good.

Construction

The 464 is larger than you'd expect but it has that increasingly long and thin fashionable shape that is actually very nice to work with. The conventional qwerty keyboard is on the left followed by a numeric keypad and cursor pad, followed by the built-in cassette recorder. At the right are two controls—an on/off switch and a volume control on the integral speaker—at long last. Round the back are the interfaces with a few edge connectors showing some of the cost savings that have been made.

The first surprise is that the micro takes its 5V power from the monitor. Two short leads connect the two units together—one power, one the signal (composite or RGB) for the monitor. Guess what? You only need one plug to run the whole system. It has been said that Amstrad is making a major breakthrough by integrating all the bits of a micro system and putting it in easily handled lump. My Osborne does it, the world's first personal computer, those old Commodore PET things, and the all-in-one-box philosophy completely sorted out. But it is very nice to work with a home machine where there is no messing about with cables and sockets and that you can pick up and move when you want to.

The only possible problem might be for users who don't like to get too close to the screen.

The computer itself is a bit old-hat these days though it is beautifully done. There's a 4MHz, Z80 with 64K RAM and 32K ROM. The top 16K RAM is the screen memory and is bank-switched with the 16K Basic ROM. This leaves a more than healthy 43K free for Basic programs.

Similarly, the bottom 16K RAM and ROM can be switched over. Many micros have their screen memory part of main memory in this way. The processor and display chip (a 6845) must carefully split their time over which has access to the screen memory and this can produce a slow system. The 464 and its built-in software don't seem to be affected by this problem.

The software has provision to go on extending the memory map to ridiculous sizes in the order of 4Mb. This is provided so that add-ons can contain their own driving software and so that plug-in-and-run cartridges can be used. It is obvious that Amstrad doesn't intend to leave the system as it stands but to expand it to a complete range of options.

Keyboard

The Amstrad has a full keyboard with 75 keys. It doesn't feel like the world's most expensive keyboard but it is good enough for fast typing.

The layout is fairly standard, the only quibbles being the curious position of the Control key and a non-locking Caps Lock key. Typists who know where to put their fingers may also find that the stretch to the ENTER, DEL and cursor keys is something of a shock. There are one or two labelling oddities—the square bracket keys produce braces ({and}) when shifted and the CLR key generates a DELETE-RIGHT for the Basic editor.

If we skip ahead a little, you can get a good idea of the sort of software that's gone into this machine. As part of the Basic (and operating system), the entire keyboard is redefinable. So you can say which keys generate which ASCII codes and also whether they auto-repeat and what they generate when shifted or controlled. For example, KEY DEF 68,1,13 turns the TAB key into another ENTER key.

What's more, 32 ASCII codes (128-159) can be used as function keys. Any key generating one of these codes can have a string of up to 32 characters associated with it (provided the total of all the function keys doesn't exceed 120 characters). So not only can you have 32 function keys, you can position them where you like around the keyboard. The nicest system seems to be to put ten common Basic commands on the numeric pad but lots of other customisations are possible.

Display

With a standard Amstrad, you are stuck with either the monochrome green screen or the RGB monitor; neither was particularly impressive although with such low-cost parts you do expect a lot of variation between units, and review systems are invariably heavily knocked about.

The green screen is an angled 12in monitor with no anti-glare coating. It needs to be carefully positioned or else you'll get a contrast-free display with a picture of your room in it. The review model also undulated to the point where it was unusable—again, probably just the review sample.

The RGB monitor is much more impressive, producing bright colours. However, Amstrad has cut corners with the monitor's resolution and admits that the screen can't quite cope with the 464's 640×200, 80-column display mode. The result is that 80-column text is not very readable—you can read it, particularly if you choose your colours carefully. But I'd hate to try sitting down and reading screenfuls of text for four hours at a go. Rather disappointingly, some micros and some TVs can match the quality of the 80-column screen on this dedicated monitor.

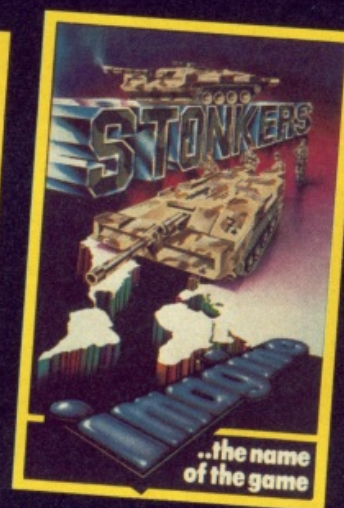
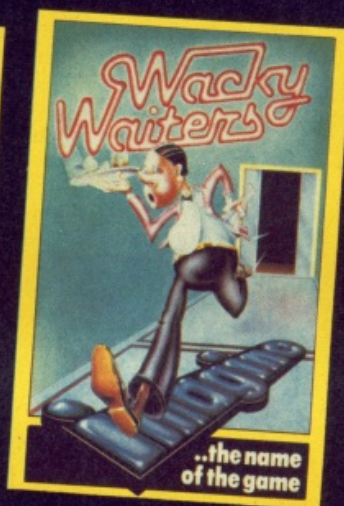
Amstrad's solution to this rather daft problem is to offer the monochrome monitor for those who want to word process or whatever. To get the colour back, the company is then going to offer a **35 ▶**



Amstrad's keyboard gives a clue to the software-thinking behind the micro. As part of the Basic and OS the whole keyboard is redefinable. A total of 32 ASCII codes can be used as function keys, which you can position wherever you wish.

The keyboard boasts a numeric keyboard and cursor pad, and has three-key rollover.

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ETRON 12 PEDRO
ETRON 15 B.C. BILL

BBC 32

BBCB 12 PEDRO
BBCB 14 COSMIC CRUISER
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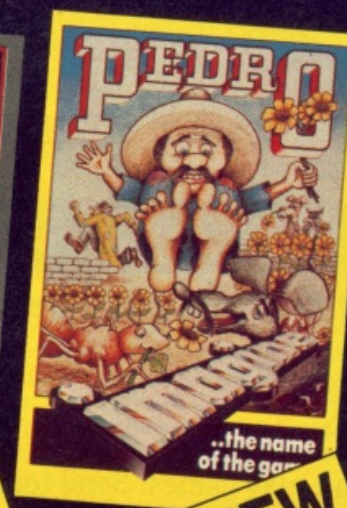
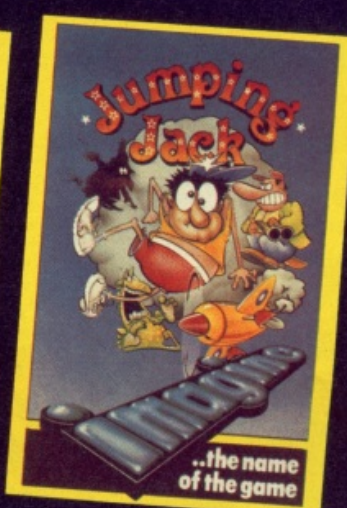
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VIC 20 3 CATCHA SNATCHA
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◀ combined modulator/power supply for £30 so that you can connect the system to your TV. Amstrad seriously believes that most people will buy the black-and-white machine and then come back and pay £30 extra so that they can ignore the monitor/power supply they have just bought and connect the system to the TV they owned all along. Tut, tut!

The display itself is a bit-mapped screen generated by a 6845 and provides three modes:

160×200 graphics, 16 colours chosen from 27, 20×24 text
320×200 graphics, 4 colours chosen from 27, 40×24 text
640×200 graphics, 2 colours chosen from 27, 80×24 text.

In addition, the border can be set and there are several flashing colours available. The system can also do tricks like a hardware-assisted scroll in any of the four directions. Surprisingly, the majority of the 27 colours are genuine and bright tones — very useful for creative graphics. The video memory occupies the top 16K RAM and each of the modes uses the same amount of memory so that there is no extra overhead for being in 80-columns as there is on machines like the BBC. Incidentally, it should be possible to set up other modes by direct access to the 6845.

Sound

Like almost everyone else, Amstrad has gone for the General Instruments 8910 3-voice sound chip to provide three synthesised channels and one noise channel. But it's been done very sensibly. The sound is stereo — voice one goes to the left channel, voice two to both and voice three to the right hand channel. Even on something as simple as Durrel's Harrier Attack (yes, it runs on the 464 as well as the Spectrum), the stereo sound is surprisingly effective.

Of course, to take advantage of this, you'll need either headphones or to position your micro between your hi-fi speakers. If you can't be bothered, there's a rather tinny speaker built into the machine itself. It's refreshing to see someone actually produce the stereo sound.

The sound chip is also extremely well supported from the Basic. There are more sound commands than on any machine with an equivalent chip so you can do proper chords, rhythms, sound queueing and define your own envelopes to imitate real noises and instruments. So you've more control than on most systems but don't expect it to be particularly easy.

Storage

Amstrad has taken away most of the problems of cassette storage by building a dedicated unit into the console. This operates at a healthy 1000 or 2000 baud; you don't have to worry which one as the

correct speed is automatically selected by the 464 as it reads the tape. The machine also has the equivalent of a REMote lead, giving it control over the tape motor. However, Amstrad hasn't taken full advantage of the situation. The tape is manually controlled and there is no provision for audio tracks to be reproduced through the machine. The unit seemed to operate reliably but, rather curiously, very slowly.

Amstrad doesn't expect to have disks ready until September. You shouldn't go overboard at the prospect of turning your 464 into a CP/M business computer either. If you've got 64K RAM with 16K of video memory, that leaves you 48K of space for CP/M. Most CP/M programs will run but the level of disk overlaying and access will be quite something.

Expansion

The 464 has a rather curious collection of connections. The main one is an expansion bus labelled 'floppy disk' which will allow almost any device to be hooked to the system. There's a Centronics printer interface and a joystick interface. The latter is an extended Atari-standard, allowing two fire buttons and a second stick to be plugged in via the first! Besides the power in and monitor out connectors, the only other jack is a headphone-style output for the stereo sound.

It's worth noting that the company has produced piles of technical documentation and that this will be available to qualified parties. It is available now (for a price) to companies that want to be ready for the major launch in September.

Basic/OS

The 464 is extremely well put together, both in terms of hardware and software. Being a home machine, it operates in Basic — a fast and extensive implementation of the little known Locomotive Basic. However, the 464 has a completely separate operating system which handles most of Basic's clever tricks for it in a similar way to MOS on the BBC micro. So new programs can take advantage of a complex piece of hardware using a ready-made and well documented set of supporting routines.

The operating system is completely transparent rather than the messy *FX and VDU calls of the BBC. Everything, apart

Amstrad connections: if we're going to demand our pound of flesh, the 464 ought to have a bi-directional serial interface for modem freaks. Sadly, you have to lose out somewhere. Amstrad is, however, considering its own serial interface add-on.

from a series of control codes to look after the screen, has its own Basic keyword.

Locomotive Basic is extremely nice to work with.

It's very fast — certainly fast enough for simple graphic games — and it has a set of extensions that make the machine very approachable and versatile. Although there isn't room to give a full description of the Basic, it's evident that there have been two guiding principles behind its implementation. First, it's pretty close to Microsoft and it shouldn't be too hard using other people's listings on the machine.

Second, Basic provides everything. There's almost no need for PEEKS and POKES and all the facilities of the machine have a keyword. As an example, to write text at any particular pixel on the BBC you join the text and graphics cursors together — VDU 5 (or was it *FX5?). On the Amstrad, you just join the cursors together with TAG and TAGOFF. It's all that simple. If you want a home computer to learn Basic, the Amstrad is ideal.

Program development is greatly speeded by having both a line editor and a screen editor at the same time. This is a rather brute-force 'best of both worlds' idea and a slightly more sophisticated line editor would have been welcome. However, the result is very helpful indeed. You've also got the usual RENUM, TRON and TROFF.

Graphics are easy to do. MODE selects one of the three display modes and you've got commands to draw lines and points. Probably the biggest obvious weakness of the Basic is that there are no CIRCLE and PAINT commands. You do get user definable characters with the SYMBOL command. SYMBOL AFTER even lets you retain a section of the ROM character definitions and mix them with your own new characters.

Colour is easily handled. PAPER sets the background colour and PEN selects one of the available foreground colours (either 16, 4 or 2 depending on the mode). INK is used to select the colours that PEN actually produces. So you can use INK first of all to select from the range of 27 available colours. Changing INK with that particular PEN colour already on the screen causes the new colour to magically replace the old. This can be very useful for fast animation effects.

Amstrad Basic has a timer/interrupt ability that, with the possible exception of ▶



the ill-fated Comx 35, is unique among Basics. There are four programmable timers which act a bit like alarm clocks. The command AFTER 200,2 GOSUB 1000 will do a GOSUB to line 1000 after 200*0.02 seconds using timer 2. The four timers have a priority order so that you can establish an importance for your interrupt routines. The Z80ish instructions DI and EI turn the interrupts on and off so that, for example, interrupt routines don't get interrupted.

EVERY works like AFTER except it repeatedly calls the subroutine at a given interval. Imagine an EVERY command which caused the system to update an on-screen clock every five seconds. Or one that lets an interrupt routine place the next note of a tune in the sound queue while the main program played a game. Look mum, two tasks. Interrupts are very new to Basic programmers but, used properly, they can be a staggeringly powerful aid.

The Amstrad also supports eight on-screen windows. Only jokingly of course—it's the same pseudo-windowing system used on the Sinclair QL. Each window is a particular output channel (PRINT#0, PRINT#1 and so on) with its own background and foreground colours and its own position on the screen. It looks like a windowing system but the windows don't have any 'contents' as such and where windows overlap, the lower ones are destroyed. The 464 has one important facility that got left out on the QL; the default output channel can be moved to any of the windows. And, using EVERY and AFTER on the Amstrad, it's easy to make it look as if the machine is multi-tasking. Even so, the window system is no more than a potentially useful screen handling gimmick.

Briefly describing any Basic this size will miss out on some of its sweet little features. It's got all sorts of bells and whistles — UPPER\$ and LOWER\$ for folding strings to upper and lower case. Even a command called ZONE which sets the column width introduced by using a comma in a PRINT statement. Amstrad Basic has been designed by people who know what they are doing.

Software

Neither has Amstrad fallen for the oldie of launching a machine with no software to choose from. Quite the contrary. Early machines have been out with software houses from January and the initial limited supply period is intended deliberately so that when the company has its big selling push in the autumn, there'll be lots of programs to go for.

There are already around 50 titles including familiar names such as Harrier Attack and something that looks not unlike Booga-Boo. The quality is quite remarkable. Some of the games are churned out in Locomotive Basic but you'd be hard put to realise that from the way they look. Incidentally, the Basic has a SAVE,P option which SAVES a protected version of the listing to stop it being examined. Told you there was no need to mess around with POKES.

Amstrad has set up a division called

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Amsoft to look after the machine and launch 'official' software. Some of the plans are quite remarkable as well as ambitious. Hisoft is porting its Spectrum Pascal and C compilers onto the system. There are spreadsheets and word processors being discussed — the operating system would allow these as external ROMs. And there's a good chance that the CP/M version of the machine will be bundled with a choice of business, accounting, programming or games software.

Amsoft also seems to be taking packaging seriously and is producing proper manuals for cassette-based programs. You never can tell how a new machine will be received and supported — particularly when it comes from a brand-new supplier. But at the moment, things are looking good.

Documentation

The manuals are only at a preliminary stage but even the first machines to go to customers will have their User Guides in a printed form. This covers all the usual stuff, including the Basic, with an unusual amount of clarity and depth. There's also lots of introductory stuff for computer-shy newcomers. Amsoft claims to have written the manual in two weeks; something you'd never guess from the quality of the work.

However, more in-depth technical information such as the internals of the operating system and hardware details will be separately priced manuals. Most users won't need these although anyone who gets into programming will undoubtedly want one. These manuals are currently available in photocopied form for £20 a go.

Verdict

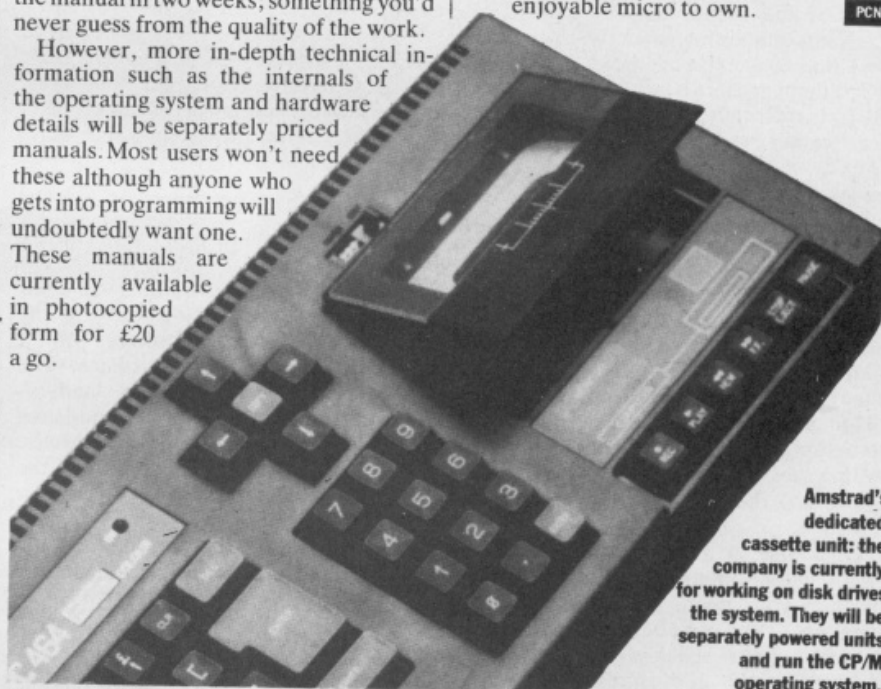
No matter how nice it is, don't forget that Amstrad's new micro is rather old fashioned. That's a very cruel judgement on what is one of the most capable, mature and usable of home computers yet. Even so, this is a Z80 and 64K RAM micro that won't be around until September. There's also every probability that the CP/M version of the machine won't be so wonderful. Amstrad has taken the wise route of sticking to old established technology to provide an affordable and reliable system.

So you can rest assured that it is an easy and capable machine that offers tremendous value for money. You also get a machine which is, on this short analysis, more attractive than the first generation of MSX systems.

Amstrad also threatens to be big with the system and to create a Sinclair/Acorn sized software and add-on market. It has a too-big-to-print estimate of its first year's world-wide sales that would make the Spectrum look like a failure.

In short, it's a great home computer if a little late — provided all of Amstrad's claims come true and provided that machines don't fall apart after a month. Keep an eye on it . . . it could be a very enjoyable micro to own.

PCN

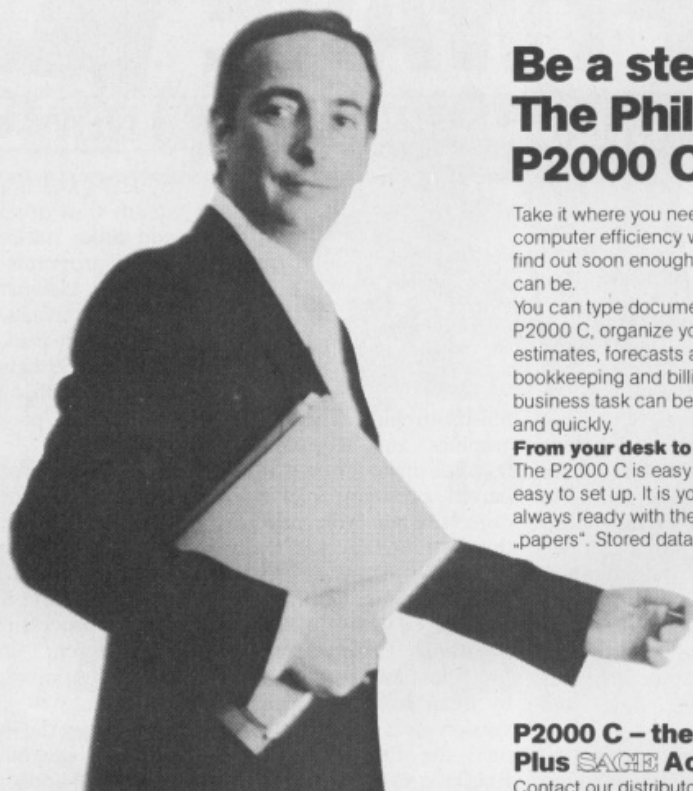


Amstrad's dedicated cassette unit: the company is currently for working on disk drives the system. They will be separately powered units and run the CP/M operating system.

Specification	
Price	CPC464 monochrome screen £200 CPC464 RGB screen £300
Processor	Z80, 4MHz
RAM	64K (43K free for Basic)
ROM	32K
Screen display	MODE 0, 16 colours, 160×200 graphics, 20×24 text MODE 1, 4 colours, 320×200 graphics, 40×24 text MODE 2, 2 colours, 640×200 graphics, 80×24 text In all modes, the colours can be chosen from a palette of 27
Storage	Built-in cassette recorder, 1000 or 2000 baud, CP/M disk drives being developed
Interfaces	Expansion connector, centronics, joystick, Stereo sound, monitor output
OS/Languages	Extended Locomotive Basic
Distributor	Amstrad Consumer Electronics, Brentwood House, 169 Kings Rd, Brentwood, Essex, (0277) 228888



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Games

Foreign software is filtering slowly but surely into Britain. Among the latest imports are four Spectrum games from Spanish company Ventamatic. They will soon be available from retailers, with games for the Commodore 64 and Oric Atmos close behind.

Escalador Loco (Crazy Climber) is the best of the bunch; you control a well-drawn figure scaling the side of a building, using windows for hand and footholds. You move your figure's arms and legs by keyboard or joystick and life is made difficult by irate tenants dropping flower pots on you, or closing the window blinds.

Ventamatic's other games are competent arcade-type games; for example, *Tuneles Marcianos* resembles *Lunar Jetman* or *The Pyramid* — you operate a spaceman and must blast approaching aliens. While their games don't quite take your breath away it's interesting to see the direction of software export reversed and it may stimulate the imagination of British programmers.

Following its superb *Psytron*,



Beyond has released its long awaited graphics adventure *Lords of Midnight*, where scenes are drawn according to each character's viewpoint. Though simple, they are drawn quickly and adequately. Unusually, commands are single-keyed and the package includes a keyboard overlay marked with directions and commands like look, move, think and choose.

There is a prize associated with the game; simply dump chosen screens to a printer, and the best sequence will win. The winner will be the co-author of a book written around that specific story and will share royalties.

3D Tank Duel from Realtime joins such Spectrum versions of *Battlezone* as *Rommel's Revenge* (Crystal) and *3D Combat Zone* (Artic), but our review copy wouldn't load.

Sabre Wulf is Ultimate's follow-up to *Atic Atac* and it's very good, even if it is just *Atic Atac* again, but in the jungle. You control a Pith-hatted explorer wandering a maze of luxuriant foliage and tackling a host of noxious life forms such as tarantulas, rhinoceri and

poison orchids. The excellent graphics and a number of features make it better than its parent program; picking up objects when you pass over them is automatic, for instance. The sound effects are reminiscent of *Atic Atac* and the game is best played with a joystick.

Cosmic Cruiser from the Imagine stable is now marketed by Beau Jolly. The Spectrum version gives you two games in one: the first is rather like Rabbit's *Paratrooper*, except that here you fire the cannon to open airlocks in a revolving space station. In the second part you can move into the station to rescue imprisoned spacemen, but you must also kill any aliens in the station before you can leave. The Spectrum version's graphics are smooth and the scene inside the station is detailed, but the Dragon version lacks the interior game, the cannon has only five positions and the game on this machine is hardly worthy of the same name.

Utilities

The BBC's viability as a small business machine is advancing

by leaps and bounds due to a steady flow of new accounting and other packages. Each of three programs from CYB, *Payroll*, *Mailmerge* and *Mailing List* is available for a BBC with Torch pack for between £10 and £30 extra. Up to 600 employees are catered for by the Torch pack version of *Payroll*.

More upmarket is Xenix, the Unix-like operating system for the IBM and Lisa II, currently being pushed by Sphinx among others. New software includes *Multiplan* from Microsoft, and word processing, database management and business accounting modules from Tetraplan.

Xenix on the PC allows users to hook several terminals to their IBM and share programs and data.

The £3.50 *Maths Utilities* programs from Solway, which can be bought together as a single package for £8.95, offer such useful mathematical routines as graph plotting, linear regression, mean and standard deviation, polar coordinates and base changing.

Most of the routines are straightforward and available in listings in books, but you don't have to type them in and debug them for yourself, sparing your powers of concentration for the arithmetic. Besides which, they're excellent value, especially at the three-in-one price.

PCN

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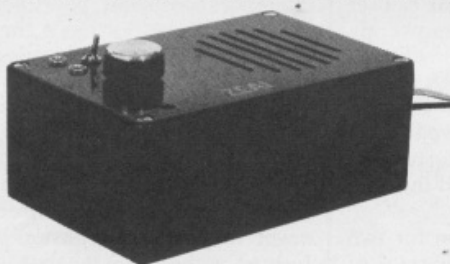
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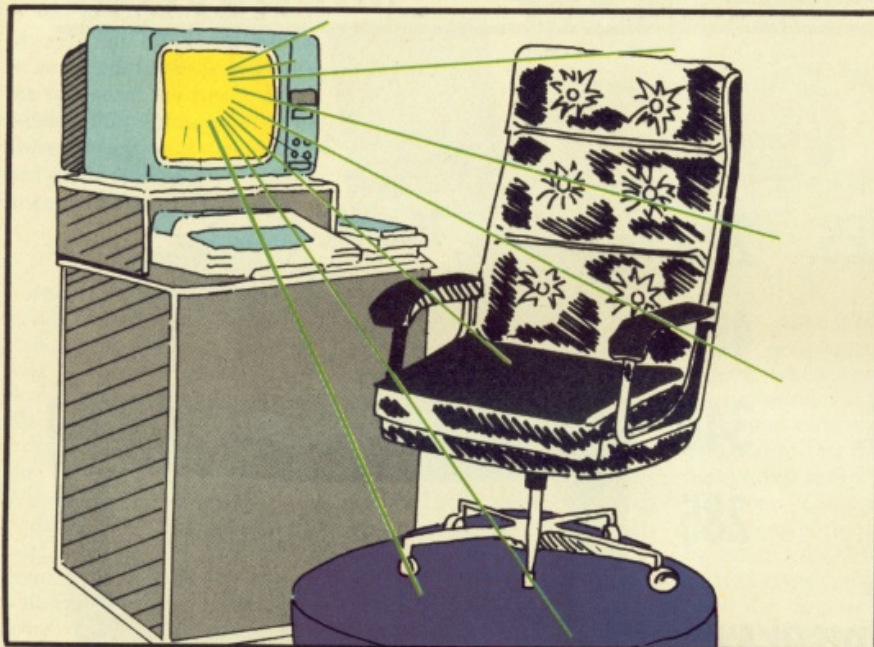
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LET'S GET QUIZZICAL



Bob Chappell asks some questions of BBCs and Spectrums.

Although Samuel Johnson is reputed to have said that questioning was not the mode of conversation among gentlemen, there's no doubt today that questioning exercises a strange fascination over much of the population. The popularity of quiz books and magazines, together with such long-running radio and TV shows as Brain of Britain, University Challenge and Mastermind practically settles any argument on that subject.

The interest shown in question-and-answer entertainment is such that it was inevitable that they would find their way onto home computers. However, does a micro-based set of quizzes have any advantages over a book containing exactly the same quizzes, bearing in mind that the book is likely to be cheaper, quicker, and more convenient to use? Like many questions, there are pros and cons.

Drawbacks

One disadvantage with a micro-based quiz is that you've got the bother of loading in the program, and then further loading of the database of questions and answers. Where a cassette has several quizzes, each of which must be loaded separately, there's the extra trouble of locating the correct start position on the tape rather than waiting around the program searches for the desired section.

Some micro quizzes attempt to match your answers against the stored ones, and this can often lead to some silliness. For example, you could type in SAINT PAUL as the answer to a question but receive the

response WRONG. THE ANSWER IS ST. PAUL. The better programs give the answers and leave you to allocate the marks.

Advantage, home computer

However, a computer-based quiz can set up and control a time limit for answering the questions. Even better, it might offer an automatic adjusting limit which sets the time limit for the next question at a lower or higher level, depending on how well you're doing. At the end of the quiz, it can provide the totals of both the marks and the time expended.

If the program has an option for two players to participate it can keep track of whose turn it is, prompting as necessary. Also, you can't accidentally cheat by flipping over to the answer page and having your eye caught by the answer to a question you haven't yet been asked.

Your starter for ten

Acornsoft, in association with Ivan Berg Software, have published six programs in their Grandmaster Quiz series for the BBC B micro. The programs are based on Weidenfield Quiz books and each one is devoted to a specific subject, backed by a famous name in that field. The topics are Crime and Detection (Julian Symons), History (John Julius Norwich), Music (Steve Race), Science Fiction (Brian Aldiss), Royalty (Anthony Holden), and Theatre (Sheridan Morley).

Each package consists of two cassettes, one holding the master program, the other

the database of 30 quizzes. As each quiz contains ten questions, you will be given a massive test (at least 300 questions, some of which require multiple answers) on your chosen subject. All the programs work to the same format and offer solo play; dual play as two competing individuals or two teams; optional time limit; auto-adjustment of time limit; self-marking (maximum two points per question); a PASS feature; and totalling of scores and timings.

The questions are attractively displayed and are phrased in many different ways. They range over a wide number of topics within a subject, and may require more than one answer. Here's a few examples: Crime and Detection — Quiz 1 Elementary, My Dear Reader; Quiz 11 The Film of the Book; Quiz 13 For Chandler Addicts. History — Quiz 4 Not Upon Oath; Quiz 6 Gunpowder, Treason and Plot; Quiz 11 Dumb Friends. Music — Quiz 4 The Singer, Not the Song; Quiz 8 Operatissimo; Quiz 12 Instrumentally Speaking.

The programs are pleasingly presented, the contents thoroughly stimulating. It's not an examination — the quizzes are meant for pleasure, to amuse rather than instruct. Excellent entertainment courtesy of Acornsoft and your BBC B.

Mensa material

Much more scientific but equally entertaining is Professor Cattell's IQ Test, published by Sinclair for the 48K Spectrum. It is a fully standardised IQ test, the object of which is to test the general ability of adults of above-average intelligence.

The whole thing takes about 1.5 hours to complete and consists of six tests. These cover synonyms, classification (find the odd one out), opposites, analogies (a is to b as c is to ?), sentence completion, and inferences (problems, puzzles and reasoning tests). Each test has a time limit for completion, such as 12 minutes to answer 25 questions. If you finish early, you get a chance to review and amend any of your solutions.

The possible answers to each question are given as a list; you merely have to pick out the one you think is correct. You are never told what the answer should be. Instead, at the end of the sixth test, you are given a report on your performance, your IQ score and a percentile rating. If you have an IQ of 147 and a percentile rating of 97, this means that 97 per cent of the population would have scored lower than you. Achieve this level of rating and the program will suggest you apply for membership of MENSA.

An excellent program, though don't take the final results too seriously since you are not really being tested under standard conditions. Apart from the entertainment value, it will give the old grey matter a thorough shake-up.

PCN

Name Grandmaster Quizzes **Price** £12.65 each
System BBC B **Publisher** Acornsoft, Cambridge
Format Cassette
Name Cattell IQ Test **Price** £12.95 **System**
Spectrum 48K **Publisher** Sinclair, Cambridge
Format Cassette

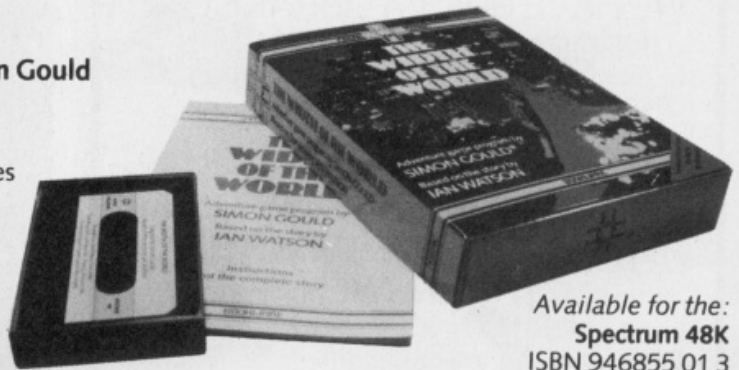
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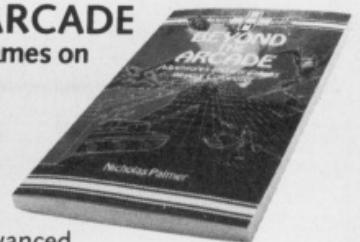
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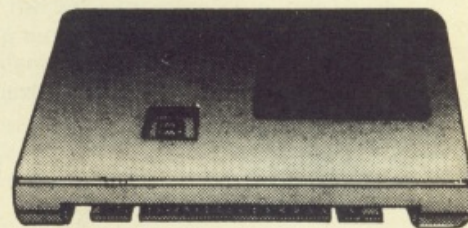


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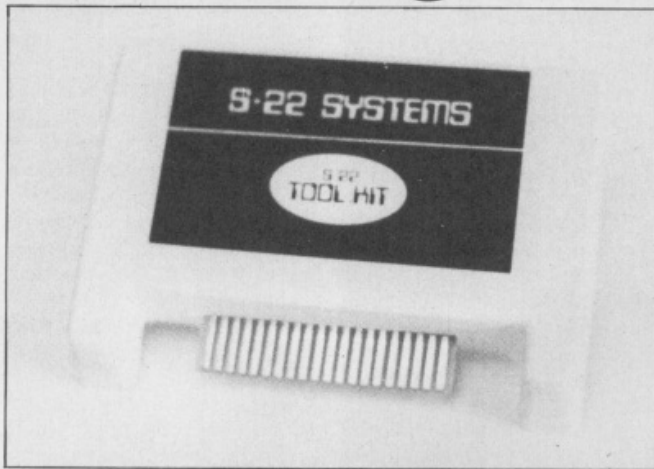
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Dig into Dragon code

The 6809 cpu at the heart of the Dragon computer is the most powerful 8-bit processor currently available—and has given rise to more software suppliers providing more assemblers, disassemblers, monitors, debuggers and so on.

The S-22 Microsystems Toolkit cartridge from Ashby Computer Centre combines many of these programming aids. Cartridges use almost no RAM at all, leaving it free for your machine code and Basic programs. But they do cost a few pounds more.



registers and stacks. Using the trace facility a program can be run one step at a time, the contents of each register shown after each step. This is obviously useful for rooting out bugs that are not immediately obvious.

Even more powerful is the ability to set the trace tables to the expected values of a register or registers, and have the trace aborted if the program produces the wrong results at any time. Display options available with this command include controlling the speed at which the trace runs.

Features

The S-22 program is co-resident with Basic, so it can be called up at any time, either directly or from within programs. Once the cartridge is in place, all that is needed to start up S-22 is to enter EXEC 49152. Documentation for the S-22 comes as a hefty manual. As well as describing all S-22 commands, this includes tutorial and pseudo data sheets on the Dragon's hardware. In addition, there is a very basic memory map of the Dragon 32 and the S-22 cartridge. Also included is the plastic-coated Action Card, listing all the 6809 instructions and their op-codes.

G – Execute commands or return to Basic
H – Toggle printer
L – Disassemble from following address
M – 'Open' memory location
N – 'Names' – delete or list
T – Trace facility
W – Produce DATA statements
Z – Reset all internal control bytes

Some of the S-22 package's main commands, each of which can be followed with a number of values or directives.

In use

Once S-22 is up and running, there are a number of commands available, each being invoked by a single key press followed by further values or directives. The G command is used to execute routines or return to Basic. H can be used to toggle printer output on and off. The manuals state that some printers may not work directly with S-22, but give no information as to which these are.

The toolkit uses the concept of opening memory locations. This can be confusing for the beginner; it's a powerful, if a little clumsy, method of addressing memory. The M command opens a memory location.

Brian Cadge welcomes a toolkit useful to all Dragon machine code programmers.

If this is followed by a space character then the last address is assumed, otherwise the hex address is entered. In addition, labels can be used; a number of predefined routines are set up in S-22, such as SOUTCHV, which displays the character in the A register. All I/O is vectored, so it is relatively simple to customise.

Once a memory location is opened, you can change it by entering the new hex value or character. This method is the only way of entering machine code or data into memory from S-22. The toolkit will allow use of labels and will calculate branch offsets for you, but there is no assembler included, and all programs you write will have to be converted manually into their hex op-codes.

This same command can also be used to search for a particular byte or string of bytes in memory, useful for locating strings of text or references to routines with JSR type jumps.

The full disassembler is invoked by the L command. The amount of memory to be disassembled can be set between 1 and 255 bytes and output can also be sent to the printer. The disassembler can be used to check programs that have been entered using M as it will point out any illegal op-codes. Once you have your routine or program working properly, you might want to put it into a Basic program, using data statements.

The S-22 w command will produce data statements at the end of the current Basic program using data in RAM, together with a Rem line to identify separate routines. S-22 does not, however, check that there is sufficient memory left for the Basic before attempting to produce it; this is left to the user.

Most useful are the three separate trace tables available, each with their pseudo

Verdict

The S-22 toolkit is a useful addition to anyone seriously interested in machine code programming at all levels. The displays produced are easy to understand and the command system is faster to use than a menu selection method. But the lack of an assembler spoils what should and could be an excellent package. The halfway approach of allowing labels and offsets is no substitute.

However, the powerful debugging techniques offered make S-22 a good competi-

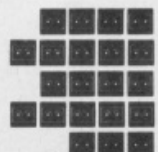
GEECH (\$C4BB) –
Get last key input
INTCH (\$C48D) –
Key input
KLINE (\$C0FE) –
Effectively 'LINE INPUT'
NAMSOR (\$C1EF) –
Sort a data table
SOUTCHV –
Output routine
SPDATA –
Sends a string of ASCII characters to SOUTCHV

S-22 features a number of built-in routines which can be called by your programs.

tor to similar packages for the Dragon, such as DASM/Demon from Compusense, Dragon Data's All Dream, and Mace from Windrush.

RATING (/5)

Features
Documentation
Performance
Reliability
Overall value



Name S-22 **Price** £39.95 **Application** Machine code utility **System** Dragon 32 (64 in 32 mode) **Format** Cartridge **Publisher** S-22 Systems **Supplier** Ashby Computer Centre, 186 Ashby High Street, Ashby, Scunthorpe, South Humberside DN16 2JR. 0724 863466.



GAMEPLAY

Bob Chappell rolls out his trusty Spectrum to test five new games cassettes.

Frantic hazards

THE SNOWMAN



Based on the delightful story by the artist and author Raymond Briggs, this arcade game from Quicksilver gets you building a large snowman. Although there are plenty of hazards to thwart your innocent pursuit, the worst that can befall you is a gentle fall into comfortable bed. In keeping with the seasonal motif of the game, there's nothing more violent than a quick trip to the land of nod.

The basic game screen is not unfamiliar. A running animated character gathers various objects lying about on multi-level platforms connected by ladders. In this case, the platforms are covered in snow, the ladders are ice chutes and you guide the Gingerbread Man-type figure through four stages of the game.

First, you must collect clumps of snow, dropping them one by one at the appointed place so that they build into a snowman. Animated gas flames toddle around the screen — they won't hurt you but will melt any snow you are carrying. A flame can be immobilised by collecting and carrying an ice lolly. An indicator shows your energy source dwindling — grabbing a roast turkey or Christmas pudding replenishes it. Bonus points if you also find time to collect Christmas crackers, presents stockings or trees.

Stages two and three have you equipping your snowman with clothes, glasses, and nose and a smile while sleep monsters try to knock you into bed but an alarm clock keeps them at bay. Preserving your completed snowman with ice cubes is the last stage, then it's on to a different layout and through the cycle again.

Snowman's quite challenging action is smooth — although moving from a chute to a platform can be tricky since your man's feet must be exactly level with the platform otherwise he won't co-operate. The graphically charming snowman is faithful to Briggs' original drawing.

FRED



Here we have another good title from Quicksilver with one of the funniest and most unlikely-looking game heroes I've seen this side of the Muppet Show. Fred is a Clousseau-like, hobnail-booted explorer in search of treasure around a labyrinth of tunnels.

Also tramping around the caves are rats, ghosts, mummies, vampires, chameleons and skeletons. None are in the least bit frightening, but you could be tickled to death by their humourously drawn appearance. The rather cuddly rats are purple balls of fluff, while the ghosts are white sheets with noses Cyrano De Bergerac would have given a year's supply of hankies to have met.

The caves' many levels are linked by ropes — Fred will automatically leap on and off them. As Fred moves (up, down, left or right), the six different screens scroll (although none too smoothly) in the appropriate directions revealing more of the labyrinth, and meaner monsters.

The game plays slowly and is not terribly exciting, but the graphics are a hoot — *The Goon Show* on a home computer.



THRUSTA



Software Projects have unveiled a new weapon for use in Earth's continuing struggle against invading wriggles from outer space — blooming great boulders.

You control a chunky little rocket ship equipped with a standard issue laser weapon. The ship flies around the platform-filled screen, blasting guardian aliens to its heart's content. What these particular creatures are guardians of are down at the bottom of the screen, neatly tucked up in individual slots — yellow, speckled, quivering eggs. They eventually crack open to hatch out octopus-impersonating aliens. Since these hatchlings turn out to be invulnerable to your laser, you have to destroy the eggs before they hatch.

Luckily, good old Mother Earth has bounteous natural resources — rocks, to be precise.

One of these will pop up somewhere on the topmost ledge; you must push it from shelf to shelf, so that when it finally falls off, it scrambles a surprised egg.

An original idea and nicely executed with crisp, smooth graphics and action. The pulsating blobs are enough to put you off henfruit for life.



BEAR BOVVER



Teddy bears were never like this in my day. Ted has taken early delivery

of Sinclair's new electric car and all he needs now are batteries to keep it running.

No problem — there they are at the top of some scaffolding. Up he climbs to retrieve a battery, quenching his thirst from time to time with a swig of milk. Trouble in the shape of skin-headed teddy bears in bovver boots arrives, strutting around the scaffolding doing their best to hamper Ted's efforts and aided by upright crocodiles. Ted obviously thinks the birch is too good for these hooligans.

Instead, he drops time bombs to drastically alleviate the harassment.

Good graphics, a catchy tune and unusual plot make this *Teddy Boys'* picnic from Artic an engaging game.

SKULL



As 3D mazes go, this one from Games Machine goes very well indeed. You are presented with a ground level perspective view of a randomly generated maze. Strewn around are crosses, keys, gems and coins which you strive to collect. Keys lock and unlock portcullises while crosses help to deal with huge diamond-eyed skulls that you encounter.

Skull is beautifully presented with clear instructions and a range of options.

Overall, it's an impressive and enjoyable game.

The Snowman; Fred, £6.95 each, Quicksilver Palmerston Park House, 13 Palmerston Road, Southampton 0703 20169, mail order/retail

Thrusta, £5.95. Software Projects, Bear Brand Complex, Allerton Road, Woolton Liverpool (051) 418 7990, mail order/retail

Bear Bovver, £5.95, Artic, Main Street, Brandesburton, Driffield 0401 43553, mail order/retail

Skull, £6.95, Games Machine, Business & Technology Centre, Bessemer Drive, Stevenage, Herts 0438 316561, mail order/retail.

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VIC 20

Mousey marvel

Name Bongo **System** Vic 20 16K exp **Price** £7.95 **Publisher** Anirog Software, 29 West Hill, Dartford, Kent **Format** Cassette **Language** Machine code **Other versions** Spectrum, Commodore 64 **Outlets** Retail/mail order

It's not every day you get the chance to win the hand of a princess, particularly one in a miniskirt, as depicted on the cassette's cover. Normally it helps to be a frog, but in this game you're Bongo the super-mouse.

Objectives

The avaricious King, more keen on his diamonds than his daughter, announces he will hand her over to anyone who finds his stolen jewels. As rodent hero Bongo, that's what you set out to do.

You find yourself in a cave where the diamonds are hidden, and where you are constantly being pursued by determined pig-like monsters.

In play

The cave's five levels are joined by ladders. There are several gaps in the layer floors, which you can jump over using trampolines, or you can slide down chutes to lower floors. When the game starts the first flashing diamond appears.

Hot on your tail is the smarter-than-average porky monster who can jump across the gaps unaided. He is, though,

frightened of using the chutes.

As you make your way to the first diamond, you must catch letters making up Bongo's name to score 1000 points. This is definitely a game of strategy and, until you increase your cunning, the monster will nab you infuriatingly quickly.

Using two transporters at the left of the screen craftily will gain a little time as does sliding down a chute just as the monster jumps over the gap, but any slight adjustment in your timing is fatal.

The monster shadows you at the same plodding speed, and even the slightest contact (disputable sometimes) means you topple into the river below. Surprisingly for a mouse, however, you have nine lives.

An extra life is given to Bongo on 10,000 points. Control is joystick only, using the fire button to trampoline, slide or transport. There are three levels of difficulty, the second and third having two monsters. One's bad enough—two is nigh on impossible.

Verdict

Bongo and the monsters are impressively large and detailed, but that means the action is slow. This does not result in a simple game and only the most cunning and patient of Bongos will win the princess and live happily ever after.

Nickie Robinson

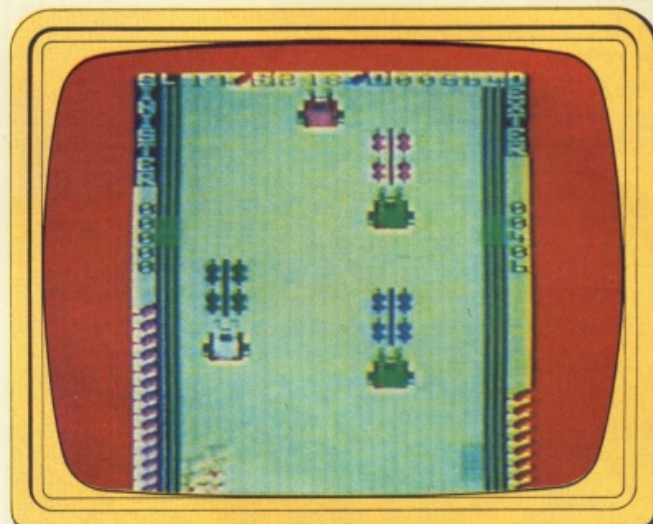
RATING (/5)

Lasting appeal

Playability

Use of machine

Overall value



Roman racers

Name Chariot Race **Price** £6.95 **System** Unexpanded Vic 20 **Format** Cassette **Other versions** None **Supplier** Micro Antics, Littlehome, Hawthorne Lane, Codsall, Staffs (09074) 5147 **Outlets** Mail order/retail

If we said: 'Here is a game with good, fast colour graphics, needs skill and can be played by two players at the same time', you'd be forgiven for expecting it to need at least 8K expansion. You'd be wrong. Chariot Race runs on the unexpanded Vic 20.

Objectives

A little on the Road Racer theme; this game has more thrills and spills than average. You have to guide your chariot up the screen, between the walls of the grandstand, in competition with the other player and other Vic chariots.

The left hand player is called Sinister, the right's Dexter—all in true Roman fashion. Each player has four control keys; left, right, faster and slower. There is no joystick option.

In play

Survival is everything at first. Then you'll want to knock up a few points by bumping other chariots into the side walls. Every so often a buttress sticks out from the walls and you have to keep opponents pinned against the wall until their chariot smashes into it.

If you go too slowly, the crowd will get restless and throw fireballs on the course, which can mean instant anni-

hilation. The more points you get, the more speed the crowd expects.

Your pushing power is depleted when you have a go at another chariot and is replenished if you don't then use the direction controls. It's all too easy to run out of pushing power and find yourself trapped between chariots with buttresses coming up at warp ten.

To successfully carve up a chariot you have to smash your chariot's wheels against the other chariot's horses. Then move left or right to push the chariot up against a wall. At this point, slow up—or the chariot may duck out from behind you. You could run out of pushing power and be repulsed, so to speak, so keep an eye on your power indicator. It's possible to trip up other chariots to get points; you do this by backing into them.

Scoring for destroyed chariots is related to your speed. A Vic chariot is worth twice your speed, the other player counts for twice that, while crossing the finishing line gives you eight times your velocity. Dangerous as it may be, it really pays to keep the heat on.

Verdict

The graphics may not be brilliant and the screen design is simple, but given the limitations of 3.5K of RAM, it requires intense concentration, and two players can enjoy the game at the same time.

Bryan Skinner

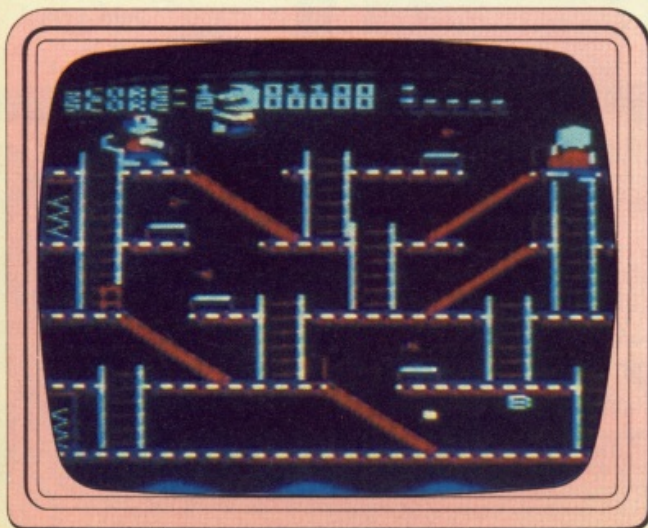
RATING (/5)

Playability

Lasting appeal

Use of machine

Overall value



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Mike and Peter Gerrard are regular contributors to *Which Micro?* and *Personal Computer News*. Peter Gerrard is the author of many titles in the Duckworth Home Computing list, including the Exploring Adventures series, and contributes to *Popular Computing Weekly*, *Commodore Horizons* and *Micro Adventurer*.



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MENU

Kenn Garroch's utility for the BBC micro displays your disk catalogue in a neat four column array. You can then choose a file and execute it.

To begin with the file at the top left of the display is highlighted in red and you can move this highlight around like a cursor using the cursor keys. When you have positioned the cursor on the file you want to work with, press return to execute it. If it is a text file it will try and load the ROM word processor (Wordwise to be exact), if you have one, if not then a syntax error will be generated.

If it is a Basic file, it is automatically chained, ie loaded and RUN. Machine code files are loaded to their specified load addresses and then run from their execute addresses.

The program contains a number of useful utilities that may be extracted and used elsewhere; in fact, they were written with this in mind as the procedures and functions nearly all use Local variables.

Once the program is typed in and running, it can be made to auto boot with the following:

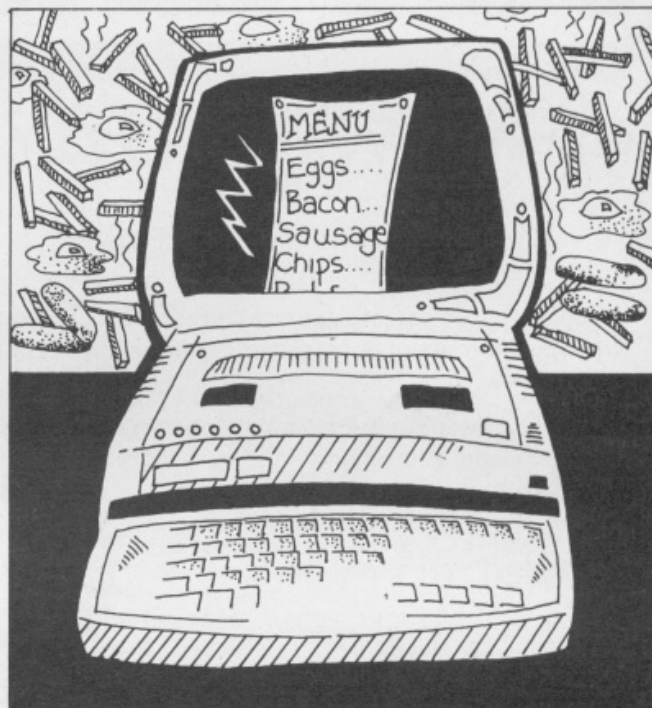
*BUILD !BOOT

1 CHAIN"MENU"

2 <ESCAPE>

*OPT 4,3

Pressing shift and Break will now automatically run the Menu program.



Title: Menu
Machine: BBC
Language: BBC Basic
Application: Utility
Author: Kenn Garroch

10	Screen mode 7 for serial attributes
20-30	Dim two arrays to hold the catalogue information
40-50	Set aside a block memory
60	Read catalogue from disk
70	Format the catalogue information
80	Print catalogue on the screen
90	Execute selected file
100	Repeat
110	Start definition of PROCKAT
120	Set up local variables
130	Read disk, track 0, sector 0
140-180	Read file names into array
190	Read disk, track 0, sector 1
200-220	Read file information into Kat array
240-400	Standard track sector read write routine using OSWORD &7F
410	Define procedure to print catalogue
440-445	List title in double lines
450	Move cursor
460-480	Prints formatted file names on the screen
490	Print last three files

```
>L.
10MODE 7
20DIM KAT$(31)
30DIM KAT(31)
40DIM BLK 256
50DIM PARA 10
60PROCKAT
70PROCFORM
80PROC PKAT
90PROCEXEC
100GOTO90
110DEFPROCKAT
120LOCAL S%,T%
130PROC RW DISK(0,0,1)
140FOR T%=0 TO 31
150FOR S%=0 TO 7
160KAT$(T%)=KAT$(T%)+CHR$(?((T%*8)+S%+
BLK))
170NEXT
180NEXT
190PROC RW DISK(0,1,1)
200FOR T%=0 TO 31
210KAT(T%)=!((T%*8)+BLK)
220NEXT
230ENDPROC
240DEFPROC RW DISK(T,S,RW)
250REM READ IS 1 ****
260LOCAL RDWT
270IF RW=1 THEN RDWT=&53 ELSE RDWT=&4B
280? PARA=0
290! (PARA+1)=BLK
300? (PARA+5)=3
310? (PARA+6)=RDWT
320? (PARA+7)=T
330? (PARA+8)=S
340? (PARA+9)=&21
350A%=&7F
360X%=PARA MOD 256
370Y%=PARA DIV 256
380CALL &FFF1
```


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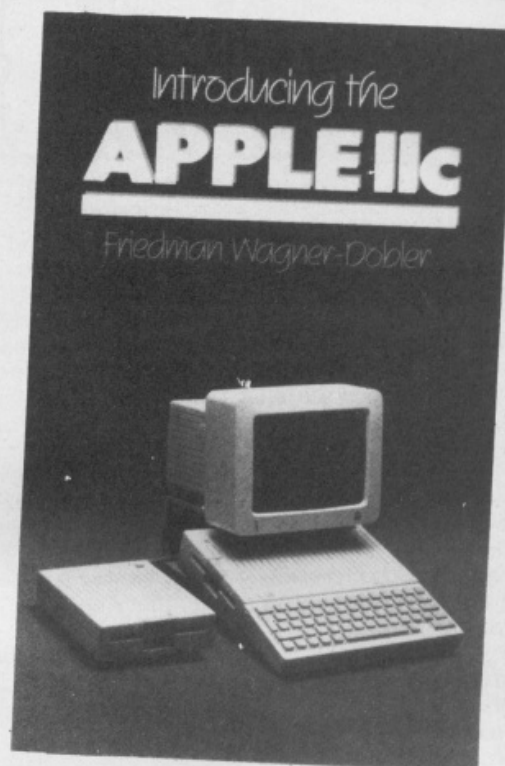
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Disc: £27.75

Cartesian is fun to use, which should go a long way towards ensuring that it is used, and it is both powerful and flexible enough to be of real benefit to any serious student of mathematics.

-Hobby Electronics

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FILE BASE

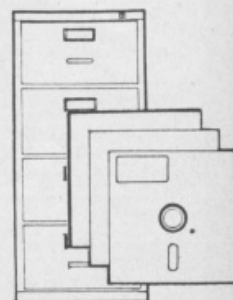
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MENU

47

- 510 Define a function to select a file
- 520 Define editing keys as ordinary keys
- 530 Set up pointers
- 540 Highlight first file name in red (could change first attribute to flash etc)
- 550 Gets a key
- 560 Turn off highlight
- 570-600 Test for cursor keys and updates H and V accordingly
- 610 Check for carriage return
- 630-650 Makes the cursor wrap around
- 660 Renew highlight
- 680 Repeat
- 690 Return keys to editing mode
- 700 The result of the function is the file number
- 710-770 Format Kat\$ with directory name
- 780 Get file number
- 810 If a text file then executes word processor
- 820 If Basic file then chain it. NB If 1982 Basic then 8023 should be 801F
- 830-840 Set x and y registers to point to Para
- 850 POKE file name into Para
- 860 Execute OSCLI on machine code file
- 880-1050 Execute word processor. NB This is set up for Wordwise and will need modification for others.

PCN



```

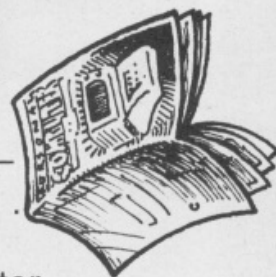
390 IF ?(PARA+10)<>0 THEN VDU 7:PRINT T
AB(0,22)"RW ERROR ";ERR
400 ENDPROC
410 DEFPROC PKAT
420 LOCAL T
430 CLS
440 PRINT CHR$(141);"Disk Title :";KAT$(
0)
445 PRINT CHR$(141);"Disk Title :";KAT$(
0)
450 VDU 31,0,9
460 FOR T=1 TO 27 STEP 4
470 PRINT;" ";KAT$(T);" ";KAT$(T+1);" "
;KAT$(T+2);" ";KAT$(T+3)
480 NEXT
490 PRINT;" ";KAT$(T);" ";KAT$(T+1);" "
;KAT$(T+2)
500 ENDPROC
510 DEFFN FILE
520 *FX 4 1
530 H=0:V=9
540 PRINT TAB(H,V);CHR$(129);TAB(H+10,V
);CHR$(135);:VDU 31,H,V
550 A=GET
560 PRINT TAB(H,V);CHR$(135);
570 IF A=136 THEN H=H-10
580 IF A=137 THEN H=H+10
590 IF A=138 THEN V=V+2
600 IF A=139 THEN V=V-2
610 IF A=13 THEN 690
620 IF H<0 THEN H=0:V=V-2
630 IF H>37 THEN V=V+2:H=0
640 IF V>24 THEN V=9
650 IF V<9 THEN V=23
660 PRINT TAB(H,V);CHR$(129);TAB((H<29
)*-H)+10,V);CHR$(135);:VDU 31,H,V
680 GOTO 550
690 *FX 4 0
700 =INT(((V-9)*4)/2+(H/8))+1
710 DEFPROC FORM
720 LOCAL T
730 FOR T=1 TO 31
740 IF KAT$(T)=(STRING$(8,CHR$(0))) THEN
KAT$(T)=" "
750 KAT$(T)=RIGHT$(KAT$(T),1)+". "+LEFT$(
KAT$(T),7)
760 NEXT
770 ENDPROC
780 DEFPROC EXEC
790 A=FN FILE
800 CLS
810 IF (KAT(A) AND &FFFF)=0 THEN PROCWO
RD(KAT$(A))
820 IF (KAT(A) AND &FFFF0000)=&80230000
THEN CHAIN KAT$(A)
830 X%=PARA MOD 256
840 Y%=PARA DIV 256
850 *PARA=RIGHT$(KAT$(A),7)
860 CALL &FFF7
870 ENDPROC
880 DEFPROC WORD(A*)
890 LOCAL T
900 *FX 138,0,42
910 *FX 138,0,87
920 *FX 138,0,46
930 *FX 138,0,13
940 *FX 138,0,32
950 *FX 138,0,50
960 X%=0
970 A%=138
980 Y%=PARA DIV 256
990 FOR T=1 TO LEN(A*)
1000 Y%=ASC(MID$(A*,T,1))
1010 CALL &FFF4
1020 NEXT
1030 *FX 138,0,13
1040 *FX 138,0,55
1050 END

```


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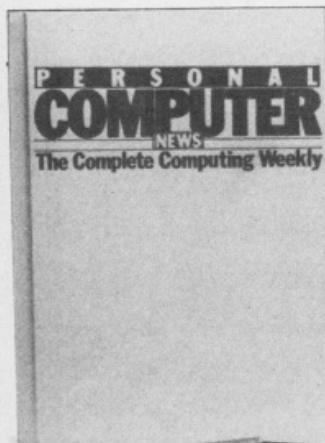
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PCN Billboard

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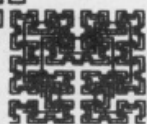
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"... I haven't seen any other compiler that could match Hisoft's Pascal" ... *Using the Spectrum Micro — Autumn 1983.*

"This is a very impressive product ... of benefit to any Spectrum programmer" ... *David Bolton ZX COMPUTING Aug/Sept 1983.*

Just two comments from full length reviews of our powerful and virtually full implementation of Standard Pascal. The advantages of using the Pascal language are many; fast, self-documenting and truly structured programming — many schools and universities insist on a good knowledge and understanding of Pascal for their Computer Studies courses.

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Hisoft Pascal for the ZX Spectrum now comes complete with ZX Microdrive support (anything you can do with tape you can do with Microdrive) and a Turtle Graphics package which allows easy creation of complex graphic programs.

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"... DEVPAC is most highly recommended. The documentation is first class" ... *Your Computer — May 1983.*

"... it is impossible to recommend any other development package for the Spectrum over DEVPAC." ... *Adam Denning — ECM April 1984.*

Need we say more? DEVPAC 3 is a very powerful assembler, editor and disassembler/debugger. Forget about buying lots of separate packages for your machine-code development — it's all in DEVPAC 3. A full Z80 assembler with conditional assembly, all standard directives, full arithmetic (*, /, +, -, OR, XOR, AND, MOD), many assembler commands for controlling object code generation, listing, printing etc., full line editor with advanced facilities like search/replace string, 'include' facility that lets you assemble from tape (or Microdrive) without taking up memory for your source text AND a superb disassembler/debugger with 'front panel' display of Z80 registers and flags with commands like search for string of bytes, copy memory, disassemble memory (to an assembler textfile, if you wish), list memory in ASCII, set multiple breakpoints, and, above all, single-step through machine code programs, one instruction at a time, **EVEN IN ROM!**

DEVPAC comes complete with a 45 page user manual.

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On a sticky wicket



You gave an unusually muted response to the Laughline competition in issue 62 — perhaps you thought it irrelevant to lampoon the greatest living Englishman?

There were some pretty hostile deliveries from one or two entrants but when the scorecard was totted up we decided that the most appropriate opening partner was Jon Abbot of Cookridge, Leeds (and Yorkshire). He put the cheery beam on Sir Geoffrey's face down to the fact that he is saying: 'I bet it doesn't make its RUNS as fast as me!'

Thanks, Jon, the £20 will be on its way soon; and thanks to everybody else who entered this time round.

SUNTAX ERRORS

The PCN Charts in Issue 63 listed Peaksoft's The Boss at number 14 and climbing — but the price we quoted, £6.95, was out by £2. The Boss costs £8.95.

Last week's review of the Riteman printer was actually written by Tom Sato and not Kenn Garroch. Sorry, Tom.

... And cats like it too

The Courier in Tunbridge Wells has scooped the world with news of a remarkable peripheral that ACT has managed to keep under wraps so far.

It printed this priceless snippet last week in a piece on the Apricot:

It weighs only 17½lb and the 90 character keyboard fits inside the systems box. There is a separate high resolution monitor but a small liquid crystal display (LCD) screen is incorporated in the keyboard, and a mouse trap.

MJ Edwards of Tunbridge Wells wins £5 for spotting this for the PCN Gibberish and Misprints Bug Hunt.

We suggest he spends it on cheese.

NEXT WEEK

Advancing — British micros march on with the Advance 86, featured on the cover and Pro-Tested inside.

Still spritely — Step this way for the machine code approach to good graphics on the Dragon.

Atari diskola — We look at a drive that offers Atari users more than just storage capacity.

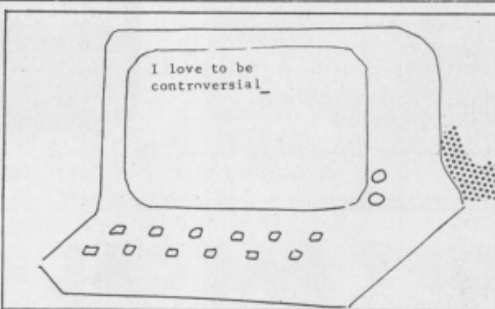
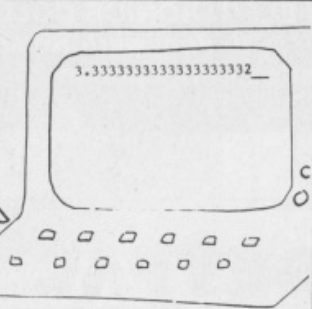
Win an Amstrad — the UK's most talked about micro of the moment is the prize in next week's competition.

Gameplay — Reviews of the latest software for the Spectrum, BBC, and Commodore 64.

PAL2000

by Mollusc

What's 10 divided by 3



PCN DATELINES

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

Organisers who would like details of coming events included in

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

UK EVENTS

Event	Dates	Venue	Organisers
IBM User Show	June 12-14	Wembley Complex	Online Conferences 01-868 4466
Computer Fair	June 14-17	Earls Court	Reed Exhibitions 01-643 8040
Compec North	June 19-21	Belle Vue, Manchester	Reed Exhibitions 01-643 8040
National Conference and Exhibition on Computers in Personnel	June 26-28	Royal Lancaster Hotel, London	Peter Mirrington Exhibitions 0277 232030
Networks 84	July 3-5	Wembley Complex	Online Conferences 01-868 4466
PC User Show	July 3-5	Novotel Hotel, London W6	Daniel Evans 01-837 3699 ext 244
Microtrade '84	July 4-6	Barbican, London	Montbuild Ltd 01-486 1951
Artificial Intelligence for Society Conference	July 6	Brighton Polytechnic	Dr Gill, 0273 693655
Electron & BBC Micro User Show	July 19-22	Alexandra Palace, London	Database Publications, 061-456 8383

OVERSEAS EVENTS

Event	Dates	Venue	Organisers
International Computer Show for Office, Home, Hobby	June 14-17	Cologne, Germany	German Chamber of Industry and Commerce 01-930 7251
National Computer Conference and Exhibition	July 9-12	Las Vegas, USA	American Federation of Information Processing Societies Inc. 0101 703 620 8900

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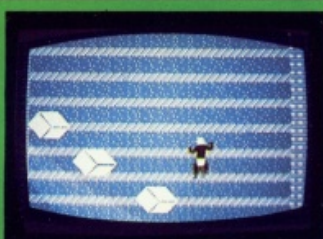
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Forbidden Forest is more of a quest than just a game! The action takes place in a four dimensional scrolling forest landscape which many have entered, but none has returned. Yes, I did say FOUR dimensional - day fades into night as the action unfolds! The quest is to seek out and destroy the Demogorgon, mystic ruler of the Forbidden Forest. Before you can even set eyes on him you will have to contend with his army of fearsome creatures, including mutant spiders, showers of giant frogs, snakes, dragons, skeleton soldiers and more! You have only your trusty bow and arrows to depend on!



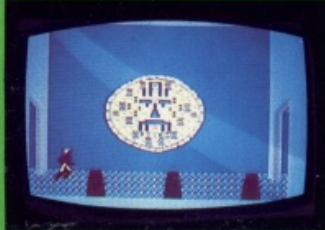
SS018



AZTEC CHALLENGE

A challenge on an epic scale! Aztec Challenge takes you on a journey to Mexico and the ancient pyramid of Tenochtitlan. The ancient Aztec gods and their devotees have ensured that no ordinary human can learn the secrets of the temple and live to tell the tale. The pyramid is protected by all

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



SS019

SLINKY

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



SS020

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